DOE/PC/62684-T2(Pt.2)

(DE86015392)

Distribution Category UC-90b

Department of Chemical and Petroleum Engineering

Department of Industrial Engineering,
Engineering Management and Operations Research

University of Pittsburgh

Pittsburgh, Pennsylvania 15261

MASTER

COMPUTER SIMULATION OF
COAL PREPARATION PLANTS

FINAL REPORT

PART II - USER'S MANUAL

December, 1985

U.S. Department of Energy Contract No. DE-AC22-83PC62684

Prepared by

Byron S. Gottfried
Professor of Industrial Engineering, Engineering Management
and Operations Research
University of Pittsburgh

John W. Tierney
Professor of Chemical and Petroleum Engineering
University of Pittsburgh

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

ACKNOWLEDGEMENTS

Many people have contributed to the success of this project over a period of several years. We especially want to thank Albert W. Deurbrouck, Director of the U.S. Department of Energy Coal Preparation Laboratory at the Pittsburgh Energy Technology Center, for having had the foresight to initiate this project and for his continuing interest and support over the years.

We also wish to thank the following people for their substantial contributions: Dr. Peter L. Luckie and Mark Klima (Pennsylvania State University), Rand Batchelder and John T. Wizzard (U.S. Dept. of Energy), P. Stanley Jacobsen (Burns & Roe Services Corp.), Dr. A. Vaillant (Automated Process Surveys), Dr. J. Abara, Wayne Baughman, Dr. Monica Mengoli Chaves, Nancy Ciezlak, Nancy Fallon, Taryn Melkus and Guan-Qi Zhao (University of Pittsburgh).

Finally, we wish to thank the U.S. Department of Energy for supporting this project under contract no. DE-AC22-83PC62684

I. INTRODUCTION

Coal preparation, commonly known as coal washing, offers a practical and economical approach to the removal of ash and pyritic sulfur from raw coal. For example, the ash in a typical U.S. Northern Appalachian bituminous coal can typically be reduced from 14 percent to 6 percent and the total sulfur from 3 to 1.5 percent, at yields ranging from 60 to 90 percent, using existing coal preparation technology.

A typical coal preparation plant consists primarily of various interconnected crushing, screening, classifying, washing, dewatering, drying and thickening units. Several different types of washing units may be used, because each piece of washing equipment is best suited for a certain characteristic size fraction of coal. The crushers break the coal into the proper sizes, and the screens and classifying units separate the crushed coal into appropriate size fractions. The dewatering and thermal drying units reduce surface moisture to acceptable limits. These various units are interconnected in a number of ways, the choice being dependent upon the characteristics of the coal being processed and the desired degree of beneficiation.

The principal consideration in operating a coal preparation plant is to maximize the yield of clean coal while reducing the impurities to an acceptably low level. In addition, in assessing the possible interconnection of units in an existing plant, or when a new plant is being considered, it is essential that the optimum configuration be determined for a given degree of cleaning. Usually these matters are handled by some prudent combination of experience and experimentation. A computerized plant simulator can be an effective aid, however, in comparing

alternatives provided the simulator is sufficiently comprehensive to describe the conditions found in actual industrial practice.

This report describes a comprehensive computer program that allows the user to simulate the performance of realistic coal preparation plants. The program is very flexible in the sense that it can accommodate any particular plant configuration that may be of interest. This allows the user to compare the performance of different plant configurations and to determine the impact of various modes of operation with the same configuration. In addition, the program can be used to assess the degree of cleaning obtained with different coal feeds for a given plant configuration and a given mode of operation. Hence, the user is able to consider a wide variety of alternatives through the use of this simulator.

A plant configuration may contain as many as 100 units and 200 flowstreams, though it is unlikely that an actual configuration will be this large. Thus, for all practical purposes, there are no restrictions on the number of units or flowstreams within a proposed plant configuration.

Use of the simulator requires that the user specify the appearance of the plant configuration, the plant operating conditions, and a description of the coal feed. The simulator will then determine the flowrates within the plant, and a description of each flowrate (i.e., the weight distribution, percent ash, pyritic sulfur and total sulfur, moisture, and BTU content).

The simulation program has been written in modular form using the Fortran language. Some Fortran-77 features are used, though most of the program is written in Fortran IV (Fortran-66). It can be implemented on a great many different types of computers, ranging from large scientific mainframes to IBM-type personal computers with a fixed disk. Some customization may be required, however, to ensure compatibility with the features of Fortran available on a particular computer.

Part I of this report contains a general description of the methods used to carry out the simulation. Each of the major types of units is described separately, in addition to a description of the overall system analysis. Part II is intended as a user's manual. It contains a listing of the mainframe version of the program, instructions for its use (on both a mainframe and a microcomputer), and output for a representative sample problem.

Copies of the program can be obtained in machine-readable form from:

Coal Preparation Analysis Laboratory
Pittsburgh Energy Technology Center
U.S. Department of Energy
P.O. Box 10940
Pittsburgh, PA 15236

II. USE OF THE SIMULATOR

To use the simulator, the following information must be provided:

1. For each major plant component (unit), appropriate unit settings (control parameters).
2. The origin and destination of each flowstream.
3. A screen analysis of the raw feed.
4. A specific gravity analysis for the overall feed (i.e., the distribution of weight, ash, pyritic sulfur, total sulfur, and moisture content).
5. Constants for calculating the BTU content of the coal as a function of its ash content (default values are provided if these constants are unavailable).
6. Economic data for the particular plant configuration.

Numerical values must also be provided for other parameters, such as the feed rate, total number of units, total number of flowstreams, and type of output required.

The output generated by the simulator will include the following information:

1. A summary of the input data specifying the plant configuration, the control variables, BTU data, economic data and several miscellaneous program parameters.
2. A table summarizing the yield and BTU recovery of each unit within the plant.

3. A table summarizing the flowrate, composition, BTU content, lbs SO₂/MM BTU, and moisture content for each flowstream in the plant.
4. An overall plant summary table, including a description of each stream entering or leaving the plant, overall yield data, an overall water balance summary, and overall cost data.

In addition, the simulator can generate optional tables giving more detailed information about each unit and each flowstream. Specifically, the simulator can generate

1. A table summarizing the performance of each unit, by feed size fractions and for the entire feed composite.
2. A complete specific gravity analysis for each flowstream.

The unit summary tables can be printed out by themselves, or the unit summaries can be followed by the flowstream summaries. The latter option is voluminous, though it provides the most complete level of output information.

The simulator employs a highly modularized structure, requiring about 64K words of memory on a mainframe computer. Memory requirements can be further reduced through the use of an overlay structure, though this may result in longer execution times.

The program typically requires less than one minute of running time on a large computer. For example, a plant configuration consisting of 19 units and 32 flowstreams was simulated on a DECsystem-10 computer in about 32 seconds (compilation required another 57 seconds).

The microcomputer version of the simulator has been designed to run on an IBM Personal Computer (or compatible computers using the MS DOS operating system) equipped with a fixed (hard) disk. A minimum of 512K bytes of memory is recommended, though 640K is suggested. A numerical coprocessor is also highly recommended.

The sample plant configuration containing 19 units and 32 flowstreams, which required 32 seconds of execution time on a DECsystem-10 mainframe computer, required 8 minutes of execution on an IBM PC-AT equipped with an 80287 numerical coprocessor. Compilation required substantially longer.

A special program to facilitate the creation and editing of the input data has been developed for the microcomputer version of the simulator. This program is self-prompting, and it contains error-traps which prevent the entering of inappropriate information. The program is distributed with the simulator, on a floppy disk.

III. MAINFRAME VERSION OF THE SIMULATOR

The mainframe version of the simulation program has been developed for a DECsystem-10 computer, though it has been used on many other large computers. The program is written in Fortran IV (Fortran-66) though it makes use of random data file procedures, which are not standardized. Some minor modifications may be required when implementing the simulator on another computer, particularly with respect to the use of random data files.

Mainframe memory requirements are under 64K words. Typical execution time is less than one minute for a realistic preparation plant configuration. A substantial amount of output may be generated by the program, particularly if the more detailed output levels are selected.

A complete listing of the mainframe source program is given on the following pages.

```

00001 C *****
00002 C   COAL PREPARATION PLANT SIMULATOR   *
00003 C                                     *
00004 C   UNIVERSITY OF PITTSBURGH           *
00005 C                                     *
00006 C   MAINFRAME VERSION 4.1             *
00007 C                                     *
00008 C   AUGUST, 1985                      *
00009 C                                     *
00010 C   THIS PROGRAM WAS DEVELOPED AT THE UNIVERSITY OF PITTSBURGH AND   *
00011 C   THE PENNSYLVANIA STATE UNIVERSITY, UNDER SPONSORSHIP OF THE   *
00012 C   U. S. DEPARTMENT OF ENERGY, PITTSBURGH ENERGY TECHNOLOGY CENTER, *
00013 C   COAL PREPARATION AND ANALYSIS LABORATORY                       *
00014 C                                     *
00015 C   ALBERT W. DEURBROUCK, CHIEF                                       *
00016 C                                     *
00017 C   RAND BATCHELDER, TECHNICAL PROJECT OFFICER                       *
00018 C                                     *
00019 C   PRINCIPAL CONTRIBUTORS:                                           *
00020 C                                     *
00021 C   BYRON S. GOTTFRIED, PROFESSOR OF INDUSTRIAL ENGINEERING         *
00022 C   UNIVERSITY OF PITTSBURGH                                         *
00023 C                                     *
00024 C   JOHN W. TIERNEY, PROFESSOR OF CHEMICAL ENGINEERING              *
00025 C   UNIVERSITY OF PITTSBURGH                                         *
00026 C                                     *
00027 C   PETER T. LUCKIE, PROFESSOR OF MINERAL ENGINEERING               *
00028 C   PENNSYLVANIA STATE UNIVERSITY                                   *
00029 C                                     *
00030 C *****
00031 C
00032 C PRINCIPAL ARRAYS AND VARIABLES                                     *
00033 C                                     *
00034 C   IU           = UNIT INDEX (FLOWSHEET IDENTIFICATION)             *
00035 C                 (SPECIFY IN ORDER THAT CALCULATIONS WILL BE       *
00036 C                 CARRIED OUT)                                       *
00037 C   L(IU)        = DESIGNATES TYPE OF UNIT                           *
00038 C                                     *
00039 C                 L= 1 FOR CONCENTRATING TABLE                     (D1,D2) *
00040 C                 L= 2 FOR DENSE-MEDIUM VESSEL                     (D1,D2) *
00041 C                 L= 3 FOR DENSE-MEDIUM CYCLONE                     (D1,D2) *
00042 C                 L= 4 FOR HYDROCYCLONE                             (D1,D2) *
00043 C                 L= 5 FOR SINGLE-STAGE BAUM JIG                     (D1,D2) *
00044 C                 L= 6 FOR TWO-STAGE BAUM JIG                         (D1,D2) *
00045 C                 L= 7 FOR SINGLE-STAGE BATAK JIG                     (D1,D2) *
00046 C                 L= 8 FOR TWO-STAGE BATAK JIG                       (D1,D2) *
00047 C                 L= 9 FOR SAND CONE                                 (D1,D2) *
00048 C                 L=10 FOR DYNABHIRLPOOL                             (D1,D2) *
00049 C                 L=19 FOR FROTH FLOTATION                           (D1)   *
00050 C                                     *
00051 C                 L=21 FOR ROTARY BREAKER                             (D1,D2,D3) *
00052 C                 L=22 FOR PRIMARY MULTIPLE ROLL CRUSHER             (D1)   *
00053 C                 L=23 FOR PRIMARY GYRATORY/JAW CRUSHER              (D1)   *
00054 C                 L=24 FOR PRIMARY SINGLE ROLL CRUSHER               (D1)   *
00055 C                 L=25 FOR PRIMARY CAGE MILL CRUSHER                 (D1)   *
00056 C                 L=26 FOR SECONDARY MULTIPLE ROLL CRUSHER           (D1)   *

```



```

00057 C          L=27 FOR SECONDARY GYRATORY/JAW CRUSHER      (D1)      *
00058 C          L=28 FOR SECONDARY SINGLE ROLL CRUSHER      (D1)      *
00059 C          L=29 FOR SECONDARY CAGE MILL CRUSHER        (D1)      *
00060 C
00061 C          L=31 FOR DRY UPPER SCREEN                    (D1)      *
00062 C          L=32 FOR DRY LOWER SCREEN                  (D1)      *
00063 C          L=33 FOR WET UPPER SCREEN                   (D1,D2)   *
00064 C          L=34 FOR WET LOWER SCREEN                   (D1,D2)   *
00065 C
00066 C          L=41 FOR STREAM BLENDER                      (D1)      *
00067 C
00068 C          L=51 FOR STREAM SPLITTER                     (D1)      *
00069 C
00070 C          L=81 FOR CENTRIFUGE (PERFORATED BASKET)       (D1,D2,D3) *
00071 C          L=82 FOR CENTRIFUGE (VIBRATING BASKET)     (D1,D2,D3) *
00072 C          L=83 FOR CENTRIFUGE (SOLID BOWL)           (D1,D2,D3) *
00073 C          L=84 FOR CONTINUOUS DISK FILTER              (D1,D2,D3) *
00074 C          L=87 FOR THERMAL DRYER                     (D1,D2,D3) *
00075 C          L=89 FOR THICKENER                          (D1,D2,D3) *
00076 C
00077 C          L=71 FOR CLASSIFIER HYDROCYCLONE            (D1,D2)   *
00078 C          L=72 FOR SIEVE BEND                          (D1,D2)   *
00079 C
00080 C          D1(IU)    = UNIT DECISION VARIABLE            *
00081 C          D2(IU)    = UNIT DECISION VARIABLE            *
00082 C          D3(IU)    = UNIT DECISION VARIABLE            *
00083 C          VSLYLD(IU) = YIELD FOR A GIVEN UNIT           *
00084 C          VSLBTU(IU) = BTU RECOVERY FOR GIVEN UNIT       *
00085 C          WATER(1,IU) = WATER DEMAND FOR UNIT IU IN GAL/MIN (EITHER FRESH *
00086 C                       WATER OR WATER FROM THICKENER - VALUE SUPPLIED BY *
00087 C                       USER)                            *
00088 C          WATER(2,IU) = WATER LEAVING UNIT IU IN GAL/MIN (DOES NOT INCLUDE *
00089 C                       WATER IN FLOWSTREAMS - CALCULATED BY PROGRAM)       *
00090 C
00091 C          IF        = FLOWSTREAM INDEX (FLOWSHEET IDENTIFICATION)       *
00092 C          KF(1,IF) = UNIT DESIGNATION OF FLOWSTREAM ORIGIN           *
00093 C                       (O INDICATES AN EXTERNAL ORIGIN)           *
00094 C          KF(2,IF) = UNIT DESIGNATION OF FLOWSTREAM DESTINATION       *
00095 C                       (O INDICATES AN EXTERNAL DESTINATION)       *
00096 C          FLOW(IF) = FLOW RATE, EXPRESSED AS A FRACTION OF THE PLANT *
00097 C                       FEED STREAM                       *
00098 C          S(IF)    = SYMBOL INDICATING TYPE OF FLOWSTREAM       *
00099 C                       C    INDICATES A CLEAN COAL STREAM       *
00100 C                       M    INDICATES A MIDDINGS STREAM       *
00101 C                       R    INDICATES A REFUSE STREAM       *
00102 C                       U    INDICATES A SCREEN OVERFLOW (UPPER) STREAM *
00103 C                           OR A SPLITTER OVERFLOW (UPPER) STREAM       *
00104 C                       L    INDICATES A SCREEN UNDERFLOW (LOWER) STREAM *
00105 C                           OR A SPLITTER UNDERFLOW (LOWER) STREAM       *
00106 C                       S    INDICATES A SOLIDS STREAM FROM A DEWATERING UNIT *
00107 C                           (C, M OR R ARE ALSO ACCEPTABLE)       *
00108 C                       W    INDICATES A WATER STREAM FROM A DEWATERING UNIT *
00109 C
00110 C          I        = DESIGNATES SIZE INCREMENT OF COAL       *
00111 C          J        = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL       *
00112 C          K        = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR *

```

```

00113 C      (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE ENTIRE *
00114 C      STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT) *
00115 C      SIZE(I)      = BOUNDARIES OF COAL SIZE INCREMENTS *
00116 C      WT(I)       = WEIGHT OF COAL IN VARIOUS SIZE INCREMENTS *
00117 C      GBOUND(J)   = BOUNDARIES OF SPECIFIC GRAVITY INCREMENTS *
00118 C      GRAV(J)     = SPECIFIC GRAVITIES *
00119 C      FEED(I,J,K)  = PROPERTIES OF THE FEED STREAM *
00120 C      CC(I,J,K)   = PROPERTIES OF THE CLEAN COAL *
00121 C      REF(I,J,K)  = PROPERTIES OF THE REFUSE *
00122 C      MID(I,J,K) = PROPERTIES OF THE MIDDINGS *
00123 C *
00124 C      WFEED      = MOISTURE CONTENT OF THE FEED STREAM *
00125 C      WCC       = MOISTURE CONTENT OF THE CLEAN COAL *
00126 C      WREF      = MOISTURE CONTENT OF THE REFUSE *
00127 C      WMID      = MOISTURE CONTENT OF THE MIDDINGS *
00128 C *
00129 C      NUNITS     = NUMBER OF UNITS IN PLANT CONFIGURATION *
00130 C      MAXIMUM VALUE IS 100 *
00131 C      NFlows    = NUMBER OF FLOWSTREAMS IN PLANT CONFIGURATION *
00132 C      MAXIMUM VALUE IS 200 *
00133 C      NRETRT    = NUMBER OF RETREATMENT STREAMS *
00134 C      MAXIMUM VALUE IS 3 *
00135 C      NSIZE     = NUMBER OF SIZE INCREMENTS OF COAL *
00136 C      MAXIMUM VALUE IS 22 *
00137 C      NGRAV    = NUMBER OF SPECIFIC GRAVITY INCREMENTS OF COAL *
00138 C      MAXIMUM VALUE IS 10 *
00139 C      IOUT     = OUTPUT LEVEL DESIGNATION *
00140 C      IOUT=0 FOR MINIMUM OUTPUT *
00141 C      (OVERALL PLANT SUMMARY) *
00142 C      IOUT=1 FOR MORE DETAILED OUTPUT *
00143 C      (SPECIFIC GRAVITY ANALYSIS OF FEED AND *
00144 C      PRODUCT STREAMS, SUMMARY OF EACH UNIT AND *
00145 C      OVERALL PLANT SUMMARY) *
00146 C      IOUT=2 FOR MOST DETAILED OUTPUT *
00147 C      (SPECIFIC GRAVITY ANALYSIS OF ALL FLOWSTREAMS, *
00148 C      SUMMARY OF EACH UNIT AND OVERALL PLANT SUMMARY) *
00149 C      IOUT=3 FOR DEBUGGING ONLY *
00150 C      (COMPLETE OUTPUT FOR EACH ITERATION) *
00151 C      NCOMP     = INDICATES HOW SEPARATIONS WILL BE DETERMINED *
00152 C      NCOMP=0 FOR SEPARATION BY SIZE INCREMENTS *
00153 C      NCOMP=1 FOR SEPARATION USING COMPOSITE CURVE *
00154 C      ICOUNT  = ITERATION COUNTER FOR RETREATMENT STREAMS *
00155 C      KCONVG    = CONVERGENCE INDICATOR *
00156 C      KCONVG=0 INDICATES A NONCONVERGENT CONDITION *
00157 C      KCONVG=1 INDICATES THAT CONVERGENCE HAS BEEN *
00158 C      ATTAINED *
00159 C *
00160 C      TONAGE     = FEED RATE TO PLANT, TONS PER HOUR *
00161 C      HRS       = PLANT OPERATION TIME, HOURS PER WEEK *
00162 C      YCOST     = UNIFORM ANNUALIZED TOTAL COST, THOUSANDS OF DOLLARS *
00163 C      YCF       = YEARLY CASH FLOW, THOUSANDS OF DOLLARS *
00164 C      (20 YEARS MAXIMUM) *
00165 C      INV       = INITIAL INVESTMENT, MILLIONS OF DOLLARS *
00166 C      INTRST    = ANNUAL INTEREST RATE *
00167 C *
00168 C BTU CONTENT OF COAL IS CALCULATED AS A LINEAR OR QUADRATIC FUNCTION *

```

```

00169 C      OF ASH CONTENT (SEE FUNCTION BTUPLB)
00170 C
00171 C INPUT/OUTPUT UNIT DESIGNATIONS:
00172 C      DSK      = THE AUXILIARY MEMORY DEVICE NUMBER (DISK)
00173 C      G        = THE INPUT DEVICE NUMBER (CARD READER)
00174 C      H        = THE OUTPUT DEVICE NUMBER (LINE PRINTER)
00175 C
00176 C TO CHANGE UNIT DESIGNATIONS, ALTER THE STATEMENTS LABELED * UNIT *
00177 C      IN COLS 73-80      (3 STATEMENTS IN MAIN)
00178 C
00179 C TO CHANGE DIMENSIONS, ALTER APPROPRIATE STATEMENTS LABELED * DIM *
00180 C      IN COLS 73-80
00181 C
00182 C NOTE: THIS PROGRAM USES A RANDOM-ACCESS DISK FILE TO STORE
00183 C      FLOWSTREAM INFORMATION (EACH RECORD REPRESENTS ONE FLOWSTREAM)
00184 C
00185 C      THIS IS A SYSTEM-DEPENDENT FEATURE
00186 C      (SEE STATEMENTS LABELED * SYS * IN COLS 73-80 OF MAIN AND OUTPT4)
00187 C
00188 C *****
00189 C      DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),MID(23,10,4), * DIM *
00190 C      1 KPOINT(200),SYMBOL(8,23),KF(2,200),SIZE(23),GBOUND(11),GRAV(10), * DIM *
00191 C      2 FLOW(203),WATER(2,100),S(200),TITLE(20),D1(100),D2(100),D3(100), * DIM *
00192 C      3 L(100),C1(3),C2(3),VSLYLD(100),VSLBTU(100),WT(23),BTU(4),YCF(20) * DIM *
00193 C      COMMON V1(844),V2(844),SCR(3741) * DIM *
00194 C      COMMON /BLK1/ SFEEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5), * DIM *
00195 C      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24), * DIM *
00196 C      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00197 C      COMMON /BLK2/ DISTRB(24,10),JCOUNT * DIM *
00198 C      COMMON /SYS/ G,H
00199 C      EQUIVALENCE (IF,IG)
00200 C      INTEGER G,H,DSK,PSJ,TFLAG
00201 C      REAL MID
00202 C      REAL INV,INTRST
00203 C      DATA S1,S2,S3,S4,S5,S6,S7,S8 / 1HC,1HM,1HR,1HU,1HL,1HS,1HW,1H /
00204 C      DATA WATER /200*0./
00205 C      100 FORMAT(20A4)
00206 C      101 FORMAT(28I3)
00207 C      102 FORMAT(I3,2X,F5.3,2X,F5.3,2X,F5.3)
00208 C      103 FORMAT(2I3,2X,A1)
00209 C      104 FORMAT(8(8A1,4X))
00210 C      105 FORMAT(13(1X,F5.1))
00211 C      106 FORMAT(8(F7.5,3X))
00212 C      107 FORMAT(3F10.2)
00213 C      200 FORMAT(1H1,20X,43HC O A L   P R E P A R A T I O N   P L A N T ,
00214 C      1 20H   S I M U L A T O R ///,1H0,20X,20A4//)
00215 C      201 FORMAT(1H0,10X,11HUNIT NUMBER,24X,9HUNIT TYPE,24X,
00216 C      1 18HDECISION VARIABLES)
00217 C      202 FORMAT(1H0,14X,I2,23X,I2)
00218 C      203 FORMAT(1H+,89X,F5.3)
00219 C      204 FORMAT(1H0,7X,17HFLOWSTREAM NUMBER,15X,20HORIGIN - UNIT NUMBER,
00220 C      1 18X,25HDESTINATION - UNIT NUMBER)
00221 C      205 FORMAT(1H0,14X,I2,32X,I2,2X,A2,30X,I2)
00222 C      206 FORMAT(1H+,18X,8H(FEED))
00223 C      207 FORMAT(1H+,18X,20H(CLEAN COAL PRODUCT))
00224 C      208 FORMAT(1H+,18X,19H(MIDDLEINGS PRODUCT))

```

```

00225 209 FORMAT(1H+,18X,16H(REFUSE PRODUCT))
00226 210 FORMAT(1H+,18X,20H(RETREATMENT STREAM))
00227 211 FORMAT(1H+,83X,F8.3)
00228 212 FORMAT(1H+,73X,F8.3,2X,F8.3)
00229 213 FORMAT(1H+,73X,F8.2,2X,F8.3,2X,F8.3)
00230 300 FORMAT(1H0,58X,17HITERATION NUMBER ,I2/)
00231 301 FORMAT(1H1,37X,58HSUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UN
00232 1IT NUMBER ,I2/)
00233 302 FORMAT(1H0,48X,33HSPECIFIC GRAVITY OF SEPARATION = ,F4.2//,
00234 1 56X,14HWATER ADDED = ,F8.1,4H GPM/)
00235 303 FORMAT(1H0,22X,9HLENGTH = ,F5.2,5H FEET,10X,11HDIAMETER = ,F5.2,
00236 1 5H FEET,10X,18HSIZE OF OPENING = ,F4.2,7H INCHES/)
00237 304 FORMAT(1H0,52X,18HCRUSHER SETTING = ,F4.2,7H INCHES/)
00238 305 FORMAT(1H0,52X,18HSIZE OF OPENING = ,F4.2,7H INCHES//
00239 1 56X,14HWATER ADDED = ,F8.1,4H GPM/)
00240 306 FORMAT(1H0,48X,20HUPPER FLOW STREAM = ,F4.1,16H PERCENT OF FEED/)
00241 307 FORMAT(1H0,39X,32HDIAMETER OF CENTRIFUGE BASKET = ,F5.1,7H INCHES)
00242 308 FORMAT(1H+,5X,17HCAKE THICKNESS = ,F5.2,7H INCHES)
00243 309 FORMAT(1H+,88X,29HROTATIONAL SPEED OF BASKET = ,F8.1,4H RPM)
00244 310 FORMAT(1H0,17X,34HPRESSURE DIFFERENCE ACROSS CAKE = ,F5.1,5H(PSI))
00245 311 FORMAT(1H+,68X,17HAREA OF FILTER = ,F8.1,
00246 1 12H SQUARE FEET)
00247 312 FORMAT(1H ,17X,13HCYCLE TIME = ,F5.1,8H MINUTES)
00248 313 FORMAT(1H ,17X,17HCAKE THICKNESS = ,F5.1,7H INCHES)
00249 314 FORMAT(1H ,17X,22HCYCLE TIME = 3 MINUTES,29X,
00250 1 23HCAKE THICKNESS = 1 INCH)
00251 315 FORMAT(1H+,68X,23HCAKE THICKNESS = 1 INCH)
00252 316 FORMAT(1H+,68X,22HCYCLE TIME = 3 MINUTES)
00253 317 FORMAT(1H0,56X,14HWATER ADDED = ,F8.1,4H GPM/)
00254 318 FORMAT(1H0,50X,19HCYCLONE DIAMETER = ,F5.1,7H INCHES//,
00255 1 56X,14HWATER ADDED = ,F8.1,4H GPM/)
00256 319 FORMAT(1H0,53X,13HSLOT WIDTH = ,F5.1,7H INCHES//,
00257 1 56X,14HWATER ADDED = ,F8.1,4H GPM/)
00258 320 FORMAT(1H0,11HWATER IN = ,F7.1,12H GALLONS/MIN/,
00259 1 12H WATER OUT = ,F7.1,12H GALLONS/MIN)
00260 321 FORMAT(1H0,5X,19HAREA OF THICKENER = ,F7.1,12H SQUARE FEET)
00261 322 FORMAT(1H0,5X,23HALL SOLIDS TO UNDERFLOW )
00262 323 FORMAT(1H+,48X,30HFRACTION SOLID IN UNDERFLOW = ,F5.3)
00263 324 FORMAT(1H+,45HFRACTION SOLIDS IN UNDERFLOW = 0.35 (DEFAULT) )
00264 325 FORMAT(1H+, 95X,30HFLOCCULANT CORRECTION FACTOR = ,F5.2)
00265 326 FORMAT(1H+, 95X,31HNO FLOCCULANT CORRECTION FACTOR)
00266 327 FORMAT(1H0,41H***WARNING: ONLY ONE THICKENER IS ALLOWED ,
00267 1 18H. THIS PLANT HAS ,I3)
00268 328 FORMAT(1H0,27H***WARNING: PRODUCT STREAM ,I4,11H SHOULD BE
00269 1 22HLABELED C, M, W, OR R )
00270 329 FORMAT(1H+,65X,10H (DEFAULT) )
00271 330 FORMAT(1H+,65X,11H (DECISION) )
00272 331 FORMAT(1H0,5X,40HMOISTURE CONTENT OF DRIED COAL (PERCENT) ,
00273 1 10(1H.),F9.2)
00274 332 FORMAT(1H0,5X,30HCOMBUSTION GAS TEMPERATURE (F) ,20(1H.),F9.1)
00275 333 FORMAT(1H0,5X,24HEXIT GAS TEMPERATURE (F) ,26(1H.),F9.2)
00276 334 FORMAT(1H0,5X,39HRELATIVE HUMIDITY OF EXIT GAS (PERCENT) ,
00277 1 11(1H.),F9.2)
00278 335 FORMAT(1H0,5X,44HRAE OF COAL CONSUMPTION IN DRYER (TONS/HR) ,
00279 1 8(1H.),F9.2)
00280 336 FORMAT(1H0,5X,37HTOTAL FLOW OF COMBUSTION GASES (SCFM) ,

```

```

00281      1 13(1H.),F9.0)
00282      337 FORMAT(1H0,5X,32HSO2 CONTENT IN DRYER GASES (PPM) ,18(1H.),F9.3)
00283      338 FORMAT(1H0,5X,37H****WARNING****SPECIFIED HUMIDITY OF ,F5.1,
00284      1 47H NOT OBTAINED. CONVERGENCE PROCEDURE FAILED. ,
00285      2 18H FINAL HUMIDITY = ,F5.1)
00286      339 FORMAT(1H0,5X,42H****WARNING****HUMIDITY OF EXIT GASES TOO ,
00287      1 44HHIGH. EXIT GAS TEMPERATURE MUST BE RAISED. )
00288      340 FORMAT(1H0,/,/,39H TOTAL WATER FLOW INTO THICKENER (GPM) ,
00289      1 11(1H.),F7.2)
00290      341 FORMAT(1H ,46H CLARIFIED WATER PRODUCED FROM THICKENER (GPM) ,
00291      1 3(1H.), F7.2)
00292      342 FORMAT(1H ,38H WATER DEMAND FROM OTHER UNITS (GPM) ,13(1H.),
00293      1 F7.2)
00294      343 FORMAT(1H0,28H      NET SURPLUS WATER (GPM) ,21(1H.),F7.2)
00295      344 FORMAT(1H0,28H      NET DEFICIT WATER (GPM), 21(1H.),F7.2)
00296      400 FORMAT(1H1,47X,33HSPECIFIC GRAVITY ANALYSIS OF FEED/)
00297      401 FORMAT(1H1,37X,47HSPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER ,
00298      1 I2/)
00299      402 FORMAT(1H0,5X,28HFLOWRATE, PERCENT OF FEED = ,F5.1/,
00300      1 1H0,5X,22HBTU CONTENT, BTU/LB = ,F8.0/.
00301      2 1H0,5X,22HLBS SO2/MILLION BTU = ,F4.2)
00302      403 FORMAT(1H1,27X,47HSPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT,
00303      1 18H FROM UNIT NUMBER ,I2/)
00304      404 FORMAT(1H1,27X,64HSPECIFIC GRAVITY ANALYSIS OF MIDDINGS PRODUCT F
00305      1ROM UNIT NUMBER ,I2/)
00306      405 FORMAT(1H1,27X,81HSPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM
00307      1 UNIT NUMBER ,I2/)
00308      406 FORMAT(1H0,31X,21HORIGIN - UNIT NUMBER ,I3,2X,A2,8X,26HDESTINATION
00309      1 - UNIT NUMBER ,I3/)
00310      500 FORMAT(1H0,120(1H*)/,2H *,118X,1H*/,2H *,34X,36HCONVERGENCE HAS BE
00311      1EN ATTAINED AFTER ,I3,11H ITERATIONS,34X,1H*/,2H *,118X,1H*/,1H ,1
00312      220(1H*))
00313      501 FORMAT(1H0,52X,17HITERATION NUMBER ,I2/)
00314      502 FORMAT(1H1,120(1H*)/,2H *,118X,1H*/,2H *,32X,40HTHE COMPUTATION HA
00315      1S NOT CONVERGED AFTER ,I3,11H ITERATIONS,32X,1H*/,2H *,118X,1H*/,1
00316      2H ,120(1H*))
00317      503 FORMAT(1H0,5X,23HNUMBER OF ITERATIONS = ,I3)
00318      600 FORMAT(1H0,60(2H- )/)
00319      601 FORMAT(1H0,5X,7HNUNITS=,I3,5X,7HNFLOWS=,I3,5X,6HNSIZE=,I3,5X,
00320      1 6HNGRAV=,I3,5X,5HIOUT=,I3,5X,6HICMAX=,I3,5X,6HNCOMP=,I3,
00321      2 5X,5HNYRS=,I3/)
00322      602 FORMAT(1H0,5X,7HBTU(1)=,F7.1,5X,7HBTU(2)=,F7.1,5X,7HBTU(3)=,
00323      1 F7.3,5X,7HBTU(4)=,F7.1,5X,14HFEED MOISTURE=,F5.1,8H PERCENT/)
00324      603 FORMAT(1H0,5X,8HTONNAGE=,F7.2,5X,4HHRS=,F8.2,5X,6HYCOST=,F11.2/)
00325      605 FORMAT(1H0,5X,8HTONNAGE=,F7.2,5X,4HHRS=,F8.2,5X,6HYCOST=,F11.2,
00326      1 5X,9HINTEREST=,F8.2,1X,1H%,5X,19HINITIAL INVESTMENT=,F13.2/)
00327      607 FORMAT(1H0,10X,5HYEAR=,I3,20X,17HYEARLY CASH FLOW=,F12.2)
00328      900 FORMAT(1H1)
00329      C SET NUMERICAL PARAMETERS
00330      DSK=4
00331      G=5
00332      H=8
00333      NFALL=70
00334      EPSLN1=0.001
00335      EPSLN2=0.001
00336      KCONVG=1

```

* UNIT
* UNIT
* UNIT

```

00337 C *****
00338 C READ INPUT DATA *
00339 C *****
00340 READ (G,100) TITLE
00341 READ (G,101) NUNITS,NFLOWS,NSIZE,NGRAV,IOUT,ICMAX,NCOMP,NYRS,PSJ
00342 IF (ICMAX.EQ.0) ICMAX=50
00343 IF (NCOMP.NE.0) NSIZE=1
00344 NS=NSIZE+1
00345 NG=NGRAV+1
00346 TFLAG=0
00347 DO 1000 IU=1,NUNITS
00348 READ (G,102) L(IU),D1(IU),D2(IU),D3(IU)
00349 IF (L(IU).LT.19) WATER(1,IU)=D2(IU)
00350 IF (L(IU).EQ.19) WATER(1,IU)=D1(IU)
00351 IF ((L(IU).EQ.31).OR.(L(IU).EQ.32)) WATER(1,IU)=0.
00352 IF ((L(IU).EQ.33).OR.(L(IU).EQ.34)) WATER(1,IU)=D2(IU)
00353 IF (L(IU).EQ.41) WATER(1,IU)=D1(IU)
00354 IF ((L(IU).GE.71).AND.(L(IU).LE.73)) WATER(1,IU)=D2(IU)
00355 IF (L(IU).EQ.69) TFLAG=TFLAG+1
00356 1000 CONTINUE
00357 IF (TFLAG.GT.1) WRITE (H,327) TFLAG
00358 DO 1010 IF=1,NFLOWS
00359 READ (G,103) KF(1,IF),KF(2,IF),S(IF)
00360 C FORCE PRODUCTS FROM THICKENER TO BE EXTERNAL FLOWSTREAMS
00361 IF (L(KF(1,IF)).EQ.69) KF(2,IF)=0
00362 IF ((KF(2,IF).EQ.0).AND..NOT.((S(IF).EQ.S1).OR.(S(IF).EQ.S2)
00363 1 .OR.(S(IF).EQ.S3).OR.(S(IF).EQ.S7))) WRITE (H,328) IF
00364 1010 CONTINUE
00365 READ (G,104) ((SYMBOL(K,I),K=1,8),I=1,NS) * DIM *
00366 READ (G,105) (WT(I),I=1,NSIZE)
00367 READ (G,105) (GBOUND(J),J=1,NG)
00368 READ (G,106) BTU(1),BTU(2),BTU(3),BTU(4)
00369 CALL CONVRT(SYMBOL,SIZE,NSIZE)
00370 DO 1 J=1,NGRAV
00371 1 GRAV(J)=.5*(GBOUND(J)+GBOUND(J+1))
00372 SUM1=0.
00373 DO 2 I=1,NSIZE
00374 SUM1=SUM1+WT(I)
00375 DO 2 J=1,NGRAV
00376 READ (G,106) (FEED(I,J,K),K=1,4) * DIM *
00377 IF (FEED(I,J,1).EQ.0.) FEED(I,J,1)=1.E-8
00378 2 CONTINUE
00379 READ (G,107) WFEED
00380 IF (WFEED.EQ.0.) WFEED=100.*MOISTR(FEED,SIZE,GRAV,NSIZE,NGRAV,
00381 1 0,2)
00382 IF (NYRS.GT.0) GO TO 921
00383 READ (G,107) TONAGE,HRS,YCOST
00384 GO TO 923
00385 C CALCULATE PRESENT WORTH OF INITIAL INVESTMENT AND
00386 C YEARLY CASH FLOWS
00387 921 READ (G,107) TONAGE,HRS,INTRST
00388 FACTOR=(1+.01*INTRST)
00389 READ (G,107) INV
00390 PW=INV
00391 DO 922 I=1,NYRS
00392 READ (G,107) YCF(I)

```

```

00393      PW=PW+YCF(I)/FACTOR**I
00394      922 CONTINUE
00395      C CALCULATE EQUIVALENT UNIFORM ANNUAL COST
00396      YCOST=0.01*INTRST*PW*FACTOR**NYRS/(FACTOR**NYRS-1.)
00397      923 DO 4 I=1,NSIZE
00398      SUM2=0.
00399      DO 3 J=1,NGRAV
00400      3 SUM2=SUM2+FEED(I,J,1)
00401      DO 4 J=1,NGRAV
00402      FEED(I,J,1)=(WT(I)/SUM1)*(FEED(I,J,1)/SUM2)
00403      FEED(I,J,2)=.01*FEED(I,J,2)
00404      FEED(I,J,3)=.01*FEED(I,J,3)
00405      4 FEED(I,J,4)=.01*FEED(I,J,4)
00406      C TEST FOR HIGH SEPARATION GRAVITY IN WASHERS
00407      DO 40 IU=1,NUNITS
00408      IF ((L(IU).LT.10).AND.(D1(IU).GE.GRAV(NGRAV-2))) GO TO 41
00409      40 CONTINUE
00410      GO TO 45
00411      C ADD EXTRA GRAVITY INCREMENTS BECAUSE OF HIGH SEPARATION GRAVITY
00412      41 NOLD=NGRAV
00413      NXTRA=10-NOLD
00414      IF (NXTRA.LT.1) GO TO 45
00415      NGRAV=NOLD+NXTRA
00416      NG=NGRAV+1
00417      GBOUND(NG)=GBOUND(NOLD+1)
00418      DELTA=0.1*INT(10.*(GBOUND(NG)-GBOUND(NOLD)))/(NXTRA+1)
00419      DO 42 JXTRA=1,NXTRA
00420      GBOUND(NOLD+JXTRA)=GBOUND(NOLD)+JXTRA*DELTA
00421      42 GRAV(NOLD+JXTRA-1)=.5*(GBOUND(NOLD+JXTRA-1)+GBOUND(NOLD+JXTRA))
00422      GRAV(NGRAV)=.5*(GBOUND(NG-1)+GBOUND(NG))
00423      DO 44 I=1,NSIZE
00424      WEIGHT=FEED(I,NOLD,1)
00425      DO 43 JXTRA=1,NXTRA
00426      FEED(I,NOLD+JXTRA-1,1)=WEIGHT*DELTA/(GBOUND(NG)-GBOUND(NOLD))
00427      DO 43 K=2,4
00428      43 FEED(I,NOLD+JXTRA,K)=FEED(I,NOLD,K)
00429      44 FEED(I,NGRAV,1)=WEIGHT*(1.-NXTRA*DELTA/(GBOUND(NG)-GBOUND(NOLD)))
00430      45 CONTINUE
00431      C *****
00432      C WRITE INPUT DATA
00433      C *****
00434      WRITE (H,200) TITLE
00435      WRITE (H,800)
00436      WRITE (H,201)
00437      DO 5 IU=1,NUNITS
00438      WRITE (H,202) IU,L(IU)
00439      IF ((L(IU).EQ.19).OR.(L(IU).EQ.41).OR.(L(IU).EQ.51))
00440      1 WRITE (H,211) D1(IU)
00441      IF ((L(IU).GE.22).AND.(L(IU).LE.32)) WRITE (H,211) D1(IU)
00442      IF (L(IU).LT.19) WRITE (H,212) D1(IU),D2(IU)
00443      IF ((L(IU).EQ.33).OR.(L(IU).EQ.34)) WRITE (H,212) D1(IU),D2(IU)
00444      IF ((L(IU).EQ.71).OR.(L(IU).EQ.72)) WRITE (H,212) D1(IU),D2(IU)
00445      IF (L(IU).EQ.21) WRITE (H,213) D1(IU),D2(IU),D3(IU)
00446      IF ((L(IU).GE.61).AND.(L(IU).LE.69))
00447      1 WRITE (H,213) D1(IU),D2(IU),D3(IU)
00448      5 CALL VESSEL(L(IU),1)

```

* DIM *

```

00449      WRITE (H,600)
00450      WRITE (H,204)
00451      DO 6 IF=1,NFLOWS
00452      WRITE (H,205) IF,KF(1,IF),S(IF),KF(2,IF)
00453      IF (KF(1,IF).EQ.0) WRITE (H,206)
00454      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S1)) WRITE (H,207)
00455      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S2)) WRITE (H,208)
00456      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S3)) WRITE (H,209)
00457      IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 6
00458      WRITE (H,210)
00459      6 CONTINUE
00460      WRITE (H,600)
00461      WRITE (H,601) NUNITS,NFLOWS,NSIZE,NGRAV,IOUT,ICMAX,NCOMP,NYRS
00462      WRITE (H,600)
00463      WRITE (H,602) BTU,WFEED
00464      WRITE (H,600)
00465      IF(NYRS.EQ.0) WRITE (H,603) TONAGE,HRS,YCOST
00466      IF(NYRS.NE.0) WRITE (H,605) TONAGE,HRS,YCOST,INTRST,INV
00467      WRITE (H,600)
00468      IF(NYRS.NE.0) WRITE (H,607) (I,YCF(I),I=1,NYRS)
00469      WRITE (H,600)
00470      C      IF (IOUT.GT.0.) GO TO 666
00471      C      WRITE (H,400)
00472      C      CALL OUTPT1(FEED,WFEED,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,
00473      C      1 NCOMP)
00474      C      CALL OUTPT3(FEED,WFEED,BTU,1.,TONAGE,NSIZE,NGRAV)
00475      666 CONTINUE
00476      C*****
00477      C OPEN RANDOM-ACCESS DISK FILE (EACH RECORD REPRESENTS ONE FLOWSTREAM) *
00478      C *
00479      C NOTE: THIS IS A SYSTEM-DEPENDENT FEATURE *
00480      C*****
00481      NRECRD=NSIZE*(4*NGRAV+1)+1
00482      NFILE=NRECRD*(NFLOWS+3) * DIM *
00483      OPEN(UNIT=DSK,ACCESS='RANDOM',MODE='BINARY',FILE SIZE=NFILE, * SYS *
00484      1 RECORD SIZE=NRECRD) * SYS *
00485      C *****
00486      C INITIALIZE FEED AND RETREATMENT STREAMS *
00487      C *****
00488      ICOUNT=0
00489      NRETRT=0
00490      DO 8 IF=1,NFLOWS
00491      IF (KF(1,IF).NE.0) GO TO 7
00492      C INITIALIZE AND STORE FEED STREAM
00493      CALL ZCHECK(FEED,WFEED,NSIZE,NGRAV)
00494      WRITE (DSK ' IG) (((FEED(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WFEED* SYS *
00495      FLOW(IF)=1.
00496      GO TO 8
00497      7 IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 8
00498      C INITIALIZE AND STORE RETREATMENT STREAMS
00499      NRETRT=NRETRT+1
00500      KPOINT(IF)=NRETRT+NFLOWS
00501      DO 70 I=1,NRECRD
00502      V1(I)=1.E-6
00503      70 V2(I)=1.E-6
00504      WRITE (DSK ' IG) (V1(I),I=1,NRECRD) * SYS *

```



```

00505      WRITE (DSK ' KPOINT(IG)) (V2(I),I=1,NRECRD)                                * SYS *
00506      FLOW(IF)=0.
00507      FLOW(KPOINT(IF))=0.
00508      C2(NRETRT)=0.
00509      IF (IOUT.LT.3) GO TO 8
00510      WRITE (H,401) KPOINT(IF)
00511      READ (DSK ' IG) (((MID(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WMID        * SYS *
00512      CALL OUTPT1(MID,WMID,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,
00513      1 NCOMP)
00514      CALL OUTPT3(MID,WMID,BTU,FLOW(KPOINT(IF)),TONAGE,NSIZE,NGRAV)
00515      8 CONTINUE
00516      IF (NRETRT.GT.0) KCONVG=0
00517      C *****
00518      C
00519      C                        ***** BEGIN MAIN LOOP *****
00520      C
00521      C CARRY OUT UNIT OPERATIONS IN THE ORDER THAT THE UNITS ARE SPECIFIED
00522      C IN THE INPUT DATA
00523      C
00524      C *****
00525      9 ICOUNT=ICOUNT+1
00526      IF (ICOUNT.GE.ICMAX-1) IOUT=3
00527      KBSG=KCONVG
00528      IF (IOUT.EQ.3) KBSG=1
00529      DO 25 IU=1,MUNITS
00530      IF (L(IU).EQ.69) GO TO 25
00531      C *****
00532      C RETRIEVE INPUT STREAMS
00533      C *****
00534      DO 10 IF=1,NFLOWS
00535      IF (KF(2,IF).NE.IU) GO TO 10
00536      READ (DSK ' IG) (((FEED(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WFEED * SYS *
00537      FLOW1=FLOW(IF)
00538      IF (L(IU).NE.41) GO TO 13
00539      KFLAG=IF+1
00540      GO TO 11
00541      10 CONTINUE
00542      C STREAM BLENDER - RETRIEVE AND COMBINE ADDITIONAL INPUT STREAMS
00543      11 DO 12 IF=KFLAG,NFLOWS
00544      IF (KF(2,IF).NE.IU) GO TO 12
00545      READ (DSK ' IG) (((MID(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WMID        * SYS *
00546      FLOW2=FLOW(IF)
00547      C
00548      CALL BLEND(FEED,MID,CC,WFEED,WMID,WCC,FLOW1,FLOW2,FPROD,NSIZE,
00549      1 NGRAV,WATER(1,IU),VSLYLD(IU),VSLBTU(IU),BTU,KBSG,TONAGE)
00550      C
00551      KFLAG=IF+1
00552      GO TO 120
00553      12 CONTINUE
00554      120 DO 125 IF=KFLAG,NFLOWS
00555      IF (KF(2,IF).NE.IU) GO TO 125
00556      READ (DSK ' IG) (((MID(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WMID        * SYS *
00557      FLOW2=FLOW(IF)
00558      C
00559      CALL BLEND(MID,CC,REF,WMID,WCC,WREF,FLOW2,FPROD,FLOW1,NSIZE,
00560      1 NGRAV,O.O,VSLYLD(IU),VSLBTU(IU),BTU,KBSG,TONAGE)

```

```

00561 C
00562     DO 121 I=1,NSIZE
00563     DO 121 J=1,NGRAV
00564     DO 121 K=1,4
00565     121 CC(I,J,K)=REF(I,J,K)
00566     WCC=WREF
00567     FPROD=FLOW1
00568     125 CONTINUE
00569     GO TO 130
00570 C CARRY OUT ALL REMAINING OPERATIONS (EVERYTHING EXCEPT BLENDING)
00571 C
00572 C WASHERS
00573     13 IF (L(IU).LT.19) CALL WASH(FEED,CC,REF,MID,WFEED,WCC,WREF,WMID,
00574     1 FLOW1,SIZE,GRAV,GBOUND,D1(IU),WATER(1,IU),WATER(2,IU),YLDCC,
00575     2 YLDMID,YLDREF,NSIZE,NGRAV,L(IU),NCOMP,VSLYLD(IU),VSLBTU(IU),
00576     3 BTU,KBSG,TONAGE)
00577 C FROTH FLOTATION
00578     IF (L(IU).EQ.19) CALL FROTH(FEED,CC,REF,WFEED,WCC,WREF,FLOW1,
00579     1 SIZE,GRAV,GBOUND,WATER(1,IU),YLDCC,YLDREF,NSIZE,NGRAV,NCOMP,
00580     2 VSLYLD(IU),VSLBTU(IU),BTU,KBSG,TONAGE)
00581 C ROTARY BREAKER
00582     IF (L(IU).EQ.21) CALL ROTARY(D1(IU),D2(IU),D3(IU),SIZE,GRAV,
00583     1 NSIZE,NGRAV,FEED,CC,REF,WFEED,WCC,WREF,YLDCC,YLDREF,
00584     2 VSLYLD(IU),VSLBTU(IU),BTU,TONAGE,KBSG)
00585 C CRUSHERS
00586     IF ((L(IU).GE.22).AND.(L(IU).LE.29)) CALL CRUSH(L(IU),D1(IU),
00587     1 SIZE,GRAV,NSIZE,NGRAV,FEED,CC,WFEED,WCC,YLDCC,VSLYLD(IU),
00588     2 VSLBTU(IU),BTU,KBSG)
00589 C SCREENS
00590     IF ((L(IU).GE.31).AND.(L(IU).LE.34)) CALL SCREEN(L(IU),D1(IU),
00591     1 WATER(1,IU),WATER(2,IU),SIZE,NSIZE,GRAV,NGRAV,FEED,CC,REF,
00592     2 WFEED,WCC,WREF,FLOW1,YLDCC,YLDREF,VSLYLD(IU),VSLBTU(IU),BTU,
00593     3 KBSG,TONAGE)
00594 C SPLITTER
00595     IF (L(IU).EQ.51) CALL SPLIT(FEED,CC,REF,WFEED,WCC,WREF,BTU,
00596     1 YLDCC,YLDREF,D1(IU),NSIZE,NGRAV,VSLYLD(IU),VSLBTU(IU),KBSG)
00597 C DEWATERING DEVICES
00598     IF ((L(IU).GE.61).AND.(L(IU).LE.64)) CALL DWAT(FEED,CC,REF,
00599     1 WFEED,WCC,WREF,SIZE,GRAV,D1(IU),D2(IU),D3(IU),YLDCC,YLDREF,
00600     2 NSIZE,BTU,NGRAV,L(IU),VSLYLD(IU),VSLBTU(IU),TONAGE,FLOW1)
00601 C CLASSIFIERS
00602     IF ((L(IU).GE.71).AND.(L(IU).LE.73)) CALL CLASFR(FEED,CC,REF,
00603     1 D1(IU),WATER(1,IU),WATER(2,IU),NSIZE,NGRAV,WFEED,WCC,WREF,FLOW1,
00604     2 SIZE,GRAV,BTU,YLDCC,YLDREF,VSLBTU(IU),VSLYLD(IU),L(IU),KBSG,
00605     3 TONAGE)
00606 C THERMAL DRYER
00607     IF (L(IU).EQ.67) CALL THERMA(FEED,CC,WFEED,WCC,
00608     1 D1(IU),D2(IU),D3(IU),YLDCC,NSIZE,BTU,NGRAV,
00609     2 VSLYLD(IU),VSLBTU(IU),TONAGE,FLOW1)
00610     130 CONTINUE
00611 C *****
00612 C WRITE OPTIONAL UNIT SUMMARY *
00613 C *****
00614     IF (IOUT.LT.1) GO TO 14
00615     IF ((IOUT.LE.2).AND.(KCONVG.EQ.0)) GO TO 14
00616     WRITE (H,301) IU

```

```

00617      CALL VESSEL(L(IU),2)
00618      IF (L(IU).LT.19) WRITE (H,302) D1(IU),D2(IU)
00619      IF (L(IU).EQ.19) WRITE (H,317) D1(IU)
00620      IF (L(IU).EQ.21) WRITE (H,303) D1(IU),D2(IU),D3(IU)
00621      IF ((L(IU).GE.22).AND.(L(IU).LE.32)) WRITE (H,304) D1(IU)
00622      IF ((L(IU).GE.33).AND.(L(IU).LE.34)) WRITE (H,305) D1(IU),D2(IU)
00623      IF (L(IU).EQ.41) WRITE (H,317) D1(IU)
00624      IF (L(IU).EQ.51) WRITE (H,308) D1(IU)
00625      IF (L(IU).EQ.71) WRITE (H,318) D1(IU),D2(IU)
00626      IF (L(IU).EQ.72) WRITE (H,319) D1(IU),D2(IU)
00627      IF ((L(IU).GE.61).AND.(L(IU).LE.63)) GO TO 131
00628      GO TO 132
00629      131 IF (D1(IU).NE.O.) WRITE (H,307) D1(IU)
00630      IF (D2(IU).NE.O.) WRITE (H,308) D2(IU)
00631      IF (D3(IU).NE.O.) WRITE (H,309) D3(IU)
00632      132 IF (L(IU).EQ.64) GO TO 135
00633      IF (L(IU).EQ.67) GO TO 143
00634      GO TO 145
00635      135 WRITE (H,310) D3(IU)
00636      IF (D1(IU).GT.O.) WRITE (H,311) D1(IU)
00637      IF (D2(IU).GT.O.) WRITE (H,312) D2(IU)
00638      IF (D2(IU).LT.O.) GO TO 142
00639      IF (D2(IU).EQ.O.) WRITE (H,314)
00640      140 IF ((D1(IU).EQ.O.).AND.(D2(IU).GT.O.)) WRITE (H,315)
00641      IF ((D1(IU).EQ.O.).AND.(D2(IU).LT.O.)) WRITE (H,316)
00642      GO TO 145
00643      142 D2NEG=-D2(IU)
00644      WRITE (H,313) D2NEG
00645      GO TO 140
00646      143 WRITE(H,331) V1(1)
00647      IF (D1(IU).GT. .01) WRITE(H,330)
00648      IF (D1(IU).LE.O.) WRITE(H,329)
00649      WRITE(H,332) V1(2)
00650      IF (D2(IU).GT.100.) WRITE(H,330)
00651      IF (D2(IU).LE.100.) WRITE(H,329)
00652      WRITE(H,333) V1(3)
00653      IF (D3(IU).GT.10.) WRITE(H,330)
00654      IF ((D3(IU).LE.10.).AND.(D3(IU).GE.O.))WRITE(H,329)
00655      IF (V1(4).LT.O.) GO TO 144
00656      WRITE(H,334) V1(4)
00657      IF (D3(IU).LT.O.) WRITE(H,330)
00658      IF (V1(4) .GT. 100.) WRITE(H,339)
00659      GOTO 146
00660      144 WRITE(H,338)V1(8),V1(9)
00661      146 WRITE(H,335) V1(5)
00662      WRITE(H,336) V1(6)
00663      WRITE(H,337) V1(7)
00664      145 IF (NRETRT.GT.O) WRITE (H,300) ICOUNT
00665      CALL OUTPT2(WFEED,WCC,WREF,WMIID,SYMBOL,NSIZE,NGRAV,NCOMP,L(IU),
00666      1 PSJ,GBOUND)
00667      IF ((WATER(1,IU).GT.O.).OR.(WATER(2,IU).GT.O.)) WRITE (H,320)
00668      1 WATER(1,IU),WATER(2,IU)
00669      C *****
00670      C STORE PRODUCT STREAMS *
00671      C *****
00672      14 IF (L(IU).GE.22) GO TO 19

```

```

00673      DO 18 IF=1,NFLOWS
00674      IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S1)) GO TO 15
00675      IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S2)) GO TO 16
00676      IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S3)) GO TO 17
00677      GO TO 18
00678      15 CALL ZCHECK(CC,WCC,NSIZE,NGRAV)
00679      WRITE (DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC      * SYS *
00680      FLOW(IF)=YLDCC*FLOW1
00681      GO TO 18
00682      16 CALL ZCHECK(MID,WMID,NSIZE,NGRAV)
00683      WRITE (DSK ' IG) (((MID(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WMID      * SYS *
00684      FLOW(IF)=YLDMID*FLOW1
00685      GO TO 18
00686      17 CALL ZCHECK(REF,WREF,NSIZE,NGRAV)
00687      WRITE (DSK ' IG) (((REF(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WREF      * SYS *
00688      FLOW(IF)=YLDREF*FLOW1
00689      18 CONTINUE
00690      GO TO 25
00691      19 IF ((L(IU).LE.30).OR.(L(IU).EQ.41).OR.(L(IU).GE.61).AND.
00692      1 (L(IU).LT.70)) GO TO 23
00693      DO 22 IF=1,NFLOWS
00694      IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S4)) GO TO 20
00695      IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S5)) GO TO 21
00696      GO TO 22
00697      20 IF (L(IU).GE.72) GO TO 215
00698      220 CALL ZCHECK(CC,WCC,NSIZE,NGRAV)
00699      WRITE (DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC      * SYS *
00700      FLOW(IF)=YLDCC*FLOW1
00701      GO TO 22
00702      21 IF (L(IU).GE.72) GO TO 220
00703      215 CALL ZCHECK(REF,WREF,NSIZE,NGRAV)
00704      WRITE (DSK ' IG) (((REF(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WREF      * SYS *
00705      FLOW(IF)=YLDREF*FLOW1
00706      22 CONTINUE
00707      GO TO 25
00708      23 DO 24 IF=1,NFLOWS
00709      IF (KF(1,IF).NE.IU) GO TO 24
00710      CALL ZCHECK(CC,WCC,NSIZE,NGRAV)
00711      IF (L(IU).EQ.41) GO TO 231
00712      CALL ZCHECK(REF,WREF,NSIZE,NGRAV)
00713      231 IF ((L(IU).GE.71).AND.(S(IF).NE.S1)) WRITE (DSK ' IG)
00714      1 (((REF(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WREF
00715      IF ((L(IU).GE.71).AND.(S(IF).EQ.S1)) WRITE (DSK ' IG)
00716      1 (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC
00717      IF (L(IU).LT.60) WRITE (DSK ' IG)
00718      1 (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC
00719      IF ((L(IU).LT.60).OR.(L(IU).GE.70)) GO TO 233
00720      IF ((S(IF).EQ.S1).OR.(S(IF).EQ.S8)) GO TO 232
00721      IF (L(IU).EQ.67)GOTO 24
00722      WRITE(DSK ' IG) (((REF(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WREF
00723      FLOW(IF)=YLDREF*FLOW1
00724      GOTO 24
00725      232 WRITE(DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC
00726      FLOW(IF)=YLDCC*FLOW1
00727      GOTO 24
00728      233 CONTINUE

```

```

00729      IF (L(IU).EQ.41) FLOW(IF)=FPROD
00730      IF (L(IU).NE.41) FLOW(IF)=YLDCC*FLOW1
00731      IF ((L(IU).GE.81).AND.(S(IF).NE.S1)) FLOW(IF)=YLDREF*FLOW1
00732      24 CONTINUE
00733      25 CONTINUE
00734      C *****
00735      C
00736      C          ***** END MAIN LOOP *****
00737      C
00738      C *****
00739      C
00740      C *****
00741      C WRITE OPTIONAL FLOWSTREAM SUMMARY (OUTPUT STREAMS)
00742      C *****
00743      IF (IOUT.LT.2) GO TO 27
00744      IF ((IOUT.EQ.2).AND.(KCONVG.EQ.0)) GO TO 27
00745      DO 28 IF=1,NFLOWS
00746      IF (L(KF(1,IF)).EQ.89) GO TO 28
00747      WRITE (H,401) IF
00748      WRITE (H,408) KF(1,IF),S(IF),KF(2,IF)
00749      IF (NRETRT.GT.0) WRITE (H,501) ICOUNT
00750      READ (DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC      * SYS *
00751      CALL OUTPT1(CC,WCC,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,
00752      1 NCOMP)
00753      28 CALL OUTPT3(CC,WCC,BTU,FLOW(IF),TONAGE,NSIZE,NGRAV)
00754      27 CONTINUE
00755      C *****
00756      C TEST RETREATMENT STREAMS FOR CONVERGENCE
00757      C *****
00758      50 IF ((NRETRT.EQ.0).OR.(KCONVG.EQ.1)) GO TO 60
00759      DO 52 IF=1,NFLOWS
00760      IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 52
00761      READ (DSK ' IG) (V1(I),I=1,NRECRD)      * SYS *
00762      READ (DSK ' KPOINT(IG)) (V2(I),I=1,NRECRD)      * SYS *
00763      NSTOP=4*NGRAV*NSIZE-3
00764      DO 51 I=1,NSTOP,4
00765      DIFF=ABS(V1(I)-V2(I))
00766      IF (DIFF.GT.EPSLN1) GO TO 53
00767      51 CONTINUE
00768      IF (ABS(FLOW(IF)-FLOW(KPOINT(IF))).GT.EPSLN2) GO TO 53
00769      52 CONTINUE
00770      C CONVERGED SOLUTION
00771      IF (IOUT.EQ.3) GO TO 60
00772      KCONVG=1
00773      ICOUNT=ICOUNT-1
00774      GO TO 9
00775      53 IF (ICOUNT.LT.ICMAX) GO TO 54
00776      C CONVERGENCE NOT ATTAINED AFTER MAXIMUM NUMBER OF ITERATIONS -
00777      C TERMINATE COMPUTATION
00778      WRITE (H,502) ICOUNT
00779      GO TO 66
00780      C CONVERGENCE NOT ATTAINED - CONTINUE ITERATION
00781      54 KCOUNT=0
00782      DO 58 IF=1,NFLOWS
00783      IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 58
00784      KCOUNT=KCOUNT+1

```

```

00785      55 WRITE (DSK ' KPOINT(IG) (V1(I),I=1,NRECRD) * SYS *
00786 C TEST FOR ODD VALUE OF ICOUNT
00787      IF ((ICOUNT+1)/2.GT.ICOUNT/2) GO TO 56
00788 C ICOUNT=2,4,6,8,... APPLY ACCELERATION PROCEDURE
00789      IF (ICOUNT.EQ.0) GO TO 57
00790      FLOW(IF)=(FLOW(IF)+C2(KCOUNT)-C1(KCOUNT)**2)/(FLOW(IF)-
00791      1 2.*C1(KCOUNT)+C2(KCOUNT))
00792      C2(KCOUNT)=FLOW(IF)
00793      GO TO 57
00794 C ICOUNT=1,3,5,7,... BYPASS ACCELERATION PROCEDURE
00795      56 C1(KCOUNT)=FLOW(IF)
00796      57 FLOW(KPOINT(IF))=FLOW(IF)
00797      IF (KCOUNT.EQ.NRETRT) GO TO 9
00798      58 CONTINUE
00799      WRITE (H,502) ICOUNT
00800      GO TO 66
00801 C *****
00802 C THICKENER CALCULATIONS *
00803 C *
00804 C H2OIN = WATER GOING INTO THE THICKENER FROM ALL SOURCES EXCEPT FEED *
00805 C H2OOUT = DEMAND FOR WATER FROM OTHER UNITS *
00806 C *****
00807      60 IF (TFLAG.EQ.0) GO TO 6669
00808      H2OIN=0.
00809      H2OOUT=0.
00810      DO 6666 IU=1,NUNITS
00811      IF (L(IU).EQ.69) IUT=IU
00812      H2OIN=H2OIN+WATER(2,IU)
00813      H2OOUT=H2OOUT+WATER(1,IU)
00814      6666 CONTINUE
00815      IU=IUT
00816      WATER(1,IU)=H2OIN
00817      WATER(2,IU)=H2OOUT
00818      DO 6667 IF=1,NFLOWS
00819      IF (KF(2,IF).NE.IU) GO TO 6667
00820      READ (DSK ' IG) (((FEED(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WFEED * SYS *
00821      FLOW1=FLOW(IF)
00822      GO TO 6668
00823      6667 CONTINUE
00824      6668 CALL THICK(FEED,CC,REF,WFEED,WCC,WREF,SIZE,GRAV,D1(IU),D2(IU),
00825      1 D3(IU),WATER(1,IU),WATER(2,IU),YLDCC,YLDREF,NSIZE,BTU,NGRAV,
00826      2 TONAGE,FLOW1)
00827 C ON RETURNING FROM SUBROUTINE WATER(1,IU) CONTAINS TOTAL WATER FLOW
00828 C RATE TO THICKENER (INCLUDING THAT IN FEED). WATER(2,IU) CONTAINS
00829 C FLOW RATE OF CLARIFIED WATER
00830      DO 6671 IF=1,NFLOWS
00831      IF (KF(1,IF).NE.IU) GO TO 6671
00832      IF ((S(IF).EQ.S1).OR.(S(IF).EQ.S7)) GOTO 6650
00833      WRITE (DSK ' IG) (((REF(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WREF
00834      FLOW(IF)=YLDREF*FLOW1
00835      GOTO 6671
00836      6650 WRITE(DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC
00837      FLOW(IF)=YLDCC*FLOW1
00838      6671 CONTINUE
00839      IF (IOUT.LT.1) GO TO 6670
00840      WRITE (H,301) IU

```

```

00841      CALL VESSEL(L(IU),2)
00842      IF (D1(IU) .GT. 1.) WRITE(H,321) D1(IU)
00843      IF (D1(IU) .LE. 1.) WRITE (H,322)
00844      IF (D2(IU) .GT. .01) WRITE (H,323) D2(IU)
00845      IF (D2(IU) .LE. .01) WRITE (H,324)
00846      IF (D3(IU) .GE. .1) WRITE (H,325) D3(IU)
00847      IF (D3(IU) .LT. .1) WRITE (H,326)
00848      CALL OUTPT2(WFEED,WCC,WREF,WMID,SYMBOL,NSIZE,
00849      1 NGRAV,NCOMP,L(IU),PSJ,GBOUND)
00850      WRITE(H,340) WATER(1,IU)
00851      WRITE(H,341) WATER(2,IU)
00852      WRITE(H,342) H2OOUT
00853      WNET = WATER(2,IU)-H2OOUT
00854      WXNET = ABS(WNET)
00855      IF (WNET .GE. 0.) WRITE(H,343) WNET
00856      IF (WNET .LT. 0.) WRITE(H,344) WXNET
00857      8670 CONTINUE
00858      C *****
00859      C CALCULATE OVERALL YIELD, ASH AND SULFUR FOR PRODUCT STREAMS
00860      C *****
00861      8688 IF (IOUT.NE.1) GO TO 86
00862      IG=1
00863      READ (DSK ' IG) (((FEED(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WFEED * SYS *
00864      WRITE (H,400)
00865      CALL OUTPT1(FEED,WFEED,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,
00866      1 NCOMP)
00867      CALL OUTPT3(FEED,WFEED,BTU,1.,TONAGE,NSIZE,NGRAV)
00868      DO 85 IX=1,3
00869      DO 85 IF=2,NFLOWS
00870      IF (KF(2,IF).NE.0) GO TO 85
00871      IF ((IX.EQ.1).AND.((S(IF).EQ.S1).OR.(S(IF).EQ.S4))) GO TO 81
00872      IF ((IX.EQ.2).AND.(S(IF).EQ.S2)) GO TO 82
00873      IF ((IX.EQ.3).AND.((S(IF).EQ.S3).OR.(S(IF).EQ.S5))) GO TO 83
00874      GO TO 85
00875      81 WRITE (H,403) KF(1,IF)
00876      GO TO 84
00877      82 WRITE (H,404) KF(1,IF)
00878      GO TO 84
00879      83 WRITE (H,405) KF(1,IF)
00880      84 READ (DSK ' IG) (((CC(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),WCC * SYS *
00881      CALL OUTPT1(CC,WCC,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,
00882      1 NCOMP)
00883      CALL OUTPT3(CC,WCC,BTU,FLOW(IF),TONAGE,NSIZE,NGRAV)
00884      85 CONTINUE
00885      IF (NRETRT.GT.0) WRITE (H,503) ICOUNT
00886      C*****
00887      C CALCULATE AND PRINT SUMMARY DATA FOR ALL UNITS AND FLOWSTREAMS
00888      C*****
00889      86 CALL OUTPT4(L,D1,D2,D3,VSLYLD,VSLBTU,KF,S,FLOW,WATER,MUNITS,
00890      1 NFLOWS,DSK,NSIZE,NGRAV,S1,S2,S3,S4,S5,S6,S7,BTU,TONAGE,HRS,YCOST)
00891      IF (NRETRT.GT.0) WRITE (H,500) ICOUNT
00892      WRITE (H,900)
00893      C*****
00894      C CLOSE RANDOM-ACCESS DISK FILE
00895      C
00896      C NOTE: THIS IS A SYSTEM-DEPENDENT FEATURE

```

```
00897 C*****
00898      CLOSE(UNIT=DSK,DISPOSE='DELETE')
00899      STOP
00900      END
```

EQUIVALENCED VARIABLES

(*IF   1 I   *IG   1 I   )

COMMON BLOCKS

```
/.COMM./(+12775)
V1      +0#R      V2      +1660#R      SCR      +3540#R

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMID      +360#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFIC      +1020#R      BTUREC      +1050#R      ASHERR      +1100#R      SFLT      +1130#R
SINK      +1160#R      SMISPL      +1210#R      SNRGR      +1240#R      SGRAV      +1270#R      SPE      +1320#R
SIMP      +1350#R      SEA      +1400#R

/BLK2/(+361)
DISTRB      +0#R      JCOUNT      +360 I

/SYS/(+2)
G      +0 I      H      +1 I
```

SUBPROGRAMS CALLED

INT.   SPLIT   SCREEN   DWAT   ROTARY   ZCHECK   WASH   CONVRT   CRUSH   THERMA   MOISTR   FROTH   ABS.   VESSEL   BLEND   THICK
OUTPT1   OUTPT2   CLASFR   OUTPT3   OUTPT4

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*WMID	2 R	*WEIGHT	3 R	*S3	4 R	VSLYLD	5#R	*NCOMP	151 I
*DELTA	152 R	*DIFF	153 R	*NS	154 I	*NUNITS	155 I	*NFILE	156 I
PSJ	157 I	*IF	1 I	*H2OIN	160 R	*D2NEG	161 R	FEED	162#R
*K	2012 I	*WFEE	2013 R	*S8	2014 R	TFLAG	2015 I	D3	2016#R
*JXTRA	2162 I	*NYRS	2163 I	*NRECRD	2164 I	*NG	2165 I	*S2	2166 R
MID	2167#R	VSLBTU	4017#R	*KFLAG	4163 I	GBOUND	4164#R	*KCONVG	4177 I
*WNET	4200 R	*FPROD	4201 R	*NSTOP	4202 I	SYMBOL	4203#R	*S7	4415 R
D2	4416#R	*IOUT	4562 I	*FLOW2	4563 R	*KBSG	4564 I	*S1	4565 R
S	4566#R	KF	5076#I	*YLOMID	5716 R	KPOINT	5717#I	*WXNET	6227 R
*IU	6230 I	*YLDREF	6231 R	DSK	6232 I	*J	6233 I	*HRS	6234 R
*ICMAX	6235 I	*S6	6236 R	*H2OOUT	6237 R	D1	6240#R	*NFALL	6404 I
INTRST	6405 R	*FLOW1	6406 R	*FLBTU	6407 R	*FACTOR	6410 R	WATER	6411#R
*NOLD	6721 I	TITLE	6722#R	*WCC	6746 R	*ICOUNT	6747 I	*TONAGE	6750 R
*YLDCC	6751 R	*YCOST	6752 R	GRAV	6753#R	*NSIZE	6765 I	SIZE	6766#R
CC	7015#R	*PW	10645 R	*EPSLN1	10646 R	*S5	10647 R	C2	10650#R
*FLS02	10653 R	*NFWLWS	10654 I	*EPSLN2	10655 R	*WREF	10656 R	INV	10657 R
YCF	10660#R	BTU	10704#R	REF	10710#R	FLOW	12540#R	L	13053#I
*NXTRA	13217 I	*SUM2	13220 R	*NRETRT	13221 I	*I	13222 I	WT	13223#R

*NGRAV	13252 I	*S4	13253 R	C1	13254#R	*IX	13257 I	*KCOUNT	13260 I
*IUT	13261 I	*IG	1 I	*SUM1	13262 R				

TEMPORARIES

.S0021	15177 I	.S0022	15200 I	.S0110	15201 I	.S0023	15202 I	.S0111	15203 I
.S0070	15204 I	.S0024	15205 I	.S0112	15208 I	.S0071	15207 I	.S0025	15210 I
.S0113	15211 I	.S0072	15212 I	.S0028	15213 I	.S0114	15214 I	.S0073	15215 I
.S0027	15216 I	.S0115	15217 I	.S0074	15220 I	.S0116	15221 I	.S0075	15222 I
.S0117	15223 I	.S0076	15224 I	.S0077	15225 I	.S0010	15226 I	.S0011	15227 I
.S0012	15230 I	.S0100	15231 I	.S0013	15232 I	.S0101	15233 I	.S0060	15234 I
.S0014	15235 I	.S0102	15236 I	.S0061	15237 I	.S0015	15240 I	.S0103	15241 I
.S0062	15242 I	.S0016	15243 I	.S0150	15244 I	.S0104	15245 I	.S0063	15246 I
.S0017	15247 I	.S0151	15250 I	.S0105	15251 I	.S0064	15252 I	.S0152	15253 I
.S0106	15254 I	.S0065	15255 I	.S0153	15256 I	.S0107	15257 I	.S0066	15260 I
.S0154	15261 I	.S0067	15262 I	.S0155	15263 I	.S0156	15264 I	.S0000	15265 I
.S0001	15266 I	.S0002	15267 I	.S0003	15270 I	.S0050	15271 I	.S0004	15272 I
.S0051	15273 I	.S0005	15274 I	.S0052	15275 I	.S0006	15276 I	.S0140	15277 I
.S0053	15300 I	.S0007	15301 I	.S0141	15302 I	.S0054	15303 I	.S0142	15304 I
.S0055	15305 I	.S0143	15306 I	.S0056	15307 I	.S0144	15310 I	.S0057	15311 I
.S0145	15312 I	.S0146	15313 I	.S0147	15314 I	.S0040	15315 I	.S0041	15316 I
.S0042	15317 I	.S0130	15320 I	.S0043	15321 I	.S0131	15322 I	.S0044	15323 I
.S0132	15324 I	.S0045	15325 I	.S0133	15326 I	.S0046	15327 I	.S0134	15330 I
.S0047	15331 I	.S0135	15332 I	.S0136	15333 I	.S0137	15334 I	.S0030	15335 I
.S0031	15336 I	.S0032	15337 I	.S0120	15340 I	.S0033	15341 I	.S0121	15342 I
.S0034	15343 I	.S0122	15344 I	.S0035	15345 I	.S0123	15346 I	.S0036	15347 I
.S0124	15350 I	.S0037	15351 I	.S0125	15352 I	.S0126	15353 I	.S0127	15354 I
.S0020	15355 I	.Q0000	15356 I	.Q0001	15357 I	.Q0002	15360 I	.Q0003	15361 I
.Q0004	15362 I	.Q0005	15363 I						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	-	-	-	-	-	-	-	-	-
00330	:	3	5	7	11	13	15	16	-	-
00340	:	20	24	30	35	37	42	45	48	54
00350	:	63	72	103	115	124	138	141	143	155
00360	:	-	164	174	-	222	224	251	266	307
00370	:	311	313	321	322	326	330	332	353	372
00380	:	376	-	405	407	413	-	-	414	420
00390	:	430	432	436	442	447	-	452	465	471
00400	:	474	503	505	517	524	530	-	541	544
00410	:	556	-	557	561	564	566	570	572	575
00420	:	610	617	626	634	640	645	651	664	665
00430	:	-	-	-	-	727	733	736	741	745
00440	:	-	768	1000	1007	1021	1033	1042	-	1054
00450	:	1066	1071	1074	1103	1111	1124	1137	1152	1161
00460	:	1166	1171	1175	1200	1204	1207	1215	1222	1225
00480	:	-	1246	1254	1260	-	-	-	-	1262
00490	:	1264	1270	-	1273	1275	1335	1340	1341	-
00500	:	1351	1354	1356	1360	1363	1400	1420	1422	1424
00510	:	1431	1435	1475	-	1477	1505	1510	-	-

MAIN.	MAIN.FOR	FORTRAN V.5A(821) /K1/L 22-AUG-85						13:54	PAGE 1-18	
00520 :	-	-	-	-	-	1513	1514	1522	1524	1531
00530 :	1535	-	-	-	1540	1543	1550	1610	1613	1617
00540 :	1621	1622	-	1624	1632	1636	1676	-	1701	-
00550 :	-	1715	1720	1721	1724	1732	1736	1776	-	2001
00560 :	-	-	2011	2015	2021	2022	2041	2043	2045	2050
00570 :	-	-	-	2051	-	-	-	-	2102	-
00580 :	-	-	2121	-	-	-	2145	-	-	-
00590 :	2172	-	-	-	-	2227	-	-	2245	-
00600 :	-	-	2300	-	-	-	-	2335	-	-
00610 :	-	-	-	-	2361	2364	2370	2374	2401	2411
00620 :	2420	2427	2441	2453	2462	2471	2500	2507	2514	2515
00630 :	2524	2532	2540	2544	2547	2550	2555	2563	2571	2573
00640 :	2600	2610	2617	2620	2623	2627	2630	2634	2643	2650
00650 :	2654	2662	2667	2673	2701	2710	2712	2716	2723	2730
00660 :	2731	2735	2741	2745	2751	2757	-	2764	-	-
00670 :	-	-	3000	3004	3010	3020	3031	3042	3043	3045
00680 :	3105	3111	3112	3114	3154	3160	3161	3163	3223	3227
00690 :	3232	3233	-	3250	3254	3264	3275	3276	3302	3304
00700 :	3344	3350	3351	3355	3357	3417	3423	3426	3427	3433
00710 :	3437	3441	3445	3447	-	3517	-	3567	-	3633
00720 :	3642	3651	3654	3714	3720	3721	3781	3765	-	3766
00730 :	3775	4004	4017	4022	-	-	-	-	-	-
00740 :	-	-	-	4025	4030	4034	4040	4045	4051	4060
00750 :	4066	4126	-	4130	-	-	-	-	4140	4145
00760 :	4151	4157	4174	4214	4221	4231	4236	4240	4243	4252
00770 :	-	4255	4260	4262	4264	4265	-	-	4270	4274
00780 :	-	4275	4276	4301	4310	4311	-	4331	-	4343
00790 :	4345	-	4362	4363	-	4364	4370	4374	4377	4401
00800 :	4405	-	-	-	-	-	-	4408	4410	4411
00810 :	4412	4414	4417	4423	4427	4431	4433	4436	4442	4445
00820 :	4452	4512	4515	4516	4520	-	-	-	-	-
00830 :	4543	4546	4553	4562	4622	4626	4627	4667	4673	4675
00840 :	4700	4704	4711	4721	4726	4735	4743	4752	4760	-
00850 :	4764	4772	5000	5004	5011	5013	5020	-	-	-
00860 :	-	5025	5030	5031	5071	5074	-	5076	5100	5103
00870 :	5110	5113	5125	5133	5144	5145	5153	5154	5162	5163
00880 :	5171	5231	-	5233	5240	5246	-	-	-	5254
00890 :	-	5256	5264	-	-	-	-	-	5267	5271
00900 :	5273	-	-	-	-	-	-	-	-	-

MAIN. OCTAL PROG SIZE=26177 [SCALARS/ARRAYS=13262 + FORMATS=1714 + TEMPS/CONS=214 + CODE=5275 + ARGS=3270] + COMMON=15010
[NO ERRORS DETECTED]

```

00001      SUBROUTINE BLEND(FEED1,FEED2,PROD,WFEED1,WFEED2,WPROD,FLOW1,FLOW2,
00002      1 FPROD,NSIZE,NGRAV,GPMIN,YLOVSL,BTUVSL,BTU,KBSG,TONAGE)
00003      C *****
00004      C THIS SUBROUTINE COMBINES TWO DISTINCT FLOW STREAMS
00005      C
00006      C BOTH INCOMING FLOW STREAMS MUST BE EXPRESSED IN TERMS OF THE SAME
00007      C SIZE INCREMENTS
00008      C *****
00009      DIMENSION FEED1(23,10,4),FEED2(23,10,4),PROD(23,10,4),BTU(4)
00010      COMMON /BLK1/ SFEEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),
00011      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),
00012      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24)
00013      DO 5 I=1,NSIZE
00014      DO 4 J=1,NGRAV
00015      FLOW=FLOW1*FEED1(I,J,1)+FLOW2*FEED2(I,J,1)
00016      IF (FLOW.LE.1.E-6) GO TO 2
00017      DO 1 K=2,4
00018      1 PROD(I,J,K)=(FLOW1*FEED1(I,J,1)+FEED1(I,J,K)+FLOW2*FEED2(I,J,1)*
00019      1 FEED2(I,J,K))/FLOW
00020      GO TO 4
00021      2 DO 3 K=2,4
00022      3 PROD(I,J,K)=0.
00023      4 PROD(I,J,1)=FLOW/(FLOW1+FLOW2)
00024      5 CONTINUE
00025      C *****
00026      C WATER BALANCE CALCULATIONS
00027      C *****
00028      FPROD=(FLOW1+FLOW2)
00029      W1=.01*WFEED1/(1.-.01*WFEED1)
00030      W2=.01*WFEED2/(1.-.01*WFEED2)
00031      WATOUT=.25*GPMIN+(FLOW1*W1+FLOW2*W2)*TONAGE
00032      WPROD=100.*WATOUT/(WATOUT+FPROD*TONAGE)
00033      IF (KBSG.EQ.0) RETURN
00034      C*****
00035      C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00036      C*****
00037      CALL SDSIZE(FEED1,SFEED,BTU,NSIZE,NGRAV)
00038      CALL SDSIZE(FEED2,SCC,BTU,NSIZE,NGRAV)
00039      CALL SDSIZE(PROD,SREF,BTU,NSIZE,NGRAV)
00040      RETURN
00041      END

```

COMMON BLOCKS

/BLK1/(+1430)									
SFEED	+0#R	SCC	+170#R	SMID	+380#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1180#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SIMP	+1350#R	SEA	+1400#R						

SUBPROGRAMS CALLED

SDSIZE

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*W1	1 R	*WATOUT	2 R	*K	3 I	PROD	4#R	%YLDVSL	
*FPROD	5 R	*FLOW2	6 R	*WFEE1	7 R	*WFEE2	10 R	*KBSG	11 I
%BTUVSL		*J	12 I	*WPROD	13 R	*FLOW1	14 R	*GPMIN	15 R
*TONAGE	18 R	*NSIZE	17 I	FEED2	20#R	BTU	21#R	*FLOW	22 R
*I	23 I	*W2	24 R	*NGRAV	25 I	FEED1	26#R		

TEMPORARIES

.S0000	27 I	.S0001	30 I	.S0002	31 I	.S0003	32 I	.A0016	33 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	-	0	-	-	-	-	-	-	-	-
00010 :	-	-	-	37	43	47	63	65	66	-
00020 :	120	121	122	133	147	-	-	-	152	155
00030 :	164	173	203	210	-	-	-	212	214	216
00040 :	-	220								

BLEND   OCTAL PROG SIZE=315   [SCALARS/ARRAYS=26 + TEMPS/CONS=12 + CODE=233 + ARGS=22]   + COMMON=1430
[NO ERRORS DETECTED]

```

00001      FUNCTION BTUPLB(BTU,ASH,SULF)
00002      C *****
00003      C THIS FUNCTION CALCULATES THE BTU CONTENT (HIGHER HEATING VALUE) OF A POUND *
00004      C OF COAL BY ONE OF TWO METHODS *
00005      C 1. IF BTU(1) .NEQ. 0 A LINEAR OR QUADRATIC FUNCTION OF ASH CONTENT IS USED *
00006      C 2. IF BTU(1) .EQ. 0, DULONG'S FORMULA IS USED WITH BTU(2),BTU(3),AND *
00007      C BTU(4) BEING PERCENT H, O, AND N *
00008      C (IF BTU(2) IS 0, THEN DEFAULT VALUES USED: PCTH=4, PCTO=8, AND PCTN=1) *
00009      C VARIABLES USED IN PROGRAM *
00010      C ASH = FRACTION ASH IN DRY COAL *
00011      C BTUPLB = GROSS HEAT OF COMBUSTION, DRY BASIS *
00012      C HCOMB = GROSS HEAT OF COMBUSTION, DRY ASH-FREE BASIS *
00013      C PCTASH = PERCENT ASH IN DRY COAL *
00014      C PCTC = PERCENT CARBON IN DRY ASH-FREE COAL *
00015      C PCTH = PERCENT HYDROGEN IN DRY ASH-FREE COAL *
00016      C PCTN = PERCENT NITROGEN IN DRY ASH-FREE COAL *
00017      C PCTO = PERCENT OXYGEN IN DRY ASH-FREE COAL *
00018      C SULF = WEIGHT FRACTION SULFUR IN DRY COAL *
00019      C *****
00020      DIMENSION BTU(4)
00021      PCTASH=100.*ASH
00022      IF (BTU(1) .EQ. 0.) GO TO 100
00023      BTUPLB=BTU(1)-BTU(2)*PCTASH+BTU(3)*PCTASH**2
00024      IF(BTUPLB.LT.BTU(4))BTUPLB=BTU(4)
00025      RETURN
00026      100 PCTH = 4.
00027      PCTO = 8.
00028      PCTN = 1.
00029      IF (BTU(2) .EQ. 0.) GO TO 200
00030      PCTH = BTU(2)
00031      PCTO = BTU(3)
00032      PCTN = BTU(4)
00033      C PUT SULFUR ON ASH FREE BASIS
00034      200 PCTS = SULF*100*(1./(1.-ASH))
00035      PCTC = 100. - PCTS - PCTH - PCTO - PCTN
00036      HCOMB = (145.44*PCTC +620.28*(PCTH-PCTO/8.))+40.5*PCTS)
00037      BTUPLB = HCOMB * (1.-ASH)
00038      RETURN
00039      END

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "/" SUBSCRIPTED]

*PCTC	1 R	*SULF	2 R	*PCTASH	3 R	*BTUPLB	4 R	*PCTO	5 R
*PCTH	6 R	*ASH	7 R	*PCTN	10 R	*HCOMB	11 R	BTU	12/R
*PCTS	13 R								

TEMPORARIES

.A0002	14 R	.A0003	15 R	.A0004	16 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	-	-	-	-
00020 :	-	11	14	17	26	32	33	35	37	41
00030 :	44	46	50	-	52	62	70	101	-	105

BTUPLB OCTAL PROG SIZE=133 [SCALARS/ARRAYS=13 + TEMPS/CONS=5 + CODE=113 + ARGS=0]
[NO ERRORS DETECTED]

```

00001        SUBROUTINE BVALS(N,XMAX,SR)
00002 C*****
00003 C
00004 C        THIS SUBROUTINE CALCULATES THE BREAKAGE DISTRIBUTION
00005 C        VALUES, EMPLOYING A FUNCTIONAL FORM
00006 C
00007 C*****
00008        COMMON /BLK3/ SKIP(4050),B(1275),FILL(104)
00009        DATA BETA/7.0/,GAMMA/1.2/,DELTA/0.0/,PHI/0.5/
00010        FI = PHI
00011        R = 1./SR
00012        RB = R*BETA
00013        RG = R*GAMMA
00014        RD = R*(-DELTA)
00015        N1 = N-1
00016        DO 20 J = 1,N1
00017        XB = 1.
00018        XG = 1.
00019        J1 = J+1
00020        DO 10 I=J1,N
00021        IJ = I*(I-1)/2 + J
00022        B(IJ) = FI*XG + (1.-FI)*XB
00023        XB = XB*RB
00024 10        XG = XG*RG
00025        FI = FI*RD
00026        IF(FI.GT.1.) FI = 1.
00027 20        CONTINUE
00028        IJ = N*N1/2 + N1
00029        B(IJ) = 1.
00030        RETURN
00031        END

```

COMMON BLOCKS

```

/BLK3/(+12485)
SKIP        +O#R        B        +7722#R        FILL        +12315#R

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*DELTA	1 R	*GAMMA	2 R	*N1	3 I	*N	4 I	*BETA	5 R
*RD	6 R	*IJ	7 I	%XMAX		*J1	10 I	*J	11 I
*SR	12 R	*FI	13 R	*XB	14 R	*RB	15 R	*R	16 R
*PHI	17 R	*XG	20 R	*I	21 I	*RG	22 R		

TEMPORARIES

.S0000	23 I	.S0001	24 I	.A0018	25 R	.Q0000	26 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
00000 :	0	-	-	-	-	-	-	-	-	-
00010 :	5	7	12	15	20	25	30	34	36	37
00020 :	41	45	55	64	66	72	74	100	103	112
00030 :	-	114								

BVALS   OCTAL PROG SIZE=160   [SCALARS/ARRAYS=22 + TEMPS/CONS=8 + CODE=117 + ARGS=11]   + COMMON=12485
 [NO ERRORS DETECTED]


```

00001        SUBROUTINE BYPASS(XMAX,GAP,SR,N)
00002 C*****
00003 C
00004 C        THIS SUBROUTINE CALCULATES THE SIZE SELECTIVITY VALUES
00005 C        FOR A DOUBLE ROLL CRUSHER WITH A SPECIFIED GAP
00006 C
00007 C*****
00008        COMMON /BLK3/ SKIP(5325),A(50),AP(50),FILL(4)
00009        REAL MU,LAMBDA
00010        DATA MU/1.7/,LAMBDA/2.5/
00011        DO 5 I=1,50
00012        5 AP(I)=0.
00013        R = 1./SR
00014        RL = R*LAMBDA
00015        C = (XMAX/GAP/MU) *LAMBDA
00016        XL = 1.
00017        X = XMAX
00018        XG = GAP/R
00019        AP(1) = 0.
00020        IG = 0
00021        DO 30 I = 1,N
00022        A(I) = 1./((1. +C*XL)
00023        A(I) = 1.-A(I)
00024        XL = XL*RL
00025        DIF = X-XG
00026        IF (DIF.GT.0.1) GO TO 10
00027        IF ( ABS(DIF).LT. 0.1) GO TO 20
00028        AP(I) = A(I)
00029        GO TO 30
00030        10 IF (I.GT.1) AP(I) = A(I-1)
00031        GO TO 30
00032        20 IG =I
00033        30 X = X*R
00034        IF (IG.NE.0) AP(IG) = (A(IG) + A(IG-1))/2
00035        RETURN
00036        END

```

COMMON BLOCKS

```

/BLK3/(+12485)
SKIP        +O#R        A        +12315#R        AP        +12377#R        FILL        +12481#R

```

SUBPROGRAMS CALLED

ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*GAP	1 R	MU	2 R	*N	3 I	*XMAX	4 R	*SR	5 R
*X	6 R	*R	7 R	*XG	10 R	*I	11 I	*DIF	12 R
*C	13 R	*XL	14 R	LAMBDA	15 R	*IG	16 I	*RL	17 R

TEMPORARIES

.S0000   20 I   .S0001   21 I   .A0018   22 R   .Q0000   23 1

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	-	-	-	-
00010 :	-	11	12	14	17	22	31	33	35	40
00020 :	41	42	44	52	54	56	61	63	66	70
00030 :	71	75	76	77	103	-	111			

BYPASS   OCTAL PROG SIZE=150   [SCALARS/ARRAYS=17 + TEMPS/CONS=7 + CODE=114 + ARGS=6]   + COMMON=12465
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE CLASFR(FEED,FINE,COARSE,VAL,GPMIN,GPMOUT,NSIZE,NGRAV,
00002      1 WFEE,WFINE,WCORSE,FLOW1,SIZE,GRAV,BTU,YLDCC,YLDREF,BTUVSL,
00003      2 YLDVSL,IU,KBSG,TONAGE)
00004      C*****
00005      C
00006      C THIS SUBROUTINE DETERMINES THE WEIGHT DISTRIBUTION AND
00007      C COMPOSITION OF THE CLASSIFIER PRODUCTS FOR A GIVEN FEED
00008      C
00009      C*****
00010      DIMENSION FEED(23,10,4),FINE(23,10,4),COARSE(23,10,4),
00011      1 SIZE(23),GRAV(10),BTU(4)
00012      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),
00013      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),
00014      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24)
00015      COMMON /BLK3/ PT(50,10,4),SKIP(50),Q(50,10,4),FILL(1379)
00016      REAL MOISTR
00017      XMAX=25400.0*SIZE(1)
00018      SR=SQRT(2.)
00019      CALL XPAND(NSIZE,NGRAV,FEED,SIZE,NX,FINE,1)
00020      IF (IU.EQ.71) GO TO 10
00021      CALL SIEVE(VAL,SR,XMAX,NX,C,IU,NGRAV)
00022      GO TO 30
00023      10 SUMM=1.E-5
00024      SUMV=1.E-5
00025      DO 20 I=1,NSIZE
00026      DO 20 J=1,NGRAV
00027      SUMM=SUMM+FEED(I,J,1)
00028      SUMV=SUMV+FEED(I,J,1)/GRAV(J)
00029      20 CONTINUE
00030      RHO=SUMM/SUMV
00031      CALL HYDRO(VAL,SR,XMAX,NX,C,RHO,NGRAV,GRAV)
00032      30 CALL SQUEZ(NSIZE,NGRAV,COARSE,SIZE,NX)
00033      DO 35 I=1,NX
00034      DO 35 J=1,NGRAV
00035      DO 35 K=1,4
00036      PT(I,J,K)=Q(I,J,K)
00037      35 CONTINUE
00038      CALL SQUEZ(NSIZE,NGRAV,FINE,SIZE,NX)
00039      YLDCC=1./(1.+C)
00040      YLDREF=1.-YLDCC
00041      C *****
00042      C WATER BALANCE CALCULATIONS
00043      C
00044      C (DISTRIBUTE OUTPUT WATER IN DIRECT PROPORTION TO DRY SOLID FLOWRATES)
00045      C
00046      C *****
00047      NS=NSIZE+1
00048      WATIN=0.25*GPMIN+(0.01*WFEE/(1.-0.01*WFEE))*FLOW1*TONAGE
00049      WFINE=100.*WATIN/(WATIN+FLOW1*TONAGE)
00050      WCORSE=WFINE
00051      GPMOUT=0.
00052      IF(KBSG.EQ.0) RETURN
00053      C*****
00054      C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00055      C*****
00056      CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)

```

```

00057      CALL SDSIZE(FINE,SCC,BTU,NSIZE,NGRAV)
00058      CALL SDSIZE(COARSE,SREF,BTU,NSIZE,NGRAV)
00059      DO 490 I=1,NSIZE
00060      SYLD(I)=100.*YLDCC*SCC(I,1)/SFEED(I,1)
00061      BTUREC(I)=SYLD(I)*SCC(I,5)/SFEED(I,5)
00062  490 CONTINUE
00063      SYLD(NS)=100.*YLDCC
00064      BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5)
00065      1 )
00066      BTUVSL=BTUREC(NS)
00067      YLDVSL=SYLD(NS)
00068      RETURN
00069      END

```

COMMON BLOCKS

```

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMID      +360#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFC      +1020#R      BTUREC      +1050#R      ASHERR      +1100#R      SFLT      +1130#R
SINK      +1160#R      SMISPL      +1210#R      SNRGR      +1240#R      SGRAV      +1270#R      SPE      +1320#R
SIMP      +1350#R      SEA      +1400#R

/BLK3/(+12465)
PT      +0#R      SKIP      +3720#R      Q      +4002#R      FILL      +7722#R

```

SUBPROGRAMS CALLED

SQRT. SIEVE SQUEZ SDSIZE XPAND HYDRO

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*GPMOUT	1 R	*NS	2 I	*WCORSE	3 R	FEED	4#R	*K	5 I
*WFEED	6 R	*NX	7 I	*YLDVSL	10 R	*SUMV	11 R	*KBSG	12 I
*XMAX	13 R	*IU	14 I	*BTUVSL	15 R	*YLDREF	18 R	*J	17 I
*SR	20 R	%MOISTR		*FLOW1	21 R	*GPMIN	22 R	*TONAGE	23 R
*YLDCC	24 R	GRAV	25#R	*NSIZE	28 I	SIZE	27#R	*WATIN	30 R
*SUMM	31 R	*WFINE	32 R	*RHO	33 R	BTU	34#R	FINE	35#R
*VAL	36 R	*I	37 I	*NGRAV	40 I	*C	41 R	COARSE	42#R

TEMPORARIES

.S0000	43 I	.S0001	44 I	.S0002	45 I	.S0003	46 I	.S0004	47 I
.S0005	50 I	.A0016	51 R						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	55	81	84	-
00020	68	71	73	74	76	77	103	105	113	124
00030	131	134	138	140	144	150	151	161	170	172
00040	177	-	-	-	-	-	-	202	205	221
00050	227	230	231	-	-	-	233	235	237	241
00060	243	250	253	255	261	-	271	272	-	274

CLASFR OCTAL PROG SIZE=476 [SCALARS/ARRAYS=42 + TEMPS/CONS=16 + CODE=325 + ARGS=71] + COMMON=14115
 [NO ERRORS DETECTED]

38

```

00057      DO 9 I=1,NSIZE
00058      IF (SIZE(I+1).LT.SIZE(I)) GO TO 9
00059      DO 8 J=1,15                                * DIM *
00060      IF (ABS(SIZE(I+1)-SMESH(J,1)).GT.1.E-5) GO TO 8
00061      SIZE(I+1)=SMESH(J,2)
00062      GO TO 80
00063      8 CONTINUE
00064      80 IF (I.GT.1) GO TO 9
00065      DO 81 J=1,15                                * DIM *
00066      IF (ABS(SIZE(I)-SMESH(J,1)).GT.1.E-5) GO TO 81
00067      SIZE(I)=SMESH(J,2)
00068      GO TO 9
00069      81 CONTINUE
00070      9 CONTINUE
00071      RETURN
00072      END

```

SUBPROGRAMS CALLED

ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*NS	1 I	*K1	2 I	*K	3 I	*XDENOM	4 R	SYMBOL	5/R
SMESH	8/R	S	50/R	*XNUM	65 R	*J	66 I	*NSIZE	67 I
SIZE	70/R	*KJ	71 I	*K3	72 I	*I	73 I	C	74/R
*K2	108 I								

TEMPORARIES

.S0010	107 I	.S0000	110 I	.S0001	111 I	.S0002	112 I	.S0003	113 I
.S0004	114 I	.S0005	115 I	.A0016	118 R	.S0006	117 I	.S0007	120 I
.Q0000	121 I								

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	-	-	-	-
00020 :	7	12	18	17	20	21	-	23	24	38
00030 :	45	50	53	54	57	-	61	63	66	75
00040 :	78	77	-	100	103	105	111	132	-	137
00050 :	141	142	153	164	165	172	-	175	201	205
00060 :	207	217	223	224	225	230	232	242	246	247
00070 :	250	-	253							

CONVRT OCTAL PROG SIZE=410 [SCALARS/ARRAYS=108 + TEMPS/CONS=21 + CODE=256 + ARGS=3]
[NO ERRORS DETECTED]

```

00001      SUBROUTINE CRUSH(N,SO,SIZE,GRAV,NSIZE,NGRAV,FEED,PROD,WFEED,
00002      1 WPROD,FPROD,YLDVSL,BTUVSL,BTU,KBSG)
00003 C *****
00004 C THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE *
00005 C CRUSHER PRODUCT FOR A GIVEN FEED. *
00006 C *
00007 C *
00008 C VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST *
00009 C SO = CRUSHER SETTING *
00010 C SIZE(I) = BOUNDARIES OF COAL SIZE INCREMENTS *
00011 C NSIZE = NUMBER OF SIZE INCREMENTS *
00012 C NGRAV = NUMBER OF GRAVITY INCREMENTS *
00013 C FEED(I,J,K) = PROPERTIES OF FEED STREAM *
00014 C PROD(I,J,K) = PROPERTIES OF PRODUCT STREAM *
00015 C FPROD = PRODUCT FLOW RATE *
00016 C I = DESIGNATES SIZE INCREMENT OF COAL *
00017 C J = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL *
00018 C K = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR *
00019 C (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE *
00020 C STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT) *
00021 C *****
00022 C DIMENSION BTU(4),SIZE(23),GRAV(10),FEED(23,10,4),PROD(23,10,4) * DIM *
00023 C COMMON /BLK1/ SFEEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5),
00024 C &SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),
00025 C &SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24)
00026 C REAL MOISTR
00027 C SR=SQRT(2.)
00028 C CALL XPAND(NSIZE,NGRAV,FEED,SIZE,NX,PROD,0)
00029 C CALL BVALS(NX,SIZE(1),SR)
00030 C XG=SO
00031 C CALL BYPASS(SIZE(1),XG,SR,NX)
00032 C CALL TRANSF(NX)
00033 C CALL ROLL(NX,NGRAV)
00034 C CALL SQUEEZ(NSIZE,NGRAV,PROD,SIZE,NX)
00035 C IF(KBSG.EQ.0)RETURN
00036 C *****
00037 C CALCULATE SUMMARY DATA BY SIZE INCREMENTS *
00038 C *****
00039 C CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00040 C CALL SDSIZE(PROD,SCC,BTU,NSIZE,NGRAV)
00041 C FPROD=1.
00042 C DO 30 I=1,NSIZE
00043 C SYLD(I)=100.*SCC(I,1)/SFEED(I,1)
00044 C BTUREC(I)=100.*SCC(I,1)*SCC(I,5)/(SFEED(I,1)*SFEED(I,5))
00045 C 30 CONTINUE
00046 C NS=NSIZE+1
00047 C SYLD(NS)=100.
00048 C BTUREC(NS)=100.*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5))
00049 C YLDVSL=SYLD(NS)
00050 C BTUVSL=BTUREC(NS)
00051 C WPROD=WFEED
00052 C RETURN
00053 C END

```


COMMON BLOCKS

/BLK1/(+1430)

SFEED	+0#R	SCC	+170#R	SMD	+380#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1180#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SIMP	+1350#R	SEA	+1400#R						

SUBPROGRAMS CALLED

ROLL SQRT. TRANSF SQUEEZ BYPASS SDSIZE BVALS XPAND

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*NS	1 I	*SO	2 R	%N		FEED	3#R	*WFEED	4 R
*NX	5 I	PROD	8#R	*YLDVSL	7 R	*FPROD	10 R	*KBSG	11 I
*BTUVSL	12 R	*WPROD	13 R	*SR	14 R	%MOISTR		%GRAV	
*NSIZE	15 I	SIZE	16#R	BTU	17#R	*XG	20 R	*I	21 I
*NGRAV	22 I								

TEMPORARIES

.S0000 23 I .A0018 24 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	-	-	-
00020 :	-	-	-	-	-	-	-	35	40	42
00030 :	44	48	50	52	54	56	-	-	-	60
00040 :	62	64	66	70	74	103	105	110	112	120
00050 :	122	124	-	128						

CRUSH OCTAL PROG SIZE=246 [SCALARS/ARRAYS=22 + TEMPS/CONS=5 + CODE=145 + ARGS=52] + COMMON=1430
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE DWAT(FEED,CC,REF,WFEED,WCC,WREF,SIZE,GRAV,
00002      1          D1,D2,D3,YLDCC,YLDREF,NSIZE,BTU,NGRAV,L,
00003      2          VSLYLD,VSLBTU,TONAGE,FLOW1)
00004      DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),
00005      1          SIZE(23),GRAV(10),BTU(4)
00006      COMMON DEGRAD(23),FEEDGR(23,10),CAKEFL(23,10),SICP(23),
00007      1          SIFP(23),SSFEED(23,10),FEEDJP(23,10),SUMF(10),SOLCAP(23),
00008      2          SOLFLP(23),FEEDCA(23,10),FEEDF(23,10),FLOSF(23)
00009      COMMON /BLK1/ SFEEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),      * DIM *
00010      1          SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),      * DIM *
00011      2          SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SMIP(24),SEA(24) * DIM *
00012      FRATE=TONAGE*FLOW1*2000
00013      C *****
00014      C SUBPROGRAM TO CALCULATE MOISTURE CONTENT AND DISTRIBUTION OF WEIGHT, SULFUR*
00015      C AND ASH IN PRODUCTS FROM A CONTINUOUS DISK FILTER OR CENTRIFUGE      *
00016      C SEPARATE ENTRIES ARE PROVIDED FOR EACH TYPE OF UNIT      *
00017      C PARAMETERS AND DEFAULT VALUES      *
00018      C PORS      =POROSITY OF DRY SOLIDS      *
00019      C      =VOID VOLUME / TOTAL VOLUME      *
00020      C      =0.45 ( DEFAULT )      *
00021      C SCREEN      =SIZE ( TYLER MESH ) OF OPENING IN SCREEN      *
00022      C      =0.0098 INCHES ( 60 MESH ) ( DEFAULT FOR FILTER )      *
00023      C      =0.0116 INCHES ( DEFAULT 48 MESH, PERFORATED BASKET CENTRIFUGE*
00024      C      =0.0029 INCHES ( DEFAULT 200 MESH FOR SOLID BOWL CENTRIFUGE ) *
00025      C TEMP      =TEMPERATURE OF WATER ( CENTIGRADE )      *
00026      C      =25. ( DEFAULT )      *
00027      C VARIABLES USED FOR FILTER AND CENTRIFUGE      *
00028      C AVSIZE      =AVERAGE VALUE OF SIZE(I) AND SIZE(I+1) FOR EACH SIZE      *
00029      C      DISTRIBUTION      *
00030      C BTUREC(I)   =BTU RECOVERY IN PERCENT OF FILTER CAKE, DEFINED AS BTU IN      *
00031      C      SIZE(I) IN CAKE DIVIDED BY BTU IN SIZE(I) IN FEED      *
00032      C      ( NOTE THAT YIELD OR BTU RECOVERY MAY BE MORE THAN 100 %      *
00033      C      BECAUSE OF DEGRADATION AND LOSS )      *
00034      C CAPN      =CAPILLARY NUMBER, DIMENSIONLESS      *
00035      C CT      =FILTRATION CONSTANT      *
00036      C DP      =PARTICLE DIAMETER, BASED ON SPECIFIC SURFACE AREA, FT      *
00037      C FRATE      =FEED RATE, LBS/HR      *
00038      C GAV      =AVERAGE SPECIFIC GRAVITY OF FILTER CAKE      *
00039      C L      =TYPE OF UNIT      *
00040      C      =61 FOR PERFORATED BASKET CENTRIFUGE      *
00041      C      =62 FOR VIBRATING BASKET CENTRIFUGE      *
00042      C      =63 FOR SOLID BOWL CENTRIFUGE      *
00043      C      =64 FOR CONTINUOUS DISK FILTER      *
00044      C PERM      =PERMEABILITY ( FT **3-LBM / SEC**2-LBF )      *
00045      C SAT      =FRACTION OF VOIDS WHICH ARE FILLED WITH WATER      *
00046      C SATEF      =EFFECTIVE SATURATION      *
00047      C SATRD      =RESIDUAL OR EQUILIBRIUM SATURATION      *
00048      C SICP(I)    =PERCENT OF DRY SOLIDS OF SIZE(I) IN CAKE      *
00049      C SIFP(I)    =PERCENT OF DRY SOLIDS OF SIZE(I) IN FILTRATE OR CENTRATE      *
00050      C SOLCAP(I)  =PERCENT OF DRY SOLIDS OF SIZE(I) IN FEED WHICH IS LEFT IN      *
00051      C      CAKE      *
00052      C SOLFLP(I)  =PERCENT OF DRY SOLIDS OF SIZE(I) IN FEED WHICH IS LOST TO      *
00053      C      FILTRATE OR CENTRATE LIQUID      *
00054      C SYLD(I)    =SIZE YIELD IN PERCENT OF CAKE, DEFINED AS MASS IN      *
00055      C      SIZE(I) IN CAKE DIVIDED BY MASS IN SIZE(I) IN FEED      *
00056      C THICKF      =THICKNESS OF CAKE ( FEET )      *

```

```

00057 C   WATCK      =WATER LEAVING IN CAKE *
00058 C   WATD      =WATER CONTENT OF CAKE (DRY BASIS, LB WATER/LB DRY CAKE) *
00059 C   WATIN     =WATER IN FEED PER KG OF DRY COAL FEED *
00060 C   WATW      =WATER CONTENT OF CAKE (WET BASIS, LB WATER/LB WET CAKE) *
00061 C   WATRF     =WATER IN REFUSE *
00062 C   VSCST     =VISCOSITY OF WATER ( LBM / FT-SEC ) *
00063 C   Y         =EXPONENT IN THE EFFECTIVE SATURATION EQUATION *
00064 C *****
00065 C   IF((L.EQ.81).OR.(L.EQ.82).OR.(L.EQ.83)) GO TO 1000
00066 C *****
00067 C   ENTRY FOR CONTINUOUS DISK FILTER *
00068 C *
00069 C   DECISION VARIABLES AND ASSUMED PARAMETER VALUES *
00070 C   D1         =DECISION VARIABLE *
00071 C             AREA OF FILTER, SQUARE FEET *
00072 C             =FRATE/75 (DEFAULT IF D1 IS ZERO) *
00073 C   D2, CYTIMF =DECISION VARIABLE *
00074 C             CYCLE TIME (MINUTES) *
00075 C   OR *
00076 C   D2, THICK  =DECISION VARIABLE (IF D2 IS NEGATIVE) *
00077 C             CAKE THICKNESS (INCHES) *
00078 C             =1. INCHES (DEFAULT IF D2 IS ZERO) *
00079 C   D3, PRDIFF =DECISION VARIABLE *
00080 C             PRESSURE DIFFERENCE ACROSS FILTER (PSI) *
00081 C             =9.8 PSI (20 INCHES VACUUM, DEFAULT IF D3 IS ZERO) *
00082 C *
00083 C   FLMAXF     =MAXIMUM LOSS OF COAL TO FILTRATE, EXPRESSED AS FRACTION OF *
00084 C             FEED, ASSUMED TO OCCUR FOR SMALLEST SIZE RANGE *
00085 C             =0.3 ( DEFAULT ) *
00086 C   FCDEW      =FRACTION OF CYCLE USED FOR DEWATERING *
00087 C             =1./3.( DEFAULT ) *
00088 C   PRFAC      =PRESSURE DROP CORRECTION FACTOR *
00089 C             =0.8 ( DEFAULT ) *
00090 C *
00091 C   VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE *
00092 C   FPHSFF     =FLOW OF SOLIDS TO FILTER (POUNDS PER HOUR PER SQUARE FOOT) *
00093 C   FLTTM      =FILTER TIME ( SECOND ) *
00094 C   DESF       =DESATURATING FORCE ( LBF / FT **2 ) *
00095 C   FLOSF(I)   =FRACTION OF FEED OF SIZE(I) WHICH IS LOST TO FILTRATE *
00096 C *****
00097 C   SET UP DEFAULT VALUES FOR DECISION VARIABLES AND PARAMETERS *
00098 C *****
00099 C   DEFAULT VALUES FOR PARAMETERS *
00100 C   PORS=0.45 *
00101 C   SCREEN=0.0098 *
00102 C   FLMAXF=0.3 *
00103 C   PRFAC=0.8 *
00104 C   FCDEW=1./3. *
00105 C   TEMP=25. *
00106 C   VISCOSITY AND SURFACE TENSION OF WATER *
00107 C   VSCST=(1.63088-(3.79498E-2)*TEMP+(3.40643E-4)*TEMP*TEMP)*(8.72E-4) *
00108 C   GAM=0.0052-0.000011*TEMP *
00109 C *****
00110 C   CALCULATE LOSS OF COAL TO FILTRATE *
00111 C *****
00112 C   NS=NSIZE+1

```

```

00113 CALL SDSIZE(FEED,SPEED,BTU,NSIZE,NGRAV)
00114 C SUM1P AND SUM2P ARE TOTAL AMOUNTS OF DRY SOLIDS IN CAKE AND FILTRATE
00115 C FOR 100 UNITS OF FEED
00116 SUM1P=0.0
00117 SUM2P=0.0
00118 DO 10 I=1,NSIZE
00119 AVSIZE=(SIZE(I)+SIZE(I+1))/2.
00120 IF (AVSIZE .GT. SCREEN) FLOSF(I)=0.
00121 IF ((AVSIZE .LE. SCREEN) .AND. (AVSIZE .GT. SIZE(NSIZE)))
00122 1 FLOSF(I)=FLMAXF*(SCREEN-AVSIZE)/(SCREEN-SIZE(NSIZE))
00123 IF (AVSIZE .LE. SIZE(NSIZE)) FLOSF(I)=FLMAXF
00124 SOLFLP(I)=SFEED(I,1)*FLOSF(I)
00125 SOLCAP(I)=SFEED(I,1)-SOLFLP(I)
00126 SUM2P=SUM2P+SOLFLP(I)
00127 10 CONTINUE
00128 SUM1P=100.-SUM2P
00129 C YIELD OF FILTER CAKE AND LOSS TO FILTRATE ARE CALCULATED
00130 YLDREF=SUM2P/100.
00131 YLDCC=SUM1P/100.
00132 DO 20 I=1,NSIZE
00133 SIFP(I)=100.*SOLFLP(I)/SUM2P
00134 SICP(I)=100.*SOLCAP(I)/SUM1P
00135 20 CONTINUE
00136 C *****
00137 C CORRECTION OF ASH, SULFUR, AND BTU *
00138 C *****
00139 C WEIGHT FRACTION OF SPECIFIC GRAVITY J AND SIZE I IN CAKE AND FILTRATE
00140 C (FOR EACH SIZE THE SPECIFIC GRAVITY DISTRIBUTION OF DRY SOLIDS IN THE
00141 C CAKE AND THE FILTRATE IS ASSUMED TO BE THE SAME AS THE DISTRIBUTION
00142 C IN THE FEED)
00143 DO 30 I=1,NSIZE
00144 DO 30 J=1,NGRAV
00145 CC(I,J,1)=FEED(I,J,1)/SFEED(I,1)*SICP(I)
00146 REF(I,J,1)=FEED(I,J,1)/SFEED(I,1)*SIFP(I)
00147 30 CONTINUE
00148 C ASH AND SULFUR FOR EACH SPECIFIC GRAVITY AND SIZE IN CAKE AND FILTRATE
00149 C ARE CALCULATED
00150 DO 40 I=1,NSIZE
00151 DO 40 J=1,NGRAV
00152 DO 40 K=2,4
00153 CC(I,J,K)=FEED(I,J,K)
00154 REF(I,J,K)=CC(I,J,K)
00155 40 CONTINUE
00156 CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00157 CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00158 C *****
00159 C EQUILIBRIUM AND FINAL MOISTURE CONTENT OF CAKE *
00160 C *****
00161 C GET AVERAGE GRAVITY AND PERMEABILITY OF FILTER CAKE
00162 GO TO 500
00163 C OBTAIN VALUES FOR DECISION VARIABLES
00164 501 FPHSFF=75.
00165 IF (D1 .GT. 0.) FPHSFF=FRATE/D1
00166 THICK=1.
00167 IF (D2 .GT. 0.) CYTIMF=D2
00168 IF (D2 .GT. 0.)

```

```

00169      1      THICK=FPHSFF*YLDCC*CYTIMF/(5.*82.4*GAV*(1.-PORS))
00170      IF (D2.LT. 0.) THICK=-D2
00171      IF (D2.LE. 0.)
00172      1      CYTIMF=THICK*5.*82.4*(1.-PORS)*GAV/(FPHSFF*YLDCC)
00173      PRDIFF=9.8
00174      IF (D3.GT. 0.) PRDIFF=D3
00175      FLTTM=FCDEW*CYTIMF*60.
00176      THICKF=THICK/12.
00177      DESF=PRDIFF*PRFAC*144.
00178      CAPN=((PORS**3)*DESF*(DP**2))/(((1.-PORS)**2)*THICKF*GAM)
00179      SATRD=0.155*(1.+0.031*(CAPN**(-.49)))
00180      IF (SATRD.GT.1.) SATRD=1.
00181      Y=1.38399+(2.75241E-2)*ALOG10(DP)+0.14013*(ALOG10(DP))**2
00182      CT=(VSCST*PORS*THICKF**2)/(PERM*DESF)
00183      SATEF=(FLTTM/CT*(2./((1.-SATRD)**2+1.))*(Y-1.))+1.)*(1./(1.-Y))
00184      SAT=(SATEF-2.*SATEF*SATRD+SATRD)/(1.-SATEF*SATRD)
00185      WATD=SAT*PORS/(GAV*(1.-PORS))
00186      WATW=WATD/(1.+WATD)
00187      C      WATER BALANCE FOR FILTER
00188      WATIN=WFEED/(100.-WFEED)
00189      WATCK=WATD*YLDCC
00190      WATRF=WATIN-WATCK
00191      IF (WATRF.LT.0.) WATRF=0.
00192      WCC=WATW*100.
00193      WREF=(WATRF/(WATRF+YLDREF))*100.
00194      VSLYLD=YLDCC*100.
00195      VSLBTU=((SCC(NS,5)*YLDCC)/SFEED(NS,5))*100.
00196      DO 60 I=1,NSIZE
00197      SYLD(I)=(SICP(I)/SFEED(I,1))*100.
00198      80      BTUREC(I)=((SICP(I)*SCC(I,5))/(SFEED(I,1)*SFEED(I,5)))*100.
00199      SYLD(NS)=VSLYLD
00200      BTUREC(NS)=VSLBTU
00201      RETURN
00202      C *****
00203      1000      CONTINUE
00204      C *****
00205      C      ENTRY TO CENTRIFUGE CALCULATIONS
00206      C
00207      C      DECISION VARIABLES AND ASSUMED PARAMETER VALUES
00208      C      D1      =DECISION VARIABLE (D1=0., GFOR=300.)
00209      C      DIAMETER OF CENTRIFUGE BASKET AT DISCHARGE (INCHES)
00210      C      THICK,D2      =DECISION VARIABLE, DEFAULT VALUE 1.0 INCH
00211      C      THICKNESS OF CAKE AT DISCHARGE (INCHES)
00212      C      D3      =DECISION VARIABLE (D3=0., GFOR=300.)
00213      C      ROTATIONAL SPEED OF BASKET (REVOLUTIONS PER MINUTE)
00214      C
00215      C      FLOSM      =MAXIMUM FRACTION OF COAL WHICH IS LOST THROUGH SCREEN OPENING
00216      C      =0.4      ( DEFAULT )
00217      C
00218      C      HLDTM      =TIME COAL IS IN CENTRIFUGE (DEFAULT, 60 SECONDS)
00219      C      CKD      =CONSTANT FOR FRACTION OF COAL DEGRADED (DEFAULT, 2.5)
00220      C      VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE
00221      C      GFOR      =CENTRIFUGAL FORCE
00222      C      SSF      =AUX VARIABLE FOR CALCULATING SSFEED(I,J) (PERCENT)
00223      C      DGRLFT      =FRACTION OF FEED OF SIZE(I) WHICH IS NOT DEGRADED TO
00224      C      SMALLER SIZES

```

```

00225 C   DEGRAS      =AUXILIARY VARIABLE FOR CALCULATING ACCUMULATIVE SUMMARY OF *
00226 C             FEED IN SIZE GREATER THAN M DEGRADED INTO SIZE M (FRACTION)*
00227 C   SUMF(J)      =FRACTION OF FEED WITH GRAVITY J *
00228 C   DEGRAD(I)    =FRACTION OF FEED OF SIZE(I) WHICH IS DEGRADED TO SMALLER SIZE *
00229 C             =(0.75/0.30)*(AVERAGE SIZE IN INCHES) *
00230 C             (CORRELATION BASED ON LYONS (1951)) *
00231 C             < OR = 0.90 *
00232 C             SMALLEST SIZE IN FEED IS NOT DEGRADED *
00233 C   SSFEED(I,J)  =CUMULATIVE SUMMARY OF FEED OF SIZE(I) UP TO SIZE(I) *
00234 C             EACH GRAVITY(J) (PERCENT) *
00235 C   CAKEFL(I,J)  =FRACTION OF CAKE PLUS EFFLUENT IN SIZE(I) AND GRAVITY(J) *
00236 C             AFTER DEGRADATION (FRACTION)*
00237 C   FEEDGR(I,J)  =FRACTION OF FEED OF SIZE(I) AND GRAVITY(J) WHICH IS DEGRADED*
00238 C   FEEDJP(I,J)  =PERCENT OF MATERIAL OF GRAVITY J WHICH IS IN SIZE RANGE I *
00239 C   FEEDCA(I,J)  =FRACTION OF DRY SOLIDS OF SIZE(I) AND GRAVITY(J) WHICH IS *
00240 C             LEFT IN CAKE *
00241 C   FEEDF(I,J)  =FRACTION OF DRY SOLIDS OF SIZE(I) AND GRAVITY(J) WHICH IS *
00242 C             LOST TO EFFLUENT *
00243 C *****
00244 C   NS=NSIZE+1
00245 C *****
00246 C   SET UP DEFAULT VALUES FOR DECISION VARIABLES *
00247 C *****
00248 C   TEMP=25.
00249 C   CKD=2.5
00250 C   THICK=D2
00251 C   HLDTM=80.
00252 C   IF (D2.EQ.0.) THICK=1.
00253 C   THICKF=THICK/12.
00254 C   GFOR=D3*D3*(D1-THICK)/70471.
00255 C   IF ((D1.EQ.0.) .OR. (D3.EQ.0.)) GFOR=300.
00256 C   PORS=0.45
00257 C   SCREEN=0.0116
00258 C   IF (L.EQ.83) SCREEN=0.0029
00259 C   FLOSM=0.4
00260 C   CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00261 C   VSCST=(1.63088-(3.79496E-2)*TEMP+(3.40643E-4)*TEMP*TEMP)*(6.72E-4)
00262 C   GAM=0.0052-0.000011*TEMP
00263 C *****
00264 C   CALCULATE THE SIZE DISTRIBUTION OF FEED BASED ON EACH SPECIFIC GRAVITY *
00265 C *****
00266 C   DO 120 J=1,NGRAV
00267 C     SUMF(J)=0.
00268 C   DO 110 I=1,NSIZE
00269 C     SUMF(J)=SUMF(J)+FEED(I,J,1)
00270 C   110 CONTINUE
00271 C   DO 120 I=1,NSIZE
00272 C     FEEDJP(I,J)=100.*FEED(I,J,1)/SUMF(J)
00273 C   120 CONTINUE
00274 C *****
00275 C   CALCULATE CHANGE IN PARTICLE SIZE DISTRIBUTION DUE TO DEGRADATION *
00276 C   AND LOSS OF FINES *
00277 C *****
00278 C   DO 130 I=1,NSIZE
00279 C     AVSIZE=(SIZE(I)+SIZE(I+1))/2.
00280 C     DEGRAD(I)=CKD*AVSIZE

```

```

00281      IF (DEGRAD(I).GT.0.9) DEGRAD(I)=0.90
00282      IF (I.EQ.NSIZE) DEGRAD(I)=0.
00283  130    CONTINUE
00284      DO 140 I=1,NSIZE
00285      DO 140 J=1,NGRAV
00286      FEEDGR(I,J)=FEED(I,J,1)*DEGRAD(I)
00287      CAKEFL(I,J)=0.
00288  140    CONTINUE
00289      DO 180 J=1,NGRAV
00290      SSF=0.
00291      DO 150 I=1,NSIZE-1
00292      DGRLFT=FEED(I,J,1)-FEEDGR(I,J)
00293      CAKEFL(I,J)=CAKEFL(I,J)+DGRLFT
00294      SSF=SSF+FEEDJP(I,J)
00295      SSFEED(I,J)=SSF
00296      AMTLFT=100.-SSF
00297  C      SIZE DISTRIBUTION OF DEGRADED MATERIAL FOR EACH SPECIFIC GRAVITY IS
00298  C      ASSUMED TO BE THE SAME AS THE DISTRIBUTION IN THE FEED
00299      DO 150 M=I+1,NSIZE
00300      IF (AMTLFT.GE.0.01) DGRLFT=FEEDGR(I,J)*(FEEDJP(M,J)/AMTLFT)
00301      IF (AMTLFT.LT.0.01) DGRLFT=0.
00302      CAKEFL(M,J)=CAKEFL(M,J)+DGRLFT
00303  150    CONTINUE
00304      CAKEFL(NSIZE,J)=CAKEFL(NSIZE,J)+FEED(NSIZE,J,1)
00305  180    CONTINUE
00306  C *****
00307  C      WEIGHT FRACTION OF GRAVITY J AND SIZE I IN CAKE AND EFFLUENT ARE      *
00308  C      ESTIMATED, SOME FINE PARTICLES WILL LEAVE IN EFFLUENT                *
00309  C *****
00310      DO 180 I=1,NSIZE
00311      AVSIZE = (SIZE(I)+SIZE(I+1))/2.
00312      IF (AVSIZE .GT. SCREEN) FLOSS=0.
00313      IF ((AVSIZE .LE. SCREEN).AND.(AVSIZE.GT.SIZE(NSIZE)))
00314      1 FLOSS=FLOSM*(SCREEN-AVSIZE)/(SCREEN-SIZE(NSIZE))
00315      IF (AVSIZE.LE.SIZE(NSIZE)) FLOSS=FLOSM
00316  170    DO 180 J=1,NGRAV
00317      FEEDCA(I,J)=(1.-FLOSS)*CAKEFL(I,J)
00318      FEEDEF(I,J)=FLOSS*CAKEFL(I,J)
00319  180    CONTINUE
00320  C      SUM1P AND SUM2P ARE TOTAL AMOUNTS OF DRY SOLIDS IN CAKE AND EFFLUENT
00321  C      FOR 100 UNITS OF FEED
00322      SUM1P=0.
00323      SUM2P=0.
00324      DO 200 I=1,NSIZE
00325      SOLCAP(I)=0.
00326      SOLFLP(I)=0.
00327      DO 190 J=1,NGRAV
00328      SOLCAP(I)=SOLCAP(I)+(100.*FEEDCA(I,J))
00329      SOLFLP(I)=SOLFLP(I)+(100.*FEEDEF(I,J))
00330  190    CONTINUE
00331      SUM1P=SUM1P+SOLCAP(I)
00332      SUM2P=SUM2P+SOLFLP(I)
00333  200    CONTINUE
00334  C      YIELD OF CENTRIFUGED CAKE AND LOSS TO CENTRATE WATER ARE CALCULATED
00335      YLDCC=SUM1P/100.
00336      YLDREF=SUM2P/100.

```

```

00337      DO 210 I=1,NSIZE
00338      SICP(I)=100.*SOLCAP(I)/SUM1P
00339      SIFP(I)=100.*SOLFLP(I)/SUM2P
00340      DO 210 J=1,NGRAV
00341      CC(I,J,1)=100.*FEEDCA(I,J)/SUM1P
00342      REF(I,J,1)=100.*FEEDEF(I,J)/SUM2P
00343 210    CONTINUE
00344 C *****
00345 C      CORRECTION OF ASH, SULFUR, AND BTU *
00346 C *****
00347 C      ASH AND SULFUR FOR EACH GRAVITY ARE CALCULATED FOR LARGEST SIZE
00348 C      BY MATERIAL BALANCE
00349      DO 230 K=2,4
00350      DO 230 J=1,NGRAV
00351      IF (CAKEFL(1,J).LT.1.E-6) GO TO 220
00352      CC(1,J,K)=FEED(1,J,K)*FEED(1,J,1)*(1-DEGRAD(1))/CAKEFL(1,J)
00353      GO TO 225
00354 220    CC(1,J,K)=FEED(1,J,K)
00355 225    REF(1,J,K)=CC(1,J,K)
00356 230    CONTINUE
00357 C      ASH AND SULFUR FOR EACH GRAVITY AND SIZE LESS THAN LARGEST ARE CALCULATED
00358      DO 270 K=2,4
00359      DO 270 I=2,NSIZE
00360      DO 270 J=1,NGRAV
00361      DEGRAS=0
00362      DO 240 M=1,I-1
00363      DEGRAS=FEED(M,J,K)*FEEDGR(M,J)*(FEEDJP(I,J)
00364      1 /((100.-SSFEED(M,J)))+DEGRAS
00365 240    CONTINUE
00366      IF (CAKEFL(I,J).LE.1.E-6) GO TO 250
00367      CC(I,J,K)=(DEGRAS+FEED(I,J,K)*FEED(I,J,1)*(1-DEGRAD(I)))
00368      1 /CAKEFL(I,J)
00369      GO TO 260
00370 250    CC(I,J,K)=FEED(I,J,K)
00371 260    REF(I,J,K)=CC(I,J,K)
00372 270    CONTINUE
00373      CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00374      CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00375 C *****
00376 C      MOISTURE CONTENT AND WATER BALANCE *
00377 C *****
00378      GO TO 500
00379 502    CAPN=((PORS**3)*(DP**2)*GFOR*62.4)/
00380      1 (((1.-PORS)**2)*GAM*((2*3.1416)**2))
00381      SATRD=0.0524*(CAPN**(-.19))
00382      IF (CAPN.GT. 0.14) SATRD=0.0139*(CAPN**(-.86))
00383      IF (SATRD.GT. 1.) SATRD=1.
00384      Y=1.38399+(2.75241E-2)*ALOG10(DP)+0.14013*(ALOG10(DP))**2
00385      DESF=GFOR*62.4*(THICK/12.)
00386      CT=(VSCST*PORS*THICKF**2)/(PERM*DESF)
00387      SATEF=(HLDTM/CT*(2./((1.-SATRD)**2+1.))*(Y-1.)+1.)*(1./(1.-Y))
00388      SAT=(SATEF-2.*SATEF*SATRD+SATRD)/(1.-SATEF*SATRD)
00389      WATD=SAT*PORS/(GAV*(1.-PORS))
00390      WATW=WATD/(1.+WATD)
00391      WATIN=WFEED/(100.-WFEED)
00392      WATCK=WATD*YLDCC

```



```

00393      WATRF=WATIN-WATCK
00394      IF (WATRF.LT.O.) WATRF=0.
00395      WCC=WATW*100.
00396      WREF=(WATRF/(WATRF+YLDREF))*100.
00397      VSLYLD=YLDCC*100.
00398      VSLBTU=((SCC(NS,5)*YLDCC)/SFEED(NS,5))*100.
00399      DO 290 I=1,NSIZE
00400      SYLD(I)=(SICP(I)/SFEED(I,1))*100.
00401 290      BTUREC(I)=((SICP(I)*SCC(I,5))/(SFEED(I,1)*SFEED(I,5)))*100.
00402      SYLD(NS)=VSLYLD
00403      BTUREC(NS)=VSLBTU
00404      RETURN
00405  C *****
00406  C   THIS SECTION CALCULATES THE AVERAGE SPECIFIC GRAVITY, PARTICLE DIAMETER, *
00407  C   AND PERMEABILITY OF CENTRIFUGE AND FILTER CAKES *
00408  C *
00409  C *****
00410 500      SUM2=0.
00411  C      SUM3 IS THE WEIGHT OF SOLID, SUM2 IS VOLUME
00412      SUM3=0.
00413      DO 520 J=1,NGRAV
00414  C      SUM1 IS THE TOTAL WEIGHT OF GRAVITY J
00415      SUM1=0.
00416      DO 510 I=1,NSIZE
00417      SUM1=SUM1+CC(I,J,1)
00418 510      CONTINUE
00419      SUM3=SUM3+SUM1
00420      SUM2=SUM2+SUM1/GRAV(J)
00421 520      CONTINUE
00422      GAV=SUM3/SUM2
00423      SUM1=0.
00424      SUM2=0.
00425      DO 530 I=1,NSIZE
00426      AVSIZE=(SIZE(I)+SIZE(I+1))/2.
00427      SUM1=SICP(I)/AVSIZE+SUM1
00428      SUM2=SUM2+SICP(I)
00429 530      CONTINUE
00430      SSA=6.*12.*SUM1/SUM2
00431      DP=SUM2/(SUM1*12.)
00432      PERM=(PORS**3)/(5.*(SSA**2)*((1.-PORS)**2))
00433      IF (L.LT.84) GO TO 502
00434      GO TO 501
00435      RETURN
00436      END

```

COMMON BLOCKS

/. COMM. /(+2770)							
DEGRAD	+0#R	FEEDGR	+27#R	CAKEFL	+375#R	SICP	+743#R
SSFEED	+1021#R	FEEDJP	+1387#R	SUMF	+1735#R	SOLCAP	+1747#R
FEEDCA	+2025#R	FEEDF	+2373#R	FLOSF	+2741#R	SIFP	+772#R
						SOLFLP	+1776#R
/BLK1/(+1430)							
SFEED	+0#R	SCC	+170#R	SMID	+360#R	SREF	+550#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R
						SYLD	+740#R
						SFLT	+1130#R

DWAT DWAT.FOR FORTRAN V.5A(821) /KI/L 22-AUG-85 13:55 PAGE 1-8

SINK +1160#R SMISPL +1210#R SNRGR +1240#R SGRAV +1270#R SPE +1320#R
 SMIP +1350#R SEA +1400#R

SUBPROGRAMS CALLED

ALG10. SDSIZE

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*FPHSFF	1 R	*DP	2 R	*SAT	3 R	*VSLYLD	4 R	*SCREEN	5 R
*NS	6 I	*FLTTM	7 R	FEED	10#R	*K	11 I	*WFEED	12 R
*D3	13 R	*WATCK	14 R	*GAM	15 R	*WATD	16 R	*SATEF	17 R
*VSLBTU	20 R	*FRATE	21 R	*GFOR	22 R	*CKD	23 R	*PORS	24 R
*DGRLFT	25 R	*WATW	26 R	*D2	27 R	*Y	30 R	*THICKF	31 R
*CAPN	32 R	*DESF	33 R	*AVSIZE	34 R	*FLMAXF	35 R	*YLDREF	36 R
*M	37 I	*VSCST	40 R	*J	41 I	*PRFAC	42 R	*D1	43 R
*SSA	44 R	*FLOW1	45 R	*WCC	46 R	*TONAGE	47 R	*SATRD	50 R
*FCDEW	51 R	*DEGRAS	52 R	*YLDCC	53 R	*PRDIFF	54 R	GRAV	55#R
*SUM3	56 R	*CT	57 R	*NSIZE	60 I	SIZE	61#R	CC	62#R
*GAV	63 R	*SUM2P	64 R	*FLOSS	65 R	*WATIN	66 R	*WREF	67 R
*TEMP	70 R	BTU	71#R	REF	72#R	*L	73 I	*SUM2	74 R
*AMTLFT	75 R	*I	76 I	*FLOSM	77 R	*SUM1P	100 R	*WATRF	101 R
*NGRAV	102 I	*THICK	103 R	*SSF	104 R	*HLDTM	105 R	*SUM1	106 R
*PERM	107 R	*CYTIMF	110 R						

TEMPORARIES

.S0021	111 I	.S0022	112 I	.S0023	113 I	.S0024	114 I	.S0025	115 I
.S0026	116 I	.S0027	117 I	.I0000	120 I	.S0010	121 I	.S0011	122 I
.S0012	123 I	.S0013	124 I	.S0014	125 I	.S0015	126 I	.S0016	127 I
.S0017	130 I	.S0000	131 I	.S0001	132 I	.S0002	133 I	.S0003	134 I
.S0004	135 I	.S0005	136 I	.A0016	137 R	.S0006	140 I	.S0007	141 I
.S0040	142 I	.S0030	143 I	.S0031	144 I	.S0032	145 I	.S0033	146 I
.S0034	147 I	.S0035	150 I	.S0036	151 I	.S0037	152 I	.S0020	153 I
.Q0000	154 I	.Q0001	155 I						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00010	:	-	53	-	-	-	-	-	-	-
00060	:	-	-	-	-	56	-	-	-	-
00100	:	63	65	67	71	73	75	77	107	-
00110	:	-	113	116	-	-	120	121	122	124
00120	:	132	134	-	154	162	165	170	172	174
00130	:	177	202	204	206	212	216	-	-	-
00140	:	-	-	220	224	226	242	255	-	-
00150	:	262	266	272	273	307	323	332	334	-
00160	:	-	336	-	337	341	347	351	355	-
00170	:	370	373	-	410	412	416	422	425	447

00180 :	458	482	475	504	530	542	550	-	554	581
00190 :	564	568	570	572	600	603	611	813	817	630
00200 :	633	635	-	-	-	-	-	-	-	-
00240 :	-	-	-	-	638	-	-	-	841	843
00250 :	645	647	651	654	657	668	678	700	702	707
00260 :	711	713	724	-	-	-	730	734	735	737
00270 :	746	750	752	764	-	-	-	-	771	773
00280 :	1001	1003	1010	1012	1014	1020	1022	1033	1037	1044
00290 :	1050	1051	1056	1068	1072	1077	1103	-	-	1110
00300 :	1114	1131	1133	1140	1145	1154	-	-	-	-
00310 :	1157	1183	1170	1172	-	1212	1220	1222	1231	1237
00320 :	-	-	1244	1245	1248	1252	1253	1254	1256	1265
00330 :	1273	1275	1277	1301	-	1304	1307	1312	1318	1322
00340 :	1326	1330	1341	1352	-	-	-	-	-	1357
00350 :	1362	1384	1371	1413	1414	1427	1442	-	1447	1452
00360 :	1457	1463	1484	1487	-	1511	1513	1521	-	1548
00370 :	1547	1583	1577	1610	1612	-	-	-	1614	1615
00380 :	-	1634	1640	1646	1653	1668	1674	1704	1731	1743
00390 :	1751	1755	1762	1765	1767	1771	1773	2001	2004	2012
00400 :	2014	2020	2031	2034	2036	-	-	-	-	-
00410 :	2037	-	2040	2041	-	2045	2048	2050	2058	2080
00420 :	2082	2088	2071	2074	2075	2078	2100	2108	2111	2113
00430 :	2115	2121	2128	2143	2146	-	2147	-	-	-

DWAT OCTAL PROG SIZE=2501 [SCALARS/ARRAYS=110 + TEMPS/CONS=110 + CODE=2172 + ARGS=67] + COMMON=4420
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE FROTH(FEED,CC,REF,WFEED,WCC,WREF,FLOW1,SIZE,GRAV,
00002      1 GBOUND,GPM,YLDCC,YLDREF,NSIZE,NGRAV,NCOMP,YLDVSL,BTUVSL,BTU,
00003      2 KBSG,TONAGE)
00004 C *****
00005 C THIS SUBROUTINE DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF *
00006 C THE CLEAN COAL (FLOAT) AND REFUSE (TAILS) FROM A FROTH FLOTATION CELL *
00007 C *
00008 C THE CALCULATIONS ARE BASED UPON THE "YIELD AT 1.50, ASH AT 1.60" RULE *
00009 C (WITH RESPECT TO THE FEED STREAM) *
00010 C *
00011 C A FICTITIOUS DISTRIBUTION CURVE IS THEN FITTED TO THE OVERALL SEPARATION *
00012 C IN ORDER TO CALCULATE THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE *
00013 C PRODUCT STREAMS AS A FUNCTION OF SPECIFIC GRAVITY *
00014 C *****
00015      DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),SIZE(23),BTU(4), * DIM *
00016      1 GRAV(10),GBOUND(11),GRAVITY(20) * DIM *
00017      COMMON SCMT(20),SCMASH(20),YLDPTS(20),ASHPTS(20), * DIM *
00018      1 S(20),DELTA(10),YIELD(23),ASH(23) * DIM *
00019      COMMON /BLK1/ SFEE(24,5),SCC(24,5),SMID(24,5),SREF(24,5), * DIM *
00020      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24), * DIM *
00021      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00022      COMMON /BLK2/ DISTRB(24,10),KCOUNT * DIM *
00023      REAL MOISTR
00024      DATA GRAVITY /20*0./ * DIM *
00025      NS=NSIZE+1
00026      NG=NGRAV+1
00027      KCOUNT=0
00028      DO 1 J=1,NG
00029      1 GRAVITY(J)=GBOUND(J)
00030 C *****
00031 C DETERMINE OVERALL YIELD AND OVERALL ASH CONTENT IN FLOAT FOR EACH *
00032 C SIZE INCREMENT *
00033 C *****
00034      DO 2 I=1,NSIZE
00035      SFEE(I,1)=0.
00036      DO 2 J=1,NGRAV
00037      2 SFEE(I,1)=SFEE(I,1)+100.*FEED(I,J,1)
00038      DO 5 I=1,NSIZE
00039      SCMT(1)=0.
00040      SCMASH(1)=0.
00041      DO 4 J=2,NG
00042      J1=J-1
00043      SCMT(J)=0.
00044      SCMASH(J)=0.
00045      DO 3 K=1,J1
00046      SCMT(J)=SCMT(J)+1.E+4*FEED(I,K,1)/SFEE(I,1)
00047      3 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00048      SCMASH(J)=1.E+4*SCMASH(J)/(SCMT(J)*SFEE(I,1))
00049      IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00050      4 CONTINUE
00051      YIELD(I)=.01*YINTRP(GRAVITY,SCMT,1.50,NG)
00052      ASH(I)=.01*YINTRP(GRAVITY,SCMASH,1.60,NG)
00053      5 CONTINUE
00054      STOT1=0.
00055      STOT2=0.
00056 C *****

```

```

00057 C FIT DISTRIBUTION DATA TO OVERALL SEPARATION FOR EACH SIZE INCREMENT *
00058 C *****
00059     DO 10 I=1,NSIZE
00060     IJ=0
00061     DMIN=1.E+38
00062     DO 8 I1=1,7
00063     J1=I1
00064 C CARRY OUT SEPARATION USING SEVERAL DISTRIBUTION CURVES (TABLES DATA)
00065 C AND 20 VALUES OF SGSP FOR EACH DISTRIBUTION CURVE
00066     DO 7 INDEX=1,20
00067     SUM1=0.
00068     SUM2=0.
00069     SUM3=0.
00070     S(INDEX)=1.40+.01*INDEX
00071     DO 6 J=1,NGRAV
00072     X=GRAV(J)/S(INDEX)
00073     CC(I,J,1)=Y(X,1,J1)*FEED(I,J,1)
00074     REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)
00075     CC(I,J,2)=FEED(I,J,2)
00076     REF(I,J,2)=FEED(I,J,2)
00077     SUM1=SUM1+FEED(I,J,1)
00078     SUM2=SUM2+CC(I,J,1)
00079     SUM3=SUM3+CC(I,J,1)*CC(I,J,2)
00080     8 CONTINUE
00081 C CALCULATE YIELD AND ASH CONTENT FOR EACH SEPARATION GRAVITY
00082     YLDPTS(INDEX)=SUM2/SUM1
00083     ASHPTS(INDEX)=SUM3/SUM2
00084     IF ((INDEX.GT.1).AND.(ASHPTS(INDEX).LT.ASHPTS(INDEX-1)))
00085     1 ASHPTS(INDEX)=ASHPTS(INDEX-1)
00086     7 CONTINUE
00087     IF ((YLDPTS(1).GT.YIELD(I)).OR.(YLDPTS(20).LT.YIELD(I))) GO TO 8
00088     IF ((ASHPTS(1).GT.ASH(I)).OR.(ASHPTS(20).LT.ASH(I))) GO TO 8
00089 C DETERMINE DISTRIBUTION CURVE AND SEPARATION GRAVITY THAT BEST MATCH
00090 C OVERALL YIELD AND OVERALL ASH CALCULATIONS
00091     SGSP1=YINTRP(YLDPTS,S,YIELD(I),20)
00092     SGSP2=YINTRP(ASHPTS,S,ASH(I),20)
00093     IF (ASHPTS(20)-ASHPTS(1).LE.0.00001) SGSP2=SGSP1
00094     SGAV=.5*(SGSP1+SGSP2)
00095     DIFF=ABS(SGSP2-SGSP1)
00096     IF (DIFF.GE.DMIN) GO TO 8
00097     IJ=I1
00098     SGSP=SGAV
00099     DMIN=DIFF
00100     8 CONTINUE
00101 C RECALCULATE SEPARATION USING BEST DISTRIBUTION CURVE (IJ) AND BEST
00102 C VALUE FOR SPECIFIC GRAVITY OF SEPARATION (SGSP)
00103     SUM1=0.
00104     SUM2=0.
00105     SUM3=0.
00106     SUM4=0.
00107     DO 9 J=1,NGRAV
00108     CC(I,J,1)=YIELD(I)*FEED(I,J,1)
00109     IF (IJ.EQ.0) GO TO 80
00110     X=GRAV(J)/SGSP
00111     CC(I,J,1)=Y(X,1,IJ)*FEED(I,J,1)
00112     80 REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)

```

* DIM *

* DIM *

* DIM *

```

00113      SUM1=SUM1+FEED(I,J,1)
00114      SUM2=SUM2+CC(I,J,1)
00115      SUM3=SUM3+CC(I,J,1)*FEED(I,J,2)
00116      SUM4=SUM4+REF(I,J,1)
00117      DO 9 K=2,4
00118      CC(I,J,K)=FEED(I,J,K)
00119      REF(I,J,K)=FEED(I,J,K)
00120      9 CONTINUE
00121      XYLD=SUM2/SUM1
00122      XASH=SUM3/SUM2
00123      C ***** BEGIN FIX (MODIFICATION OF DISTRIBUTION DATA) *****
00124      IF (IJ.EQ.0) GO TO 92
00125      IF (ABS(YIELD(I)-XYLD).LE.1.E-4) GO TO 92
00126      YLDAV=.5*(YIELD(I)+XYLD)
00127      ASHAV=.5*(ASH(I)+XASH)
00128      TARGET=YLDAV*(ASH(I)-XASH)/(YIELD(I)-XYLD)
00129      DMIN=1.E+38
00130      C DETERMINE SPECIFIC GRAVITY INCREMENT FOR WHICH (ASH(J)-OVERALL ASH)
00131      C APPROACHES TARGET VALUE MOST CLOSELY
00132      DO 90 J=1,NGRAV
00133      DELTA(J)=0.
00134      ASHDIF=CC(I,J,2)-ASHAV
00135      DIFF=ABS(TARGET-ASHDIF)
00136      IF (DIFF.GE.DMIN) GO TO 90
00137      JK=J
00138      DMIN=DIFF
00139      90 CONTINUE
00140      C MODIFY DISTRIBUTION DATA IN SPECIFIC GRAVITY INCREMENT JK AND
00141      C RECALCULATE SEPARATION
00142      DELTA(JK)=(YIELD(I)-XYLD)/FEED(I,JK,1)
00143      SUM1=0.
00144      SUM2=0.
00145      SUM3=0.
00146      SUM4=0.
00147      DO 91 J=1,NGRAV
00148      X=GRAV(J)/SGSP
00149      F=Y(X,1,IJ)+DELTA(J)
00150      IF (F.GT.1.) F=1.
00151      IF (F.LT.0.) F=0.
00152      CC(I,J,1)=F*FEED(I,J,1)
00153      REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)
00154      SUM1=SUM1+FEED(I,J,1)
00155      SUM2=SUM2+CC(I,J,1)
00156      SUM3=SUM3+CC(I,J,1)*CC(I,J,2)
00157      91 SUM4=SUM4+REF(I,J,1)
00158      XYLD=SUM2/SUM1
00159      XASH=SUM3/SUM2
00160      92 CONTINUE
00161      C ***** END FIX *****
00162      STOT1=STOT1+SUM2
00163      STOT2=STOT2+SUM4
00164      10 CONTINUE
00165      YLDCC=STOT1
00166      YLDREF=STOT2
00167      C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00168      DO 11 I=1,NSIZE

```

* DIM *

```

00169      DO 11 J=1,NGRAV
00170      CC(I,J,1)=CC(I,J,1)/STOT1
00171      11 REF(I,J,1)=REF(I,J,1)/STOT2
00172      C *****
00173      C WATER BALANCE CALCULATIONS
00174      C *****
00175      WATIN=0.25*GPM+(0.01*WFEED/(1.-0.01*WFEED))*FLOW1*TONAGE
00176      C NOTE: THE OUTPUT CONCENTRATE IS ARBITRARILY ASSUMED 25 PERCENT SOLIDS
00177      C IF THIS REQUIRES MORE WATER THAN IN FEED, THE WATER IS DIVIDED
00178      C IN THE SAME RATIO AS THE SOLIDS IN PRODUCT STREAMS
00179      WCC=75.0
00180      WATOUT=WATIN-0.01*FLOW1*TONAGE*(WCC/(1.-0.01*WCC))*YLDCC
00181      IF(WATOUT.GE.0.) GO TO 12
00182      WCC=100.*WATIN/(WATIN+FLOW1*TONAGE)
00183      WREF=WCC
00184      GOTO 13
00185      12 WREF=100.*WATOUT/(WATOUT+FLOW1*TONAGE*YLDREF)
00186      13 IF (KBSG.EQ.0) RETURN
00187      C *****
00188      C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00189      C *****
00190      CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00191      CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00192      CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00193      DO 17 I=1,NSIZE
00194      SYLD(I)=100.*STOT1*SCC(I,1)/SFEED(I,1)
00195      17 BTUREC(I)=100.*YLDCC*SCC(I,1)*SCC(I,5)/(SFEED(I,1)*SFEED(I,5))
00196      SYLD(NS)=100.*YLDCC
00197      BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5))
00198      1)
00199      YLDVSL=SYLD(NS)
00200      BTUVSL=BTUREC(NS)
00201      RETURN
00202      END

```

COMMON BLOCKS

```

/.COMM./(+234)
SCMWT      +0#R      SCMAH      +24#R      YLDPTS      +50#R      ASHPTS      +74#R      S      +120#R
DELTA      +144#R    YIELD      +156#R    ASH      +205#R

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMID      +360#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFIC      +1020#R    BTUREC      +1050#R    ASHERR      +1100#R    SFLT      +1130#R
SINK      +1180#R    SMISPL      +1210#R    SNRGR      +1240#R    SGRAV      +1270#R    SPE      +1320#R
SIMP      +1350#R    SEA      +1400#R

/BLK2/(+361)
DISTRB      +0#R      KCOUNT      +360 I

```

SUBPROGRAMS CALLED

YINTRP Y SDSIZE ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*XASH	1 R	*SGSP2	2 R	*DMIN	3 R	%NCOMP		*DIFF	4 R
*NS	5 I	*WATOUT	6 R	FEED	7#R	*K	10 I	*STOT1	11 R
*WFEED	12 R	*SGSP1	13 R	*NG	14 I	GBOUND	15#R	*YLDVSL	16 R
*YLDV	17 R	*XYLD	20 R	*IJ	21 I	*ASHAV	22 R	*KBSG	23 I
*SGSP	24 R	*BTUVSL	25 R	*INDEX	26 I	*YLDREF	27 R	*J1	30 I
*SGAV	31 R	*J	32 I	GRAVITY	33#R	*SUM4	57 R	*GPM	60 R
%MOISTR		*FLOW1	61 R	*WCC	62 R	*TONAGE	63 R	*YLDCC	64 R
GRAV	65#R	*SUM3	66 R	*NSIZE	67 I	%SIZE		CC	70#R
*X	71 R	*WATIN	72 R	*WREF	73 R	BTU	74#R	REF	75#R
*SUM2	76 R	*I1	77 I	*I	100 I	*F	101 R	*TARGET	102 R
*JK	103 I	*NGRAV	104 I	*ASHDIF	105 R	*SUM1	106 R	*STOT2	107 R

TEMPORARIES

.S0010	110 I	.S0011	111 I	.S0012	112 I	.S0013	113 I	.S0014	114 I
.S0015	115 I	.S0016	116 I	.S0017	117 I	.S0000	120 I	.S0001	121 I
.S0002	122 I	.S0003	123 I	.S0004	124 I	.S0005	125 I	.A0016	126 R
.S0006	127 I	.S0007	130 I	.S0020	131 I	.Q0000	132 I		

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00020	:	-	-	-	-	51	54	57	60	62
00030	:	-	-	-	70	74	75	77	114	120
00040	:	121	122	127	131	133	134	136	150	171
00050	:	175	200	205	211	214	215	-	-	216
00060	:	222	223	225	231	-	-	232	236	240
00070	:	241	245	247	255	270	304	315	326	342
00080	:	351	-	353	357	362	-	371	374	403
00090	:	-	411	416	424	432	436	442	444	446
00100	:	450	-	-	453	454	455	456	457	463
00110	:	477	504	517	533	541	547	561	567	570
00120	:	620	624	627	-	632	634	642	645	650
00130	:	-	-	661	663	664	673	677	701	702
00140	:	-	-	705	717	720	721	722	723	725
00150	:	736	742	744	756	772	1000	1006	1015	1025
00160	:	-	-	1033	1035	1037	1042	1044	-	1046
00170	:	1054	1063	-	-	-	1077	-	-	1113
00180	:	1115	1130	1131	1137	1140	1141	1151	-	-
00190	:	1153	1155	1157	1161	1163	1170	1202	1206	-
00200	:	1220	-	1222						1216

FROTH OCTAL PROG SIZE=1500 [SCALARS/ARRAYS=107 + TEMPS/CONS=42 + CODE=1245 + ARGS=62] + COMMON=2245
[NO ERRORS DETECTED]


```

00001 SUBROUTINE HYDRO (DIA,SR,XMAX,N,C,RHO,M,GRAV)
00002 C*****
00003 C
00004 C THIS SUBROUTINE CALCULATES THE SIZE/SPECIFIC GRAVITY
00005 C WEIGHT FRACTION AND COMPOSITION OF THE COARSE STREAM
00006 C AND THE FINE STREAM FOR A GIVEN FEED STREAM ENTERING
00007 C A CLASSIFYING HYDROCYCLONE WITH A SPECIFIED DIAMETER
00008 C
00009 C VARIABLE AND ARRAYS APPEARING IN THE SUBROUTINE LIST
00010 C
00011 C RHO = SPECIFIC GRAVITY OF COAL
00012 C CP = MASS FRACTION OF SOLIDS IN FEED STREAM
00013 C CT = SOLIDS TO SLURRY RATIO IN FEED STREAM
00014 C DIA = DIAMETER OF THE CYCLONE (INCHES)
00015 C SR = SIEVE RATIO
00016 C XMAX = UPPER BOUNDARY OF SIZE
00017 C DP = DIFFERENTIAL PRESSURE IN CYCLONE (PSIG)
00018 C SI = SHARPNESS INDEX
00019 C N = NUMBER OF SIZE INTERVALS
00020 C CI = CLASSIFICATION NUMBER FOR SIZE(1)
00021 C P(I,J,K) = PROPERTIES OF FEED STREAM
00022 C Q(I,J,K) = PROPERTIES OF FINE STREAM
00023 C T(I,J,K) = PROPERTIES OF COARSE STREAM
00024 C I = DESIGNATES SIZE INCREMENT OF COAL
00025 C J = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL
00026 C K = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR
00027 C (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE
00028 C STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)
00029 C*****
00030 DIMENSION GRAV(10)
00031 COMMON /BLK3/ PT(50,10,4),SKIP(50),Q(50,10,4),FILL(1379)
00032 DATA CP/.1/,CT/.45/,SI/.4/
00033 R=1./SR
00034 CV= 1./((1.+RHO*(1.-CP))/CP)
00035 DP=73.86-18.553*ALOG(DIA)
00036 D50=18.*DIA **.68/DP** .3/(1.-1.8*CV)**1.43
00037 ASI=ALOG(SI)
00038 SUM=0.
00039 ONE=0.
00040 DO 20 J=1,M
00041 XI=XMAX/D50*SQRT(GRAV(J)-1.)
00042 DO 20 I=1,N
00043 Z=ALOG(XI)/ASI
00044 IF ((Z.GT.40.).OR.(I.EQ.N)) GO TO 5
00045 IF (Z.LT.-2.5) Z=-2.5
00046 Z=EXP(-1.5725*Z)
00047 CBAR=1./2.**Z
00048 GO TO 10
00049 5 CBAR=1.
00050 10 IF (PT(I,J,1).LT.1E-12) PT(I,J,1)=0.
00051 Q(I,J,1)=CBAR*PT(I,J,1)
00052 SUM=SUM+Q(I,J,1)
00053 ONE=ONE+PT(I,J,1)
00054 20 XI=XI*R
00055 C=CT*(1.-CP)/(CT-CP)*(1.-SUM)/SUM
00056 DO 30 J=1,M

```

```

00057      DO 30 I=1,N
00058      Q(I,J,1)=Q(I,J,1)/SUM
00059      PT(I,J,1)=PT(I,J,1)/ONE
00060      PT(I,J,1)=PT(I,J,1)+(PT(I,J,1)-Q(I,J,1))/C
00061      DO 30 K=2,4
00062      30 Q(I,J,K)=PT(I,J,K)
00063      RETURN
00064      END

```

COMMON BLOCKS

```

/BLK3/(+12465)
PT          +O#R      SKIP      +3720#R      Q          +4002#R      FILL      +7722#R

```

SUBPROGRAMS CALLED

SQRT. ALOG. EXP.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*Z	1 R	*DP	2 R	*N	3 I	*K	4 I	*SI	5 R
*D50	6 R	*CV	7 R	*CP	10 R	*XMAX	11 R	*XI	12 R
*CBAR	13 R	*M	14 I	*DIA	15 R	*J	16 I	*SUM	17 R
*SR	20 R	GRAV	21#R	*CT	22 R	*R	23 R	*RHO	24 R
*I	25 I	*C	26 R	*ONE	27 R	*ASI	30 R		

TEMPORARIES

.S0000	31 I	.S0001	32 I	.S0002	33 I	.S0003	34 I	.S0004	35 I
.A0016	36 R	.Q0000	37 I						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00030	:	-	-	21	24	34	41	60	63	64
00040	:	65	71	103	105	111	114	120	126	133
00050	:	136	150	156	163	170	177	212	216	222
00060	:	236	245	246	-	265				

HYDRO OCTAL PROG SIZE=374 [SCALARS/ARRAYS=30 + TEMPS/CONS=24 + CODE=272 + ARGS=26] + COMMON=12465
 [NO ERRORS DETECTED]

```

00001 SUBROUTINE INTS(X,Y,RX,RY,N)
00002 C *****
00003 C LINEAR INTERPOLATION / EXTRAPOLATION ROUTINE *
00004 C *
00005 C CALLED BY SUBROUTINE SCREEN *
00006 C *****
00007 C DIMENSION X(13),Y(13) * DIM *
00008 C IF(X(2)-X(1)) 3,3,4
00009 3 DO 5 J=2,N
00010 K=J
00011 IF(RX-X(J)) 5,2,2
00012 5 CONTINUE
00013 GO TO 2
00014 4 DO 1 J=2,N
00015 K=J
00016 IF(RX-X(J)) 2,2,1
00017 1 CONTINUE
00018 2 J=K
00019 RY=((Y(J-1)-Y(J))*(X(J)-RX)/(X(J)-X(J-1)))+Y(J)
00020 RETURN
00021 END

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*N	1 I	*K	2 I	Y	3#R	*J	4 I	*RY	5 R
X	6#R	*RX	7 R						

TEMPORARIES

.S0000	10 I	.S0001	11 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	12	16
00010	:	22	24	30	32	33	37	41	45	51
00020	:	-	68							

INTS OCTAL PROG SIZE=104 [SCALARS/ARRAYS=7 + TEMPS/CONS=3 + CODE=72 + ARGS=0]
[NO ERRORS DETECTED]

```

00001      REAL FUNCTION MOISTR(FEED,SIZE,GRAV,NSIZE,NGRAV,IZ,K)
00002      C*****
00003      C THIS FUNCTION CALCULATES THE MOISTURE CONTENT OF COAL ASSUMING THAT      *
00004      C THE COAL IS WELL DRAINED                                          *
00005      C                                                                    *
00006      C MOISTURE CONTENT CAN BE EITHER DRY OR WET, DEPENDING ON K:      *
00007      C   K=1: DRY BASIS (LBS WATER/LB DRY COAL)                        *
00008      C   K=2: WET BASIS (LBS WATER/(LB COAL+WATER))                    *
00009      C*****
00010      REAL NC
00011      DIMENSION FEED(23,10,4),SIZE(23),GRAV(10)                        * DIM *
00012      C *****
00013      C ASSIGN APPROXIMATE VALUES
00014      C   DENS = DENSITY OF WATER
00015      C   PORS = POROSITY OF SAMPLE
00016      C   TEMP = TEMPERATURE (CELSIUS)
00017      DENS=62.4
00018      PORS=0.47
00019      TEMP=25.
00020      C END APPROXIMATIONS
00021      C *****
00022      C SUM3 IS TOTAL MASS OF SAMPLE
00023      SUM3=0.
00024      C SUM4 IS TOTAL VOLUME OCCUPIED BY SAMPLE
00025      SUM4=0.
00026      SUM5=0.
00027      DO 4 J=1,NGRAV
00028      SUM1=0.
00029      SUM2=0.
00030      DO 3 I=1,NSIZE
00031      SUM1=SUM1+FEED(I,J,1)
00032      XI=(SIZE(I)+SIZE(I+1))/2.
00033      3 SUM2=SUM2+FEED(I,J,1)/(XI/12.)
00034      SUM3=SUM3+SUM1
00035      SUM4=SUM4+SUM1/GRAV(J)
00036      4 SUM5=SUM5+SUM2
00037      DP=1./SUM5
00038      SG=SUM3/SUM4
00039      C CALCULATE SURFACE TENSION
00040      GAM=0.0052-0.000011*TEMP
00041      C CALCULATE CAPILLARY NUMBER
00042      NC=(PORS**3)*(DP**2)*DENS/(((1.-PORS)**2)*GAM)
00043      C CALCULATE RESIDUAL SATURATION
00044      IF (NC .LT. 0.0085) SATR=0.155*(1.+0.031*NC*(-.49))
00045      IF ((NC .GE. 0.0085) .AND. (NC .LT. 0.024)) SATR = 1./(.585.*NC)
00046      IF (NC .GE. 0.024) SATR = 0.078
00047      IF (SATR.GT.1.) SATR=1.
00048      WATER=(PORS*SATR)/((1.-PORS)*SG)
00049      IF (K.EQ.2) WATER=WATER/(1.+WATER)
00050      MOISTR=WATER
00051      RETURN
00052      END

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*DP	1 R	*DENS	2 R	FEED	3#R	*K	4 I	*GAM	8 R
*PORS	6 R	*SUM5	7 R	*XI	10 R	*SATR	11 R	*J	12 I
*SG	13 R	*SUM4	14 R	%IZ		*WATER	15 R	MOISTR	16 R
GRAV	17#R	*SUM3	20 R	*NSIZE	21 I	SIZE	22#R	*TEMP	23 R
*SUM2	24 R	*I	25 I	*NGRAV	26 I	NC	27 R	*SUM1	30 R

TEMPORARIES

.S0000	31 I	.S0001	32 I	.A0018	33 R	.A0002	34 R	.A0003	35 R
.A0004	36 R	.A0005	37 R						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	-	0	-	-	-	-	-	-	-	-
00010 :	-	-	-	-	-	-	-	21	23	25
00020 :	-	-	-	27	-	30	31	32	36	37
00030 :	40	42	50	58	70	72	78	103	108	-
00040 :	111	-	115	-	131	141	150	155	162	171
00050 :	200	-	201							

MOISTR OCTAL PROG SIZE=287 [SCALARS/ARRAYS=30 + TEMPS/CONS=24 + CODE=210 + ARGS=3]
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE OUTPT1(FEED,WFEED,SYMBOL,GBOUND,BTU,FLBTU,FLSO2,NSIZE,
00002      1 NGRAV,NCOMP)
00003  C *****
00004  C THIS SUBROUTINE PRINTS THE SPECIFIC GRAVITY ANALYSIS OF A SPECIFIED *
00005  C FLOW STREAM *
00006  C *****
00007      DIMENSION FEED(23,10,4),SYMBOL(6,23),GBOUND(11),PERCNT(23),WT(10),* DIM *
00008      1 BTU(4),XBTU(10) * DIM *
00009      COMMON /SYS/ G,H
00010      INTEGER G,H
00011      DATA BLANK /1H /
00012      500 FORMAT(1H0,39X,8HSPESIFIC,12X,15HDIRECT, PERCENT,28X,19HCUMULATIVE
00013      1, PERCENT/,8X,24HSIZE FRACTION AND WEIGHT, 8X,7HGRAVITY,
00014      2 2(4X,34HWEIGHT ASH PYRITIC TOTAL BTU/LB ),9H MOISTURE/,
00015      3 48X,2(15X,15HSULFUR SULFUR ,8X))
00016      501 FORMAT(1H0,2X,6A1,4H BY ,6A1, 5X,F5.1,16H PERCENT FLOAT ,F4.2,2X,
00017      1 F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,5X,F5.1,1X,F5.1,2X,F5.2,
00018      2 2X,F5.2,2X,F6.0,2X,F6.2)
00019      502 FORMAT(40X,F4.2,1H-,F4.2,2X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,
00020      1 5X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0)
00021      503 FORMAT(40X,5HSINK ,F4.2,2X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,
00022      1 5X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0)
00023      504 FORMAT(1H0,5X,9HCOMPOSITE, 9X,F5.1,16H PERCENT FLOAT ,F4.2,2X,
00024      1 F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,5X,F5.1,1X,F5.1,2X,F5.2,
00025      2 2X,F5.2,2X,F6.0,2X,F6.2)
00026  C *****
00027  C WRITE OUTPUT FOR EACH SIZE INCREMENT *
00028  C *****
00029      WRITE (H,500)
00030      DO 5 I=1,NSIZE
00031  C CALCULATE WEIGHT DISTRIBUTION IN EACH SPECIFIC GRAVITY INCREMENT
00032      PERCNT(I)=0.
00033      DO 1 J=1,NGRAV
00034      1 PERCNT(I)=PERCNT(I)+FEED(I,J,1)
00035      IF (NCOMP.NE.0) GO TO 50
00036      IF (PERCNT(I).LE.0.000499) GO TO 5
00037      DO 2 J=1,NGRAV
00038      WT(J)=100.*FEED(I,J,1)/PERCNT(I)
00039      2 CONTINUE
00040  C CALCULATE CUMULATIVE WEIGHT, ASH, PYRITIC SULFUR, TOTAL SULFUR AND
00041  C BTU CONTENT
00042      CUMWT=WT(1)
00043      CUMASH=0.
00044      CUMPS=0.
00045      CUMTS=0.
00046      CUMBTU=0.
00047      ASH=100.*FEED(I,1,2)
00048      SUMASH=FEED(I,1,2)*WT(1)
00049      PS=100.*FEED(I,1,3)
00050      SUMPS=FEED(I,1,3)*WT(1)
00051      TS=100.*FEED(I,1,4)
00052      SUMTS=FEED(I,1,4)*WT(1)
00053      SUMBTU=BTUPLB(BTU,FEED(I,1,2),FEED(I,1,4))*WT(1)
00054      PERCNT(I)=100.*PERCNT(I)
00055      DO 23 K=1,6 * DIM *
00056      IF (SYMBOL(6,I).NE.BLANK) GO TO 21

```

```

00057      DO 20 KJ=1,5                                * DIM *
00058      KI=7-KJ
00059      20 SYMBOL(KI,I)=SYMBOL(KI-1,I)
00060      SYMBOL(1,I)=BLANK
00061      21 IF (SYMBOL(1,I+1).NE.BLANK) GO TO 23
00062      DO 22 KJ=1,5                                * DIM *
00063      22 SYMBOL(KJ,I+1)=SYMBOL(KJ+1,I+1)
00064      SYMBOL(6,I+1)=BLANK
00065      23 CONTINUE
00066      IF (WT(1).EQ.0.) GO TO 24
00067      CUMASH=ASH
00068      CUMPS=PS
00069      CUMTS=TS
00070      XBTU(1)=BTUPLB(BTU,FEED(I,1,2),FEED(I,1,4))
00071      C IF (XBTU(1).LT.0.) XBTU(1)=0.
00072      CUMBTU=XBTU(1)
00073      24 WRITE (H,501) (SYMBOL(K,I),K=1,6), (SYMBOL(K,I+1),K=1,6), * DIM *
00074      1 PERCNT(I),GBOUND(2),WT(1),ASH,PS,TS,XBTU(1),WT(1),CUMASH,CUMPS,
00075      2 CUMTS,CUMBTU
00076      C NOTE: WFEED(I) CAN BE ADDED TO THE END OF THE PRECEDING STATEMENT
00077      DO 4 J=2,NGRAV
00078      CUMWT=CUMWT+WT(J)
00079      SUMASH=SUMASH+FEED(I,J,2)*WT(J)
00080      ASH=100.*FEED(I,J,2)
00081      SUMPS=SUMPS+FEED(I,J,3)*WT(J)
00082      PS=100.*FEED(I,J,3)
00083      SUMTS=SUMTS+FEED(I,J,4)*WT(J)
00084      TS=100.*FEED(I,J,4)
00085      XBTU(J)=BTUPLB(BTU,FEED(I,J,2),FEED(I,J,4))
00086      C IF (XBTU(J).LT.0.) XBTU(J)=0.
00087      SUMBTU=SUMBTU+XBTU(J)*WT(J)
00088      IF (CUMWT.EQ.0.) GO TO 25
00089      CUMASH=100.*SUMASH/CUMWT
00090      CUMPS=100.*SUMPS/CUMWT
00091      CUMTS=100.*SUMTS/CUMWT
00092      CUMBTU=SUMBTU/CUMWT
00093      25 IF (J.EQ.INGRAV) GO TO 3
00094      WRITE (H,502) GBOUND(J),GBOUND(J+1),WT(J),ASH,PS,TS,XBTU(J),CUMWT,
00095      1 CUMASH,CUMPS,CUMTS,CUMBTU
00096      GO TO 4
00097      3 WRITE (H,503) GBOUND(J),WT(J),ASH,PS,TS,XBTU(J),CUMWT,CUMASH,
00098      1 CUMPS,CUMTS,CUMBTU
00099      4 CONTINUE
00100      5 CONTINUE
00101      IF (NSIZE.EQ.1) RETURN
00102      C *****
00103      C WRITE OUTPUT FOR COMPOSITE *
00104      C *****
00105      50 PREWT=0.0
00106      PER=0.0
00107      SUMASH=0.0
00108      SUMPS=0.0
00109      SUMTS=0.0
00110      SUMBTU=0.0
00111      NS=NSIZE+1
00112      DO 9 J=1,NGRAV

```

```

00113      W=0.0
00114      ASH=0.0
00115      PS=0.0
00116      TS=0.0
00117      ZBTU=0.0
00118      DO 8 I=1,NSIZE
00119      IF (J.EQ.1) PER=PER+PERCNT(I)
00120      W=W+FEED(I,J,1)
00121      ASH=ASH+FEED(I,J,1)*FEED(I,J,2)
00122      PS = PS+FEED(I,J,1)*FEED(I,J,3)
00123      TS = TS+FEED(I,J,1)*FEED(I,J,4)
00124      8 ZBTU=ZBTU+FEED(I,J,1)*BTUPL8(BTU,FEED(I,J,2),FEED(I,J,4))
00125  C      IF (ZBTU.LT.0.) ZBTU=0.
00126      IF (W.EQ.0.) GO TO 80
00127      ASH=100.*ASH/W
00128      PS=100.*PS/W
00129      TS=100.*TS/W
00130      ZBTU=ZBTU/W
00131      60 CUMWT=PREWT+W
00132      SUMASH=SUMASH+ASH*W
00133      SUMPS=SUMPS+PS*W
00134      SUMTS=SUMTS+TS*W
00135      SUMBTU=SUMBTU+ZBTU*W
00136      IF (CUMWT.EQ.0.) GO TO 85
00137      CUMASH=SUMASH/CUMWT
00138      CUMPS=SUMPS/CUMWT
00139      CUMTS=SUMTS/CUMWT
00140      CUMBTU=SUMBTU/CUMWT
00141      65 PREWT=CUMWT
00142      W=100.*W
00143      CUMWT=100.*CUMWT
00144      IF (NCOMP.NE.0.) PER=100.*PER
00145      IF (J.GT.1) GO TO 7
00146      WRITE (H,504) PER,GBOUND(2),W,ASH,PS,TS,ZBTU,CUMWT,CUMASH,CUMPS,
00147      1 CUMTS,CUMBTU,WFEED
00148      GO TO 9
00149      7 IF (J.EQ.NGRAV) GO TO 8
00150      WRITE (H,502) GBOUND(J),GBOUND(J+1),W,ASH,PS,TS,ZBTU,CUMWT,CUMASH,
00151      1 CUMPS,CUMTS,CUMBTU
00152      GO TO 9
00153      8 WRITE (H,503) GBOUND(J),W,ASH,PS,TS,ZBTU,CUMWT,CUMASH,CUMPS,CUMTS,
00154      1 CUMBTU
00155      9 CONTINUE
00156      FLBTU=CUMBTU
00157      FLS02=.02*CUMTS
00158      RETURN
00159      END

```

COMMON BLOCKS

```

/SYS/(+2)
G      +0 I      H      +1 I

```


SUBPROGRAMS CALLED

BTUPLB

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "##" SUBSCRIPTED]

*TS	1 R	*W	2 R	*CUMPS	3 R	*NCOMP	4 I	*NS	5 I
XBTU	6#R	FEED	20#R	*K	21 I	*WFEE	22 R	*SUMBTU	23 R
GBOUND	24#R	SYMBOL	25#R	*SUMASH	26 R	*PS	27 R	PERCNT	30#R
*ZBTU	57 R	*CUMTS	60 R	*BLANK	61 R	*J	62 I	*FLBTU	63 R
*SUMPS	64 R	*PREWT	65 R	*CUMBTU	66 R	*ASH	67 R	*NSIZE	70 I
*KJ	71 I	*FLS02	72 R	BTU	73#R	*CUMWT	74 R	*PER	75 R
*CUMASH	76 R	*I	77 I	WT	100#R	*NGRAV	112 I	*KI	113 I
*SUMTS	114 R								

TEMPORARIES

.S0010	330 I	.S0011	331 I	.S0012	332 I	.S0000	333 I	.S0001	334 I
.S0002	335 I	.S0003	336 I	.S0004	337 I	.S0005	340 I	.A0016	341 R
.S0006	342 I	.S0007	343 I	.Q0000	344 I	.Q0001	345 I		

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	-	-	-	-
00020 :	-	-	-	-	-	-	-	-	-	25
00030 :	30	-	34	35	37	50	52	58	60	71
00040 :	-	-	73	75	78	77	100	101	108	113
00050 :	120	125	132	137	151	154	157	165	168	171
00060 :	200	205	213	214	223	230	233	235	237	241
00070 :	243	-	254	258	-	-	-	314	317	321
00080 :	330	337	348	355	364	373	-	408	411	412
00090 :	415	420	423	425	427	-	435	438	-	444
00100 :	446	451	-	-	-	454	455	458	457	460
00110 :	461	462	465	471	472	473	474	475	476	500
00120 :	505	512	521	530	537	-	555	557	583	587
00130 :	573	576	601	604	607	612	615	618	620	622
00140 :	624	628	630	632	633	636	641	-	646	647
00150 :	652	-	657	660	-	666	671	673	-	678

OUTPT1 OCTAL PROG SIZE=1502 [SCALARS/ARRAYS=114 + FORMATS=213 + TEMPS/CONS=23 + CODE=705 + ARGS=223] + COMMON=2
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE OUTPT2(WFEED,WCC,WREF,WMID,SYMBOL,NSIZE,NGRAV,NCOMP,
00002      1 L,PSJ,GBOUND)
00003      C *****
00004      C THIS SUBROUTINE PRINTS SUMMARY DATA BY SIZE INCREMENTS FOR EACH UNIT      *
00005      C *
00006      C ARRAY NAMES ARE IDENTIFIED BY THEIR CORRESPONDING FORMAT STATEMENTS      *
00007      C *****
00008      DIMENSION SYMBOL(6,23),STORE(6),COMP(6),GBOUND(11)      * DIM *
00009      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),      * DIM *
00010      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),      * DIM *
00011      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24)      * DIM *
00012      COMMON /BLK2/ DISTRB(24,10),KCOUNT      * DIM *
00013      COMMON /SYS/ G,H
00014      INTEGER G,H
00015      INTEGER PSJ
00016      DATA BLANK,BY,COMP /' ','BY',' ','C','O','M','P',' '/      * DIM *
00017      100 FORMAT(21HOSIZE, INCHES OR MESH)
00018      101 FORMAT(26HOSCREEN ANALYSIS, PERCENT:)
00019      102 FORMAT(3X,4HFEED,37(1H.),9(2X,F5.1,2X))
00020      103 FORMAT(3X,10HCLEAN COAL,31(1H.),9(2X,F5.1,2X))
00021      104 FORMAT(3X,6HREFUSE,35(1H.),9(2X,F5.1,2X))
00022      105 FORMAT(3X,9HMIDDLINGS,32(1H.),9(2X,F5.1,2X))
00023      106 FORMAT(14HOASH, PERCENT:)
00024      107 FORMAT(25HOPYRITIC SULFUR, PERCENT:)
00025      108 FORMAT(23HOTOTAL SULFUR, PERCENT:)
00026      109 FORMAT(16HOACTUAL RECOVERY,20(1H.),8H PERCENT,9(2X,F5.1,2X))
00027      110 FORMAT(21H THEORETICAL RECOVERY,15(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00028      111 FORMAT(20H RECOVERY EFFICIENCY,16(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00029      112 FORMAT(10H ASH ERROR,26(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00030      113 FORMAT(16HOFLOAT IN REFUSE,9(1H.),19H PERCENT OF PRODUCT,
00031      1 9(2X,F5.1,2X))
00032      114 FORMAT(19H SINK IN CLEAN COAL,6(1H.),9X,2HDO,8X,9(2X,F5.1,2X))
00033      115 FORMAT(25H TOTAL MISPLACED MATERIAL,3(1H.),16H PERCENT OF FEED,
00034      1 9(2X,F5.1,2X))
00035      116 FORMAT(26H NEAR GRAVITY 0.1 MATERIAL,2(1H.),6X,2HDO,8X,9(2X,F5.1,
00036      1 2X))
00037      117 FORMAT(31HOSPECIFIC GRAVITY OF SEPARATION,13(1H.),9(2X,F5.2,2X))
00038      118 FORMAT(33H PROBABLE ERROR, SPECIFIC GRAVITY,11(1H.),9(2X,F5.3,2X))
00039      119 FORMAT(13H IMPERFECTION,31(1H.),9(2X,F5.3,2X))
00040      120 FORMAT(11H ERROR AREA,33(1H.),9(2X,F5.0,2X))
00041      121 FORMAT(13H BTU RECOVERY,23(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00042      122 FORMAT(1H+,43X,9(2X,6A1,1X))
00043      123 FORMAT(44X,9(4X,A2,3X))
00044      124 FORMAT(44X,9(2X,6A1,1X))
00045      125 FORMAT(3X,4HFEED,37(1H.),9(1X,F6.2,2X))
00046      126 FORMAT(3X,10HCLEAN COAL,31(1H.),9(1X,F6.2,2X))
00047      127 FORMAT(3X,6HREFUSE,35(1H.),9(1X,F6.2,2X))
00048      128 FORMAT(3X,9HMIDDLINGS,32(1H.),9(1X,F6.2,2X))
00049      130 FORMAT(3X,18HFEED (COAL + ROCK),23(1H.),9(2X,F5.1,2X))
00050      131 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H.),9(2X,F5.1,2X))
00051      132 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H.),9(2X,F5.1,2X))
00052      133 FORMAT(3X,18HFEED (COAL + ROCK),23(1H.),9(1X,F6.2,2X))
00053      134 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H.),9(1X,F6.2,2X))
00054      135 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H.),9(1X,F6.2,2X))
00055      136 FORMAT(23HOCOAL PRODUCT/COAL FEED,13(1H.),8H PERCENT,
00056      1 9(2X,F5.1,2X))

```

```
00057 140 FORMAT(3X,12HCRUSHED COAL,29(1H.),9(2X,F5.1,2X))
00058 141 FORMAT(3X,12HCRUSHED COAL,29(1H.),9(1X,F8.2,2X))
00059 150 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H.),9(2X,F5.1,2X))
00060 151 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H.),9(2X,F5.1,2X))
00061 152 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H.),9(1X,F8.2,2X))
00062 153 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H.),9(1X,F8.2,2X))
00063 154 FORMAT(32HWEIGHT RATIO, UNDERFLOW TO FEED,4(1H.),8H PERCENT,
00064 1 9(2X,F5.1,2X))
00065 155 FORMAT(29H BTU RATIO, UNDERFLOW TO FEED,7(1H.),4X,2HDO,2X,
00066 1 9(2X,F5.1,2X))
00067 156 FORMAT(38H UNDERSIZE MATERIAL IN OVERFLOW STREAM,1H.,1X,2HDO,2X,
00068 1 9(2X,F5.1,2X))
00069 157 FORMAT(38H OVERSIZE MATERIAL IN UNDERFLOW STREAM,1H.,1X,2HDO,2X,
00070 1 9(2X,F5.1,2X))
00071 160 FORMAT(3X,6HFEED 1,35(1H.),9(2X,F5.1,2X))
00072 161 FORMAT(3X,6HFEED 2,35(1H.),9(2X,F5.1,2X))
00073 162 FORMAT(3X,7HPRODUCT,34(1H.),9(2X,F5.1,2X))
00074 163 FORMAT(3X,6HFEED 1,35(1H.),9(1X,F8.2,2X))
00075 164 FORMAT(3X,6HFEED 2,35(1H.),9(1X,F8.2,2X))
00076 165 FORMAT(3X,7HPRODUCT,34(1H.),9(1X,F8.2,2X))
00077 170 FORMAT(37HODISTRIBUTION, PERCENT TO WASHED COAL)
00078 171 FORMAT(2X,28H(SPECIFIC GRAVITY FRACTION):)
00079 172 FORMAT(2X,6HFLOAT ,F4.2,32(1H.),9(2X,F5.1,2X))
00080 173 FORMAT(3X,F4.2,1H-,F4.2,32(1H.),9(2X,F5.1,2X))
00081 174 FORMAT(3X,5HSINK ,F4.2,32(1H.),9(2X,F5.1,2X))
00082 175 FORMAT(30HBTU PER POUND, MOISTURE FREE:)
00083 176 FORMAT(3X,4HFEED,37(1H.),9(1X,F8.0,2X))
00084 177 FORMAT(3X,10HCLEAN COAL,31(1H.),9(1X,F8.0,2X))
00085 178 FORMAT(3X,6HREFUSE,35(1H.),9(1X,F8.0,2X))
00086 179 FORMAT(3X,9HMIDDLINGS,32(1H.),9(1X,F8.0,2X))
00087 180 FORMAT(3X,12HCRUSHED COAL,29(1H.),9(1X,F8.0,2X))
00088 181 FORMAT(3X,6HFEED 1,35(1H.),9(1X,F8.0,2X))
00089 182 FORMAT(3X,6HFEED 2,35(1H.),9(1X,F8.0,2X))
00090 183 FORMAT(3X,7HPRODUCT,34(1H.),9(1X,F8.0,2X))
00091 184 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H.),9(1X,F8.0,2X))
00092 185 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H.),9(1X,F8.0,2X))
00093 186 FORMAT(3X,18HFEED (COAL + ROCK),23(1H.),9(1X,F8.0,2X))
00094 187 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H.),9(1X,F8.0,2X))
00095 188 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H.),9(1X,F8.0,2X))
00096 190 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H.),9(2X,F5.1,2X))
00097 191 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H.),9(2X,F5.1,2X))
00098 192 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H.),9(1X,F8.2,2X))
00099 193 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H.),9(1X,F8.2,2X))
00100 194 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H.),9(1X,F8.0,2X))
00101 195 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H.),9(1X,F8.0,2X))
00102 197 FORMAT(3X,19HCENTRIFUGED PRODUCT,22(1H.),9(2X,F5.1,2X))
00103 1970 FORMAT(3X,25HSOLIDS IN EFFLUENT LIQUID,16(1H.),9(2X,F5.1,2X))
00104 198 FORMAT(3X,19HCENTRIFUGED PRODUCT,22(1H.),9(1X,F8.2,2X))
00105 199 FORMAT(3X,19HCENTRIFUGED PRODUCT,22(1H.),9(1X,F8.0,2X))
00106 1991 FORMAT(37HOPERCENT MOISTURE OF FEED (WET BASIS),30(1H.),
00107 1 (1X,F8.2,2X))
00108 1992 FORMAT(52H PERCENT MOISTURE OF CENTRIFUGED PRODUCT (WET BASIS),
00109 1 15(1H.),1(1X,F8.2,2X))
00110 1993 FORMAT(33H PERCENT SOLID IN EFFLUENT LIQUID,34(1H.),1(1X,F8.2,2X))
00111 1994 FORMAT(37H PERCENT OF FEED IN CENTRIFUGED CAKE,30(1H.),
00112 1 (1X,F8.2,2X))
```

```

00113 1995 FORMAT(33H BTU RECOVERY IN CENTRIFUGED CAKE,34(1H.),(1X,F6.2,2X))
00114 2000 FORMAT(3X,11HFILTER CAKE,30(1H.),9(2X,F5.1,2X))
00115 2001 FORMAT(3X,11HFILTER CAKE,30(1H.),9(1X,F6.2,2X))
00116 2002 FORMAT(3X,11HFILTER CAKE,30(1H.),9(1X,F6.0,2X))
00117 2003 FORMAT(3X,18HSOLIDS IN FILTRATE,23(1H.),9(2X,F5.1,2X))
00118 2004 FORMAT(3X,18HSOLIDS IN FILTRATE,23(1H.),9(1X,F6.2,2X))
00119 2005 FORMAT(3X,18HSOLIDS IN FILTRATE,23(1H.),9(1X,F6.0,2X))
00120 2006 FORMAT(47H PERCENT MOISTURE OF FILTER PRODUCT (WET BASIS),
00121 1 20(1H.),(1X,F6.2,2X))
00122 2007 FORMAT(26H PERCENT SOLID IN FILTRATE,41(1H.),(1X,F6.2,2X))
00123 2008 FORMAT(31H PERCENT OF FEED IN FILTER CAKE,36(1H.),(1X,F6.2,2X))
00124 2009 FORMAT(28H BTU RECOVERY IN FILTER CAKE,39(1H.),(1X,F6.2,2X))
00125 2100 FORMAT(3X,28HSOLIDS IN THICKENER OVERFLOW,13(1H.),9(2X,F5.1,2X))
00126 2101 FORMAT(3X,29HSOLIDS IN THICKENER UNDERFLOW,12(1H.),9(2X,F5.1,2X))
00127 2102 FORMAT(3X,28HSOLIDS IN THICKENER OVERFLOW,13(1H.),9(1X,F6.2,2X))
00128 2103 FORMAT(3X,29HSOLIDS IN THICKENER UNDERFLOW,12(1H.),9(1X,F6.2,2X))
00129 2104 FORMAT(3X,28HSOLIDS IN THICKENER OVERFLOW,13(1H.),9(1X,F6.0,2X))
00130 2105 FORMAT(3X,29HSOLIDS IN THICKENER UNDERFLOW,12(1H.),9(1X,F6.0,2X))
00131 2106 FORMAT(1H0,27HPERCENT OF FEED TO OVERFLOW,16(1H.),9(1X,F6.1,2X))
00132 2010 FORMAT (/,/ ,39H SOLIDS IN THICKENER OVERFLOW (PERCENT) ,
00133 1 10(1H. ), F6.3)
00134 2011 FORMAT (40H SOLIDS IN THICKENER UNDERFLOW (PERCENT) ,
00135 1 9(1H. ), F6.3)
00136 2012 FORMAT (35H SOLIDS IN THICKENER FEED (PERCENT) ,
00137 1 14(1H. ), F6.3)
00138 2013 FORMAT(3X,19HFEED AND DRIED COAL ,22(1H.),9(2X,F5.1,2X))
00139 2014 FORMAT(3X,19HFEED AND DRIED COAL ,22(1H.),9(1X,F6.2,2X))
00140 2015 FORMAT (3X,19HFEED AND DRIED COAL ,22(1H.),9(1X,F6.0,2X))
00141 200 FORMAT(1H0,132(1H*)/)
00142 300 FORMAT(1H0,5X,17HEMPTY FEED STREAM/)
00143 400 FORMAT(1H0,88HNUMBER OF ITERATIONS REQUIRED TO OBTAIN DESIRED OVER
00144 1ALL SPECIFIC GRAVITY OF SEPARATION =,I3)
00145 500 FORMAT(3X,16HFINE COAL STREAM,25(1H.),9(2X,F5.1,2X))
00146 501 FORMAT(3X,18HCOARSE COAL STREAM,23(1H.),9(2X,F5.1,2X))
00147 502 FORMAT(3X,16HFINE COAL STREAM,25(1H.),9(1X,F6.2,2X))
00148 503 FORMAT(3X,18HCOARSE COAL STREAM,23(1H.),9(1X,F6.2,2X))
00149 504 FORMAT(3X,16HFINE COAL STREAM,25(1H.),9(1X,F6.0,2X))
00150 505 FORMAT(3X,18HCOARSE COAL STREAM,23(1H.),9(1X,F6.0,2X))
00151 C DETERMINE LARGEST NONEMPTY SIZE INCREMENT
00152 DO 20 I=1,NSIZE
00153 IF ((L.NE.41).AND.(SFEED(I,1).LT.1.01E-2*NGRAV)) GO TO 20
00154 IF ((L.EQ.41).AND.(SREF(I,1).LT.1.01E-2*NGRAV)) GO TO 20
00155 NSTART=I
00156 GO TO 21
00157 20 CONTINUE
00158 WRITE (H,300)
00159 RETURN
00160 21 NS=NSIZE+1
00161 K1=NSTART
00162 K2=NSTART+8
00163 IF (NCOMP.NE.0) K1=NS
00164 DO 3 I=1,NS
00165 KNB=0
00166 KP=0
00167 DO 1 K=1,8
00168 IF (SYMBOL(K,I).NE.BLANK) KNB=KNB+1

```

* DIM *

```

00169      IF ((KP.EQ.0).AND.(SYMBOL(K,I).NE.BLANK)) KP=K
00170      STORE(K)=SYMBOL(K,I)
00171      1 SYMBOL(K,I)=BLANK
00172      KBL=3-KNB/2
00173      IF (KNB.EQ.3) KBL=1
00174      IF (KNB.EQ.5) KBL=0
00175      DO 2 K=1,KNB
00176      KA=KBL+K
00177      KB=KP+K-1
00178      2 SYMBOL(KA,I)=STORE(KB)
00179      3 CONTINUE
00180      IF ((NCOMP.EQ.0).AND.(NSIZE.EQ.1)) NS=1
00181      4 IF (K2.GT.NS) K2=NS
00182      WRITE (H,100)
00183      IF ((NS.GT.1).AND.(K2.EQ.NS)) GO TO 5
00184      WRITE (H,122) ((SYMBOL(K,I),K=1,8),I=K1,K2) * DIM *
00185      WRITE (H,123) (BY,I=K1,K2) * DIM *
00186      WRITE (H,124) ((SYMBOL(K,I+1),K=1,8),I=K1,K2) * DIM *
00187      GO TO 7
00188      5 IF (K1.EQ.NS) GO TO 8
00189      WRITE (H,122) ((SYMBOL(K,I),K=1,8),I=K1,NSIZE),COMP * DIM *
00190      WRITE (H,123) (BY,I=K1,NSIZE) * DIM *
00191      WRITE (H,124) ((SYMBOL(K,I+1),K=1,8),I=K1,NSIZE) * DIM *
00192      GO TO 7
00193      6 WRITE (H,122) COMP
00194      7 WRITE (H,101)
00195      IF (L.LE.19) GO TO 600
00196      IF (L.EQ.21) GO TO 650
00197      IF ((L.GE.22).AND.(L.LE.29)) GO TO 700
00198      IF ((L.GE.31).AND.(L.LE.34)) GO TO 750
00199      IF (L.EQ.41) GO TO 800
00200      IF (L.EQ.51) GO TO 900
00201      IF ((L.GE.61).AND.(L.LE.63)) GO TO 1000
00202      IF (L.EQ.64) GO TO 1100
00203      IF (L.EQ.67) GO TO 1400
00204      IF (L.EQ.69) GO TO 1300
00205      IF ((L.EQ.71).OR.(L.EQ.72)) GO TO 1200
00206      RETURN
00207      C PRINT SUMMARY DATA FOR WASHING VESSELS
00208      600 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00209      WRITE (H,103) (SCC(I,1),I=K1,K2)
00210      WRITE (H,104) (SREF(I,1),I=K1,K2)
00211      IF (L.EQ.6) WRITE (H,105) (SMID(I,1),I=K1,K2)
00212      WRITE (H,106)
00213      WRITE (H,102) (SFEED(I,2),I=K1,K2)
00214      WRITE (H,103) (SCC(I,2),I=K1,K2)
00215      WRITE (H,104) (SREF(I,2),I=K1,K2)
00216      IF (L.EQ.8) WRITE (H,105) (SMID(I,2),I=K1,K2)
00217      WRITE (H,107)
00218      WRITE (H,125) (SFEED(I,3),I=K1,K2)
00219      WRITE (H,126) (SCC(I,3),I=K1,K2)
00220      WRITE (H,127) (SREF(I,3),I=K1,K2)
00221      IF (L.EQ.8) WRITE (H,128) (SMID(I,3),I=K1,K2)
00222      WRITE (H,108)
00223      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00224      WRITE (H,126) (SCC(I,4),I=K1,K2)

```

```
00225      WRITE (H,127) (SREF(I,4),I=K1,K2)
00226      IF (L.EQ.6) WRITE (H,128) (SMID(I,4),I=K1,K2)
00227      WRITE (H,175)
00228      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00229      WRITE (H,177) (SCC(I,5),I=K1,K2)
00230      WRITE (H,178) (SREF(I,5),I=K1,K2)
00231      IF (L.EQ.6) WRITE (H,179) (SMID(I,5),I=K1,K2)
00232      WRITE (H,109) (SYLD(I),I=K1,K2)
00233      IF (L.EQ.19) GO TO 8
00234      WRITE (H,110) (TYLD(I),I=K1,K2)
00235      WRITE (H,111) (EFFIC(I),I=K1,K2)
00236      8 WRITE (H,121) (BTUREC(I),I=K1,K2)
00237      IF (L.EQ.19) GO TO 9
00238      WRITE (H,112) (ASHERR(I),I=K1,K2)
00239      IF (PSJ.EQ.0) GO TO 9
00240      WRITE (H,113) (SFLT(I),I=K1,K2)
00241      WRITE (H,114) (SINK(I),I=K1,K2)
00242      WRITE (H,115) (SMISPL(I),I=K1,K2)
00243      WRITE (H,116) (SNRGR(I),I=K1,K2)
00244      WRITE (H,117) (SGRAV(I),I=K1,K2)
00245      WRITE (H,118) (SPE(I),I=K1,K2)
00246      WRITE (H,119) (SIMP(I),I=K1,K2)
00247      WRITE (H,120) (SEA(I),I=K1,K2)
00248      WRITE (H,170)
00249      WRITE (H,171)
00250      WRITE (H,172) (GBOUND(2),(DISTRB(I,1),I=K1,K2)
00251      NLIM=NGRAV-1
00252      DO 625 J=2,NLIM
00253      625 WRITE (H,173) (GBOUND(J),GBOUND(J+1),(DISTRB(I,J),I=K1,K2)
00254      WRITE (H,174) (GBOUND(NGRAV),(DISTRB(I,NGRAV),I=K1,K2)
00255      GO TO 9
00256      C PRINT SUMMARY DATA FOR ROTARY BREAKER
00257      650 WRITE (H,130) (SFEED(I,1),I=K1,K2)
00258      WRITE (H,131) (SREF(I,1),I=K1,K2)
00259      WRITE (H,132) (SCC(I,1),I=K1,K2)
00260      WRITE (H,106)
00261      WRITE (H,130) (SFEED(I,2),I=K1,K2)
00262      WRITE (H,131) (SREF(I,2),I=K1,K2)
00263      WRITE (H,132) (SCC(I,2),I=K1,K2)
00264      WRITE (H,107)
00265      WRITE (H,133) (SFEED(I,3),I=K1,K2)
00266      WRITE (H,134) (SREF(I,3),I=K1,K2)
00267      WRITE (H,135) (SCC(I,3),I=K1,K2)
00268      WRITE (H,108)
00269      WRITE (H,133) (SFEED(I,4),I=K1,K2)
00270      WRITE (H,134) (SREF(I,4),I=K1,K2)
00271      WRITE (H,135) (SCC(I,4),I=K1,K2)
00272      WRITE (H,175)
00273      WRITE (H,186) (SFEED(I,5),I=K1,K2)
00274      WRITE (H,187) (SREF(I,5),I=K1,K2)
00275      WRITE (H,188) (SCC(I,5),I=K1,K2)
00276      WRITE (H,136) (SYLD(I),I=K1,K2)
00277      GO TO 9
00278      C PRINT SUMMARY DATA FOR CRUSHERS
00279      700 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00280      WRITE (H,140) (SCC(I,1),I=K1,K2)
```

```
00281      WRITE (H,106)
00282      WRITE (H,102) (SFEED(I,2),I=K1,K2)
00283      WRITE (H,140) (SCC(I,2),I=K1,K2)
00284      WRITE (H,107)
00285      WRITE (H,125) (SFEED(I,3),I=K1,K2)
00286      WRITE (H,141) (SCC(I,3),I=K1,K2)
00287      WRITE (H,108)
00288      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00289      WRITE (H,141) (SCC(I,4),I=K1,K2)
00290      WRITE (H,175)
00291      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00292      WRITE (H,180) (SCC(I,5),I=K1,K2)
00293      GO TO 9
00294      C PRINT SUMMARY DATA FOR SCREENS
00295      750 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00296      WRITE (H,150) (SCC(I,1),I=K1,K2)
00297      WRITE (H,151) (SREF(I,1),I=K1,K2)
00298      WRITE (H,106)
00299      WRITE (H,102) (SFEED(I,2),I=K1,K2)
00300      WRITE (H,150) (SCC(I,2),I=K1,K2)
00301      WRITE (H,151) (SREF(I,2),I=K1,K2)
00302      WRITE (H,107)
00303      WRITE (H,125) (SFEED(I,3),I=K1,K2)
00304      WRITE (H,152) (SCC(I,3),I=K1,K2)
00305      WRITE (H,153) (SREF(I,3),I=K1,K2)
00306      WRITE (H,108)
00307      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00308      WRITE (H,152) (SCC(I,4),I=K1,K2)
00309      WRITE (H,153) (SREF(I,4),I=K1,K2)
00310      WRITE (H,175)
00311      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00312      WRITE (H,184) (SCC(I,5),I=K1,K2)
00313      WRITE (H,185) (SREF(I,5),I=K1,K2)
00314      WRITE (H,154) (SYLD(I),I=K1,K2)
00315      WRITE (H,155) (BTUREC(I),I=K1,K2)
00316      GO TO 9
00317      C PRINT SUMMARY DATA FOR BLENDERS
00318      800 WRITE (H,160) (SFEED(I,1),I=K1,K2)
00319      WRITE (H,161) (SCC(I,1),I=K1,K2)
00320      WRITE (H,162) (SREF(I,1),I=K1,K2)
00321      WRITE (H,106)
00322      WRITE (H,160) (SFEED(I,2),I=K1,K2)
00323      WRITE (H,161) (SCC(I,2),I=K1,K2)
00324      WRITE (H,162) (SREF(I,2),I=K1,K2)
00325      WRITE (H,107)
00326      WRITE (H,163) (SFEED(I,3),I=K1,K2)
00327      WRITE (H,164) (SCC(I,3),I=K1,K2)
00328      WRITE (H,165) (SREF(I,3),I=K1,K2)
00329      WRITE (H,108)
00330      WRITE (H,163) (SFEED(I,4),I=K1,K2)
00331      WRITE (H,164) (SCC(I,4),I=K1,K2)
00332      WRITE (H,165) (SREF(I,4),I=K1,K2)
00333      WRITE (H,175)
00334      WRITE (H,181) (SFEED(I,5),I=K1,K2)
00335      WRITE (H,182) (SCC(I,5),I=K1,K2)
00336      WRITE (H,183) (SREF(I,5),I=K1,K2)
```

```
00337 C WRITE (H,196)
00338 C WRITE (H,163) (WFEED(I),I=K1,K2)
00339 C WRITE (H,164) (WMID(I),I=K1,K2)
00340 C WRITE (H,165) (WCC(I),I=K1,K2)
00341 GO TO 9
00342 C PRINT SUMMARY DATA FOR SPLITTERS
00343 900 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00344 WRITE (H,190) (SCC(I,1),I=K1,K2)
00345 WRITE (H,191) (SREF(I,1),I=K1,K2)
00346 WRITE (H,106)
00347 WRITE (H,102) (SFEED(I,2),I=K1,K2)
00348 WRITE (H,190) (SCC(I,2),I=K1,K2)
00349 WRITE (H,191) (SREF(I,2),I=K1,K2)
00350 WRITE (H,107)
00351 WRITE (H,125) (SFEED(I,3),I=K1,K2)
00352 WRITE (H,192) (SCC(I,3),I=K1,K2)
00353 WRITE (H,193) (SREF(I,3),I=K1,K2)
00354 WRITE (H,108)
00355 WRITE (H,125) (SFEED(I,4),I=K1,K2)
00356 WRITE (H,192) (SCC(I,4),I=K1,K2)
00357 WRITE (H,193) (SREF(I,4),I=K1,K2)
00358 WRITE (H,175)
00359 WRITE (H,181) (SFEED(I,5),I=K1,K2)
00360 WRITE (H,194) (SCC(I,5),I=K1,K2)
00361 WRITE (H,195) (SREF(I,5),I=K1,K2)
00362 GO TO 9
00363 C PRINT SUMMARY DATA FOR CENTRIFUGE
00364 1000 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00365 WRITE (H,197) (SCC(I,1),I=K1,K2)
00366 WRITE (H,1970) (SREF(I,1),I=K1,K2)
00367 WRITE (H,106)
00368 WRITE (H,102) (SFEED(I,2),I=K1,K2)
00369 WRITE (H,197) (SCC(I,2),I=K1,K2)
00370 WRITE (H,107)
00371 WRITE (H,125) (SFEED(I,3),I=K1,K2)
00372 WRITE (H,198) (SCC(I,3),I=K1,K2)
00373 WRITE (H,108)
00374 WRITE (H,125) (SFEED(I,4),I=K1,K2)
00375 WRITE (H,198) (SCC(I,4),I=K1,K2)
00376 WRITE (H,175)
00377 WRITE (H,176) (SFEED(I,5),I=K1,K2)
00378 WRITE (H,199) (SCC(I,5),I=K1,K2)
00379 GO TO 9
00380 C PRINT SUMMARY DATA FOR FILTER
00381 1100 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00382 WRITE (H,2000) (SCC(I,1),I=K1,K2)
00383 WRITE (H,2003) (SREF(I,1),I=K1,K2)
00384 WRITE (H,106)
00385 WRITE (H,102) (SFEED(I,2),I=K1,K2)
00386 WRITE (H,2000) (SCC(I,2),I=K1,K2)
00387 WRITE (H,2003) (SREF(I,2),I=K1,K2)
00388 WRITE (H,107)
00389 WRITE (H,125) (SFEED(I,3),I=K1,K2)
00390 WRITE (H,2001) (SCC(I,3),I=K1,K2)
00391 WRITE (H,2004) (SREF(I,3),I=K1,K2)
00392 WRITE (H,108)
```



```
00393      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00394      WRITE (H,2001) (SCC(I,4),I=K1,K2)
00395      WRITE (H,2004) (SREF(I,4),I=K1,K2)
00396      WRITE (H,175)
00397      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00398      WRITE (H,2002) (SCC(I,5),I=K1,K2)
00399      WRITE (H,2005) (SREF(I,5),I=K1,K2)
00400      GO TO 9
00401      C PRINT SUMMARY DATA FOR CLASSIFIERS
00402      1200 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00403      WRITE (H,500) (SCC(I,1),I=K1,K2)
00404      WRITE (H,501) (SREF(I,1),I=K1,K2)
00405      WRITE (H,106)
00406      WRITE (H,102) (SFEED(I,2),I=K1,K2)
00407      WRITE (H,500) (SCC(I,2),I=K1,K2)
00408      WRITE (H,501) (SREF(I,2),I=K1,K2)
00409      WRITE (H,107)
00410      WRITE (H,125) (SFEED(I,3),I=K1,K2)
00411      WRITE (H,502) (SCC(I,3),I=K1,K2)
00412      WRITE (H,503) (SREF(I,3),I=K1,K2)
00413      WRITE (H,108)
00414      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00415      WRITE (H,502) (SCC(I,4),I=K1,K2)
00416      WRITE (H,503) (SREF(I,4),I=K1,K2)
00417      WRITE (H,175)
00418      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00419      WRITE (H,504) (SCC(I,5),I=K1,K2)
00420      WRITE (H,505) (SREF(I,5),I=K1,K2)
00421      GO TO 9
00422      C PRINT SUMMARY DATA FOR THICKENER
00423      1300 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00424      WRITE (H,2100) (SCC(I,1),I=K1,K2)
00425      WRITE (H,2101) (SREF(I,1),I=K1,K2)
00426      WRITE (H,106)
00427      WRITE (H,102) (SFEED(I,2),I=K1,K2)
00428      WRITE (H,2100) (SCC(I,2),I=K1,K2)
00429      WRITE (H,2101) (SREF(I,2),I=K1,K2)
00430      WRITE (H,107)
00431      WRITE (H,125) (SFEED(I,3),I=K1,K2)
00432      WRITE (H,2102) (SCC(I,3),I=K1,K2)
00433      WRITE (H,2103) (SREF(I,3),I=K1,K2)
00434      WRITE (H,108)
00435      WRITE (H,125) (SFEED(I,4),I=K1,K2)
00436      WRITE (H,2102) (SCC(I,4),I=K1,K2)
00437      WRITE (H,2103) (SREF(I,4),I=K1,K2)
00438      WRITE (H,175)
00439      WRITE (H,176) (SFEED(I,5),I=K1,K2)
00440      WRITE (H,2104) (SCC(I,5),I=K1,K2)
00441      WRITE (H,2105) (SREF(I,5),I=K1,K2)
00442      WRITE (H,2106) (SYLD(I),I=K1,K2)
00443      GO TO 9
00444      C THERMAL DRYER
00445      1400 WRITE (H,2013) (SFEED(I,1),I=K1,K2)
00446      WRITE (H,106)
00447      WRITE (H,2013) (SFEED(I,2),I=K1,K2)
00448      WRITE (H,107)
```

```

00449      WRITE(H,2014) (SFEED(I,3),I=K1,K2)
00450      WRITE(H,108)
00451      WRITE(H,2014) (SFEED(I,4),I=K1,K2)
00452      WRITE(H,175)
00453      WRITE(H,2015) (SFEED(I,5),I=K1,K2)
00454      9 IF (K2.EQ.NS) GO TO 10
00455      WRITE (H,200)
00456      K1=K2+1
00457      K2=K2+9
00458      GO TO 4
00459      10 IF ((L.GE.81).AND.(L.LE.63)) GO TO 11
00460      IF (L.EQ.64) GO TO 15
00461      IF (L.EQ.69) GO TO 18
00462      GO TO 19
00463      11 WRITE (H,1991) WFEED
00464      WRITE (H,1992) WCC
00465      PSOLID=100.-WREF
00466      WRITE (H,1993) PSOLID
00467      WRITE (H,1994) SYLD(NS)
00468      WRITE (H,1995) BTUREC(NS)
00469      GO TO 19
00470      15 WRITE (H,1991) WFEED
00471      WRITE (H,2006) WCC
00472      PSOLID=100.-WREF
00473      WRITE (H,2007) PSOLID
00474      WRITE (H,2008) SYLD(NS)
00475      WRITE (H,2009) BTUREC(NS)
00476      GO TO 19
00477      16 UNPCT=(100.-WREF)
00478      OVPCT=(100.-WCC)
00479      FDPCT=100.-WFEED
00480      WRITE (H,2010)OVPCT
00481      WRITE (H,2011)UNPCT
00482      WRITE (H,2012)FDPCT
00483      19 IF (L.LT.19) WRITE (H,400) KCOUNT
00484      RETURN
00485      END

```

COMMON BLOCKS

```

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMID      +360#R      SREF      +550#R      SYLD      +740#R
TYLD       +770#R      EFFIC    +1020#R     BTUREC    +1050#R     ASHERR    +1100#R     SFLT      +1130#R
SINK       +1160#R     SMISPL   +1210#R     SNRGR     +1240#R     SGRAV     +1270#R     SPE       +1320#R
SIMP       +1350#R     SEA      +1400#R

/BLK2/(+361)
DISTRB     +0#R      KCOUNT  +360 I

/SYS/(+2)
G          +0 I      H          +1 I

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "/" SUBSCRIPTED]

%WMID		*NCOMP	1 I	*NS	2 I	PSJ	3 I	*KB	4 I
*BY	5 R	*K1	6 I	*K	7 I	*WFEED	10 R	GBOUND	11/R
*KA	12 I	SYMBOL	13/R	*KBL	14 I	*OVPC	15 R	*KNB	16 I
*BLANK	17 R	*PSOLID	20 R	*J	21 I	*WCC	22 R	*KP	23 I
*FDPCT	24 R	STORE	25/R	*NSIZE	33 I	*NSTART	34 I	*WREF	35 R
*UNPCT	36 R	COMP	37/R	*L	45 I	*I	46 I	*NGRAV	47 I
*NLIM	50 I	*K2	51 I						

TEMPORARIES

.S0268	2302 I	.S0021	2303 I	.S0287	2304 I	.S0022	2305 I	.S0110	2306 I
.S0023	2307 I	.S0111	2310 I	.S0070	2311 I	.S0024	2312 I	.S0112	2313 I
.S0071	2314 I	.S0025	2315 I	.S0200	2316 I	.S0113	2317 I	.S0072	2320 I
.S0026	2321 I	.S0201	2322 I	.S0160	2323 I	.S0114	2324 I	.S0073	2325 I
.S0027	2326 I	.S0202	2327 I	.S0161	2330 I	.S0115	2331 I	.S0074	2332 I
.S0203	2333 I	.S0162	2334 I	.S0116	2335 I	.S0075	2336 I	.S0250	2337 I
.S0204	2340 I	.S0163	2341 I	.S0117	2342 I	.S0076	2343 I	.S0251	2344 I
.S0205	2345 I	.S0164	2346 I	.S0077	2347 I	.S0252	2350 I	.S0206	2351 I
.S0165	2352 I	.S0253	2353 I	.S0207	2354 I	.S0166	2355 I	.S0254	2356 I
.S0167	2357 I	.S0255	2360 I	.S0010	2361 I	.S0256	2362 I	.S0011	2363 I
.S0257	2364 I	.S0012	2365 I	.S0100	2366 I	.S0013	2367 I	.S0101	2370 I
.S0060	2371 I	.S0014	2372 I	.S0102	2373 I	.S0061	2374 I	.S0015	2375 I
.S0103	2376 I	.S0062	2377 I	.S0016	2400 I	.S0150	2401 I	.S0104	2402 I
.S0063	2403 I	.S0017	2404 I	.S0151	2405 I	.S0105	2406 I	.S0064	2407 I
.S0152	2410 I	.S0106	2411 I	.S0065	2412 I	.S0240	2413 I	.S0153	2414 I
.S0107	2415 I	.S0066	2416 I	.S0241	2417 I	.S0154	2420 I	.S0067	2421 I
.S0242	2422 I	.S0155	2423 I	.S0243	2424 I	.S0156	2425 I	.S0244	2426 I
.S0157	2427 I	.S0245	2430 I	.S0000	2431 I	.S0246	2432 I	.S0001	2433 I
.S0247	2434 I	.S0002	2435 I	.S0003	2436 I	.S0050	2437 I	.S0004	2440 I
.S0051	2441 I	.S0005	2442 I	.A0016	2443 R	.S0052	2444 I	.S0006	2445 I
.S0140	2446 I	.S0053	2447 I	.S0007	2450 I	.S0141	2451 I	.S0054	2452 I
.S0142	2453 I	.S0055	2454 I	.S0230	2455 I	.S0143	2456 I	.S0056	2457 I
.S0231	2460 I	.S0144	2461 I	.S0057	2462 I	.S0232	2463 I	.S0145	2464 I
.S0233	2465 I	.S0146	2466 I	.S0234	2467 I	.S0147	2470 I	.S0235	2471 I
.S0236	2472 I	.S0237	2473 I	.S0040	2474 I	.S0041	2475 I	.S0042	2476 I
.S0130	2477 I	.S0043	2500 I	.S0131	2501 I	.S0044	2502 I	.S0132	2503 I
.S0045	2504 I	.S0220	2505 I	.S0133	2506 I	.S0046	2507 I	.S0221	2510 I
.S0134	2511 I	.S0047	2512 I	.S0222	2513 I	.S0135	2514 I	.S0223	2515 I
.S0136	2516 I	.S0270	2517 I	.S0224	2520 I	.S0137	2521 I	.S0271	2522 I
.S0225	2523 I	.S0226	2524 I	.S0227	2525 I	.S0030	2526 I	.S0031	2527 I
.S0032	2530 I	.S0120	2531 I	.S0033	2532 I	.S0121	2533 I	.S0034	2534 I
.S0122	2535 I	.S0035	2536 I	.S0210	2537 I	.S0123	2540 I	.S0036	2541 I
.S0211	2542 I	.S0170	2543 I	.S0124	2544 I	.S0037	2545 I	.S0212	2546 I
.S0171	2547 I	.S0125	2550 I	.S0213	2551 I	.S0172	2552 I	.S0126	2553 I
.S0260	2554 I	.S0214	2555 I	.S0173	2556 I	.S0127	2557 I	.S0261	2560 I
.S0215	2561 I	.S0174	2562 I	.S0262	2563 I	.S0216	2564 I	.S0175	2565 I
.S0263	2566 I	.S0217	2567 I	.S0176	2570 I	.S0264	2571 I	.S0177	2572 I

.S0265   2573 I   .S0020   2574 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00150	:	-	25	30	40	50	52	53	55	60
00160	:	61	64	66	70	73	77	100	101	111
00170	:	122	130	137	145	152	154	158	161	175
00180	:	200	207	212	215	223	253	271	321	322
00190	:	356	374	424	425	431	434	437	441	445
00200	:	453	455	461	463	465	467	472	-	473
00210	:	531	550	572	575	614	633	652	674	677
00220	:	735	754	776	1001	1020	1037	1058	1100	1103
00230	:	1141	1160	1202	1221	1224	1243	1262	1301	1304
00240	:	1325	1344	1363	1402	1421	1440	1457	1476	1515
00250	:	1523	1545	1550	1553	1602	1627	-	1630	1647
00260	:	1705	1710	1727	1746	1765	1770	2007	2026	2045
00270	:	2067	2108	2125	2130	2147	2166	2205	2224	-
00280	:	2244	2263	2266	2305	2324	2327	2346	2365	2370
00290	:	2426	2431	2450	2467	-	2470	2507	2526	2545
00300	:	2567	2608	2625	2630	2647	2666	2705	2710	2727
00310	:	2765	2770	3007	3026	3045	3064	3103	-	3104
00320	:	3142	3161	3164	3203	3222	3241	3244	3263	3302
00330	:	3324	3343	3362	3401	3404	3423	3442	-	-
00340	:	-	3461	-	3462	3501	3520	3537	3542	3561
00350	:	3617	3622	3641	3660	3677	3702	3721	3740	3757
00360	:	4001	4020	4037	-	4040	4057	4076	4115	4120
00370	:	4156	4161	4200	4217	4222	4241	4260	4263	4302
00380	:	-	4322	4341	4360	4377	4402	4421	4440	4457
00390	:	4501	4520	4537	4542	4561	4600	4617	4622	4641
00400	:	4677	-	4700	4717	4736	4755	4760	4777	5016
00410	:	5040	5057	5076	5115	5120	5137	5156	5175	5200
00420	:	5236	5255	-	5256	5275	5314	5333	5336	5355
00430	:	5413	5416	5435	5454	5473	5476	5515	5534	5553
00440	:	5575	5614	5633	5652	-	5653	5672	5675	5714
00450	:	5736	5741	5760	5763	6002	6005	6010	6012	6014
00460	:	6022	6024	6026	6027	6033	6037	6042	6046	6053
00470	:	6060	6064	6070	6073	6077	6104	6110	6111	6114
00480	:	6122	6126	6132	6136	-	6145			

OUTPT2 OCTAL PROG SIZE=14744 [SCALARS/ARRAYS=51 + FORMATS=2230 + TEMPS/CONS=276 + CODE=6150 + ARGS=3775] + COMMON=2013
[NO ERRORS DETECTED]

```

00001      SUBROUTINE OUTPT3(FEED,WFEED,BTU,YFLOW,TONAGE,NSIZE,NGRAV)
00002      C *****
00003      C THIS SUBROUTINE CALCULATES THE MEAN PERCENT ASH, PYRITIC SULFUR,
00004      C TOTAL SULFUR, BTU CONTENT, LBS SO2/MILLION BTU AND FLOWRATE
00005      C FOR A GIVEN FLOWSTREAM
00006      C
00007      C EACH OF THESE QUANTITIES IS THEN PRINTED OUT
00008      C *****
00009      DIMENSION FEED(23,10,4),BTU(4)
00010      COMMON /SYS/ G,H
00011      INTEGER G,H
00012      100 FORMAT(1H0,5X,18HFLOWSTREAM SUMMARY/)
00013      101 FORMAT(1H0,5X,11HFLOWRATE = ,F5.0,14H TONS PER HOUR,5X,6HASH = ,
00014      1 F4.1,8H PERCENT,5X,17HPYRITIC SULFUR = ,F5.2,8H PERCENT,5X,
00015      2 15HTOTAL SULFUR = ,F5.2,8H PERCENT/,1H0,5X,14HBTU CONTENT = ,
00016      3 F6.0,7H BTU/LB, 33X,14HSO2 CONTENT = ,F6.2,
00017      4 20H LBS SO2/MILLION BTU/,1H0,5X,19HMOISTURE CONTENT = ,F6.2,
00018      5 8H PERCENT)
00019      NS=NSIZE+1
00020      SUM1=0.
00021      SUM2=0.
00022      SUM3=0.
00023      SUM4=0.
00024      YIELD=100.*YFLOW
00025      DO 1 I=1,NSIZE
00026      DO 1 J=1,NGRAV
00027      SUM1=SUM1+100.*FEED(I,J,1)*FEED(I,J,2)
00028      SUM2=SUM2+100.*FEED(I,J,1)*FEED(I,J,3)
00029      SUM3=SUM3+100.*FEED(I,J,1)*FEED(I,J,4)
00030      1 SUM4=SUM4+FEED(I,J,1)*BTUPLB(BTU,FEED(I,J,2),FEED(I,J,4))
00031      IF (SUM4.LT.0.) SUM4=0.
00032      SO2=8999.
00033      IF (SUM4.GT.0.) SO2=2.E+4*SUM3/SUM4
00034      TYIELD=TONAGE*YFLOW
00035      WRITE (H,100)
00036      WRITE (H,101) TYIELD,SUM1,SUM2,SUM3,SUM4,SO2,WFEED
00037      RETURN
00038      END

```

COMMON BLOCKS

/SYS/(+2)			
G	+0 I	H	+1 I
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

SUBPROGRAMS CALLED

BTUPLB

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "/" SUBSCRIPTED]

*NS	1 I	*S02	2 R	FEED	3/R	*WFEED	4 R	*YFLOW	5 R
*J	6 I	*SUM4	7 R	*TONAGE	10 R	*SUM3	11 R	*NSIZE	12 I
BTU	13/R	*SUM2	14 R	*I	15 I	*TYIELD	16 R	*NGRAV	17 I

OUTPT3 OUTPT3.FOR   FORTRAN V.5A(621) /KI/L 22-AUG-85   13:56   PAGE 1-1

*YIELD   20 R   *SUM1   21 R

TEMPORARIES

.S0000   124 I   .S0001   125 I   .A0016   126 R   .Q0000   127 1   .Q0001   130 1

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	-	0	-	-	-	-	-	-	-	-
00010 :	-	-	-	-	-	-	-	-	-	17
00020 :	22	23	24	25	26	31	35	37	47	57
00030 :	67	110	113	115	123	126	131	-	135	

OUTPT3 OCTAL PROG SIZE=324 [SCALARS/ARRAYS=21 + FORMATS=102 + TEMPS/CONS=10 + CODE=140 + ARGS=31] + COMMON=2
[NO ERRORS DETECTED]

```

00001      SUBROUTINE OUTPT4(L,D1,D2,D3,VSLYLD,VSLBTU,KF,S, FLOW, WATER,
00002      1 NUNITS,NFLOWS,DSK,NSIZE,NGRAV,S1,S2,S3,S4,S5,S6,S7,BTU,TONAGE,
00003      2 HRS,YCOST)
00004 C*****
00005 C
00006 C THIS SUBROUTINE CALCULATES AND PRINTS SUMMARY DATA FOR ALL
00007 C UNITS AND FLOWSTREAMS
00008 C
00009 C*****
00010      DIMENSION D1(100),D2(100),D3(100),L(100),VSLYLD(100),VSLBTU(100), * DIM *
00011      1 KF(2,200),S(200),FLOW(203),WATER(2,100),BTU(4) * DIM *
00012      COMMON STREAM(23,10,4),WSTRM * DIM *
00013      COMMON /SYS/ G,H
00014      INTEGER G,H,DSK
00015      DATA SUMCC,SUMMID,SUMREF,ASHCC,ASHMID,ASHREF,PSCC,PSMID,PSREF,
00016      1 TSCC,TSMID,TSREF,BTUCC,BTUMID,BTUREF,WCC,WMID,WREF,SUMW,ASHW,
00017      2 PSW,TSW,BTUW,SUMDR,ASHDR,PSDR,TSDR,BTUDR/28*0./
00018      100 FORMAT(1H1,55X,22HSUMMARY DATA FOR UNITS)
00019      101 FORMAT(1H0,81X,5HYIELD,8X,12HBTU RECOVERY,3X,8HWATER IN,3X,
00020      1 9HWATER OUT)
00021      102 FORMAT(1H ,3X,11HUNIT NUMBER,8X,9HUNIT TYPE,24X,
00022      1 18HDECISION VARIABLES,8X,9H(PERCENT),7X,9H(PERCENT),7X,
00023      2 5H(GPM),8X,5H(GPM))
00024      103 FORMAT(1H0,7X,I2,7X,I2)
00025      104 FORMAT(1H ,3X,11(1H-),8X,9(1H-),24X,18(1H-),8X,9(1H-),8X,12(1H-),
00026      1 3X,8(1H-),3X,9(1H-))
00027      105 FORMAT(1H+,59X,F8.3)
00028      106 FORMAT(1H+,49X,F8.3,2X,F8.3)
00029      107 FORMAT(1H+,49X,F8.3,2X,F8.3,2X,F8.3)
00030      108 FORMAT(1H+,59X,F8.3,14X,F5.1,11X,F5.1)
00031      109 FORMAT(1H+,49X,F8.3,2X,F8.3,14X,F5.1,11X,F5.1)
00032      110 FORMAT(1H+,49X,F8.3,2X,F8.3,2X,F8.3,4X,F5.1,11X,F5.1)
00033      111 FORMAT(1H+,108X,F8.3,3X,F8.3)
00034      200 FORMAT(1H1,47X,28HSUMMARY DATA FOR FLOWSTREAMS)
00035      201 FORMAT(1H0,79X,7HPYRITIC,5X,5HTOTAL)
00036      202 FORMAT(1H ,2X,10HFLOWSTREAM,20X,6HORIGIN,4X,11HDESTINATION,
00037      1 3X,8HFLOWRATE, 6X,3HASH,6X,6HSULFUR,6X,6HSULFUR,14X,
00038      2 8HLBS SO2/,4X,8HMOISTURE)
00039      203 FORMAT(1H ,4X,6HNUMBER,21X,8HUNIT NO.,4X,8HUNIT NO.,5X,
00040      1 8HTONS/HR.,3X,9H(PERCENT),2X,9H(PERCENT),3X,
00041      2 9H(PERCENT),2X,7HBTU/LB.,2X,11HMILLION BTU,2X,9H(PERCENT))
00042      204 FORMAT(1H0,6X,I2,24X,I2,2X,A2,8X,I2,9X,F5.1,7X,F5.1,8X,
00043      1 F5.2,6X,F5.2,6X,F6.0,4X,F6.2,6X,F6.2)
00044      205 FORMAT(1H+,10X,6H(FEED))
00045      206 FORMAT(1H+,10X,20H(CLEAN COAL PRODUCT))
00046      207 FORMAT(1H+,10X,19H(MIDDINGS PRODUCT))
00047      208 FORMAT(1H+,10X,16H(REFUSE PRODUCT))
00048      209 FORMAT(1H ,2X,10(1H-),19X,8(1H-),3X,11(1H-),3X,8(1H-),
00049      1 3X,9(1H-),2X,9(1H-),3X,9(1H-),2X,7(1H-),2X,11(1H-),2X,
00050      2 9(1H-))
00051      210 FORMAT(1H1,50X,21HOVERALL PLANT SUMMARY)
00052      211 FORMAT(1H0,55X,7HPYRITIC,7X,5HTOTAL)
00053      212 FORMAT(1H ,27X,8HFLOWRATE,8X,3HASH,9X,6HSULFUR,8X,6HSULFUR,20X,
00054      1 8HLBS SO2/,7X,8HMOISTURE)
00055      213 FORMAT(1H ,12X,10HFLOWSTREAM,5X,8HTONS/HR.,3(5X,9H(PERCENT)),5X,
00056      1 7HBTU/LB.,5X,11HMILLION BTU,5X,9H(PERCENT))

```

```

00057 214 FORMAT(1H,12X,10(1H-),5X,8(1H-),3(5X,9(1H-)),5X,7(1H-),5X,
00058 1 11(1H-),5X,9(1H-))
00059 215 FORMAT(1H0,12X,4HFEED,13X,F5.1,8X,F5.1,9X,F5.2,9X,F5.2,8X,F6.0,
00060 1 7X,F6.2,9X,F6.2)
00061 216 FORMAT(1H0,12X,10HCLEAN COAL,7X,F5.1,8X,F5.1,9X,F5.2,9X,F5.2,8X,
00062 1 F6.0,7X,F6.2,9X,F6.2)
00063 217 FORMAT(1H0,12X,9HMIDDLINGS,8X,F5.1,8X,F5.1,9X,F5.2,9X,F5.2,8X,
00064 1 F6.0,7X,F6.2,9X,F6.2)
00065 218 FORMAT(1H0,12X,6HREFUSE,11X,F5.1,8X,F5.1,9X,F5.2,9X,F5.2,8X,F6.0,
00066 1 7X,F6.2,9X,F6.2)
00067 219 FORMAT(1H0,12X,9HSOLIDS IN,8X,F5.1,8X,F5.1,9X,F5.2,9X,F5.2,
00068 1 8X,F6.0,7X,F6.2,/,1H,12X,14HWATER PRODUCTS)
00069 220 FORMAT(1H0,12X,10HDRYER FUEL,7X,F5.2,8X,F5.1,9X,F5.2,9X,F5.2,
00070 1 8X,F6.0////)
00071 221 FORMAT(1H+,10X,15H(WATER PRODUCT))
00072 250 FORMAT(1H0,12X,18HOVERALL YIELD DATA)
00073 251 FORMAT(1H0,17X,11HCLEAN COAL:,F6.2,8H PERCENT)
00074 252 FORMAT(1H0,17X,23HCLEAN COAL + MIDLINGS:,F6.2,
00075 1 8H PERCENT////)
00076 300 FORMAT(1H0,12X,22HCOAL WASHING COST DATA)
00077 301 FORMAT(1H0,17X,1H$,F5.2,16H PER TON OF FEED)
00078 302 FORMAT(1H0,17X,1H$,F5.2,22H PER TON OF CLEAN COAL/)
00079 303 FORMAT(1H0,12X,34HBASED UPON AN ANNUALIZED COST OF $,F11.2)
00080 304 FORMAT(1H0,12X,15HA FEED RATE OF ,F7.2,14H TONS PER HOUR)
00081 305 FORMAT(1H0,12X,4HAND ,F6.2,28H HOURS OF OPERATION PER WEEK)
00082 NS=NSIZE+1
00083 310 FORMAT(1H0,12X,21HWATER BALANCE SUMMARY,/,1H0,17X,
00084 1 28HTOTAL DEMAND FOR WATER (GPM),15(1H.),F7.2)
00085 311 FORMAT(1H,17X,36HWATER AVAILABLE FROM CLARIFIER (GPM),
00086 1 7(1H.),F7.2)
00087 312 FORMAT(1H0,20X,25HMAKEUP WATER NEEDED (GPM),15(1H.),F7.2)
00088 313 FORMAT(1H0,20X,19HSURPLUS WATER (GPM),24(1H.),F7.2)
00089 C PRINT SUMMARY DATA FOR UNITS
00090 WRITE (H,100)
00091 WRITE (H,101)
00092 WRITE (H,102)
00093 WRITE (H,104)
00094 WDMND=0.
00095 DO 10 IU=1,NUNITS
00096 WRITE (H,103) IU,L(IU)
00097 IF (L(IU).LT.19) WRITE (H,109) D1(IU),D2(IU),VSLYLD(IU),VSLBTU(IU)
00098 IF (L(IU).EQ.19) WRITE (H,108) D1(IU),VSLYLD(IU),VSLBTU(IU)
00099 IF ((L(IU).EQ.21).OR.(L(IU).EQ.69))WRITE(H,107)D1(IU),D2(IU),D3(IU)
00100 IF ((L(IU).GE.22).AND.(L(IU).LE.32)) WRITE (H,105) D1(IU)
00101 IF ((L(IU).EQ.33).OR.(L(IU).EQ.34)) WRITE (H,106) D1(IU),D2(IU)
00102 IF ((L(IU).EQ.41).OR.(L(IU).EQ.51)) WRITE (H,105) D1(IU)
00103 IF ((L(IU).GE.61).AND.(L(IU).LT.69)) WRITE (H,110)
00104 1 D1(IU),D2(IU),D3(IU),VSLYLD(IU),VSLBTU(IU)
00105 IF (L(IU).GE.71) WRITE (H,109) D1(IU),D2(IU),VSLYLD(IU),VSLBTU(IU)
00106 IF ((WATER(1,IU).GT.0.).OR.(WATER(2,IU).GT.0.)) WRITE (H,111)
00107 1 WATER(1,IU),WATER(2,IU)
00108 IF (L(IU).NE.69) WDMND=WDMND+WATER(1,IU)
00109 IF (L(IU).EQ.69) IUTH=IU
00110 10 CALL VESSEL(L(IU),3)
00111 C PRINT SUMMARY DATA FOR FLOWSTREAMS
00112 WRITE (H,200)

```



```

00113      WRITE (H,201)
00114      WRITE (H,202)
00115      WRITE (H,203)
00116      WRITE (H,209)
00117      DO 30 IF=1,NFLOWS
00118      SUM1=0.
00119      SUM2=0.
00120      SUM3=0.
00121      SUM4=0.
00122      IG=IF
00123      READ (DSK / IG) (((STREAM(I,J,K),K=1,4),J=1,NGRAV),I=1,NSIZE),      * SYS *
00124      1 WSTRM      * SYS *
00125      DO 20 I=1,NSIZE
00126      DO 20 J=1,NGRAV
00127      SUM1=SUM1+100.*STREAM(I,J,1)*STREAM(I,J,2)
00128      SUM2=SUM2+100.*STREAM(I,J,1)*STREAM(I,J,3)
00129      SUM3=SUM3+100.*STREAM(I,J,1)*STREAM(I,J,4)
00130      20 SUM4=SUM4+STREAM(I,J,1)*BTUPLB(BTU,STREAM(I,J,2),STREAM(I,J,4))
00131      IF (SUM4.LT.0.) SUM4=0.
00132      FLRATE=TONAGE*FLOW(IF)
00133      S02=999.
00134      IF (SUM4.GT.0.) S02=2.E+4*SUM3/SUM4
00135      WRITE (H,204) IF,KF(1,IF),S(IF),KF(2,IF),FLRATE,SUM1,SUM2,SUM3,
00136      1 SUM4,S02,WSTRM
00137      IF (KF(1,IF).EQ.0) GO TO 22
00138      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S1)) GO TO 24
00139      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S2)) GO TO 28
00140      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S3)) GO TO 28
00141      IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S7)) GO TO 28
00142      IF (L(KF(1,IF)).EQ.67) GO TO 31
00143      GO TO 30
00144      22 WRITE (H,205)
00145      ASHF=SUM1
00146      PSF=SUM2
00147      TSF=SUM3
00148      BTUF=SUM4
00149      S02F=2.E+4*TSF/BTUF
00150      WF=WSTRM
00151      GO TO 30
00152      24 WRITE (H,206)
00153      SUMCC=SUMCC+FLRATE
00154      ASHCC=ASHCC+SUM1*FLRATE
00155      PSCC=PSCC+SUM2*FLRATE
00156      TSCC=TSCC+SUM3*FLRATE
00157      BTUCC=BTUCC+SUM4*FLRATE
00158      WCC=WCC+.01*FLRATE*WSTRM/(1.-.01*WSTRM)
00159      GO TO 30
00160      28 WRITE (H,207)
00161      SUMMID=SUMMID+FLRATE
00162      ASHMID=ASHMID+SUM1*FLRATE
00163      PSMID=PSMID+SUM2*FLRATE
00164      TSMID=TSMID+SUM3*FLRATE
00165      BTUMID=BTUMID+SUM4*FLRATE
00166      WMID=WMID+.01*FLRATE*WSTRM/(1.-.01*WSTRM)
00167      GO TO 30
00168      28 WRITE (H,208)

```

```
00169      SUMREF=SUMREF+FLRATE
00170      ASHREF=ASHREF+SUM1*FLRATE
00171      PSREF=PSREF+SUM2*FLRATE
00172      TSREF=TSREF+SUM3*FLRATE
00173      BTUREF=BTUREF+SUM4*FLRATE
00174      WREF=WREF+.01*FLRATE*WSTRM/(1.-.01*WSTRM)
00175      GO TO 30
00176 29 WRITE(H,221)
00177      SUMW=SUMW+FLRATE
00178      ASHW=ASHW+SUM1*FLRATE
00179      PSW=PSW+SUM2*FLRATE
00180      TSW=TSW+SUM3*FLRATE
00181      BTUW=BTUW+SUM4*FLRATE
00182      GO TO 30
00183 31 BURNED=FLRATE*(100.-VSLYLD(KF(1,IF)))/VSLYLD(KF(1,IF))
00184      SUMDR=SUMDR+BURNED
00185      ASHDR=ASHDR+SUM1*BURNED
00186      PSDR=PSDR+SUM2*BURNED
00187      TSDR=TSDR+SUM3*BURNED
00188      BTUDR=BTUDR+SUM4*BURNED
00189 30 CONTINUE
00190      IF (NUNITS.EQ.1) RETURN
00191 C PRINT OVERALL PLANT SUMMARY
00192      ASHCC=ASHCC/SUMCC
00193      PSCC=PSCC/SUMCC
00194      TSCC=TSCC/SUMCC
00195      BTUCC=BTUCC/SUMCC
00196      SO2CC=2.E+4*TSCC/BTUCC
00197      WCC=100.*(WCC/SUMCC)/(1.+WCC/SUMCC)
00198      IF (SUMMID.EQ.0.) GO TO 35
00199      ASHMID=ASHMID/SUMMID
00200      PSMID=PSMID/SUMMID
00201      TSMID=TSMID/SUMMID
00202      BTUMID=BTUMID/SUMMID
00203      SO2MID=2.E+4*TSMID/BTUMID
00204      WMID=100.*(WMID/SUMMID)/(1.+WMID/SUMMID)
00205 35 ASHREF=ASHREF/SUMREF
00206      PSREF=PSREF/SUMREF
00207      TSREF=TSREF/SUMREF
00208      BTUREF=BTUREF/SUMREF
00209      SO2REF=2.E+4*TSREF/BTUREF
00210      WREF=100.*(WREF/SUMREF)/(1.+WREF/SUMREF)
00211      IF(SUMW.LT.1.E-5)GO TO 36
00212      ASHW=ASHW/SUMW
00213      PSW=PSW/SUMW
00214      TSW=TSW/SUMW
00215      BTUW=BTUW/SUMW
00216      SO2W=2.E+4*TSW/BTUW
00217 36 IF (SUMDR.LT.1.E-5) GO TO 37
00218      ASHDR=ASHDR/SUMDR
00219      PSDR=PSDR/SUMDR
00220      TSDR=TSDR/SUMDR
00221      BTUDR=BTUDR/SUMDR
00222 37 WRITE (H,210)
00223      WRITE (H,211)
00224      WRITE (H,212)
```

```

00225      WRITE (H,213)
00226      WRITE (H,214)
00227      WRITE (H,215) TONAGE,ASHF,PSF,TSF,BTUF,S02F,WF
00228      WRITE (H,216) SUMCC,ASHCC,PSCC,TSCC,BTUCC,S02CC,WCC
00229      IF (SUMMID.GT.0.) WRITE (H,217) SUMMID,ASHMID,PSMID,TSMID,
00230      1 BTUMID,S02MID,WMID
00231      WRITE (H,218) SUMREF,ASHREF,PSREF,TSREF,BTUREF,S02REF,WREF
00232      IF (SUMW.GE.1.E-5) WRITE (H,219) SUMW,ASHW,PSW,TSW,BTUW,S02W
00233      IF (SUMDR.GE.1.E-5) WRITE (H,220) SUMDR,ASHDR,PSDR,TSDR,BTUDR
00234      YLD1=100.*SUMCC/TONAGE
00235      YLD2=100.*(SUMCC+SUMMID)/TONAGE
00236      WRITE (H,250)
00237      WRITE (H,251) YLD1
00238      WRITE (H,252) YLD2
00239  C WATER BALANCE SUMMARY
00240      WRITE (H,310) WDMND
00241      WRITE (H,311) WATER(2,IUTH)
00242      DIFF=WATER(2,IUTH)-WDMND
00243      XDIFF=ABS(DIFF)
00244      IF (DIFF.GE.0.) WRITE (H,313) DIFF
00245      IF (DIFF.LT.0.) WRITE (H,312) XDIFF
00246      IF (HRS.EQ.0) RETURN
00247      CPTF=YCOST/(50.*HRS*TONAGE)
00248      CPTCC=CPTF*TONAGE/SUMCC
00249      WRITE (H,300)
00250      WRITE (H,301) CPTF
00251      WRITE (H,302) CPTCC
00252      WRITE (H,303) YCOST
00253      WRITE (H,304) TONAGE
00254      WRITE (H,305) HRS
00255      RETURN
00256      END

```

COMMON BLOCKS

/.COMM./(+1831)

STREAM +0#R WSTRM +1830 R

/SYS/(+2)

G +0 I H +1 I

SUBPROGRAMS CALLED

BTUPLB ABS. VESSEL

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "##" SUBSCRIPTED]

*PSF	1 R	*BTUF	2 R	*YLD1	3 R	*WMID	4 R	*S3	5 R
VSLYLD	6#R	*CPTF	7 R	*DIFF	10 R	*NS	11 I	*NUNITS	12 I
*S02	13 R	*IF	14 I	*TSREF	15 R	*S02CC	16 R	*K	17 I
D3	20#R	*BURNED	21 R	*SUMW	22 R	*S2	23 R	VSLBTU	24#R
*WF	25 R	*ASHW	26 R	*S02F	27 R	*S7	30 R	*TSW	31 R
D2	32#R	*WDMND	33 R	*SUMMID	34 R	*S1	35 R	*BTUW	36 R

*SUMREF	37 R	S	40#R	KF	41#I	*IU	42 I	*TSDR	43 R
*TSCC	44 R	DSK	45 I	*J	46 I	*PSREF	47 R	*TSMID	50 R
*ASHMID	51 R	*SUM4	52 R	*HRS	53 R	%S6		*ASHREF	54 R
D1	55#R	*FLRATE	56 R	WATER	57#R	*SUMDR	60 R	*WCC	61 R
*SUMCC	62 R	*BTUMID	63 R	*TONAGE	64 R	*TSF	65 R	*BTUREF	68 R
*YCOST	67 R	*SUM3	70 R	*NSIZE	71 I	%S5		*ASHDR	72 R
*ASHCC	73 R	*NFlows	74 I	*PSW	75 R	*WREF	76 R	*SO2W	77 R
*XDIFF	100 R	BTU	101#R	FLOW	102#R	*BTUDR	103 R	*BTUCC	104 R
L	105#I	*SUM2	106 R	*I	107 I	*PSDR	110 R	*PSCC	111 R
*IUTH	112 I	*YLD2	113 R	*PSMID	114 R	%S4		*NGRAV	115 I
*CPTCC	118 R	*ASHF	117 R	*IG	120 I	*SO2MID	121 R	*SO2REF	122 R
*SUM1	123 R								

TEMPORARIES

.S0000	1187 I	.S0001	1170 I	.S0002	1171 I	.S0003	1172 I	.S0004	1173 I
.S0005	1174 I	.A0018	1175 R	.S0008	1178 I	.Q0000	1177 I	.Q0001	1200 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00080	-	-	57	-	-	-	-	-	-	-
00090	62	65	70	73	76	77	103	110	131	150
00100	172	210	230	248	-	274	315	-	333	345
00110	354	-	365	370	373	378	401	404	410	411
00120	412	413	414	415	-	455	481	483	472	501
00130	510	530	533	540	542	550	-	561	568	600
00140	612	624	636	646	647	652	654	656	660	662
00150	665	687	670	673	675	677	702	705	710	720
00160	721	724	728	730	733	736	741	751	752	755
00170	757	761	764	767	772	1002	1003	1006	1010	1012
00180	1015	1020	1023	1024	1040	1041	1043	1046	1051	1054
00190	1057	-	1062	1065	1070	1073	1076	1101	1111	1113
00200	1116	1121	1124	1127	1132	1142	1145	1150	1153	1156
00210	1161	1171	1174	1177	1202	1205	1210	1213	1216	1221
00220	1224	1227	1232	1235	1240	1243	1246	1251	1255	1281
00230	-	1267	1273	1302	1310	1314	1320	1323	1327	-
00240	1333	1337	1348	1354	1358	1363	1370	1373	1401	1404
00250	1407	1413	1417	1423	1427	-	1433			

OUTPT4 OCTAL PROG SIZE=3580 [SCALARS/ARRAYS=123 + FORMATS=1043 + TEMPS/CONS=22 + CODE=1436 + ARGS=712] + COMMON=1633
[NO ERRORS DETECTED]

```

00001      SUBROUTINE ROLL(N,M)
00002      C*****
00003      C
00004      C      THIS SUBROUTINE CALCULATES THE SIZE BY SPECIFIC GRAVITY
00005      C      WEIGHT FRACTION AND COMPOSITION OF A DOUBLE ROLL CRUSHER
00006      C      PRODUCT FOR A GIVEN FEED ENTERING THE DOUBLE ROLL CRUSHER
00007      C      WITH A SPECIFIED GAP
00008      C
00009      C*****
00010      COMMON /BLK3/ FP(50,10,4),SKIP(2050),D(1275),SUM(4),FILL(100)
00011      DO 30 N1=1,N
00012      I=N+1-N1
00013      II = I*(I-1)/2
00014      DO 30 J=1,M
00015      DO 10 K=1,4
00016      SUM(K)=0.
00017      10 CONTINUE
00018      DO 20 L=1,I
00019      IL=II+L
00020      DF=D(IL)*FP(L,J,1)
00021      SUM(1)=SUM(1)+DF
00022      DO 20 K=2,4
00023      SUM(K)=SUM(K)+DF*FP(L,J,K)
00024      20 CONTINUE
00025      FP(I,J,1)=SUM(1)
00026      DO 30 K=2,4
00027      FP(I,J,K)=SUM(K)/FP(I,J,1)
00028      30 CONTINUE
00029      RETURN
00030      END

```

COMMON BLOCKS

```

/BLK3/(+12465)
FP      +O#R      SKIP      +3720#R      D      +7722#R      SUM      +12315#R      FILL      +12321#R

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

```

*IL      1 I      *N1      2 I      *N      3 I      *K      4 I      *M      5 I
*J      6 I      *II      7 I      *DF      10 R      *L      11 I      *I      12 I

```

TEMPORARIES

```

.S0000    13 I      .S0001    14 I      .S0002    15 I      .S0003    16 I      .S0004    17 I
.S0005    20 I

```

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	-	-	-
00010 :	-	4	10	14	22	26	27	30	31	35
00020 :	37	45	46	47	60	64	71	72	103	-
00030 :	112									

ROLL   OCTAL PROG SIZE=137 [SCALARS/ARRAYS=12 + TEMPS/CONS=11 + CODE=114 + ARGS=0] + COMMON=12465
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE ROTARS(N,NGRAV,HOLE,SR,DIA,LEN,TPH,XMAX,EO)
00002      C*****
00003      C
00004      C      THIS SUBROUTINE CALCULATES THE SIZE/SPECIFIC GRAVITY
00005      C      WEIGHT FRACTION AND COMPOSITION OF THE RAW COAL AND THE
00006      C      REFUSE FOR A GIVEN RUN-OF-MINE FEED ENTERING THE ROTARY
00007      C      BREAKER WITH A SPECIFIED TROMMEL OPENING
00008      C
00009      C      VARIABLES AND ARRAYS APPEARING IN THIS SUBROUTINE
00010      C
00011      C      N=THE NUMBER OF SQUARE ROOT SIZE INTERVALS
00012      C      F=FEED IN INTERVAL FRACTIONS
00013      C      B=THE BREAKAGE VALUES
00014      C      XMAX=MAXIMUM FEED SIZE
00015      C*****
00016      COMMON /BLK3/ FR(50,10,4),SKIP(50),P(50,10,4),B(1275),
00017      1 WI(50),WO(50),SUM(4)
00018      REAL LEN
00019      DATA A/7.495/,EPS/0.001/
00020      C
00021      C      THE SIZE SELECTION FUNCTION
00022      C
00023      SFUNCT(FC,X)=A*C2*(X/3.937)**3.08/((1.+(X/6.1024/C1)**8.35)*2.2/
00024      8(1.+18.9*FC**1.0357)
00025      DDT=DIA/10.
00026      C1=DDT**0.2
00027      C2=SQRT(DDT)
00028      C
00029      C      THE INITIAL FRACTIONAL FILLING
00030      C
00031      FCI=0.10
00032      IS=1.-ALOG(HOLE/XMAX)/ALOG(SR)+0.78
00033      IF (IS.LT.1) IS=1
00034      IX=IS-1
00035      EO=0.
00036      C
00037      C      REMOVING MATERIAL LESS THAN THE TROMMEL OPENING IN THE RUN-
00038      C      OF-MINE FEED FOR THE FIRST INCREMENTAL LENGTH OF THE
00039      C      ROTARY BREAKER
00040      C
00041      DO 1 I=IS,N
00042      DO 1 J=1,NGRAV
00043      EO=EO+FR(I,J,1)
00044      P(I,J,1)=FR(I,J,1)
00045      FR(I,J,1)=0.
00046      DO 1 K=2,4
00047      P(I,J,K)=FR(I,J,K)
00048      IF (IS.GT.1) P(I,J,K)=P(I,J,K)*P(I,J,1)
00049      FR(I,J,K)=0.
00050      1 CONTINUE
00051      IF (IS.LE.1) RETURN
00052      EO=1.-EO
00053      E=EO
00054      U=0.
00055      DO 3 I=1,IX
00056      WO(I)=0.

```

```
00057      DO 2 J=1,NGRAV
00058      WO(I)=WO(I)+FR(I,J,1)
00059      2 CONTINUE
00060      U=U+WO(I)
00061      DO 3 J=1,NGRAV
00062      FR(I,J,1)=FR(I,J,1)/WO(I)
00063      3 CONTINUE
00064      U=0.8485*TPH/DIA/DIA/FCI*U
00065      C
00066      C      DETERMINING THE MEAN RESIDENCE TIME
00067      C
00068      TAU=LEN/U
00069      XM=6.1024*((6.35-3.08)/3.08)**(-1/6.35)
00070      C
00071      C      DETERMINING THE TOTAL NUMBER OF INCREMENTAL LENGTHS
00072      C
00073      M=SFUNCT(FCI,XM)*TAU*2.5
00074      XM=M
00075      TM=TAU/XM
00076      IC=IS*IX/2
00077      R=1./SR
00078      DO 22 LENGTH=1,M
00079      U=0.
00080      DO 99 I=1,IX
00081      WI(I)=WO(I)/E
00082      U=U+WI(I)
00083      99 CONTINUE
00084      BIC=0.
00085      X=XMAX
00086      DO 4 I=1,IX
00087      IJ=IC+I
00088      BIC=BIC+B(IJ)*SFUNCT(FCI,X)*WI(I)
00089      X=X*R
00090      4 CONTINUE
00091      DO 45 I=1,IX
00092      WI(I)=WI(I)/U
00093      45 CONTINUE
00094      C
00095      C      ESTABLISHING THE STEADY STATE CONDITIONS FOR THE
00096      C      INCREMENTAL LENGTH
00097      C
00098      E=(2.-TM*BIC)/(2.+TM*BIC)
00099      5 EOLD=E
00100      FCO=FCI+E
00101      BIC=0.
00102      X=XMAX
00103      DO 8 I=1,IX
00104      IJ=IC+I
00105      II=I-1
00106      II=I*II/2
00107      SVALI=SFUNCT(FCI,X)
00108      SVALO=SFUNCT(FCO,X)
00109      SUM(1)=0.
00110      P(I,1,1)=SVALI*WI(I)
00111      L=1
00112      8 IF(L.GT.II) GO TO 7
```



```
00113      IL=II+L
00114      IL1=IL+I
00115      SUM(1)=SUM(1)+(B(IL)-B(IL1))*P(L,1,1)
00116      L=L+1
00117      GO TO 8
00118 7      WO(I)=WI(I)*(1.-TM/2.*SVALI)+SUM(1)
00119      WO(I)=WO(I)/(1.+TM/2.*SVALO)
00120      IF(WO(I).LT.0.1E-08) WO(I)=0.
00121      P(I,1,1)=TM/2.*(P(I,1,1)+SVALO*WO(I))
00122      BIC=BIC+B(IJ)*P(I,1,1)
00123      X=X*R
00124 8      CONTINUE
00125      E=1.-BIC
00126      IF(ABS(E-EOLD).GT.EPS) GO TO 5
00127      X=XMAX
00128      FCO=FCI+E
00129  C
00130  C      PERFORMING A MATERIAL BALANCE OVER THE INCREMENTAL LENGTH
00131  C
00132      DO 16 I=1,IX
00133      IJ=IC+I
00134      I1=I-1
00135      II=I*I1/2
00136      SVALI=SFUNCT(FCI,X)
00137      SVALO=SFUNCT(FCO,X)
00138      XM=0.
00139      DO 15 J=1,NGRAV
00140      FR(I,J,1)=FR(I,J,1)*WI(I)
00141      SUM(1)=0.
00142      P(I,J,1)=SVALI*FR(I,J,1)
00143      DO 9 K=2,4
00144      SUM(K)=0.
00145      P(I,J,K)=P(I,J,1)*FR(I,J,K)
00146 9      CONTINUE
00147      L=1
00148 10     IF(L.GT.I1) GO TO 12
00149      IL=II+L
00150      IL1=IL+I
00151      DO 11 K=1,4
00152      SUM(K)=SUM(K)+(B(IL)-B(IL1))*P(L,J,K)
00153 11     CONTINUE
00154      L=L+1
00155      GO TO 10
00156 12     PRDT=FR(I,J,1)*(1.-TM/2.*SVALI)
00157      FR(I,J,1)=PRDT+SUM(1)
00158      FR(I,J,1)=FR(I,J,1)/(1.+TM/2.*SVALO)
00159      IF(FR(I,J,1).LT.0.1E-08) FR(I,J,1)=0.
00160      DO 13 K=2,4
00161      FR(I,J,K)=FR(I,J,K)*PRDT+SUM(K)
00162      FR(I,J,K)=FR(I,J,K)/(1.+TM/2.*SVALO)
00163      IF(FR(I,J,K).LT.0.1E-08) FR(I,J,K)=0.
00164      IF(FR(I,J,1).GT.0.) FR(I,J,K)=FR(I,J,K)/FR(I,J,1)
00165      IF(FR(I,J,1).EQ.0.) FR(I,J,K)=0.
00166 13     CONTINUE
00167      PRDT=SVALO*FR(I,J,1)
00168      P(I,J,1)=TM/2.*(P(I,J,1)+PRDT)
```

```

00169      DO 14 K=2,4
00170      P(I,J,K)=TM/2.*(P(I,J,K)+PRDT*FR(I,J,K))
00171      14 CONTINUE
00172      FR(I,J,1)=FR(I,J,1)/WO(I)
00173      15 CONTINUE
00174      X=X*R
00175      16 CONTINUE
00176      C
00177      C      CALCULATING THE RAW COAL FROM THE INCREMENTAL LENGTHS
00178      C
00179      DO 21 I=IS,N
00180      II=I*(I-1)/2
00181      DO 21 J=1,NGRAV
00182      L=1
00183      DO 17 K=1,4
00184      SUM(K)=0.
00185      17 CONTINUE
00186      18 IF(L.GT.IX) GO TO 20
00187      IL=II+L
00188      IL1=IL+I
00189      DO 19 K=1,4
00190      SUM(K)=SUM(K)+B(IL)*P(L,J,K)
00191      IF(I.NE.N) SUM(K)=SUM(K)-B(IL1)*P(L,J,K)
00192      19 CONTINUE
00193      L=L+1
00194      GO TO 18
00195      20 DO 21 K=1,4
00196      P(I,J,K)=P(I,J,K)+EO*SUM(K)
00197      21 CONTINUE
00198      EO=EO+E
00199      FCI=FCO
00200      22 CONTINUE
00201      EO=1.-EO
00202      DO 24 I=IS,N
00203      DO 24 J=1,NGRAV
00204      FR(I,J,1)=0.
00205      DO 23 K=2,4
00206      P(I,J,K)=P(I,J,K)/P(I,J,1)
00207      FR(I,J,K)=0.
00208      23 CONTINUE
00209      P(I,J,1)=P(I,J,1)/EO
00210      24 CONTINUE
00211      DO 25 I=1,IX
00212      DO 25 J=1,NGRAV
00213      FR(I,J,1)=FR(I,J,1)*WO(I)/E
00214      DO 25 K=1,4
00215      P(I,J,K)=0.
00216      25 CONTINUE
00217      RETURN
00218      END

```

COMMON BLOCKS

```

/BLK3/(+12485)
FR      +0#R      SKIP      +3720#R      P      +4002#R      B      +7722#R      WI      +12315#R

```

WO   +12377#R   SUM   +12481#R

SUBPROGRAMS CALLED

SQRT.   ALOG.   SFUNCT   ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*TAU	1 R	*IL	2 I	LEN	3 R	*FCI	4 R	*TM	5 R
*N	8 I	*K	7 I	*E	10 R	*IJ	11 I	*XMAX	12 R
*SVALO	13 R	*M	14 I	*DIA	15 R	*HOLE	16 R	*J	17 I
*SR	20 R	*SVALI	21 R	*II	22 I	*A	23 R	*IC	24 I
*DDT	25 R	*EOLD	28 R	*C2	27 R	*PRDT	30 R	*BIC	31 R
*X	32 R	*TPH	33 R	*XM	34 R	*U	35 R	*FCO	38 R
*R	37 R	*IL1	40 I	*LENGTH	41 I	*IS	42 I	*L	43 I
*I1	44 I	*I	45 I	*C1	46 R	*EO	47 R	*NGRAV	50 I
*EPS	51 R	*IX	52 I						

TEMPORARIES

.S0021	53 I	.S0022	54 I	.S0023	55 I	.S0024	56 I	.S0025	57 I
.S0026	60 I	.S0027	61 I	.S0010	62 I	.S0011	63 I	.S0012	64 I
.S0013	65 I	.S0014	68 I	.S0015	67 I	.S0016	70 I	.S0017	71 I
.F0001	72 R	.F0000	73 R	.S0000	74 I	.S0001	75 I	.S0002	78 I
.S0003	77 I	.S0004	100 I	.S0005	101 I	.A0018	102 R	.S0006	103 I
.S0007	104 I	.S0030	105 I	.S0031	106 I	.S0032	107 I	.S0033	110 I
.S0020	111 I	.Q0000	112 I	.Q0001	113 I	.Q0002	114 I		

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00020	:	-	-	25	-	65	70	73	-	-
00030	:	76	100	115	121	124	-	-	-	-
00040	:	125	133	137	143	150	154	155	165	200
00050	:	207	216	221	223	224	225	231	232	242
00060	:	244	247	251	260	265	-	-	273	276
00070	:	-	-	302	310	312	315	323	326	332
00080	:	333	335	340	341	343	346	351	354	362
00090	:	364	366	370	373	-	-	-	375	405
00100	:	407	411	412	414	417	422	433	436	441
00110	:	442	446	450	453	455	457	465	466	477
00120	:	506	510	517	523	525	527	532	536	540
00130	:	-	-	543	547	551	554	562	565	570
00140	:	575	602	603	611	612	613	624	625	627
00150	:	634	636	637	653	654	655	656	667	674
00160	:	720	721	733	750	770	1007	1023	1024	1032
00170	:	1043	1060	1061	1070	1073	1075	-	-	1100
00180	:	1106	1114	1120	1122	1123	1124	1125	1130	1132
00190	:	1135	1147	1164	1165	1166	1167	1170	1201	1210

ROTARS ROTARS.FOR   FORTRAN V.5A(821) /KI/L 22-AUG-85   13:58   PAGE 1-5

00200 :	1214	1217	1221	1227	1233	1236	1237	1250	1257	1260
00210 :	1268	1274	1300	1304	1313	1314	1323	-	1332	

ROTARS OCTAL PROG SIZE=1543 [SCALARS/ARRAYS=52 + TEMPS/CONS=83 + CODE=1337 + ARGS=47] + COMMON=12485
[NO ERRORS DETECTED]

```

00001      SUBROUTINE ROTARY(LENGTH,DIAM,HOLE,SIZE,GRAV,NSIZE,NGRAV,TFEED,
00002      1 CPROD,RPROD,WTFEED,WCPROD,WRPROD,FCPROD,FRPROD,YLDVSL,BTUVSL,BTU,
00003      2 FTOT,KBSG)
00004 C *****
00005 C THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE *
00006 C ROTARY BREAKER PRODUCT FOR A GIVEN FEED. *
00007 C *
00008 C VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST *
00009 C LENGTH = BREAKER LENGTH (FEET) *
00010 C DIAM = BREAKER DIAMETER (FEET) *
00011 C HOLE = OPENING SIZE (INCHES) *
00012 C SIZE(I) = BOUNDARIES OF COAL SIZE INCREMENTS *
00013 C NSIZE = NUMBER OF SIZE INCREMENTS *
00014 C NGRAV = NUMBER OF GRAVITY INCREMENTS *
00015 C TFEED(I,J,K) = PROPERTIES OF TOTAL FEED STREAM (COAL+ROCK) *
00016 C FTOT = TOTAL FEED STREAM FLOW RATE *
00017 C CPROD(I,J,K) = PROPERTIES OF COAL PRODUCT STREAM *
00018 C FCPROD = COAL PRODUCT FLOW RATE *
00019 C RPROD(I,J,K) = PROPERTIES OF ROCK PRODUCT STREAM *
00020 C FRPROD = ROCK PRODUCT FLOW RATE *
00021 C *****
00022 REAL LENGTH
00023 DIMENSION CPROD(23,10,4),RPROD(23,10,4),TFEED(23,10,4), * DIM *
00024 1 SIZE(23),GRAV(10),BTU(4) * DIM *
00025 COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5), * DIM *
00026 1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24), * DIM *
00027 2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00028 COMMON /BLK3/ FR(50,10,4),SKIP(50),P(50,10,4),FILL(1379)
00029 COMMON /SYS/ GX,HX
00030 SR=SQRT(2.)
00031 CALL XPAND(NSIZE,NGRAV,TFEED,SIZE,NX,CPROD,0)
00032 CALL BVALS(NX,SIZE(1),SR)
00033 SLOT=HOLE
00034 CALL ROTARS(NX,NGRAV,SLOT,SR,DIAM,LENGTH,FTOT,SIZE(1),YLD)
00035 CALL SQEEZ(NSIZE,NGRAV,RPROD,SIZE,NX)
00036 DO 10 I=1,NX
00037 DO 10 J=1,NGRAV
00038 DO 10 K=1,4
00039 FR(I,J,K)=P(I,J,K)
00040 10 CONTINUE
00041 CALL SQEEZ(NSIZE,NGRAV,CPROD,SIZE,NX)
00042 YLDCC=YLD
00043 FCPROD=YLDCC
00044 FRPROD=1.-FCPROD
00045 WCPROD=WTFEED
00046 WRPROD=WTFEED
00047 IF (KBSG.EQ.0) RETURN
00048 C*****
00049 C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00050 C*****
00051 CALL SDSIZE(TFEED,SFEED,BTU,NSIZE,NGRAV)
00052 CALL SDSIZE(CPROD,SCC,BTU,NSIZE,NGRAV)
00053 CALL SDSIZE(RPROD,SREF,BTU,NSIZE,NGRAV)
00054 NS=NSIZE+1
00055 DO 490 I=1,NSIZE
00056 SYLD(I)=100.*YLDCC*SCC(I,1)/SFEED(I,1)

```

```

00057      BTUREC(I)=SYLD(I)*SCC(I,5)/((SFEED(I,1)*SFEED(I,5))
00058      490 CONTINUE
00059      SYLD(NS)=100.*YLDCC
00060      BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/
00061      1 (SFEED(NS,1)*SFEED(NS,5))
00062      BTUVSL=BTUREC(NS)
00063      YLDVSL=SYLD(NS)
00064      RETURN
00065      END

```

COMMON BLOCKS

```

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMD      +360#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFIC      +1020#R      BTUREC      +1050#R      ASHERR      +1100#R      SFLT      +1130#R
SINK      +1160#R      SMISPL      +1210#R      SNRGR      +1240#R      SGRAV      +1270#R      SPE      +1320#R
SIMP      +1350#R      SEA      +1400#R

```

```

/BLK3/(+12465)
FR      +0#R      SKIP      +3720#R      P      +4002#R      FILL      +7722#R

```

```

/SYS/(+2)
GX      +0 R      HX      +1 R

```

SUBPROGRAMS CALLED

ROTARS   SQRT.   SQUEZ   SDSIZE   BVALS   XPAND

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*NS	1 I	*K	2 I	*WCPROD	3 R	TFEED	4#R	*NX	5 I
RPROD	6#R	*WTFEED	7 R	*YLDVSL	10 R	*FRPROD	11 R	CPROD	12#R
*KBSG	13 I	*BTUVSL	14 R	*HOLE	15 R	*J	16 I	*WRPROD	17 R
*SR	20 R	*YLD	21 R	*YLDCC	22 R	*DIAM	23 R	%GRAV	
*NSIZE	24 I	SIZE	25#R	BTU	26#R	LENGTH	27 R	*SLOT	30 R
*I	31 I	*FTOT	32 R	*NGRAV	33 I	*FCPROD	34 R		

TEMPORARIES

.S0000	35 I	.S0001	36 I	.S0002	37 I	.S0003	40 I	.A0018	41 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00030	:	51	54	56	60	62	64	66	72	77
00040	:	107	116	120	122	123	126	130	131	-
00050	:	-	133	135	137	141	144	146	153	163

ROTARY ROTARY.FOR   FORTRAN V.5A(821) /KI/L 22-AUG-85   13:57   PAGE 1-2

00080 : 167   -   177   200   -   202

ROTARY OCTAL PROG SIZE=366 [SCALARS/ARRAYS=34 + TEMPS/CONS=11 + CODE=233 + ARGS=66] + COMMON=14117
[NO ERRORS DETECTED]

```

00001      SUBROUTINE SCREEN(L,SCSZ,GPMIN,GPMOUT,SIZE,NSIZE,GRAV,NGRAV,
00002      1 FEED,SOVER,SUNDER,WFEED,WSOVER,WSUNDR,FLOW1,FOVER,FUNDER,YLDVSL,
00003      2 BTUVSL,BTU,KBSG,TONAGE)
00004 C *****
00005 C THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE *
00006 C SCREEN OVER AND SCREEN UNDER STREAMS FOR A GIVEN FEED. *
00007 C *
00008 C VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST *
00009 C IDRY = INDICATES IF SCREEN IS WET OR DRY *
00010 C IDRY=1 FOR DRY SCREEN *
00011 C IDRY=2 FOR WET SCREEN *
00012 C LEVEL = INDICATES IF SCREEN IS AN UPPER OR LOWER SCREEN *
00013 C LEVEL=1 FOR UPPER SCREEN *
00014 C LEVEL=2 FOR LOWER SCREEN *
00015 C SCSZ = PROJECTED SCREEN OPENING *
00016 C SCSZ=0 DENOTES A DEWATERING SCREEN *
00017 C SIZE(I) = BOUNDARIES OF COAL SIZE INCREMENTS *
00018 C NSIZE = NUMBER OF SIZE INCREMENTS *
00019 C NGRAV = NUMBER OF GRAVITY INCREMENTS *
00020 C FEED(I,J,K) = PROPERTIES OF FEED STREAM *
00021 C SOVER(I,J,K) = PROPERTIES OF OVERFLOW STREAM *
00022 C FOVER = OVERFLOW PRODUCT FLOW RATE *
00023 C SUNDER(I,J,K) = PROPERTIES OF UNDERFLOW STREAM *
00024 C FUNDER = UNDERFLOW PRODUCT FLOW RATE *
00025 C I = DESIGNATES SIZE INCREMENT OF COAL *
00026 C J = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL *
00027 C K = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR *
00028 C (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE *
00029 C STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT) *
00030 C SYLD(I) = PERCENT OF FEED OF THE ITH SIZE *
00031 C REPORTING TO THE UNDERFLOW STREAM *
00032 C *****
00033 DIMENSION SSZ(13),D1(9),D2(9),D3(9),D4(9) * DIM *
00034 DIMENSION SIZE(23),FEED(23,10,4),SUNDER(23,10,4),BTU(4), * DIM *
00035 1 SOVER(23,10,4),GRAV(10) * DIM *
00036 COMMON A(9,2,2),C(23),SMID(23),AC(13) * DIM *
00037 COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5), * DIM *
00038 1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24), * DIM *
00039 2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00040 REAL MOISTR
00041 DATA SSZ / 18.0,6.0,1.5,.375,.25,.093,.0232,.0164,.0116,4*0./ * DIM *
00042 DATA D1 /60.,20.,8.,8.,5.,3.,0.7,0.6,0.5/ * DIM *
00043 DATA D2 /60.,20.,8.,8.,4.,2.,0.7,0.6,0.5/ * DIM *
00044 DATA D3 / 60.,20.,9.,8.6,5.5,3.5,0.8,0.7,0.55 / * DIM *
00045 DATA D4 /60.,20.,9.,8.6,4.5,2.3,0.8,0.7,0.55 / * DIM *
00046 NS=NSIZE+1
00047 IDRY=1
00048 LEVEL=1
00049 IF ((L.EQ.33).OR.(L.EQ.34)) IDRY=2
00050 IF ((L.EQ.32).OR.(L.EQ.34)) LEVEL=2
00051 IF (SCSZ.GT.0.) GO TO 100
00052 DO 5 I=1,NSIZE
00053 DO 5 J=1,NGRAV
00054 SOVER(I,J,1)=FEED(I,J,1)
00055 SUNDER(I,J,1)=0.
00056 DO 5 K=2,4

```



```

00057      SOVER(I,J,K)=FEED(I,J,K)
00058      SUNDER(I,J,K)=FEED(I,J,K)
00059      5 CONTINUE
00060      GO TO 120
00061      100 FOVER=0.0
00062      FUNDER=0.0
00063      DO 7 I=1,9                                * DIM *
00064      A(I,1,1)=D1(I)
00065      A(I,1,2)=D2(I)
00066      A(I,2,1)=D3(I)
00067      A(I,2,2)=D4(I)
00068      7 AC(I)=A(I, IDRY, LEVEL)
00069      CALL INTS(SSZ, AC, SCSZ, AA, 9)              * DIM *
00070      DO 1 I=1, NSIZE
00071      SMID(I)=(SIZE(I)+SIZE(I+1))/2.0
00072      FRAC1=1.0
00073      FRAC2=1.0
00074      C1=0.0
00075      C2=0.0
00076      IF(SIZE(I)-SCSZ) 2,2,3
00077      3 C1=1.0
00078      IF(SIZE(I+1)-SCSZ) 11,10,10
00079      11 FRAC1=(SIZE(I)-SCSZ)/(SIZE(I)-SIZE(I+1))
00080      FRAC2=1.0-FRAC1
00081      SMID(I)=(SCSZ+SIZE(I+1))/2.
00082      2 C2=1./EXP(AA*(1.-SMID(I)/SCSZ))
00083      10 C(I)=C1*FRAC1+C2*FRAC2
00084      1 CONTINUE
00085      DO 4 I=1, NSIZE
00086      DO 4 J=1, NGRAV
00087      SOVER(I,J,1)=C(I)*FEED(I,J,1)
00088      SUNDER(I,J,1)=FEED(I,J,1)-SOVER(I,J,1)
00089      FOVER=SOVER(I,J,1)+FOVER
00090      FUNDER=SUNDER(I,J,1)+FUNDER
00091      DO 4 K=2,4                                * DIM *
00092      SOVER(I,J,K)=FEED(I,J,K)
00093      SUNDER(I,J,K)=FEED(I,J,K)
00094      4 CONTINUE
00095      C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00096      DO 12 I=1, NSIZE
00097      DO 12 J=1, NGRAV
00098      SOVER(I,J,1)=SOVER(I,J,1)/FOVER
00099      SUNDER(I,J,1)=SUNDER(I,J,1)/FUNDER
00100      DO 12 K=2,4                                * DIM *
00101      IF (SOVER(I,J,1).EQ.0.) SOVER(I,J,K)=0.
00102      IF (SUNDER(I,J,1).EQ.0.) SUNDER(I,J,K)=0.
00103      12 CONTINUE
00104      C *****
00105      C WATER BALANCE CALCULATIONS
00106      C *****
00107      120 WATIN=0.25*GPMIN+(0.01*WFEED/(1.-0.01*WFEED))*FLOW1*TONAGE
00108      F=0.80
00109      C NOTE: F=0.80 IS AN ARBITRARY NUMBER
00110      DRYFAC=1.0
00111      IF (IDRY.EQ.1) DRYFAC=WFEED/(100.*MOISTR(FEED,SIZE,GRAV,
00112      1 NSIZE,NGRAV,0,2))

```

```

00113      WSOVER=100.*F*DRYFAC*MOISTR(SOVER,SIZE,GRAV,NSIZE,NGRAV,0,2)
00114      WATOUT=WATIN-0.01*FOVER*FLOW1*TONAGE*(WSOVER/(1.-0.01*WSOVER))
00115      WSUNDR=100.*WATOUT/(WATOUT+FUNDER*FLOW1*TONAGE)
00116      IF (WATOUT.GE.0.) GO TO 300
00117      WATOUT=0.
00118      WSOVER=WFEED
00119      WSUNDR=WFEED
00120      300  GPMOUT=0.
00121          IF (SCSZ.EQ.0.) GPMOUT=4.*WATOUT
00122          IF (KBSG.EQ.0) RETURN
00123      C*****
00124      C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00125      C*****
00126          CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00127          CALL SDSIZE(SOVER,SCC,BTU,NSIZE,NGRAV)
00128          CALL SDSIZE(SUNDR,SREF,BTU,NSIZE,NGRAV)
00129      C CALCULATE WEIGHT AND BTU UNDERFLOW-TO-FEED RATIOS
00130          DO 40 I=1,NSIZE
00131              SYLD(I)=100.*(1.-C(I))
00132              BTUREC(I)=100.*FUNDER*SREF(I,1)*SREF(I,5)/(SFEED(I,1)*SFEED(I,5))
00133          40  CONTINUE
00134              SYLD(NS)=100.*FUNDER
00135              BTUREC(NS)=100.*FUNDER*SREF(NS,1)*SREF(NS,5)/(SFEED(NS,1)*SFEED(NS
00136              1,5))
00137      C CALCULATE UNDERSIZE IN OVERFLOW AND OVERSIZE IN UNDERFLOW
00138          DO 45 I=1,NS
00139              SFLT(I)=0.
00140          45  SINK(I)=0.
00141              DO 65 I=1,NSIZE
00142                  IF (SIZE(I+1)-SCSZ) 50,55,55
00143          50  SFLT(I)=SCC(I,1)
00144              GO TO 60
00145          55  SINK(I)=SREF(I,1)
00146          60  SFLT(NS)=SFLT(NS)+SFLT(I)
00147              SINK(NS)=SINK(NS)+SINK(I)
00148          65  CONTINUE
00149              RETURN
00150              END

```

COMMON BLOCKS

/ . COMM. / (+137)									
A	+0#R	C	+44#R	SMID	+73#R	AC	+122#R		
/BLK1/ (+1430)									
SFEED	+0#R	SCC	+170#R	SMD	+360#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1160#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SIMP	+1350#R	SEA	+1400#R						

SUBPROGRAMS CALLED

INTS	SDSIZE	EXP.	MOISTR

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "##" SUBSCRIPTED]

D4	1#R	*GPMOUT	12 R	SOVER	13#R	*NS	14 I	*WATOUT	15 R
FEED	16#R	*K	17 I	*WFEEED	20 R	D3	21#R	%YLDVSL	
*LEVEL	32 I	D2	33#R	*KBSG	44 I	*FUNDER	45 R	%BTUVSL	
*FRAC2	46 R	*FOVER	47 R	*J	50 I	*WSOVER	51 R	D1	52#R
SSZ	63#R	*FLOW1	100 R	*WSUNDR	101 R	*GPMIN	102 R	*TONAGE	103 R
*SCSZ	104 R	*FRAC1	105 R	GRAV	106#R	*NSIZE	107 I	SIZE	110#R
*C2	111 R	*WATIN	112 R	*AA	113 R	*IDRY	114 I	BTU	115#R
*L	116 I	*I	117 I	*F	120 R	*C1	121 R	*NGRAV	122 I
*DRYFAC	123 R	SUNDER	124#R						

TEMPORARIES

.S0010	125 I	.S0011	126 I	.S0012	127 I	.S0013	130 I	.S0014	131 I
.S0015	132 I	.S0000	133 I	.S0001	134 I	.S0002	135 I	.S0003	136 I
.S0004	137 I	.S0005	140 I	.A0016	141 R	.S0006	142 I	.S0007	143 I
.Q0000	144 I								

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	-	-	-
00040 :	-	-	-	-	-	-	51	53	55	58
00050 :	64	72	73	77	103	113	120	121	135	151
00060 :	160	181	162	183	164	166	170	172	174	208
00070 :	210	212	220	222	223	224	225	232	234	241
00080 :	251	254	262	274	302	304	310	314	326	342
00090 :	350	358	357	373	407	-	416	422	426	434
00100 :	443	444	462	501	-	-	-	510	524	-
00110 :	526	530	-	541	547	563	572	574	575	577
00120 :	600	601	606	-	-	-	610	612	614	-
00130 :	616	620	624	634	636	642	-	-	652	654
00140 :	655	660	682	667	671	672	674	677	701	-
00150 :	703									

SCREEN OCTAL PROG SIZE=1155 [SCALARS/ARRAYS=124 + TEMPS/CONS=31 + CODE=728 + ARGS=52] + COMMON=1567
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE SDSIZE(FLOW,SUM,BTU,NSIZE,NGRAV)
00002 C*****
00003 C THIS SUBROUTINE CALCULATES CUMULATIVE WEIGHT, ASH, PYRITIC SULFUR, *
00004 C TOTAL SULFUR AND BTU CONTENT BY SIZE INCREMENTS *
00005 C*****
00006      DIMENSION FLOW(23,10,4),SUM(24,5),BTU(4)
00007      NS=NSIZE+1
00008      DO 10 K=1,5 * DIM *
00009      SUM(NS,K)=0.
00010 10 CONTINUE
00011 C INDIVIDUAL SIZES
00012      DO 35 I=1,NSIZE
00013      DO 15 K=1,5 * DIM *
00014      SUM(I,K)=0.
00015 15 CONTINUE
00016      DO 21 J=1,NGRAV
00017      SUM(I,1)=SUM(I,1)+100.*FLOW(I,J,1)
00018      DO 20 K=2,4 * DIM *
00019      SUM(I,K)=SUM(I,K)+100.*FLOW(I,J,1)*FLOW(I,J,K)
00020 20 CONTINUE
00021      SUM(I,5)=SUM(I,5)+100.*FLOW(I,J,1)*BTUPLB(BTU,
00022 1 FLOW(I,J,2),FLOW(I,J,4))
00023 21 CONTINUE
00024      IF (SUM(I,1).GT.0.) SUM(I,5)=SUM(I,5)/SUM(I,1)
00025 C COMPOSITE - WEIGHT, ASH AND SULFUR
00026      SUM(NS,1)=SUM(NS,1)+SUM(I,1)
00027      DO 35 K=2,4 * DIM *
00028      SUM(NS,K)=SUM(NS,K)+SUM(I,K)
00029      IF (SUM(I,1).EQ.0.) GO TO 22
00030      SUM(I,K)=100.*SUM(I,K)/SUM(I,1)
00031      GO TO 35
00032 22 SUM(I,K)=0.
00033 35 CONTINUE
00034 C COMPOSITE - BTU CONTENT
00035      DO 36 I=1,NSIZE
00036      IF (SUM(NS,1).GT.0.) SUM(NS,5)=SUM(NS,5)+SUM(I,1)*
00037 1 SUM(I,5)/SUM(NS,1)
00038 36 CONTINUE
00039      RETURN
00040      END

```

SUBPROGRAMS CALLED

BTUPLB

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*NS	1 I	*K	2 I	*J	3 I	SUM	4#R	*NSIZE	5 I
BTU	6#R	FLOW	7#R	*I	10 I	*NGRAV	11 I		

TEMPORARIES

.S0000	12 I	.S0001	13 I	.S0002	14 I	.S0003	15 I	.S0004	16 I
.S0005	17 I	.A0016	20 R	.S0006	21 I	.Q0000	22 I	.Q0001	23 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	13	18	17
00010 :	24	-	25	31	32	37	40	44	54	55
00020 :	76	77	-	117	122	-	133	141	142	154
00030 :	160	172	173	200	-	204	208	-	222	-
00040 :	224									

SDSIZE OCTAL PROG SIZE=281 [SCALARS/ARRAYS=11 + TEMPS/CONS=15 + CODE=227 + ARGS=4]
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE SIEVE (SPEC,SR,XMAX,N,C,IU,M)
00002      C*****
00003      C
00004      C      THIS SUBROUTINE CALCULATES THE SIZE/SPECIFIC GRAVITY
00005      C      WEIGHT FRACTION AND COMPOSITION OF THE COARSE STREAM
00006      C      AND THE FINE STREAM FOR A GIVEN FEED STREAM PASSING OVER
00007      C      A SIEVE BEND WITH A SPECIFIED WIRE SPACING
00008      C
00009      C      VARIABLE AND ARRAYS APPEARING IN THE SUBROUTINE LIST
00010      C
00011      C      SLOT      = SLOT SIZE OF THE SIEVE BEND (INCHES)
00012      C      SR        = SIEVE RATIO
00013      C      XMAX      = UPPER BOUNDARY OF SIZE
00014      C      SI        = SHARPNESS INDEX
00015      C      CI        = CLASSIFICATION NUMBER FOR SIZE(I)
00016      C      N          = NUMBER OF SIZE INTERVALS
00017      C      P(I,J,K)  = PROPERTIES OF FEED STREAM
00018      C      Q(I,J,K)  = PROPERTIES OF FINE STREAM
00019      C      T(I,J,K)  = PROPERTIES OF COARSE STREAM
00020      C      I          = DESIGNATES SIZE INCREMENT OF COAL
00021      C      J          = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL
00022      C      K          = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR
00023      C                  (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE
00024      C                  STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)
00025      C*****
00026      COMMON /BLK3/ PT(50,10,4),SKIP(50),Q(50,10,4),FILL(1379)
00027      SLOT=SPEC*25400.
00028      R=1./SR
00029      D50=0.6*SLOT
00030      VAL=EXP(4.)-1.
00031      XI=XMAX/D50*4.
00032      SUM=0.
00033      ONE=0.
00034      DO 15 I=1,N
00035      CBAR=0.
00036      IF (XI.GT.25.) GO TO 5
00037      CBAR=1.
00038      IF (I.EQ.N) GO TO 5
00039      CBAR=EXP(XI)-1.+VAL
00040      CBAR=VAL/CBAR
00041      5 DO 10 J=1,M
00042      Q(I,J,1)=CBAR*PT(I,J,1)
00043      SUM=SUM+Q(I,J,1)
00044      10 ONE=ONE+PT(I,J,1)
00045      15 XI=XI*R
00046      A=0.05
00047      IF (IU.EQ.72) A=110./SLOT**1.05
00048      IF (A.GT.1.) A=1.
00049      C=1.E10
00050      IF (A.NE.1.) C=1./SUM/(1.-A)
00051      C=C-1.
00052      DO 20 J=1,M
00053      DO 20 I=1,N
00054      PT(I,J,1)=PT(I,J,1)/ONE
00055      Q(I,J,1)=Q(I,J,1)/SUM
00056      IF (A.EQ.1.) Q(I,J,1)=0.

```

SIEVE SIEVE.FOR FORTRAN V.5A(821) /KI/L 22-AUG-85 13:57 PAGE 1-1

```

00057      IF(A.NE.1.) PT(I,J,1)=PT(I,J,1)+(PT(I,J,1)-Q(I,J,1))/C
00058      DO 20 K=2,4
00059      20 Q(I,J,K)=PT(I,J,K)
00060      RETURN
00061      END

```

COMMON BLOCKS

/BLK3/(+12465)
PT +O#R SKIP +3720#R Q +4002#R FILL +7722#R

SUBPROGRAMS CALLED

EXP.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*N	1 I	*K	2 I	*D50	3 R	*XMAX	4 R	*XI	5 R
*IU	8 I	*CBAR	7 R	*M	10 I	*J	11 I	*SUM	12 R
*SR	13 R	*A	14 R	*R	15 R	*VAL	16 R	*SLOT	17 R
*I	20 I	*C	21 R	*SPEC	22 R	*ONE	23 R		

TEMPORARIES

.S0000	24 I	.S0001	25 I	.S0002	26 I	.S0003	27 I	.S0004	30 I
.A0018	31 R								

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	0	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	17	22	25
00030	27	33	37	40	41	45	48	51	53	55
00040	62	64	68	74	101	110	115	117	127	134
00050	138	147	151	155	161	187	175	204	215	218
00060	-	235								

SIEVE OCTAL PROG SIZE=313 [SCALARS/ARRAYS=23 + TEMPS/CONS=17 + CODE=242 + ARGS=7] + COMMON=12465
[NO ERRORS DETECTED]

```

00001
00002      SUBROUTINE SPLIT(FEED,PROD1,PROD2,WFEED,WPROD1,WPROD2,BTU,YLD1,
00003      1 YLD2,D1,NSIZE,NGRAV,YLDVSL,BTUVSL,KBSG)
00004 C *****
00005 C THIS SUBROUTINE CAUSES A FLOWSTREAM (FEED) TO BE SPLIT INTO TWO *
00006 C DISTINCT FLOWSTREAMS (PROD1 AND PROD2) HAVING THE SAME COMPOSITIONS *
00007 C *
00008 C F REPRESENTS THE FRACTION OF FEED GOING INTO PROD1 *
00009 C *****
00010      DIMENSION FEED(23,10,4),PROD1(23,10,4),PROD2(23,10,4),BTU(4)    * DIM *
00011      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),    * DIM *
00012      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),    * DIM *
00013      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00014      DO 1 I=1,NSIZE
00015      DO 1 J=1,NGRAV
00016      DO 1 K=1,4                                                            * DIM *
00017      PROD1(I,J,K)=FEED(I,J,K)
00018      PROD2(I,J,K)=FEED(I,J,K)
00019      1 CONTINUE
00020      F=.01*D1
00021      YLD1=F
00022      YLD2=1.-F
00023      IF (KBSG.EQ.0) RETURN
00024 C *****
00025 C CALCULATE SUMMARY DATA BY SIZE INCREMENTS *
00026 C *****
00027      NS=NSIZE+1
00028      DO 2 K=1,5                                                            * DIM *
00029      2 SFEED(NS,K)=0.
00030      CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00031      DO 10 I=1,NS
00032      DO 10 K=1,5                                                            * DIM *
00033      SCC(I,K)=SFEED(I,K)
00034      10 SREF(I,K)=SFEED(I,K)
00035      WPROD1=WFEED
00036      WPROD2=WFEED
00037      YLDVSL=D1
00038      BTUVSL=100.*SCC(NS,5)/SFEED(NS,5)
00039      RETURN
00040      END

```

COMMON BLOCKS

/BLK1/(+1430)									
SFEED	+0#R	SCC	+170#R	SMID	+360#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1160#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SIMP	+1350#R	SEA	+1400#R						

SUBPROGRAMS CALLED

SDSIZE

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*YLD1	1 R	*NS	2 I	FEED	3#R	*K	4 I	*WFEE	5 R
*YLDVSL	8 R	*KBSG	7 I	*BTUVSL	10 R	*J	11 I	*D1	12 R
*NSIZE	13 I	*WPROD1	14 R	*WPROD2	15 R	BTU	16#R	PROD2	17#R
*I	20 I	*F	21 R	*YLD2	22 R	*NGRAV	23 I	PROD1	24#R

TEMPORARIES

.S0000	25 I	.S0001	28 I	.S0002	27 I	.S0003	30 I	.S0004	31 I
.S0005	32 I	.A0016	33 R						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	-	-	0	-	-	-	-	-	-	-
00010 :	-	-	-	-	37	43	47	50	64	100
00020 :	107	112	113	118	-	-	-	120	123	124
00030 :	131	133	137	140	145	158	160	161	163	-
00040 :	170									

SPLIT OCTAL PROG SIZE=260 [SCALARS/ARRAYS=24 + TEMPS/CONS=13 + CODE=213 + ARGS=8] + COMMON=1430
[NO ERRORS DETECTED]

```

00001      SUBROUTINE SQUEEZ(NSIZE,NGRAV,PROD,SIZE,NX)
00002 C*****
00003 C
00004 C      THIS SUBROUTINE DECREASES THE SIZE DIMENSION OF THE
00005 C      PRODUCT WASHABILITY
00006 C
00007 C*****
00008      DIMENSION PROD(23,10,4),SIZE(23)
00009      COMMON /BLK3/ Q(50,10,4),Y(50),FILL(3379)
00010      DO 30 I=1,NSIZE
00011      DO 30 J=1,NGRAV
00012      DO 30 K=1,4
00013      PROD(I,J,K)=0.
00014 30 CONTINUE
00015      NX1=NX-1
00016      NSIZE1=NSIZE-1
00017      I1=0
00018      DO 20 I=1,NSIZE1
00019 21 I1=I1+1
00020      IF(I1.GT.NX1) GO TO 20
00021      K=I
00022      IF((Y(I1).LE.SIZE(I)).AND.(Y(I1+1).GE.SIZE(I+1))) GO TO 22
00023      IF(Y(I1).EQ.SIZE(I+1)) GO TO 50
00024      FAC1=ALOG(Y(I1)/SIZE(I+1))/ALOG(Y(I1)/Y(I1+1))
00025      FAC2=ALOG(SIZE(I+1)/Y(I1+1))/ALOG(Y(I1)/Y(I1+1))
00026      DO 91 J=1,NGRAV
00027      FAC11=FAC1*Q(I1,J,1)
00028      FAC21=FAC2*Q(I1,J,1)
00029      PROD(I,J,1)=PROD(I,J,1)+FAC11
00030      PROD(I+1,J,1)=PROD(I+1,J,1)+FAC21
00031      DO 91 K=2,4
00032      PROD(I,J,K)=PROD(I,J,K)+FAC11*Q(I1,J,K)
00033      PROD(I+1,J,K)=PROD(I+1,J,K)+FAC21*Q(I1,J,K)
00034 91 CONTINUE
00035      I2=I1+1
00036      GO TO 20
00037 22 DO 92 J=1,NGRAV
00038      PROD(I,J,1)=PROD(I,J,1)+Q(I1,J,1)
00039      DO 92 K=2,4
00040      PROD(I,J,K)=PROD(I,J,K)+Q(I1,J,1)*Q(I1,J,K)
00041 92 CONTINUE
00042      I2=I1+1
00043      GO TO 21
00044 50 I1=I1-1
00045 20 CONTINUE
00046      IF(Y(NX).NE.SIZE(NSIZE)) GO TO 41
00047      DO 93 J=1,NGRAV
00048      PROD(NSIZE,J,1)=Q(NX,J,1)
00049      DO 93 K=2,4
00050      PROD(NSIZE,J,K)=Q(NX,J,K)
00051 93 CONTINUE
00052      GO TO 42
00053 41 DO 23 I1=I2,NX
00054      DO 94 J=1,NGRAV
00055      PROD(NSIZE,J,1)=PROD(NSIZE,J,1)+Q(I1,J,1)
00056      DO 94 K=2,4

```

```

00057      PROD(NSIZE,J,K)=PROD(NSIZE,J,K)+Q(I1,J,1)*Q(I1,J,K)
00058      94 CONTINUE
00059      23 CONTINUE
00060      42 DO 305 I=1,NSIZE
00061          DO 310 J=1,NGRAV
00062              DO 315 K=2,4
00063                  IF (PROD(I,J,1).GT.0.) PROD(I,J,K)=PROD(I,J,K)/PROD(I,J,1)
00064      315 CONTINUE
00065      310 CONTINUE
00066      305 CONTINUE
00067      RETURN
00068      END

```

COMMON BLOCKS

```

/BLK3/(+12485)
Q      +0#R      Y      +3720#R      FILL      +4002#R

```

SUBPROGRAMS CALLED

ALOG.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "##" SUBSCRIPTED]

*FAC2	1 R	*K	2 I	*FAC1	3 R	*NX	4 I	PROD	5#R
*J	6 I	*I2	7 I	*NSIZE	10 I	SIZE	11#R	*FAC21	12 R
*I1	13 I	*I	14 I	*NGRAV	15 I	*NSIZE1	16 I	*NX1	17 I
*FAC11	20 R								

TEMPORARIES

.S0010	21 I	.S0011	22 I	.S0012	23 I	.S0013	24 I	.S0014	25 I
.S0015	26 I	.S0016	27 I	.S0017	30 I	.S0000	31 I	.S0001	32 I
.S0002	33 I	.S0003	34 I	.S0004	35 I	.S0005	36 I	.A0016	37 R
.S0006	40 I	.S0007	41 I	.Q0000	42 I	.Q0001	43 I		

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00010	:	13	17	23	24	34	43	46	51	52
00020	:	57	61	63	72	77	116	135	141	146
00030	:	161	166	167	207	227	233	236	237	243
00040	:	254	274	300	303	304	306	311	317	323
00050	:	334	353	357	360	366	372	402	403	423
00060	:	432	436	442	443	465	466	471	-	474

SQUEEZ OCTAL PROG SIZE=555 [SCALARS/ARRAYS=20 + TEMPS/CONS=28 + CODE=477 + ARGS=10] + COMMON=12485
[NO ERRORS DETECTED]

```

00001      SUBROUTINE THERMA(FEED,CC,WFEED,WCC,D1,D2,
00002      1 D3,YLDCC,NSIZE,BTU,NGRAV,VSLYLD,VSLBTU,TONAGE,FLOW1)
00003 C*****
00004 C
00005 C SUBROUTINE FOR SIMULATING THE PERFORMANCE OF A FLUIDIZED BED THERMAL DRYER *
00006 C
00007 C DECISION VARIABLES
00008 C D1,WEXIT =MOISTURE CONTENT DRIED COAL, PERCENT, WET BASIS
00009 C          = 4 (DEFAULT)
00010 C D2,TCOMB =TEMPERATURE OF COMBUSTION GASES , FAHRENHEIT
00011 C          = 1100 (DEFAULT)
00012 C IF D3 IS POSITIVE
00013 C D3,TEXTIT =TEMPERATURE OF GASES LEAVING DRYER, FAHRENHEIT
00014 C          =150 F
00015 C IF D3 IS NEGATIVE
00016 C D3,REXIT =RELATIVE HUMIDITY OF GASES LEAVING DRYER, PERCENT
00017 C
00018 C PARAMETERS USED IN SUBROUTINE WITH ASSUMED VALUES
00019 C
00020 C AVERAGE HEAT CAPACITIES--FIRST VALUE IS FOR LOW RANGE (77-150F)
00021 C SECOND VALUE IS FOR HIGH RANGE (77-1100F)--UNITS J/GM MOL-K
00022 C
00023 C CAIRL,CAIRH =MOLAL HEAT CAPACITY FOR AIR, 29.12, 30.25
00024 C CC02L,CC02H =MOLAL HEAT CAPACITY FOR CO2, 37.9, 46.48
00025 C CS02L,CS02H =MOLAL HEAT CAPACITY FOR SO2, 41.66, 44.80
00026 C CWVL,CWVH =MOLAL HEAT CAPACITY OF WATER VAPOR, 33.68, 36.36
00027 C CN2L,CN2H =MOLAL HEAT CAPACITY FOR NITROGEN, 29.12, 30.25
00028 C
00029 C CCOAL =HEAT CAPACITY OF COAL, 1250 J/KG-C
00030 C CPWL =HEAT CAPACITY OF LIQUID WATER, 75.31 J/GM MOL-C
00031 C
00032 C EVAP =LATENT HEAT OF EVAPORATION OF WATER, 43924 J/GM MOLE
00033 C PCTH =WEIGHT PERCENT HYDROGEN IN DRY ASH FREE COAL, 4 PERCENT
00034 C ***** IF NO VALUE IS SPECIFIED IN FUNCTION BTUPLB, THEN
00035 C PCTN =WEIGHT PERCENT NITROGEN IN DRY ASH FREE COAL, 1 PERCENT
00036 C ***** IF NO VALUE IS SPECIFIED IN FUNCTION BTUPLB, THEN
00037 C PCTO =WEIGHT PERCENT OXYGEN IN DRY ASH FREE COAL, 8 PERCENT
00038 C ***** IF NO VALUE IS SPECIFIED IN FUNCTION BTUPLB, THEN
00039 C PRESS =ATMOSPHERIC PRESSURE, 1 ATM
00040 C QLOSS =HEAT LOSS FROM DRYER, J/KG DRY COAL BURNED
00041 C          ASSUMED EQUAL TO 0.1*HCOMB
00042 C RENT =RELATIVE HUMIDITY OF AIR ENTERING DRYER, 60 PERCENT
00043 C TENT =TEMPERATURE OF AIR AND COAL ENTERING DRYER, 77 F, 25 C
00044 C
00045 C VARIABLES AND ARRAYS APPEARING IN SUBROUTINE
00046 C ASH =ASH IN COAL, WEIGHT PERCENT
00047 C COMAR =MOLS DRY AIR NEEDED TO BURN 1 KG OF DRY COAL
00048 C COMOX =MOLES OXYGEN NEEDED TO BURN 1 KG DRY COAL
00049 C DC1K =KG DRY COAL DRIED PER KG DRY COAL BURNED
00050 C EAVAL =ENERGY AVAILABLE FOR EVAPORATION PER KG DRY COAL BURNED
00051 C EH1MA =ENERGY TO HEAT 1 MOL DRY AIR TO TCOMB
00052 C EN1K =ENERGY TO DRY 1 KG DRY COAL AND ASSOCIATED WATER AND AIR
00053 C ENP =ENERGY IN PRODUCTS FROM COMBUSTION OF 1 KG DRY COAL
00054 C ENW =ENERGY IN EXIT WATER VAPOR FROM BURNING 1 KG DRY COAL
00055 C FRCB =FRACTION OF COAL BURNED IN DRYER
00056 C GRCO2 =MOLES CO2 FROM COMBUSTION OF 1 KG DRY COAL

```

```

00057 C      GMDFG      =MOLS DRY FLUE GAS FROM COMBUSTION OF 1 KG DRY COAL      *
00058 C      GMH2O      =MOLES WATER FROM COMBUSTION OF 1 KG DRY COAL      *
00059 C      GMN2       =MOLES N2 FROM COMBUSTION OF 1 KG DRY COAL      *
00060 C      GMO2        =MOLES O2 IN 1 KG DRY COAL      *
00061 C      GMSO2      =MOLES SO2 FROM COMBUSTION OF 1 KG DRY COAL      *
00062 C      HCOMB      =HEAT OF COMBUSTION OF DRY COAL, J/KG      *
00063 C      PCTC       =WEIGHT PERCENT CARBON IN DRY ASH FREE COAL      *
00064 C      PCTS      =WEIGHT PERCENT SULFUR IN DRY ASH FREE COAL      *
00065 C      TFIX      =TRUE WHEN EXIT GAS TEMPERATURE IS FIXED      *
00066 C      VENT       =VAPOR PRESSURE OF WATER AT TENT, ATM      *
00067 C      VEXIT     =VAPOR PRESSURE OF WATER AT TEXT, ATM      *
00068 C      WATA      =MOLS WATER FROM AIR FOR COMBUSTION OF 1 KG DRY COAL      *
00069 C      WATE        =MOLS WATER FROM MOISTURE IN 1 KG DRY COAL      *
00070 C      WEVDC      =MOLS WATER EVAPORATED PER KG DRY COAL WHICH IS DRIED      *
00071 C      WMFEN      =MOLE FRACTION WATER IN ENTERING AIR      *
00072 C      WMFEX      =MOLE FRACTION WATER IN EXIT AIR      *
00073 C      XSEN      =EXCESS ENERGY IN COMBUSTION GASES      *
00074 C
00075 C*****
00076      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),
00077      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),
00078      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SMIP(24),SEA(24)
00079      COMMON V1(944),T(50),R(50)
00080      DIMENSION FEED(23,10,4),CC(23,10,4),BTU(4)
00081      LOGICAL TFIX
00082 C
00083 C      SET PARAMETERS
00084      CAIRL = 29.12
00085      CAIRH = 30.25
00086      CCOAL = 1250.
00087      CCO2L = 37.9
00088      CCO2H = 46.48
00089      CPWL = 75.31
00090      CWVL = 33.68
00091      CWVH = 38.38
00092      CN2L = 29.12
00093      CN2H = 30.25
00094      CSO2L = 41.46
00095      CSO2H = 44.80
00096      EVAP = 43924.
00097      PCTH = 4.
00098      PCTN = 1.
00099      PCTO = 8.
00100 C      DEFAULT VALUES ARE USED UNLESS BTU(1).EQ.0. AND BTU(2).NE.0.
00101      IF ((BTU(1).NE.0.).OR.(BTU(2).EQ.0.)) GO TO 5
00102      PCTH=BTU(2)
00103      PCTO=BTU(3)
00104      PCTN=BTU(4)
00105      5 PRESS. = 1.
00106      TENT = 25.
00107      RENT = 60.
00108 C
00109 C      DECISION VARIABLES
00110      WEXIT = 4.
00111      IF (D1 .GT. .01) WEXIT = D1
00112      TCOMB = 1100

```

```

00113      IF (D2 .GT. 100.) TCOMB = D2
00114      TCOMB=(TCOMB-32.)/1.8
00115      TFIX = .TRUE.
00116      TEXIT = 150.
00117      IF (D3 .GT. 10.) TEXIT = D3
00118      TEXIT=(TEXIT-32.)/1.8
00119      IF (D3 .GE. 0.) GO TO 10
00120      TFIX = .FALSE.
00121      REXIT = -D3
00122  C
00123  C      PRELIMINARY CALCULATIONS
00124  10      NS=NSIZE+1
00125          VENT=(10.**(8.10765-1750.286/(TENT+235.)))/760.
00126          WMFEN=(RENT/100.)*VENT/PRESS
00127          CALL SDSIZE(FEED,SPEED,BTU,NSIZE,NGRAV)
00128          WEVDC=(WFEED/(100.-WFEED)-WEXIT/(100.-WEXIT))*1000/18.
00129  C
00130  C      FIND COMPOSITION OF COAL TO BE DRIED
00131          ASH = SPEED(NS,2)
00132          PCTS = SPEED(NS,4)*(100./((100.-ASH)))
00133          PCTC = 100. - PCTS - PCTH - PCTO - PCTN
00134  C
00135  C      CALCULATIONS FOR COMBUSTION OF 1 KG DRY COAL
00136          HCOMB=(145.44*PCTC +620.28*(PCTH -PCTO/8.) +40.5*PCTS)*2324
00137          1 *(((100.-ASH)/100.))
00138          GMC02= (((100.-ASH)/100.)*(PCTC/100.)*(1000./12.))
00139          GMH2O= (((100.-ASH)/100.)*(PCTH/100.)*(1000./2.))
00140          GMS02= (((100.-ASH)/100.)*(PCTS/100.)*(1000./32.))
00141          GMN2= (((100.-ASH)/100.)*(PCTN/100.)*(1000./28.))
00142          GMO2= (((100.-ASH)/100.)*(PCTO/100.)*(1000./32.))
00143          COMOX=GMS02 + GMC02 + 0.5*GMH2O - GMO2
00144          COMAR = COMOX/0.21
00145          GMN2=GMN2+0.79*COMAR
00146          WATA = COMAR*WMFEN/(1.-WMFEN)
00147          TC=TCOMB-25.
00148          TE=TENT-25.
00149          WATE =(WFEED/(100.-WFEED))*(1000./18.)
00150          ENW=(WATE+GMH2O)*(-CPWL*TE+EVAP+CWVH*TC)+WATA*(-CWVL*TE+CWVH*TC)
00151          ENP=GMC02*(-CC02L*TE+CC02H*TC)+GMS02*(-CS02L*TE+CS02H*TC)+
00152          1 (GMN2)*(-CN2L*TE+CN2H*TC)+ENW
00153          GMDFG = GMC02 + GMS02 + GMN2
00154  C      CALCULATION OF EXCESS AIR TO TEMPER GASES TO TCOMB
00155          QLOSS= 0.1*HCOMB
00156          XSEN=HCOMB-QLOSS-ENP
00157          EH1MA=-CAIRL*TE+CAIRH*TC+(WMFEN/(1.-WMFEN))*(-CWVL*TE+CWVH*TC)
00158          GMEA=XSEN/EH1MA
00159          GMH2O=GMH2O+GMEA*(WMFEN)/(1.-WMFEN)+WATA+WATE
00160          IF (TFIX) GO TO 100
00161  C      IF RELATIVE HUMIDITY OF EXIT GASES IS FIXED, TEXIT IS ASSUMED
00162          T(1)=TEXIT
00163          ITER=1
00164  100      TX=TEXIT-25.
00165          EAVL=GMC02*(CC02H*TC-CC02L*TX)+GMN2*(CN2H*TC-CN2L*TX)+
00166          1 GMH2O*(CWVH*TC-CWVL*TX)+GMS02*(CS02H*TC-CS02L*TX)+
00167          2 GMEA*(CAIRH*TC-CAIRL*TX)
00168  C      FIND ENERGY TO DRY 1 KG DRY COAL

```

```

00169      EN1K=CCOAL*(TEXTIT-TENT)+WEVDC*(-CPWL*TE+EVAP+CWVL*TX)
00170      1 + (WEXIT/(100.-WEXIT))*(TEXTIT-TENT)*CPWL*(1000./18.)
00171  C
00172  C      KGS OF COAL WHICH CAN BE DRIED PER KG OF COAL BURNED
00173      DC1K=EAVL/EN1K
00174      FRCB = 1./ (1.+DC1K)
00175  C      CALCULATE RELATIVE HUMIDITY OF DRYER GASES
00176      GMWAT=GMH2O+DC1K*WEVDC
00177      WMFEX=GMWAT/(GMWAT+GMEA+GMDFG)
00178      VEXIT=(10.** (8.10785-1750.288/(TEXTIT+235.)))/780.
00179      RCALC=(WMFEX*PRESS*100.)/VEXIT
00180      IF (TFIX) GO TO 200
00181      IF (ABS(REXIT-RCALC).LT..1) GO TO 200
00182  C      CORRECT TEXTIT AND REPEAT
00183      R(ITER)=RCALC
00184      IF (ITER .NE. 1) GO TO 150
00185      T(2)=T(1)+3.
00186      GO TO 180
00187      150  DRDT=(R(ITER)-R(ITER-1))/(T(ITER)-T(ITER-1))
00188      DT= (REXIT-R(ITER))/DRDT
00189      IF (ABS(DT) .GT. 10) DT=DT*10./ABS(DT)
00190      T(ITER+1)=DT+T(ITER)
00191      180  ITER=ITER+1
00192      TEXTIT=T(ITER)
00193      IF (ITER .LT. 10) GO TO 100
00194      RCALC=-RCALC
00195  C      A NEGATIVE RCALC MEANS FAILURE TO CONVERGE
00196      200  REXIT=RCALC
00197  C
00198  C      COMPUTE OUTPUT PARAMETERS
00199      YLDCC = 1. - FRCB
00200      VSLYLD = 100.*YLDCC
00201      VSLBTU =(1.-FRCB)*100.
00202      DO 300 I=1,NSIZE
00203      SYLD(I) = VSLYLD
00204      DO 300 J=1,NGRAV
00205      DO 300 K=1,4
00206      CC(I,J,K)=FEED(I,J,K)
00207      300  CONTINUE
00208      CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00209      SYLD(NS)=VSLYLD
00210      WCC=WEXIT
00211  C      FOLLOWING VALUES PASSED TO MAIN VIA COMMON FOR UNIT PRINTOUT
00212      V1(1)=WEXIT
00213      V1(2)=(TCOMB*1.8)+32.
00214      V1(3)=(TEXTIT*1.8)+32.
00215      V1(4)=REXIT
00216      V1(5)=FRCB*TONAGE*FLOW1
00217      V1(6)=V1(5)*(2000./2.20)*(GMDFG+GMEA+GMWAT)*(359./454.)/80.
00218      V1(7)=1.E6*GMSO2/(GMDFG+GMEA+GMWAT)
00219      V1(8)=-D3
00220      V1(9)=-REXIT
00221      RETURN
00222      END

```

COMMON BLOCKS

/BLK1/(+1430)

SFEED	+0#R	SCC	+170#R	SMID	+360#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1160#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SMIP	+1350#R	SEA	+1400#R						

/.COMM./(+2024)

V1	+0#R	T	+1660#R	R	+1742#R

SUBPROGRAMS CALLED

SDSIZE ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*XSEN	1 R	*WEXIT	2 R	*TEXIT	3 R	*CPWL	4 R	*EVAL	5 R
*GMH20	6 R	*VSLYLD	7 R	*WATE	10 R	*CN2L	11 R	*NS	12 I
*CWVH	13 R	*RENT	14 R	FEED	15#R	*K	16 I	*TX	17 R
*WFEED	20 R	*D3	21 R	*GMSO2	22 R	*VSLBTU	23 R	*EN1K	24 R
TFIX	25 L	*CAIRH	26 R	*WMFEN	27 R	*COMOX	30 R	*DT	31 R
*VEXIT	32 R	*ITER	33 I	*D2	34 R	*ENW	35 R	*GMDFG	36 R
*WMFEX	37 R	*PCTC	40 R	*CCOAL	41 R	*RCALC	42 R	*ENP	43 R
*WEVDC	44 R	*TENT	45 R	*CCO2H	46 R	*PRESS	47 R	*J	50 I
*CWL	51 R	*CAIRL	52 R	*TE	53 R	*EVAP	54 R	*D1	55 R
*DC1K	56 R	*FLOW1	57 R	*FRCB	60 R	*COMAR	61 R	*PCTO	62 R
*WCC	63 R	*CSO2H	64 R	*TONAGE	65 R	*GMN2	66 R	*YLDCC	67 R
*PCTH	70 R	*WATA	71 R	*ASH	72 R	*TCOMB	73 R	*CN2H	74 R
*NSIZE	75 I	*CCO2L	78 R	CC	77#R	*REXIT	100 R	*GMC02	101 R
*PCTN	102 R	*EH1MA	103 R	*VENT	104 R	*HCOMB	105 R	BTU	106#R
*DRDT	107 R	*I	110 I	*GMEA	111 R	*CSO2L	112 R	*TC	113 R
*NGRAV	114 I	*GMO2	115 R	*QLOSS	116 R	*GMWAT	117 R	*PCTS	120 R

TEMPORARIES

.S0000	121 I	.S0001	122 I	.S0002	123 I	.A0016	124 R	.Q0000	125 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00080	:	-	-	-	37	41	43	45	47	51
00090	:	53	55	57	60	61	63	65	67	73
00100	:	-	75	102	104	106	110	112	114	-
00110	:	116	120	123	125	132	136	137	141	152

THERMA THER.FOR   FORTRAN V.5A(821) /KI/L 22-AUG-85   13:57   PAGE 1-5

00120 :	154	155	-	-	157	162	174	201	203	-
00130 :	-	217	222	230	-	-	238	-	254	284
00140 :	274	304	314	324	331	333	335	343	346	351
00150 :	357	375	-	423	-	427	431	435	458	460
00160 :	467	-	471	473	475	500	-	-	-	543
00170 :	-	-	-	570	572	-	578	602	607	621
00180 :	628	630	-	635	637	641	644	645	654	660
00190 :	667	672	673	675	677	-	700	-	-	702
00200 :	705	707	713	717	721	725	728	742	751	753
00210 :	758	-	760	761	765	771	773	777	1010	1017
00220 :	1021	-	1022							

THERMA OCTAL PROG SIZE=1245 [SCALARS/ARRAYS=120 + TEMPS/CONS=42 + CODE=1041 + ARGS=22] + COMMON=3454
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE THICK(FEED,CC,REF,WFEED,WCC,WREF,SIZE,GRAV,D1,D2,D3,
00002      1 GPMIN,GPMOUT,YLDCC,YLDREF,NSIZE,BTU,NGRAV,TONAGE,FLOW1)
00003      C *****
00004      C THIS SUBROUTINE CONTAINS CALCULATIONS FOR A CONTINUOUS THICKENER
00005      C
00006      C DECISION VARIABLES
00007      C D1, TAREA =DECISION VARIABLE
00008      C CROSS SECTIONAL AREA OF THICKENER (SQ FEET)
00009      C D2,UNCONC =DECISION VARIABLE
00010      C UNDERFLOW SOLID CONCENTRATION (LB SOLID/TOTAL LB)
00011      C D3,SETLF =DECISION VARIABLE
00012      C FLOCCULANT CORRECTION FACTOR
00013      C
00014      C VARIABLES AND ARRAYS APPEARING IN SUBROUTINE
00015      C BTUREC(I) =FRACTION OF BTU IN SIZE I IN OVERFLOW
00016      C D50 =SIZE OF PARTICLE WHICH FALLS WITH VELOCITY UPVEL (IN)
00017      C EFFCOR =FRACTION OF FEED WHICH GOES TO UNDERFLOW (CORRECTED)
00018      C EFFOBS =FRACTION OF FEED WHICH GOES TO UNDERFLOW (ACTUAL)
00019      C FRATE =FEED RATE (LBS/HR)
00020      C G =GRAVITY FORCE, FT/HR**2
00021      C GPMIN =ENTRY: WATER TO THICKENER FROM ALL SOURCES EXCEPT FEED
00022      C RETURN: WATER TO THICKENER FROM ALL SOURCES INCLUDING FEED
00023      C GPMOUT =ENTRY: WATER REQUIRED FOR OTHER UNITS
00024      C RETURN: TOTAL CLARIFIED WATER FROM THICKENER
00025      C OVFRAC(I) =FRACTION OF FEED OF SIZE I IN OVERFLOW
00026      C OVGR =SPECIFIC GRAVITY OF OVERFLOW SOLID
00027      C SYLD(I) =PERCENT OF FEED OF SIZE I IN OVERFLOW
00028      C TEMP =TEMPERATURE (CENTIGRADE)
00029      C UNFRAC(I) =FRACTION OF FEED OF SIZE I WHICH LEAVES IN UNDERFLOW
00030      C UNLIF =FRACTION OF LIQUID LEAVING IN UNDERFLOW
00031      C UPVEL =AVERAGE UPWARD VELOCITY OF WATER (FT/HR)
00032      C VOLSOV =VOLUME OF SOLID IN OVERFLOW (FT**3/HR)
00033      C VSCST =VISCOSITY OF WATER (LBM/FT-HR)
00034      C WATIN =TOTAL WATER ENTERING THICKENER (LBS/HR)
00035      C WATUN =WATER LEAVING THICKENER IN UNDERFLOW (LBS/HR)
00036      C WFEED,WCC,WREF=MOISTURE CONTENT OF FEED, CC, AND REF (WET BASIS)
00037      C *****
00038      DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),SIZE(23),
00039      1 GRAV(10),BTU(4)
00040      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),
00041      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),
00042      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SMIP(24),SEA(24)
00043      COMMON UNFRAC(24),OVFRAC(24)
00044      C*****
00045      C FUNCTION USED TO CALCULATE SEPARATION EFFICIENCIES
00046      FUNCT(W)=(1.-EXP(-.693*W*W))
00047      C*****
00048      FRATE=TONAGE*FLOW1*2000.0
00049      WATIN=GPMIN*500.72 + FRATE*WFEED/(100.-WFEED)
00050      GPMIN=WATIN/500.72
00051      C MOISTURE CONTENT OF FEED IS ADJUSTED FOR ALL WATER ENTERING THICKENER
00052      WFEED=(100.*WATIN)/(WATIN+FRATE)
00053      C*****
00054      C SET DEFAULT VALUES OF DECISION VARIABLES AND PARAMETERS
00055      C*****
00056      TEMP=25.

```

```

00057      NS=NSIZE + 1
00058      G=32.2*(3600.)*3600.
00059      DO 90 I=1,NSIZE
00060      DO 90 J=1,NGRAV
00061      DO 90 K=2,4
00062      CC(I,J,K)=FEED(I,J,K)
00063      REF(I,J,K)=FEED(I,J,K)
00064      90  CONTINUE
00065      UNCONC=D2
00066      TAREA=D1
00067      SETLF=D3
00068      IF (D2.LE.0.01) UNCONC=0.35
00069      IF (D3.LE.0.1) SETLF=1.
00070      IF (D1.GE.1.) GO TO 1000
00071  C *****
00072  C IF NO AREA IS SPECIFIED, ALL SOLIDS ARE ASSUMED TO GO TO UNDERFLOW
00073      DO 100 I=1,NSIZE
00074      DO 100 J=1,NGRAV
00075      CC(I,J,1)=1.E-8
00076      REF(I,J,1)=FEED(I,J,1)
00077      100  CONTINUE
00078      CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00079      CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00080      CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00081      WREF=(1.-UNCONC)*100.
00082      WCC=100.
00083      YLDCC=0.
00084      YLDREF=1.
00085      GPMOUT=WATIN/500.72 - FRATE*(1.-UNCONC)/(UNCONC*500.72)
00086      VSLYLD=100.*YLDCC
00087      VSLBTU=((SCC(NS,5)*YLDCC)/SFEED(NS,5))
00088      DO 300 I=1,NSIZE
00089      SYLD(I)=0.
00090      BTUREC(I)=0.
00091      BTUREC(NS)=VSLBTU
00092      RETURN
00093  C *****
00094      1000 C1=0.86114
00095      C2=0.33998
00096      W1=0.34785
00097      W2=0.65215
00098      VSCST=(1.63088-(3.79498E-2)*TEMP+(3.40643E-4)*TEMP**2)*(2.42)
00099  C
00100  C THE AVERAGE UPWARD VELOCITY IS DETERMINED BY TRIAL AND ERROR
00101  C THE FIRST VALUE FOR UPVEL IS CALCULATED ASSUMING ALL SOLIDS TO UNDERFLOW
00102  C UNFRAC(NS) IS FRACTION OF SOLID IN FEED WHICH GOES TO UNDERFLOW
00103      UNFRAC(NS)=1.0
00104      OVGR=1.3
00105      UPVEL2=0.
00106  C *****
00107  C CALCULATION LOOP FOR UPWARD VELOCITY BEGINS HERE
00108  C
00109      1050 WATUN= FRATE*UNFRAC(NS)*(1.-UNCONC)/UNCONC
00110      UNLIF=WATUN/WATIN
00111      VOLSOV=FRATE*(1.-UNFRAC(NS))/(OVGR*62.4)
00112      UPVEL=((WATIN-WATUN)/(62.4)+VOLSOV)/TAREA

```

```

00113      UPVEL=UPVEL/SETLF
00114      C COMPARE NEW UPVEL WITH OLD VALUE
00115      IF (ABS(UPVEL-UPVEL2).LT.(0.01*UPVEL)) GO TO 1400
00116      DO 1200 J=1,NGRAV
00117      D50=((18.*UPVEL*VSCST)/(G*(GRAV(J)-1.)*82.4))*0.5*12.
00118      DO 1100 I=1,NSIZE
00119      XHI=SIZE(I)/D50
00120      XLO=SIZE(I+1)/D50
00121      IF (XLO .GT. 10) GOTO 998
00122      IF (XHI .LT. 0.05) GOTO 998
00123      IF (XHI .GT. 10) XHI=10.
00124      IF (XLO .LT. .05) XLO=.05
00125      DIFF=(XHI-XLO)/2.
00126      AVER=(XHI+XLO)/2.
00127      X1=-C1*DIFF+AVER
00128      X2=-C2*DIFF+AVER
00129      X3=C1*DIFF+AVER
00130      X4=C2*DIFF+AVER
00131      EFFCOR=(W1*FUNCT(X1)+W2*FUNCT(X2)+W1*FUNCT(X3)+W2*FUNCT(X4))*0.5
00132      GO TO 997
00133      998 EFFCOR=0.
00134      GO TO 997
00135      998 EFFCOR=1.0
00136      997 EFFOBS=EFFCOR*(1.-UNLIF)+UNLIF
00137      REF(I,J,1)=FEED(I,J,1)*EFFOBS
00138      CC(I,J,1)=FEED(I,J,1)*(1.-EFFOBS)
00139      1100 CONTINUE
00140      1200 CONTINUE
00141      VOLUN=0.
00142      VOLOV=0.
00143      UNFRAC(NS)=0.
00144      OVFRAC(NS)=0.
00145      DO 1300 I=1,NSIZE
00146      UNFRAC(I)=0.
00147      OVFRAC(I)=0.
00148      DO 1250 J=1,NGRAV
00149      UNFRAC(I)=UNFRAC(I)+REF(I,J,1)
00150      OVFRAC(I)=OVFRAC(I)+CC(I,J,1)
00151      VOLUN=VOLUN+REF(I,J,1)/GRAV(J)
00152      VOLOV=VOLOV+CC(I,J,1)/GRAV(J)
00153      1250 CONTINUE
00154      UNFRAC(NS)=UNFRAC(NS)+UNFRAC(I)
00155      OVFRAC(NS)=OVFRAC(NS)+OVFRAC(I)
00156      1300 CONTINUE
00157      DO 1320 I=1,NSIZE
00158      SYLD(I)=100.*(OVFRAC(I))/(OVFRAC(I)+UNFRAC(I))
00159      DO 1320 J=1,NGRAV
00160      IF (OVFRAC(NS).GT. 1.E-8) CC(I,J,1)=CC(I,J,1)/OVFRAC(NS)
00161      IF (UNFRAC(NS).GT. 1.E-8) REF(I,J,1)=REF(I,J,1)/UNFRAC(NS)
00162      1320 CONTINUE
00163      SYLD(NS)=100.*OVFRAC(NS)
00164      UNGR=UNFRAC(NS)/VOLUN
00165      OVGR=OVFRAC(NS)/VOLOV
00166      UPVEL2=UPVEL
00167      GOTO 1050
00168      1400 CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)

```

```

00169      CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00170      CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00171      WREF=(1.-UNCONC)*100.
00172      WCC=100.*(WATIN-WATUN)/(FRATE*OVFRAC(NS)+WATIN-WATUN)
00173      YLDREF=UNFRAC(NS)
00174      YLDCC=OVFRAC(NS)
00175      GPMOUT=(WATIN-WATUN)/500.72
00176      RETURN
00177      END

```

COMMON BLOCKS

```

/BLK1/(+1430)
SFEED      +0#R      SCC      +170#R      SMID      +380#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFIC      +1020#R      BTUREC      +1050#R      ASHERR      +1100#R      SFLT      +1130#R
SINK      +1180#R      SMISPL      +1210#R      SNRGR      +1240#R      SGRAV      +1270#R      SPE      +1320#R
SMIP      +1350#R      SEA      +1400#R

/.COMM./(+60)
UNFRAC      +0#R      OVFRAC      +30#R

```

SUBPROGRAMS CALLED

FUNCT SDSIZE EXP. ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*XLO	1 R	*GPMOUT	2 R	*XHI	3 R	*W1	4 R	*VSLYLD	5 R
*DIFF	6 R	*NS	7 I	*EFFOBS	10 R	FEED	11#R	*K	12 I
*X4	13 R	*WFEED	14 R	*D3	15 R	*VSLBTU	16 R	*TAREA	17 R
*FRATE	20 R	*D50	21 R	*UPVEL	22 R	*VOLSOV	23 R	*X3	24 R
*D2	25 R	*UNLIF	26 R	*EFFCOR	27 R	*SETLF	30 R	*YLDREF	31 R
*OVGR	32 R	*VSCST	33 R	*J	34 I	*X2	35 R	*UPVEL2	36 R
*G	37 R	*VOLUN	40 R	*D1	41 R	*FLOW1	42 R	*GPMIN	43 R
*WCC	44 R	*TONAGE	45 R	*YLDCC	46 R	GRAV	47#R	*NSIZE	50 I
SIZE	51#R	CC	52#R	*X1	53 R	*C2	54 R	*AVER	55 R
*WATIN	56 R	*WREF	57 R	*TEMP	60 R	BTU	61#R	REF	62#R
*I	63 I	*UNGR	64 R	*W2	65 R	*C1	66 R	*NGRAV	67 I
*WATUN	70 R	*UNCONC	71 R	*VOLOV	72 R				

TEMPORARIES

.S0010	73 I	.S0011	74 I	.S0012	75 I	.S0013	76 I	.S0000	77 I
.S0001	100 I	.S0002	101 I	.S0003	102 I	.S0004	103 I	.S0005	104 I
.A0016	105 R	.S0008	106 I	.S0007	107 I	.F0000	110 R	.Q0000	111 I
.Q0001	112 I								

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	-	-	-	-
00040 :	-	-	-	-	-	-	53	-	70	74
00050 :	104	-	106	-	-	-	114	116	121	123
00060 :	127	133	134	150	164	173	175	177	201	205
00070 :	211	-	-	213	217	221	227	240	245	247
00080 :	251	253	257	261	262	264	276	300	304	308
00090 :	307	312	315	-	316	320	322	324	326	-
00100 :	-	-	-	337	342	344	-	-	-	345
00110 :	355	357	366	374	-	376	404	410	427	432
00120 :	437	444	446	450	454	460	464	470	474	500
00130 :	504	510	532	533	534	535	537	544	555	570
00140 :	572	575	576	577	601	602	606	607	610	612
00150 :	621	627	640	651	653	656	660	663	667	675
00160 :	677	712	724	731	734	737	742	744	745	747
00170 :	751	753	757	771	773	775	-	1001		

THICK OCTAL PROG SIZE=1250 [SCALARS/ARRAYS=72 + TEMPS/CONS=47 + CODE=1026 + ARGS=61] + COMMON=1510
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE TRANSF(N)
00002      C*****
00003      C
00004      C      THIS SUBROUTINE CALCULATES THE TRANSFER VALUES
00005      C      (THE FRACTION OF MATERIAL IN A LARGER SIZE INTERVAL
00006      C      WHICH GOES INTO A SMALLER SIZE INTERVAL) FOR A DOUBLE
00007      C      ROLL CRUSHER WITH A SPECIFIED GAP
00008      C
00009      C*****
00010      COMMON /BLK3/ SKIP(4050),D(1275),A(50),AP(50),FILL(4)
00011      D(1) = 1.-A(1)
00012      DO 20 I = 2,N
00013      I1 = I-1
00014      II = I*I1/2
00015      IJ = II +I
00016      D(IJ) = 1.-A(I)
00017      DO 20 J = 1,I1
00018      IJ = II+J
00019      BVAL = D(IJ)
00020      IJ1 = IJ+I
00021      IF (I.LT.N) BVAL = BVAL - D(IJ1)
00022      SUM = BVAL *A(J)
00023      IF(J.EQ.I1) GO TO 20
00024      J1 = J+1
00025      DO 10 K = J1 ,I1
00026      IK = II +K
00027      KJ = K*(K-1)/2 +J
00028      BVAL = D(IK)
00029      IK1 = IK+I
00030      IF ( I.LT.N) BVAL = BVAL - D(IK1)
00031      10  SUM = SUM +BVAL*D(KJ)*AP(K)/(1.-AP(K))
00032      20  D(IJ) = (1.-AP(I))*SUM
00033      RETURN
00034      END

```

COMMON BLOCKS

```

/BLK3/(+12485)
SKIP      +O#R      D      +7722#R      A      +12315#R      AP      +12377#R      FILL      +12481#R

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*IJ1	1 I	*N	2 I	*K	3 I	*BVAL	4 R	*IK	5 I
*IJ	8 I	*J1	7 I	*J	10 I	*SUM	11 R	*I1	12 I
*KJ	13 I	*I1	14 I	*I	15 I	*IK1	16 I		

TRANSF TRANSF.FOR   FORTRAN V.5A(621) /KI/L 22-AUG-85   13:57   PAGE 1-1

TEMPORARIES

.S0000   17 I   .S0001   20 I   .S0002   21 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	-	-	-
00010 :	-	2	5	12	14	22	25	31	35	37
00020 :	41	43	50	54	56	60	64	67	77	101
00030 :	103	110	121	-	135					

TRANSF OCTAL PROG SIZE=161 [SCALARS/ARRAYS=16 + TEMPS/CONS=4 + CODE=137 + ARGS=0] + COMMON=12465
[NO ERRORS DETECTED]


```

00001      SUBROUTINE VESSEL(L,N)
00002      C *****
00003      C THIS SUBROUTINE PRINTS THE NAME OF EACH UNIT *
00004      C *****
00005      COMMON /SYS/ G,H
00006      INTEGER G,H
00007      100 FORMAT(1H+,42X,21H(CONCENTRATING TABLE))
00008      101 FORMAT(1H+,42X,21H(DENSE-MEDIUM VESSEL))
00009      102 FORMAT(1H+,42X,22H(DENSE-MEDIUM CYCLONE))
00010      103 FORMAT(1H+,42X,14H(HYDROCYCLONE))
00011      104 FORMAT(1H+,42X,17H(FROTH FLOTATION))
00012      105 FORMAT(1H+,42X,10H(BAUM JIG))
00013      106 FORMAT(1H+,42X,16H(ROTARY BREAKER))
00014      107 FORMAT(1H+,42X,31H(PRIMARY MULTIPLE ROLL CRUSHER))
00015      108 FORMAT(1H+,42X,30H(PRIMARY GYRATORY/JAW CRUSHER))
00016      109 FORMAT(1H+,42X,29H(PRIMARY SINGLE ROLL CRUSHER))
00017      110 FORMAT(1H+,42X,27H(PRIMARY CAGE MILL CRUSHER))
00018      111 FORMAT(1H+,42X,33H(SECONDARY MULTIPLE ROLL CRUSHER))
00019      112 FORMAT(1H+,42X,32H(SECONDARY GYRATORY/JAW CRUSHER))
00020      113 FORMAT(1H+,42X,31H(SECONDARY SINGLE ROLL CRUSHER))
00021      114 FORMAT(1H+,42X,29H(SECONDARY CAGE MILL CRUSHER))
00022      115 FORMAT(1H+,42X,18H(DRY UPPER SCREEN))
00023      116 FORMAT(1H+,42X,18H(DRY LOWER SCREEN))
00024      117 FORMAT(1H+,42X,18H(WET UPPER SCREEN))
00025      118 FORMAT(1H+,42X,18H(WET LOWER SCREEN))
00026      119 FORMAT(1H+,42X,16H(STREAM BLENDER))
00027      120 FORMAT(1H+,42X,17H(STREAM SPLITTER))
00028      121 FORMAT(1H+,42X,18H(2-STAGE BAUM JIG))
00029      122 FORMAT(1H+,42X,11H(SAND CONE))
00030      123 FORMAT(1H+,42X,30H(PERFORATED BASKET CENTRIFUGE))
00031      124 FORMAT(1H+,42X,23H(SOLID BOWL CENTRIFUGE))
00032      125 FORMAT(1H+,42X,24H(CONTINUOUS DISK FILTER))
00033      126 FORMAT(1H+,42X,26H(CLASSIFYING HYDROCYCLONE))
00034      127 FORMAT(1H+,42X,12H(SIEVE BEND))
00035      128 FORMAT(1H+,42X,20H(RAPPING SIEVE BEND))
00036      129 FORMAT(1H+,42X,29H(VIBRATING BASKET CENTRIFUGE))
00037      130 FORMAT(1H+,42X,15H(THERMAL DRYER))
00038      131 FORMAT(1H+,42X,11H(THICKENER))
00039      132 FORMAT(1H+,42X,17H(WATER COLLECTOR))
00040      133 FORMAT(1H+,42X,15H(DYNAWHIRLPOOL))
00041      134 FORMAT(1H+,42X,11H(BATAC JIG))
00042      135 FORMAT(1H+,42X,19H(2-STAGE BATAC JIG))
00043      200 FORMAT(1H0,57X,19HCONCENTRATING TABLE/)
00044      201 FORMAT(1H0,57X,19HDENSE-MEDIUM VESSEL/)
00045      202 FORMAT(1H0,57X,20HDENSE-MEDIUM CYCLONE/)
00046      203 FORMAT(1H0,61X,12HHYDROCYCLONE/)
00047      204 FORMAT(1H0,59X,15HFROTH FLOTATION/)
00048      205 FORMAT(1H0,63X,8HBAUM JIG/)
00049      206 FORMAT(1H0,60X,14HROTARY BREAKER/)
00050      207 FORMAT(1H0,52X,29HPRIMARY MULTIPLE ROLL CRUSHER/)
00051      208 FORMAT(1H0,53X,28HPRIMARY GYRATORY/JAW CRUSHER/)
00052      209 FORMAT(1H0,53X,27HPRIMARY SINGLE ROLL CRUSHER/)
00053      210 FORMAT(1H0,54X,25HPRIMARY CAGE MILL CRUSHER/)
00054      211 FORMAT(1H0,51X,31HSECONDARY MULTIPLE ROLL CRUSHER/)
00055      212 FORMAT(1H0,52X,30HSECONDARY GYRATORY/JAW CRUSHER/)
00056      213 FORMAT(1H0,52X,29HSECONDARY SINGLE ROLL CRUSHER/)

```

```

00057 214 FORMAT(1H0,53X,27HSECONDARY CAGE MILL CRUSHER/)
00058 215 FORMAT(1H0,59X,16H DRY UPPER SCREEN/)
00059 216 FORMAT(1H0,59X,16H DRY LOWER SCREEN/)
00060 217 FORMAT(1H0,59X,16H WET UPPER SCREEN/)
00061 218 FORMAT(1H0,59X,16H WET LOWER SCREEN/)
00062 219 FORMAT(1H0,60X,14H STREAM BLENDER/)
00063 220 FORMAT(1H0,60X,15H STREAM SPLITTER/)
00064 221 FORMAT(1H0,59X,16H2-STAGE BAUM JIG/)
00065 222 FORMAT(1H0,62X,9H SAND CONE/)
00066 223 FORMAT(1H0,56X,28H PERFORATED BASKET CENTRIFUGE/)
00067 224 FORMAT(1H0,54X,21H SOLID BOWL CENTRIFUGE/)
00068 225 FORMAT(1H0,55X,22H CONTINUOUS DISK FILTER/)
00069 226 FORMAT(1H0,54X,24H CLASSIFYING HYDROCYCLONE/)
00070 227 FORMAT(1H0,62X,10H SIEVE BEND/)
00071 228 FORMAT(1H0,57X,18H RAPPING SIEVE BEND/)
00072 229 FORMAT(1H0,53X,27H VIBRATING BASKET CENTRIFUGE/)
00073 230 FORMAT(1H0,60X,13H THERMAL DRYER/)
00074 231 FORMAT(1H0,62X,9H THICKENER/)
00075 232 FORMAT(1H0,59X,15H WATER COLLECTOR/)
00076 233 FORMAT(1H0,60X,13H DYNAWHIRLPOOL/)
00077 234 FORMAT(1H0,62X,9H BATAAC JIG/)
00078 235 FORMAT(1H0,58X,17H2-STAGE BATAAC JIG/)
00079 300 FORMAT(1H+,19X,21H(CONCENTRATING TABLE))
00080 301 FORMAT(1H+,19X,21H(DENSE-MEDIUM VESSEL))
00081 302 FORMAT(1H+,19X,22H(DENSE-MEDIUM CYCLONE))
00082 303 FORMAT(1H+,19X,14H(HYDROCYCLONE))
00083 304 FORMAT(1H+,19X,17H(FROTH FLOTATION))
00084 305 FORMAT(1H+,19X,10H(BAUM JIG))
00085 306 FORMAT(1H+,19X,16H(ROTARY BREAKER))
00086 307 FORMAT(1H+,19X,31H(PRIMARY MULTIPLE ROLL CRUSHER))
00087 308 FORMAT(1H+,19X,30H(PRIMARY GYRATORY/JAW CRUSHER))
00088 309 FORMAT(1H+,19X,29H(PRIMARY SINGLE ROLL CRUSHER))
00089 310 FORMAT(1H+,19X,27H(PRIMARY CAGE MILL CRUSHER))
00090 311 FORMAT(1H+,19X,33H(SECONDARY MULTIPLE ROLL CRUSHER))
00091 312 FORMAT(1H+,19X,32H(SECONDARY GYRATORY/JAW CRUSHER))
00092 313 FORMAT(1H+,19X,31H(SECONDARY SINGLE ROLL CRUSHER))
00093 314 FORMAT(1H+,19X,29H(SECONDARY CAGE MILL CRUSHER))
00094 315 FORMAT(1H+,19X,18H(DRY UPPER SCREEN))
00095 316 FORMAT(1H+,19X,18H(DRY LOWER SCREEN))
00096 317 FORMAT(1H+,19X,18H(WET UPPER SCREEN))
00097 318 FORMAT(1H+,19X,18H(WET LOWER SCREEN))
00098 319 FORMAT(1H+,19X,16H(STREAM BLENDER))
00099 320 FORMAT(1H+,19X,17H(STREAM SPLITTER))
00100 321 FORMAT(1H+,19X,18H(2-STAGE BAUM JIG))
00101 322 FORMAT(1H+,19X,11H(SAND CONE))
00102 323 FORMAT(1H+,19X,30H(PERFORATED BASKET CENTRIFUGE))
00103 324 FORMAT(1H+,19X,23H(SOLID BOWL CENTRIFUGE))
00104 325 FORMAT(1H+,19X,24H(CONTINUOUS DISK FILTER))
00105 326 FORMAT(1H+,19X,26H(CLASSIFYING HYDROCYCLONE))
00106 327 FORMAT(1H+,19X,12H(SIEVE BEND))
00107 328 FORMAT(1H+,19X,20H(RAPPING SIEVE BEND))
00108 329 FORMAT(1H+,19X,29H(VIBRATING BASKET CENTRIFUGE))
00109 330 FORMAT(1H+,19X,15H(THERMAL DRYER))
00110 331 FORMAT(1H+,19X,11H(THICKENER))
00111 332 FORMAT(1H+,19X,17H(WATER COLLECTOR))
00112 333 FORMAT(1H+,19X,15H(DYNAWHIRLPOOL))

```

```

00113 334 FORMAT(1H+,19X,11H(BATAC JIG))
00114 335 FORMAT(1H+,19X,19H(2-STAGE BATAC JIG))
00115 L1=L
00116 IF (L.EQ.19) L1=11
00117 IF (L.EQ.21) L1=12
00118 IF ((L.GE.22).AND.(L.LT.30)) L1=L-9
00119 IF ((L.GE.31).AND.(L.LT.35)) L1=L-10
00120 IF (L.EQ.41) L1=25
00121 IF (L.EQ.42) L1=26
00122 IF (L.EQ.51) L1=27
00123 IF ((L.GE.61).AND.(L.LT.70)) L1=L-33
00124 IF (L.GE.71) L1=L-34
00125 IF (N.EQ.2) GO TO 23
00126 IF (N.EQ.3) GO TO 50
00127 GO TO (1,2,3,4,5,6,718,719,800,717,7,8,9,10,11,12,13,14,15,
00128 1 16,17,18,19,20,21,718,22,610,713,620,650,720,714,720,
00129 2 715,710,711,712),L1
00130 1 WRITE (H,100)
00131 RETURN
00132 2 WRITE (H,101)
00133 RETURN
00134 3 WRITE (H,102)
00135 RETURN
00136 4 WRITE (H,103)
00137 RETURN
00138 5 WRITE (H,105)
00139 RETURN
00140 6 WRITE (H,121)
00141 RETURN
00142 800 WRITE (H,122)
00143 RETURN
00144 7 WRITE (H,104)
00145 RETURN
00146 8 WRITE (H,108)
00147 RETURN
00148 9 WRITE (H,107)
00149 RETURN
00150 10 WRITE (H,108)
00151 RETURN
00152 11 WRITE (H,109)
00153 RETURN
00154 12 WRITE (H,110)
00155 RETURN
00156 13 WRITE (H,111)
00157 RETURN
00158 14 WRITE (H,112)
00159 RETURN
00160 15 WRITE (H,113)
00161 RETURN
00162 16 WRITE (H,114)
00163 RETURN
00164 17 WRITE (H,115)
00165 RETURN
00166 18 WRITE (H,116)
00167 RETURN
00168 19 WRITE (H,117)

```

```

00169      RETURN
00170      20 WRITE (H,118)
00171      RETURN
00172      21 WRITE (H,119)
00173      RETURN
00174      22 WRITE (H,120)
00175      RETURN
00176      610 WRITE (H,123)
00177      RETURN
00178      620 WRITE (H,124)
00179      RETURN
00180      650 WRITE (H,125)
00181      RETURN
00182      710 WRITE (H,126)
00183      RETURN
00184      711 WRITE (H,127)
00185      RETURN
00186      712 WRITE (H,128)
00187      RETURN
00188      713 WRITE (H,129)
00189      RETURN
00190      714 WRITE (H,130)
00191      RETURN
00192      715 WRITE (H,131)
00193      RETURN
00194      716 WRITE (H,132)
00195      RETURN
00196      717 WRITE (H,133)
00197      RETURN
00198      718 WRITE (H,134)
00199      RETURN
00200      719 WRITE (H,135)
00201      720 RETURN
00202      23 GO TO (24,25,26,27,28,29,497,498,2900,496,30,31,32,33,34,35,
00203          1 36,37,38,39,40,41,42,43,44,495,45,46,492,47,48,499,499,
00204          2 493,499,494,49,490,491),L1
00205      24 WRITE (H,200)
00206      RETURN
00207      25 WRITE (H,201)
00208      RETURN
00209      26 WRITE (H,202)
00210      RETURN
00211      27 WRITE (H,203)
00212      RETURN
00213      28 WRITE (H,205)
00214      RETURN
00215      29 WRITE (H,221)
00216      RETURN
00217      2900 WRITE (H,222)
00218      RETURN
00219      30 WRITE (H,204)
00220      RETURN
00221      31 WRITE (H,206)
00222      RETURN
00223      32 WRITE (H,207)
00224      RETURN

```

```
00225      33 WRITE (H,208)
00226      RETURN
00227      34 WRITE (H,209)
00228      RETURN
00229      35 WRITE (H,210)
00230      RETURN
00231      36 WRITE (H,211)
00232      RETURN
00233      37 WRITE (H,212)
00234      RETURN
00235      38 WRITE (H,213)
00236      RETURN
00237      39 WRITE (H,214)
00238      RETURN
00239      40 WRITE (H,215)
00240      RETURN
00241      41 WRITE (H,216)
00242      RETURN
00243      42 WRITE (H,217)
00244      RETURN
00245      43 WRITE (H,218)
00246      RETURN
00247      44 WRITE (H,219)
00248      RETURN
00249      45 WRITE (H,220)
00250      RETURN
00251      46 WRITE (H,223)
00252      RETURN
00253      47 WRITE (H,224)
00254      RETURN
00255      48 WRITE (H,225)
00256      RETURN
00257      49 WRITE (H,226)
00258      RETURN
00259      490 WRITE (H,227)
00260      RETURN
00261      491 WRITE (H,228)
00262      RETURN
00263      492 WRITE (H,229)
00264      RETURN
00265      493 WRITE (H,230)
00266      RETURN
00267      494 WRITE (H,231)
00268      RETURN
00269      495 WRITE (H,232)
00270      RETURN
00271      496 WRITE (H,233)
00272      RETURN
00273      497 WRITE (H,234)
00274      RETURN
00275      498 WRITE (H,235)
00276      499 RETURN
00277      50 GO TO (51,52,53,54,55,56,767,768,5600,768,57,58,59,80,61,62,
00278      1 63,64,65,66,67,68,69,70,71,765,72,73,762,74,75,769,769,
00279      2 763,769,764,76,760,761),L1
00280      51 WRITE (H,300)
```

```

00281      RETURN
00282      52 WRITE (H,301)
00283      RETURN
00284      53 WRITE (H,302)
00285      RETURN
00286      54 WRITE (H,303)
00287      RETURN
00288      55 WRITE (H,305)
00289      RETURN
00290      56 WRITE (H,321)
00291      RETURN
00292      5600 WRITE (H,322)
00293      RETURN
00294      57 WRITE (H,304)
00295      RETURN
00296      58 WRITE (H,306)
00297      RETURN
00298      59 WRITE (H,307)
00299      RETURN
00300      60 WRITE (H,308)
00301      RETURN
00302      61 WRITE (H,309)
00303      RETURN
00304      62 WRITE (H,310)
00305      RETURN
00306      63 WRITE (H,311)
00307      RETURN
00308      64 WRITE (H,312)
00309      RETURN
00310      65 WRITE (H,313)
00311      RETURN
00312      66 WRITE (H,314)
00313      RETURN
00314      67 WRITE (H,315)
00315      RETURN
00316      68 WRITE (H,316)
00317      RETURN
00318      69 WRITE (H,317)
00319      RETURN
00320      70 WRITE (H,318)
00321      RETURN
00322      71 WRITE (H,319)
00323      RETURN
00324      72 WRITE (H,320)
00325      RETURN
00326      73 WRITE (H,323)
00327      RETURN
00328      74 WRITE (H,324)
00329      RETURN
00330      75 WRITE (H,325)
00331      RETURN
00332      76 WRITE (H,326)
00333      RETURN
00334      760 WRITE (H,327)
00335      RETURN
00336      761 WRITE (H,328)

```

```

00337      RETURN
00338      762 WRITE (H,329)
00339      RETURN
00340      763 WRITE (H,330)
00341      RETURN
00342      764 WRITE (H,331)
00343      RETURN
00344      765 WRITE (H,332)
00345      RETURN
00346      766 WRITE (H,333)
00347      RETURN
00348      767 WRITE (H,334)
00349      RETURN
00350      768 WRITE (H,335)
00351      769 RETURN
00352      END

```

COMMON BLOCKS

```

/SYS/(+2)
G          +0 I      H          +1 I

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "/" SUBSCRIPTED]

```

*N          1 I      *L1          2 I      *L          3 I

```

TEMPORARIES

.A0016   1400 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :		0	-	-	-	-	-	-	-	-
00110 :	-	-	-	-	-	5	6	12	16	24
00120 :	32	36	42	46	54	61	63	65	-	-
00130 :	140	143	144	147	150	153	154	157	160	163
00140 :	164	167	170	173	174	177	200	203	204	207
00150 :	210	213	214	217	220	223	224	227	230	233
00160 :	234	237	240	243	244	247	250	253	254	257
00170 :	260	263	264	267	270	273	274	277	300	303
00180 :	304	307	310	313	314	317	320	323	324	327
00190 :	330	333	334	337	340	343	344	347	350	353
00200 :	354	357	360	-	-	433	436	437	442	443
00210 :	446	447	452	453	456	457	462	463	466	467

VESSEL VESSEL.FOR FORTRAN V.5A(621) /KI/L 22-AUG-85 13:57 PAGE 1-7

00220 :	472	473	476	477	502	503	506	507	512	513
00230 :	516	517	522	523	526	527	532	533	536	537
00240 :	542	543	546	547	552	553	556	557	562	563
00250 :	566	567	572	573	576	577	602	603	606	607
00260 :	612	613	616	617	622	623	626	627	632	633
00270 :	636	637	642	643	646	647	652	653	-	-
00280 :	726	731	732	735	736	741	742	745	746	751
00290 :	752	755	756	761	762	765	766	771	772	775
00300 :	776	1001	1002	1005	1006	1011	1012	1015	1016	1021
00310 :	1022	1025	1026	1031	1032	1035	1036	1041	1042	1045
00320 :	1046	1051	1052	1055	1056	1061	1062	1065	1066	1071
00330 :	1072	1075	1076	1101	1102	1105	1106	1111	1112	1115
00340 :	1116	1121	1122	1125	1126	1131	1132	1135	1136	1141
00350 :	1142	-	1145							

VESSEL OCTAL PROG SIZE=3760 [SCALARS/ARRAYS=3 + FORMATS=1374 + TEMPS/CONS=1 + CODE=1150 + ARGS=1210] + COMMON=2
[NO ERRORS DETECTED]


```

00001      SUBROUTINE WASH(FEED,CC,REF,MID,WFEED,WCC,WREF,WMID,FLOW1,SIZE,
00002      1 GRAV,GBOUND,SGXX,GPMIN,GPMOUT,YLDCC,YLDMID,YLDREF,NSIZE,NGRAV,
00003      2 LV,NCOMP,YLDVSL,BTUVSL,BTU,KBSG,TONAGE)
00004      C *****
00005      C THIS SUBROUTINE DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE *
00006      C CLEAN COAL AND THE REFUSE FOR A GIVEN FEED ENTERING A SPECIFIED VESSEL *
00007      C AT A GIVEN OVERALL SEPARATION GRAVITY *
00008      C *
00009      C PRINCIPAL ARRAYS AND VARIABLES *
00010      C *
00011      C FLOW STREAMS *
00012      C FEED(I,J,K) = PROPERTIES OF THE FEED STREAM *
00013      C CC(I,J,K) = PROPERTIES OF THE CLEAN COAL *
00014      C REF(I,J,K) = PROPERTIES OF THE REFUSE *
00015      C MID(I,J,K) = PROPERTIES OF THE MIDDINGS (JIG ONLY) *
00016      C SIZE(I) = BOUNDARIES OF COAL SIZE INCREMENTS *
00017      C GBOUND(J) = BOUNDARIES OF SPECIFIC GRAVITY INCREMENTS *
00018      C GRAV(J) = SPECIFIC GRAVITIES *
00019      C I = DESIGNATES SIZE INCREMENT OF COAL *
00020      C J = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL *
00021      C K = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR *
00022      C (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE ENTIRE *
00023      C STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT) *
00024      C NSIZE = NUMBER OF SIZE INCREMENTS OF COAL *
00025      C NGRAV = NUMBER OF SPECIFIC GRAVITY INCREMENTS OF COAL *
00026      C GPMIN = GALLONS OF WATER PER MINUTE ENTERING WASHER *
00027      C GPMOUT = GALLONS OF WATER PER MINUTE LEAVING WASHER *
00028      C *
00029      C GENERAL *
00030      C R(I1,L) = RATIO OF SEPARATION GRAVITY FOR A GIVEN SIZE DESIGNATION TO *
00031      C THE OVERALL SEPARATION GRAVITY *
00032      C S(I1,L) = BOUNDARIES OF SEPARATION CURVE SIZE INCREMENTS *
00033      C N(L) = NUMBER OF SIZES FOR EACH VESSEL *
00034      C I1 = DESIGNATES SIZE INCREMENT OF SEPARATION CURVE *
00035      C L = DESIGNATES TYPE OF VESSEL *
00036      C L=1 FOR CONCENTRATING TABLE *
00037      C L=2 FOR DENSE-MEDIUM VESSEL *
00038      C L=3 FOR DENSE-MEDIUM CYCLONE *
00039      C L=4 FOR HYDROCYCLONE *
00040      C L=5 FOR SINGLE-STAGE BAUM JIG *
00041      C L=6 AND L=7 FOR 2-STAGE BAUM JIG *
00042      C L=8 FOR SINGLE-STAGE BATAV JIG *
00043      C L=9 AND L=10 FOR 2-STAGE BATAV JIG *
00044      C L=11 FOR SAND CONE *
00045      C L=12 FOR DYNABHIRLPOOL *
00046      C SGSP = OVERALL SEPARATION GRAVITY *
00047      C YIELD = WEIGHT FRACTION OF FEED TO CLEAN COAL *
00048      C *****
00049      DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),MID(23,10,4), * DIM *
00050      1 SIZE(23),GRAV(10),GBOUND(11),BTU(4),FACTOR(10),N(12), * DIM *
00051      2 R(10,12),S(10,12) * DIM *
00052      DIMENSION R1(10),R2(10),R3(10),R4(10),R5(10),R6(10),R7(10), * DIM *
00053      1 R8(10),R9(10),R10(10),R11(10),R12(10), * DIM *
00054      2 S1(10),S2(10),S3(10),S4(10),S5(10),S6(10),S7(10), * DIM *
00055      3 S8(10),S9(10),S10(10),S11(10),S12(10) * DIM *
00056      EQUIVALENCE (R(1,1),R1(1)),(R(1,2),R2(1)),(R(1,3),R3(1)), * DIM *

```

```

00057      1      (R(1,4),R4(1)),(R(1,5),R5(1)),(R(1,6),R6(1)),      * DIM *
00058      2      (R(1,7),R7(1)),(R(1,8),R8(1)),(R(1,9),R9(1)),      * DIM *
00059      3      (R(1,10),R10(1)),(R(1,11),R11(1)),(R(1,12),R12(1))      * DIM *
00060      EQUIVALENCE (S(1,1),S1(1)),(S(1,2),S2(1)),(S(1,3),S3(1)),      * DIM *
00061      1      (S(1,4),S4(1)),(S(1,5),S5(1)),(S(1,6),S6(1)),      * DIM *
00062      2      (S(1,7),S7(1)),(S(1,8),S8(1)),(S(1,9),S9(1)),      * DIM *
00063      3      (S(1,10),S10(1)),(S(1,11),S11(1)),(S(1,12),S12(1))      * DIM *
00064      COMMON XFEED(10,10),XCC(10,10),X MID(10,10),SCMWT(20),SCMASH(20) * DIM *
00065      COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),      * DIM *
00066      1 SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),SFLT(24),      * DIM *
00067      2 SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),SPE(24),SIMP(24),SEA(24) * DIM *
00068      COMMON /BLK2/ DISTR8(24,10),KCOUNT      * DIM *
00069      REAL MID,MOISTR
00070      C *** A CHANGE IN THE SIZE OF N WILL AFFECT THE FOLLOWING LINE      * DIM *
00071      DATA N / 8,6,8,8,8,5,8,9,8,8,6,8 /      * DIM *
00072      C *** A CHANGE IN THE SIZE OF R WILL AFFECT THE FOLLOWING LINES      * DIM *
00073      DATA R1 / .988,.994,.974,.970,1.028,1.128,1.212,1.,2*0. /      TABLES
00074      DATA R2 / .969,.981,.993,1.01,1.031,1.,4*0. /      DMV
00075      DATA R3 / .995,.989,.991,.999,1.019,1.042,1.072,1.,2*0. /      DMC
00076      DATA R4 / .810,.842,.861,.956,1.074,1.199,1.362,1.,2*0. /      HC
00077      DATA R5 / .944,.925,.965,1.009,1.048,1.083,1.108,1.,2*0. /      BMJ-OV
00078      DATA R6 / .946,.986,1.006,.983,1.,5*0. /      BMJ-PR
00079      DATA R7 / .922,.968,1.023,1.067,1.042,.959,.938,1.,2*0. /      BMJ-SEC
00080      DATA R8 / 1.,.971,.968,.969,1.02,1.065,1.196,1.229,1.,0. /      BTJ-OV
00081      DATA R9 / .978,1.,1.,1.004,.997,.958,.948,1.,2*0. /      BTJ-PR
00082      DATA R10 / 1.024,.991,.965,.959,1.033,1.085,1.237,1.,2*0. /      BTJ-SEC
00083      DATA R11 / .962,.985,.991,1.004,1.031,1.,4*0. /      SC
00084      DATA R12 / 1.001,.999,.994,.990,.997,1.025,1.036,1.,2*0. /      DWP
00085      C *** A CHANGE IN THE SIZE OF S WILL AFFECT THE FOLLOWING LINES      * DIM *
00086      DATA S1 / 100.,.25,.093,.046,.0232,.0116,.0058,3*0. /      TABLES
00087      DATA S2 / 100.,.4,.2,1.,.5,5*0. /      DMV
00088      DATA S3 / 100.,.5,.375,.25,.093,.046,.0232,3*0. /      DMC
00089      DATA S4 / 100.,.185,.093,.046,.0232,.0116,.0058,3*0. /      HC
00090      DATA S5 / 100.,.4,.2,1.,.5,.25,.093,3*0. /      BMJ-OV
00091      DATA S6 / 100.,.4,.2,1.,.6*0. /      BMJ-PR
00092      DATA S7 / 100.,.4,.2,1.,.5,.25,.093,3*0. /      BMJ-SEC
00093      DATA S8 / 100.,.5,.375,.25,.093,.046,.0232,.0116,2*0. /      BTJ-OV
00094      DATA S9 / 100.,.5,.375,.25,.093,.046,.0232,3*0. /      BTJ-PR
00095      DATA S10 / 100.,.5,.375,.25,.093,.046,.0232,3*0. /      BTJ-SEC
00096      DATA S11 / 100.,.4,.2,1.,.5,5*0. /      SC
00097      DATA S12 / 100.,.1,.5,.375,.25,.093,.046,3*0. /      DWP
00098      L=LV
00099      SGSP=SGXX
00100      KMAX=50
00101      KCOUNT=1
00102      IF ((LV.EQ.7).OR.(LV.EQ.8)) L=LV+1
00103      IF (LV.GE.9) L=LV+2
00104      100 NS=NSIZE+1
00105      NG=NGRAV+1
00106      C TEST FOR COMPOSITE FEED
00107      1000 IF (NCOMP.NE.0) GO TO 40
00108      C *****
00109      C TRANSFORM FROM WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF FEED      *
00110      C TO WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF SEPARATION CURVES      *
00111      C *****
00112      DO 1 I1=1,10      * DIM *

```

```

00113      DO 1 J=1,10
00114      XFEED(I1,J)=0.
00115      XCC(I1,J)=0.
00116      1 XMID(I1,J)=0.
00117      NF=N(L)-1
00118      DO 18 I1=1,NF
00119      C FIND SMALLEST SIZE(I) THAT IS GREATER THAN OR EQUAL TO S(I1,L)
00120      DO 2 I=1,NS
00121      IF (SIZE(I).GT.S(I1,L)) GO TO 2
00122      IMIN=I-1
00123      IF (SIZE(I).EQ.S(I1,L)) IMIN=I
00124      GO TO 3
00125      2 CONTINUE
00126      IMIN=NS
00127      3 IF ((IMIN.EQ.0).AND.(SIZE(1).LE.S(I1+1,L))) GO TO 18
00128      IF (IMIN.EQ.NS) GO TO 18
00129      C FIND LARGEST SIZE(I) THAT IS LESS THAN OR EQUAL TO S(I1+1,L)
00130      DO 4 I=1,NS
00131      IF (SIZE(I).GT.S(I1+1,L)) GO TO 4
00132      IMAX=I
00133      GO TO 5
00134      4 CONTINUE
00135      IMAX=NS+1
00136      5 IF ((IMAX.EQ.NS+1).AND.(SIZE(NS).GE.S(I1,L))) GO TO 18
00137      IF (IMAX.EQ.1) GO TO 18
00138      C DETERMINE NUMBER OF INTERVALS ENTIRELY WITHIN S(I1,L) AND S(I1+1,L)
00139      NINT=IMAX-IMIN-2
00140      IF (NINT.LT.0) NINT=0
00141      C CARRY OUT TRANSFORMATION
00142      DO 17 J=1,NGRAV
00143      IF ((IMIN.EQ.0).AND.(IMAX.LT.NS+1)) GO TO 8
00144      IF ((IMIN.GT.0).AND.(IMAX.EQ.NS+1)) GO TO 11
00145      IF ((IMIN.EQ.0).AND.(IMAX.EQ.NS+1)) GO TO 14
00146      C CASE 1 - SIZE(IMIN) .GE. S(I1,L) AND SIZE(IMAX) .LE. S(I1+1,L)
00147      IF (IMAX-IMIN.GT.1) GO TO 6
00148      XFEED(I1,J)=FEED(IMIN,J,1)*(S(I1+1,L)-S(I1,L))/(SIZE(IMAX)-
00149      1 SIZE(IMIN))
00150      GO TO 17
00151      6 XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMIN+1)-S(I1,L))/(SIZE(IMIN+1)-
00152      1 SIZE(IMIN))+FEED(IMAX-1,J,1)*(S(I1+1,L)-SIZE(IMAX-1))/
00153      2 (SIZE(IMAX)-SIZE(IMAX-1))
00154      IF (NINT.EQ.0) GO TO 17
00155      DO 7 II=1,NINT
00156      IJ=IMIN+II
00157      7 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00158      GO TO 17
00159      C CASE 2 - LEFT BOUNDARY .LT. S(I1,L) (IMIN=0)
00160      8 IF (NINT.GT.0) GO TO 9
00161      XFEED(I1,J)=FEED(IMIN+1,J,1)*(S(I1+1,L)-SIZE(IMIN+1))/(SIZE(IMAX)-
00162      1 SIZE(IMIN+1))
00163      GO TO 17
00164      9 XFEED(I1,J)=FEED(IMIN+1,J,1)+FEED(IMAX-1,J,1)*(S(I1+1,L)-
00165      1 SIZE(IMAX-1))/(SIZE(IMAX)-SIZE(IMAX-1))
00166      IF (NINT.EQ.1) GO TO 17
00167      DO 10 II=2,NINT
00168      IJ=IMIN+II

```

* DIM *

```

00169      10 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00170      GO TO 17
00171      C CASE 3 - RIGHT BOUNDARY .GT. S(I1+1,L)      (IMAX=NSIZE+1)
00172      11 IF (NINT.GT.0) GO TO 12
00173      XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMAX-1)-S(I1,L))/(SIZE(IMAX-1)-
00174      1 SIZE(IMIN))
00175      GO TO 17
00176      12 XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMIN+1)-S(I1,L))/(SIZE(IMIN+1)-
00177      1 SIZE(IMIN))+FEED(IMAX-2,J,1)
00178      IF (NINT.EQ.1) GO TO 17
00179      NJNT=NINT-1
00180      DO 13 II=1,NJNT
00181      IJ=IMIN+II
00182      13 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00183      GO TO 17
00184      C CASE 4 - LEFT BOUNDARY .LT. S(I1,L) AND RIGHT BOUNDARY .GT. S(I1+1,L)
00185      C      (IMIN=0 AND IMAX=NSIZE+1)
00186      14 IF (NINT.GT.1) GO TO 15
00187      XFEED(I1,J)=FEED(IMIN+1,J,1)
00188      GO TO 17
00189      15 XFEED(I1,J)=FEED(IMIN+1,J,1)+FEED(IMAX-2,J,1)
00190      IF (NINT.EQ.2) GO TO 17
00191      NJNT=NINT-1
00192      DO 16 II=2,NJNT
00193      IJ=IMIN+II
00194      16 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00195      17 CONTINUE
00196      18 CONTINUE
00197      C *****
00198      C CARRY OUT SEPARATION *
00199      C *****
00200      DO 19 I1=1,NF
00201      IX=I1
00202      DO 19 J=1,NGRAV
00203      X=GRAV(J)/(R(I1,L)*SGSP)
00204      XCC(I1,J)=Y(X,L,IX)*XFEED(I1,J)
00205      19 CONTINUE
00206      IF ((L.NE.8).AND.(L.NE.9)) GO TO 23
00207      C SPECIAL PROVISION FOR 2-STAGE JIGS
00208      20 NF1=N(L)-1
00209      NF2=N(L+1)-1
00210      DO 22 I1=1,NF2
00211      IX=I1
00212      DO 22 J=1,NGRAV
00213      Y1=1.
00214      IF (I1.GT.NF1) GO TO 21
00215      X=GRAV(J)/(R(I1,L)*SGSP)
00216      Y1=Y(X,L,IX)
00217      21 FF=Y1*XFEED(I1,J)
00218      X=GRAV(J)/(R(I1,L+1)*SGSP)
00219      22 XMID(I1,J)=(1.-Y(X,L+1,IX))*FF
00220      C *****
00221      C TRANSFORM FROM WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF SEPARATION *
00222      C CURVES TO WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF CLEAN COAL *
00223      C *****
00224      23 NL=N(L)

```

```

00225      DO 24 I=1,23                                * DIM *
00226      DO 24 J=1,10                                * DIM *
00227      CC(I,J,1)=0.
00228      MID(I,J,1)=0.
00229      24 REF(I,J,1)=0.
00230      DO 32 I=1,NSIZE
00231      C FIND SMALLEST S(I1,L) THAT IS GREATER THAN OR EQUAL TO SIZE(I)
00232      DO 25 I1=1,NL
00233      IF (S(I1,L).GT.SIZE(I)) GO TO 25
00234      IMIN=I1-1
00235      IF (S(I1,L).EQ.SIZE(I)) IMIN=I1
00236      GO TO 28
00237      25 CONTINUE
00238      IMIN=NL
00239      28 IF ((IMIN.EQ.0).AND.(S(1,L).LE.SIZE(I+1))) GO TO 32
00240      IF (IMIN.EQ.NL) GO TO 32
00241      C FIND LARGEST S(I1,L) THAT IS LESS THAN OR EQUAL TO SIZE(I+1)
00242      DO 27 I1=1,NL
00243      IF (S(I1,L).GT.SIZE(I+1)) GO TO 27
00244      IMAX=I1
00245      GO TO 28
00246      27 CONTINUE
00247      IMAX=NL+1
00248      28 IF ((IMAX.EQ.NL+1).AND.(S(NL,L).GE.SIZE(I))) GO TO 32
00249      IF (IMAX.EQ.1) GO TO 32
00250      C DETERMINE NUMBER OF INTERVALS ENTIRELY WITHIN SIZE(I) AND SIZE(I+1)
00251      NINT=IMAX-IMIN-2
00252      IF (NINT.LT.0) NINT=0
00253      C CARRY OUT TRANSFORMATION
00254      IF ((IMIN.EQ.0).AND.(IMAX.LT.NL+1)) GO TO 32
00255      IF ((IMIN.GT.0).AND.(IMAX.EQ.NL+1)) GO TO 32
00256      IF ((IMIN.EQ.0).AND.(IMAX.EQ.NL+1)) GO TO 32
00257      DO 31 J=1,NGRAV
00258      IF (IMAX-IMIN.GT.1) GO TO 29
00259      CC(I,J,1)=FEED(I,J,1)*XCC(IMIN,J)/XFEED(IMIN,J)
00260      MID(I,J,1)=FEED(I,J,1)*XMID(IMIN,J)/XFEED(IMIN,J)
00261      GO TO 31
00262      29 F1=(S(IMIN+1,L)-SIZE(I))/(SIZE(I+1)-SIZE(I))
00263      F2=(SIZE(I+1)-S(IMAX-1,L))/(SIZE(I+1)-SIZE(I))
00264      CC(I,J,1)=FEED(I,J,1)*(F1*XCC(IMIN,J)/XFEED(IMIN,J)+
00265      1 F2*XCC(IMAX-1,J)/XFEED(IMAX-1,J))
00266      MID(I,J,1)=FEED(I,J,1)*(F1*XMID(IMIN,J)/XFEED(IMIN,J)+
00267      1 F2*XMID(IMAX-1,J)/XFEED(IMAX-1,J))
00268      IF (NINT.EQ.0) GO TO 31
00269      DO 30 II=1,NINT
00270      IJ=IMIN+II
00271      F3=(S(IJ+1,L)-S(IJ,L))/(SIZE(I+1)-SIZE(I))
00272      CC(I,J,1)=CC(I,J,1)+FEED(I,J,1)*F3*XCC(IJ,J)/XFEED(IJ,J)
00273      MID(I,J,1)=MID(I,J,1)+FEED(I,J,1)*F3*XMID(IJ,J)/XFEED(IJ,J)
00274      30 CONTINUE
00275      31 CONTINUE
00276      32 CONTINUE
00277      GO TO 44
00278      C *****
00279      C COMPOSITE SEPARATION *
00280      C *****

```

```

00281      40 NL=N(L)
00282      DO 420 I=1,23
00283      DO 420 J=1,10
00284      420 MID(I,J,1)=0.
00285      DO 41 J=1,NGRAV
00286      X=GRAV(J)/SGSP
00287      41 CC(1,J,1)=Y(X,L,NL)*FEED(1,J,1)
00288      IF ((L.NE.8).AND.(L.NE.9)) GO TO 44
00289 C SPECIAL PROVISION FOR 2-STAGE JIGS
00290      42 DO 43 J=1,NGRAV
00291      X1=GRAV(J)/(R(N(L),L)*SGSP)
00292      FF=Y(X1,L,N(L))*FEED(1,J,1)
00293      X2=GRAV(J)/(R(N(L+1),L+1)*SGSP)
00294      MID(1,J,1)=(1.-Y(X2,L+1,N(L+1)))*FF
00295      43 CONTINUE
00296 C *****
00297 C CALCULATE DISTRIBUTION DATA, ASH AND SULFUR CONCENTRATIONS, YIELD, *
00298 C SEPARATION GRAVITY, PROBABLE ERROR AND IMPERFECTION *
00299 C *****
00300      44 SUM1=0.
00301      SUM2=0.
00302      SUM3=0.
00303      DO 45 I=1,NSIZE
00304      DO 45 J=1,NGRAV
00305      REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)-MID(I,J,1)
00306      IF (REF(I,J,1).LT.0.) REF(I,J,1)=0.
00307      SUM1=SUM1+CC(I,J,1)
00308      SUM2=SUM2+REF(I,J,1)
00309      SUM3=SUM3+MID(I,J,1)
00310      DISTRB(I,J)=100.*CC(I,J,1)/FEED(I,J,1)
00311      IF (DISTRB(I,J).GT.100.) DISTRB(I,J)=100.
00312      IF (DISTRB(I,J).LT.0.) DISTRB(I,J)=0.
00313      DO 45 K=2,4
00314      CC(I,J,K)=FEED(I,J,K)
00315      REF(I,J,K)=FEED(I,J,K)
00316      MID(I,J,K)=FEED(I,J,K)
00317      45 CONTINUE
00318      DO 411 I=1,NSIZE
00319      DO 410 J=1,NGRAV
00320      410 FACTOR(J)=100.-DISTRB(I,J)
00321      SGRAV(I)=YINTRP(FACTOR,GRAV,50.,NGRAV)
00322      SX1=YINTRP(FACTOR,GRAV,75.,NGRAV)
00323      SX2=YINTRP(FACTOR,GRAV,25.,NGRAV)
00324      SPE(I)=(SX1-SX2)/2.
00325      IF ((FACTOR(NGRAV).LT.75.).OR.(SGRAV(I).GT.GRAV(NGRAV-2)))
00326      1 SPE(I)=SGRAV(I)-SX2
00327      SIMP(I)=SPE(I)/(SGRAV(I)-1.)
00328      IF ((L.EQ.2).OR.(L.EQ.3)) SIMP(I)=SPE(I)/SGRAV(I)
00329      411 CONTINUE
00330      DO 440 J=1,NGRAV
00331      DISTRB(NS,J)=0.0
00332      SUM4=0.0
00333      DO 430 I=1,NSIZE
00334      DISTRB(NS,J)=DISTRB(NS,J)+CC(I,J,1)
00335      430 SUM4=SUM4+FEED(I,J,1)
00336      DISTRB(NS,J)=100.*DISTRB(NS,J)/SUM4

```

* DIM *

* DIM *

* DIM *

```

00337       IF (DISTRB(NS,J).GT.100.) DISTRB(NS,J)=100.
00338       IF (DISTRB(NS,J).LT.0.) DISTRB(NS,J)=0.
00339       440 CONTINUE
00340       DO 441 J=1,NGRAV
00341       441 FACTOR(J)=100.-DISTRB(NS,J)
00342       SGRAV(NS)=YINTRP(FACTOR,GRAV,50.,NGRAV)
00343       SX1=YINTRP(FACTOR,GRAV,75.,NGRAV)
00344       SX2=YINTRP(FACTOR,GRAV,25.,NGRAV)
00345       SPE(NS)=(SX1-SX2)/2.
00346       IF ((FACTOR(NGRAV).LT.75.).OR.(SGRAV(NS).GT.GRAV(NGRAV-2)))
00347       1 SPE(NS)=SGRAV(NS)-SX2
00348       SIMP(NS)=SPE(NS)/(SGRAV(NS)-1.)
00349       IF ((L.EQ.2).OR.(L.EQ.3)) SIMP(NS)=SPE(NS)/SGRAV(NS)
00350       YLDCC=SUM1
00351       YLDREF=SUM2
00352       YLDMID=SUM3
00353       C CONVERGENCE TEST FOR OVERALL SPECIFIC GRAVITY OF SEPARATION
00354       IF(ABS(SGXX-SGRAV(NS)).LE.0.003) GO TO 454
00355       IF (KCOUNT.EQ.KMAX) GO TO 454
00356       SGSP=SGSP+(FLOAT(KMAX-KCOUNT)/KMAX)*(SGXX-SGRAV(NS))
00357       KCOUNT = KCOUNT +1
00358       GO TO 1000
00359       C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00360       454 DO 46 I=1,NSIZE
00361       DO 46 J=1,NGRAV
00362       CC(I,J,1)=CC(I,J,1)/SUM1
00363       REF(I,J,1)=REF(I,J,1)/SUM2
00364       IF (SUM3.EQ.0.) GO TO 48
00365       MID(I,J,1)=MID(I,J,1)/SUM3
00366       48 CONTINUE
00367       C *****
00368       C WATER BALANCE CALCULATIONS
00369       C *****
00370       WATIN=0.25*GPMIN+(0.01*WFEED/(1.-0.01*WFEED))*FLOW1*TONAGE
00371       IF ((L.EQ.2).OR.(L.EQ.3).OR.(L.EQ.11)) GO TO 470
00372       C DISTRIBUTE OUTPUT WATER IN DIRECT PROPORTION TO DRY SOLID FLOWRATES
00373       WCC=100.*WATIN/(WATIN+FLOW1*TONAGE)
00374       WREF=WCC
00375       IF ((LV.EQ.8).OR.(LV.EQ.8)) WMID=WCC
00376       GPMOUT=0.
00377       GO TO 480
00378       C CLOSED CIRCUIT RECOVERY OF MAGNETITE OR SAND - REMOVE EXCESS WATER AND
00379       C RETURN TO THICKENER (DMV, DMC OR SC)
00380       470 WCC=100.*MOISTR(CC,SIZE,GRAV,NSIZE,NGRAV,0,2)
00381       WREF=100.*MOISTR(REF,SIZE,GRAV,NSIZE,NGRAV,0,2)
00382       GPMOUT=4.0*(WATIN-0.01*FLOW1*TONAGE*((WCC/(1.-0.01*WCC))*YLDCC+
00383       1 (WREF/(1.-0.01*WREF))*YLDREF))
00384       480 IF (KBSG.EQ.0) RETURN
00385       C *****
00386       C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00387       C *****
00388       CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00389       CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00390       CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00391       CALL SDSIZE(MID,SMID,BTU,NSIZE,NGRAV)
00392       DO 490 I=1,NSIZE

```

```

00393      SYLD(I)=100.*SUM1*SCC(I,1)/SFEED(I,1)
00394      480 CONTINUE
00395      SYLD(NS)=100.*YLDCC
00396      C CALCULATE THEORETICAL RECOVERY, WEIGHT EFFICIENCY, BTU RECOVERY AND
00397      C ASH ERROR
00398      DO 51 I=1,NSIZE
00399      SCMWT(I)=0.
00400      SCMASH(I)=0.
00401      DO 500 J=2,NG
00402      J1=J-1
00403      SCMWT(J)=0.
00404      SCMASH(J)=0.
00405      DO 50 K=1,J1
00406      SCMWT(J)=SCMWT(J)+1.E+4*FEED(I,K,1)/SFEED(I,1)
00407      50 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00408      SCMASH(J)=1.E+4*SCMASH(J)/(SCMWT(J)*SFEED(I,1))
00409      IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00410      500 CONTINUE
00411      TYLD(I)=YINTRP(SCMASH,SCMWT,SCC(I,2),NG)
00412      IF (TYLD(I).GT.0.) EFFIC(I)=100.*SYLD(I)/TYLD(I)
00413      BTUREC(I)=100.*YLDCC*SCC(I,1)*SCC(I,5)/(SFEED(I,1)*SFEED(I,5))
00414      ASHERR(I)=SCC(I,2)-YINTRP(SCMWT,SCMASH,SYLD(I),NG)
00415      51 CONTINUE
00416      SCMWT(I)=0.
00417      SCMASH(I)=0.
00418      DO 520 J=2,NG
00419      J1=J-1
00420      SCMWT(J)=0.
00421      SCMASH(J)=0.
00422      DO 52 K=1,J1
00423      DO 52 I=1,NSIZE
00424      SCMWT(J)=SCMWT(J)+100.*FEED(I,K,1)
00425      52 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00426      SCMASH(J)=100.*SCMASH(J)/SCMWT(J)
00427      IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00428      520 CONTINUE
00429      TYLD(NS)=YINTRP(SCMASH,SCMWT,SCC(NS,2),NG)
00430      IF (TYLD(NS).GT.0.) EFFIC(NS)=100.*SYLD(NS)/TYLD(NS)
00431      BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5))
00432      1 )
00433      ASHERR(NS)=SCC(NS,2)-YINTRP(SCMWT,SCMASH,SYLD(NS),NG)
00434      C CALCULATE FLOAT IN REFUSE, SINK IN CLEAN COAL, TOTAL MISPLACED
00435      C MATERIAL AND NEAR GRAVITY 0.10 MATERIAL
00436      53 DO 57 I=1,NSIZE
00437      SG1=SGRAV(I)-0.1
00438      SG2=SGRAV(I)
00439      SG3=SGRAV(I)+0.1
00440      SFLT(I)=0.
00441      SINK(I)=0.
00442      SMISPL(I)=0.
00443      SNRGR(I)=0.
00444      DO 56 J=1,NGRAV
00445      IF (SG2.GT.GBOUND(J)) GO TO 54
00446      SINK(I)=SINK(I)+1.E+4*CC(I,J,1)/SCC(I,1)
00447      SMISPL(I)=SMISPL(I)+1.E+4*SUM1*CC(I,J,1)/SFEED(I,1)
00448      GO TO 56

```



```
00449 54 IF (SG2.LT.GBOUND(J+1)) GO TO 55
00450 SFLT(I)=SFLT(I)+1.E+4*REF(I,J,1)/SREF(I,1)
00451 SMISPL(I)=SMISPL(I)+1.E+4*SUM2*REF(I,J,1)/SFEED(I,1)
00452 GO TO 58
00453 55 F=(SG2-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00454 SFLT(I)=SFLT(I)+1.E+4*F*REF(I,J,1)/SREF(I,1)
00455 SINK(I)=SINK(I)+1.E+4*(1.-F)*CC(I,J,1)/SCC(I,1)
00456 SMISPL(I)=SMISPL(I)+1.E+4*(F*SUM2*REF(I,J,1)+(1.-F)*SUM1*
00457 1 CC(I,J,1))/SFEED(I,1)
00458 56 CONTINUE
00459 DO 57 J=1,NGRAV
00460 IF ((SG1.GT.GBOUND(J+1)).OR.(SG3.LT.GBOUND(J))) GO TO 57
00461 F=1.
00462 IF ((SG1.GE.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00463 1 F=(SG3-SG1)/(GBOUND(J+1)-GBOUND(J))
00464 IF ((SG1.LT.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00465 1 F=(SG3-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00466 IF ((SG1.GE.GBOUND(J)).AND.(SG3.GT.GBOUND(J+1)))
00467 1 F=(GBOUND(J+1)-SG1)/(GBOUND(J+1)-GBOUND(J))
00468 SNRGR(I)=SNRGR(I)+1.E+4*F*FEED(I,J,1)/SFEED(I,1)
00469 57 CONTINUE
00470 SG1=SGRAV(NS)-0.1
00471 SG2=SGRAV(NS)
00472 SG3=SGRAV(NS)+0.1
00473 SFLT(NS)=0.
00474 SINK(NS)=0.
00475 SMISPL(NS)=0.
00476 SNRGR(NS)=0.
00477 DO 83 J=1,NGRAV
00478 IF (SG2.GT.GBOUND(J)) GO TO 59
00479 DO 58 I=1,NSIZE
00480 SINK(NS)=SINK(NS)+100.*CC(I,J,1)
00481 58 SMISPL(NS)=SMISPL(NS)+100.*SUM1*CC(I,J,1)
00482 GO TO 83
00483 59 IF (SG2.LT.GBOUND(J+1)) GO TO 81
00484 DO 60 I=1,NSIZE
00485 SFLT(NS)=SFLT(NS)+100.*REF(I,J,1)
00486 60 SMISPL(NS)=SMISPL(NS)+100.*SUM2*REF(I,J,1)
00487 GO TO 83
00488 81 F=(SG2-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00489 DO 62 I=1,NSIZE
00490 SFLT(NS)=SFLT(NS)+100.*F*REF(I,J,1)
00491 SINK(NS)=SINK(NS)+100.*(1.-F)*CC(I,J,1)
00492 62 SMISPL(NS)=SMISPL(NS)+100.*(F*SUM2*REF(I,J,1)+(1.-F)*SUM1*
00493 1 CC(I,J,1))
00494 83 CONTINUE
00495 DO 85 J=1,NGRAV
00496 IF ((SG1.GT.GBOUND(J+1)).OR.(SG3.LT.GBOUND(J))) GO TO 85
00497 F=1.
00498 IF ((SG1.GE.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00499 1 F=(SG3-SG1)/(GBOUND(J+1)-GBOUND(J))
00500 IF ((SG1.LT.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00501 1 F=(SG3-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00502 IF ((SG1.GE.GBOUND(J)).AND.(SG3.GT.GBOUND(J+1)))
00503 1 F=(GBOUND(J+1)-SG1)/(GBOUND(J+1)-GBOUND(J))
00504 DO 64 I=1,NSIZE
```

```

00505      64 SNRGR(NS)=SNRGR(NS)+100.*F*FEED(I,J,1)
00506      65 CONTINUE
00507      C CALCULATE ERROR AREA AND OVERALL RECOVERIES
00508          DO 69 I=1,NS
00509              DX1=(SGRAV(I)-GBOUND(1))/100.
00510              DX2=(GBOUND(NG)-SGRAV(I))/100.
00511              DO 66 J=1,NGRAV
00512      66      FACTOR(J)=DISTRB(I,J)
00513              YL=YINTRP(GRAV,FACTOR,GBOUND(1),NGRAV)
00514              YR=YINTRP(GRAV,FACTOR,GBOUND(NG),NGRAV)
00515              SUM1=(YL+50.)*DX1/3.
00516              SUM2=(50.+YR)*DX2/3.
00517              DO 67 K=2,100,2
00518                  SUM1=SUM1+4.*YINTRP(GRAV,FACTOR,GBOUND(1)+(K-1)*DX1,NGRAV)*DX1/3.
00519                  IF (SGRAV(I).GT.GRAV(NGRAV-2)) GO TO 67
00520                  SUM2=SUM2+4.*YINTRP(GRAV,FACTOR,SGRAV(I)+(K-1)*DX2,NGRAV)*DX2/3.
00521      67      CONTINUE
00522              DO 68 K=3,99,2
00523                  SUM1=SUM1+2.*YINTRP(GRAV,FACTOR,GBOUND(1)+(K-1)*DX1,NGRAV)*DX1/3.
00524                  IF (SGRAV(I).GT.GRAV(NGRAV-2)) GO TO 68
00525                  SUM2=SUM2+2.*YINTRP(GRAV,FACTOR,SGRAV(I)+(K-1)*DX2,NGRAV)*DX2/3.
00526      68      CONTINUE
00527              SEA(I)=5.*(100.*(SGRAV(I)-GBOUND(1))-SUM1+SUM2)
00528              IF (SGRAV(I).GT.GRAV(NGRAV-2))
00529      1      SEA(I)=10.*(100.*(SGRAV(I)-GBOUND(1))-SUM1)
00530      69      CONTINUE
00531              BTUVSL=BTUREC(NS)
00532              YLDVSL=SYLD(NS)
00533              RETURN
00534      END

```

EQUIVALENCED VARIABLES

(	R	1#R	R1	1#R	R2	13#R	R3	25#R	R4	37#R
	R5	51#R	R6	83#R	R7	75#R	R8	107#R	R9	121#R
	R10	133#R	R11	145#R	R12	157#R	)			
(	S	171#R	S1	171#R	S2	203#R	S3	215#R	S4	227#R
	S5	241#R	S6	253#R	S7	265#R	S8	277#R	S9	311#R
	S10	323#R	S11	335#R	S12	347#R	)			

COMMON BLOCKS

```

/ .COMM. / (+524)
XFEED      +0#R      XCC      +144#R      XMID      +310#R      SCMWT      +454#R      SCMASH      +500#R

/BLK1/ (+1430)
SFEED      +0#R      SCC      +170#R      SMID      +360#R      SREF      +550#R      SYLD      +740#R
TYLD      +770#R      EFFIC      +1020#R      BTUREC      +1050#R      ASHERR      +1100#R      SFLT      +1130#R
SINK      +1160#R      SMISPL      +1210#R      SNRGR      +1240#R      SGRAV      +1270#R      SPE      +1320#R
SIMP      +1350#R      SEA      +1400#R

/BLK2/ (+381)

```

DISTRB +O/R KCOUNT +380 I

SUBPROGRAMS CALLED

YINTRP Y FLOAT. SDSIZE MOISTR ABS.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

S9	311#R	*GPMOUT	381 R	*WMID	382 R	R5	51#R	S3	215#R
*NCOMP	363 I	*NS	364 I	*FF	365 R	*NF1	366 I	N	367#I
S11	335#R	FEED	403#R	*K	404 I	S8	277#R	*WFEE	405 R
R10	133#R	*NG	406 I	R4	37#R	*SX1	407 R	S2	203#R
MID	410#R	*SG1	411 R	*LV	412 I	GBOUND	413#R	*YLDVSL	414 R
*IMIN	415 I	*NL	416 I	R9	121#R	S7	265#R	*DX1	417 R
*Y1	420 R	*IJ	421 I	*NF	422 I	R3	25#R	*NF2	423 I
S1	171#R	*KBSG	424 I	*SGSP	425 R	S12	347#R	S	171#R
*YLDMID	426 R	*BTUVSL	427 R	*YLDREF	430 R	*J1	431 I	R11	145#R
*F3	432 R	*J	433 I	*YR	434 R	*SX2	435 R	R8	107#R
*SG2	436 R	*SUM4	437 R	*X2	440 R	S6	253#R	*IMAX	441 I
*YL	442 R	*II	443 I	R2	13#R	FACTOR	444#R	*FLOW1	456 R
*GPMIN	457 R	*NJNT	460 I	*SGXX	461 R	*WCC	462 R	*TONAGE	463 R
*DX2	464 R	*YLDCC	465 R	GRAV	466#R	*SUM3	467 R	*F2	470 R
*NSIZE	471 I	R7	75#R	SIZE	472#R	CC	473#R	*X1	474 R
S5	241#R	*X	475 R	*WATIN	476 R	*WREF	477 R	R1	1#R
R12	157#R	R	1#R	*NINT	500 I	BTU	501#R	REF	502#R
*SG3	503 R	*L	504 I	*SUM2	505 R	*I1	506 I	*I	507 I
*F1	510 R	*F	511 R	*KMAX	512 I	S10	323#R	R6	63#R
S4	227#R	*NGRAV	513 I	*IX	514 I	*SUM1	515 R		

TEMPORARIES

.S0021	516 I	.S0022	517 I	.S0023	520 I	.S0024	521 I	.S0025	522 I
.S0026	523 I	.S0027	524 I	.S0010	525 I	.S0011	526 I	.S0012	527 I
.S0013	530 I	.S0060	531 I	.S0014	532 I	.S0081	533 I	.S0015	534 I
.S0062	535 I	.S0018	536 I	.S0063	537 I	.S0017	540 I	.S0064	541 I
.S0065	542 I	.S0066	543 I	.S0000	544 I	.S0001	545 I	.S0002	546 I
.S0003	547 I	.S0050	550 I	.S0004	551 I	.S0051	552 I	.S0005	553 I
.A0016	554 R	.S0052	555 I	.S0006	556 I	.S0053	557 I	.S0007	560 I
.S0054	561 I	.S0055	562 I	.S0056	563 I	.S0057	564 I	.S0040	565 I
.S0041	566 I	.S0042	567 I	.S0043	570 I	.S0044	571 I	.S0045	572 I
.S0046	573 I	.S0047	574 I	.S0030	575 I	.S0031	576 I	.S0032	577 I
.S0033	600 I	.S0034	601 I	.S0035	602 I	.S0036	603 I	.S0037	604 I
.S0020	605 I	.Q0000	606 I	.Q0001	607 I				

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00090	:	-	-	-	-	-	-	-	67	70
00100	:	71	73	75	103	110	113	-	116	-

WASH	WASH.FOR	FORTRAN V.5A(621) /KI/L 22-AUG-85						13:57	PAGE 1-11	
00110 :	-	-	120	123	124	130	134	144	150	-
00120 :	154	157	167	172	204	205	207	211	222	-
00130 :	225	230	240	242	243	245	250	264	-	287
00140 :	273	-	275	301	307	315	-	323	327	-
00150 :	353	354	-	-	414	416	420	423	436	-
00160 :	437	441	-	466	467	-	517	522	525	530
00170 :	543	-	544	546	-	573	574	-	624	627
00180 :	631	633	636	651	-	-	652	655	666	667
00190 :	705	710	712	715	720	733	736	-	-	-
00200 :	741	745	746	750	762	771	776	-	1003	1006
00210 :	1011	1015	1016	1020	1022	1025	1037	1042	1050	1062
00220 :	-	-	-	-	1103	1106	1111	1112	1117	1124
00230 :	1135	-	1141	1144	1154	1157	1171	1172	1174	1176
00240 :	1207	-	1212	1215	1225	1227	1230	1232	1235	1251
00250 :	-	1254	1260	-	1262	1270	1277	1306	1312	1316
00260 :	1333	1351	1352	1365	1400	-	1424	-	1452	1454
00270 :	1458	1461	1474	1512	1531	1533	1536	1541	-	-
00280 :	-	1542	1545	1550	1551	1562	1564	1571	1605	-
00290 :	1612	1614	1627	1640	1653	1672	-	-	-	-
00300 :	1674	1675	1676	1677	1703	1707	1725	1740	1746	1754
00310 :	1762	2000	2012	2024	2025	2041	2055	2071	2100	2104
00320 :	2106	2116	2122	2125	2130	2134	-	2150	2155	2165
00330 :	2170	2174	2177	2200	2202	2213	2223	2232	2244	2255
00340 :	2260	2262	2272	2276	2301	2304	2310	-	2324	2331
00350 :	2341	2343	2345	-	2347	2354	2357	2370	2371	-
00360 :	2372	2376	2400	2407	2416	2420	2427	-	-	-
00370 :	2434	2450	-	2456	2464	2465	2473	2474	-	-
00380 :	2475	2501	2505	-	2531	-	-	-	2533	2535
00390 :	2537	2541	2543	2545	2552	2554	-	-	2560	2564
00400 :	2565	2566	2573	2575	2577	2600	2602	2614	2626	2635
00410 :	2641	2644	2652	2660	2670	2677	2702	2703	2704	2711
00420 :	2713	2715	2716	2722	2724	2734	2751	2756	2762	2765
00430 :	2773	3001	-	3011	-	-	3020	3024	3027	3031
00440 :	3033	3034	3035	3036	3037	3041	3046	3057	3070	3071
00450 :	3076	3107	3120	3121	3131	3142	3154	-	3176	3200
00460 :	3202	3212	3214	-	3234	-	3254	-	3274	3306
00470 :	3313	3317	3321	3323	3324	3325	3326	3327	3333	3337
00480 :	3341	3351	3363	3364	3371	3373	3403	3415	3416	3426
00490 :	3430	3441	3452	-	3475	3500	3504	3513	3515	-
00500 :	3535	-	3555	-	3575	3577	3612	-	3615	3621
00510 :	3626	3633	3635	3644	3647	3656	3663	3670	3672	3707
00520 :	3715	3731	3733	3735	3752	3760	3774	3776	4011	-
00530 :	4024	4027	4032	-	4034	-	-	-	-	-

WASH OCTAL PROG SIZE=5133 [SCALARS/ARRAYS=515 + TEMPS/CONS=111 + CODE=4065 + ARGS=220] + COMMON=2535
 [NO ERRORS DETECTED]

```

00001        SUBROUTINE XPAND(NSIZE,NGRAV,FEED,SIZE,NX,PROD,ICHEK)
00002 C*****
00003 C
00004 C        THIS SUBROUTINE INCREASES THE SIZE DIMENSION OF THE FEED
00005 C        WASHABILITY
00006 C
00007 C*****
00008        DIMENSION FEED(23,10,4),SIZE(23),PROD(23,10,4)
00009        COMMON /BLK3/ P(50,10,4),Y(50),SKIP(3275),G(50),F(24),FILL(30)
00010        ALPHA=1.
00011        DO 70 I=1,NSIZE
00012        F(I)=0.
00013        DO 71 J=1,NGRAV
00014        F(I)=F(I)+FEED(I,J,1)
00015 71    CONTINUE
00016 70    CONTINUE
00017        DO 72 I=1,NSIZE
00018        DO 73 J=1,NGRAV
00019        PROD(I,J,1)=FEED(I,J,1)/F(I)
00020 73    CONTINUE
00021 72    CONTINUE
00022        Y(1)=SIZE(1)
00023        I=0
00024        STWO=SQRT(2.)
00025        BOTTOM=SIZE(NSIZE)
00026        IF (SIZE(NSIZE+1).NE.0.) BOTTOM=SIZE(NSIZE+1)
00027        IF ((ICHEK.EQ.1).AND.(SIZE(NSIZE+1).EQ.0.)) BOTTOM=0.000393
00028 32    I=I+1
00029        IF(Y(I).LE.BOTTOM) GO TO 31
00030        Y(I+1)=Y(I)/STWO
00031        GO TO 32
00032 31    NX=I
00033        NX1=NX-1
00034        NXSIZE=NSIZE+1
00035        IF (SIZE(NXSIZE).EQ.0.) NXSIZE=NSIZE
00036        IF (NXSIZE.EQ.NSIZE+1) F(NXSIZE)=0.
00037        DO 1 I1=1,NX1
00038        DO 2 I=1,NXSIZE
00039        IF(SIZE(I).GT.Y(I1)) GO TO 2
00040        IMIN=I-1
00041        IF(SIZE(I).EQ.Y(I1)) IMIN=I
00042        GO TO 3
00043 2    CONTINUE
00044        IF (Y(I1).LT.SIZE(NXSIZE)) GO TO 8
00045 3    IF ((Y(I1).NE.SIZE(NXSIZE)).OR.(SIZE(NSIZE+1).NE.0.)) GO TO 12
00046        G(I1)=F(NSIZE)
00047        DO 90 J=1,NGRAV
00048        P(I1,J,1)=G(I1)*PROD(NSIZE,J,1)
00049        DO 90 K=2,4
00050        P(I1,J,K)=FEED(NSIZE,J,K)
00051 90    CONTINUE
00052        GO TO 9
00053 12    DO 4 I=1,NXSIZE
00054        IF(SIZE(I).GT.Y(I1+1)) GO TO 4
00055        IMAX=I
00056        IF((SIZE(I).EQ.Y(I1+1)).AND.(NSIZE.LT.I1+1)) GO TO 4

```

```

00057      GO TO 5
00058      4 CONTINUE
00059      9 G(I1+1)=F(NXSIZE)*(Y(I1+1)/SIZE(NXSIZE))**ALPHA
00060      DO 95 J=1,NGRAV
00061      P(I1+1,J,1)=G(I1+1)*PROD(NSIZE,J,1)
00062      DO 95 K=2,4
00063      P(I1+1,J,K)=FEED(NSIZE,J,K)
00064      95 CONTINUE
00065      IF (Y(I1).GE.SIZE(NSIZE).AND.(IMIN.LT.NSIZE)) GO TO 11
00066      IF (NXSIZE.GT.NSIZE) G(I1)=F(NSIZE)*ALOG(Y(I1)/SIZE(NXSIZE))/
00067      1 ALOG(SIZE(NSIZE)/SIZE(NXSIZE))
00068      G(I1)=G(I1)-G(I1+1)
00069      DO 91 J=1,NGRAV
00070      P(I1,J,1)=G(I1)*PROD(NSIZE,J,1)
00071      DO 91 K=2,4
00072      P(I1,J,K)=FEED(NSIZE,J,K)
00073      91 CONTINUE
00074      GO TO 1
00075      11 FAC1=F(IMIN)*ALOG(Y(I1)/SIZE(IMIN+1))/ALOG(SIZE(IMIN)/
00076      &SIZE(IMIN+1))
00077      FAC2=F(IMIN+1)-G(I1+1)
00078      G(I1)=FAC1+FAC2
00079      DO 92 J=1,NGRAV
00080      FAC11=FAC1*PROD(IMIN,J,1)
00081      FAC21=FAC2*PROD(IMIN+1,J,1)
00082      P(I1,J,1)=FAC11+FAC21
00083      DO 92 K=2,4
00084      P(I1,J,K)=(FAC11*FEED(IMIN,J,K)+FAC21*FEED(IMIN+1,J,K))/P(I1,J,1)
00085      92 CONTINUE
00086      GO TO 1
00087      5 IF(IMAX-IMIN.GT.1) GO TO 8
00088      G(I1)=F(IMIN)*ALOG(Y(I1)/Y(I1+1))/ALOG(SIZE(IMIN)/SIZE(IMAX))
00089      DO 93 J=1,NGRAV
00090      P(I1,J,1)=G(I1)*PROD(IMIN,J,1)
00091      DO 93 K=2,4
00092      P(I1,J,K)=FEED(IMIN,J,K)
00093      93 CONTINUE
00094      GO TO 1
00095      8 FAC1=F(IMIN)*ALOG(Y(I1)/SIZE(IMIN+1))/ALOG(SIZE(IMIN)/
00096      &SIZE(IMIN+1))
00097      FAC2=F(IMAX-1)*ALOG(SIZE(IMAX-1)/Y(I1+1))/
00098      &ALOG(SIZE(IMAX-1)/SIZE(IMAX))
00099      G(I1)=FAC1+FAC2
00100      DO 94 J=1,NGRAV
00101      FAC11=FAC1*PROD(IMIN,J,1)
00102      FAC21=FAC2*PROD(IMAX-1,J,1)
00103      P(I1,J,1)=FAC11+FAC21
00104      DO 94 K=2,4
00105      P(I1,J,K)=(FAC11*FEED(IMIN,J,K)+FAC21*FEED(IMAX-1,J,K))/P(I1,J,1)
00106      94 CONTINUE
00107      1 CONTINUE
00108      RETURN
00109      END

```

COMMON BLOCKS

/BLK3/(+12485)

P +O#R Y +3720#R SKIP +4002#R G +12315#R F +12377#R
FILL +12427#R

SUBPROGRAMS CALLED

SQRT. ALOG.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*ICHEK	1 I	*FAC2	2 R	*BOTTOM	3 R	FEED	4#R	*K	5 I
*FAC1	6 R	PROD	7#R	*NX	10 I	*IMIN	11 I	*STWO	12 R
*J	13 I	*IMAX	14 I	*NXSIZE	15 I	*NSIZE	16 I	SIZE	17#R
*FAC21	20 R	*ALPHA	21 R	*I1	22 I	*I	23 I	*NGRAV	24 I
*NX1	25 I	*FAC11	26 R						

TEMPORARIES

.S0021	27 I	.S0022	30 I	.S0010	31 I	.S0011	32 I	.S0012	33 I
.S0013	34 I	.S0014	35 I	.S0015	36 I	.S0016	37 I	.S0017	40 I
.S0000	41 I	.S0001	42 I	.S0002	43 I	.S0003	44 I	.S0004	45 I
.S0005	46 I	.A0018	47 R	.S0006	50 I	.S0007	51 I	.S0020	52 I
.Q0000	53 I	.Q0001	54 I						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00010	:	17	21	25	28	30	37	41	44	50
00020	:	65	67	72	75	78	101	104	114	125
00030	:	131	134	135	137	141	144	151	157	163
00040	:	174	177	208	207	211	217	231	235	241
00050	:	254	273	277	300	303	311	313	321	322
00060	:	337	343	355	358	375	401	412	-	440
00070	:	447	461	462	501	505	508	-	530	533
00080	:	542	550	557	564	565	611	615	616	622
00090	:	652	664	665	704	710	711	-	733	-
00100	:	757	763	771	1000	1005	1006	1036	1042	-

XPAND OCTAL PROG SIZE=1163 [SCALARS/ARRAYS=28 + TEMPS/CONS=32 + CODE=1052 + ARGS=31] + COMMON=12485
[NO ERRORS DETECTED]

```

00001      FUNCTION Y(X,L,I1)
00002  C *****
00003  C *      THIS FUNCTION EVALUATES A POINT ON THE DISTRIBUTION CURVE FOR A GIVEN *
00004  C *      VESSEL(L) AND SIZE(I1), USING A WEIBULL FUNCTION TO REPRESENT THE *
00005  C *      GENERALIZED DISTRIBUTION CURVE.      (NANCY FALLON, 4/2/84) *
00006  C *****
00007      DIMENSION A(10,12),B(10,12),C(10,12),FO(10,12),XO(10,12)
00008      DATA A / 2.97,2.1657,1.8194,1.6913,1.9377,2.223,4.9932,3*0.,
00009      1 1.,3.0991,5.2525,5.9947,3.6749,3.7838,4*0.,
00010      2 3.2199,2.1461,2.6995,1.7925,2.6972,3.2237,1.9041,1.4395,2*0.,
00011      3 1.8944,1.819,7.9272,3.4993,2.4231,12.014,15.217,1.7007,2*0.,
00012      4 1.4483,1.5491,2.7725,1.419,1.9184,2.3904,1.9776,1.7413,2*0.,
00013      5 1.9067,2.3773,2.2817,2.5403,2.6929,5*0.,
00014      6 1.3907,3.0023,1.4148,1.461,2.0786,1.7552,1.3947,.64844,2*0.,
00015      7 2.5542,2.5077,4.1062,2.077,2.0707,1.7999,1.6415,7.3558,1.687,0.
00016      8 .6.3851,15.156,2.8959,6.9717,10.955,8.8428,2.94,8.0514,2*0.,
00017      9 2.0904,2.1141,2.2526,1.8446,2.0472,1.0224,3.5295,1.3875,2*0.,
00018      * 1.506,2.618,2.653,1.56,1.601,1.862,4*0.,
00019      A 1.287,1.721,1.2139,1.698,.88911,1.2149,1.1677,1.2788,2*0. /
00020      DATA B / 4.3355E-3,1.4235E-2,2.7674E-2,4.6642E-2,7.8576E-2,
00021      1 6.3174E-2,2.6097E-3,1.837E-2,2*0.,
00022      2 1.E-5,1.4305E-4,1.E-5,1.E-5,7.7151E-4,1.7926E-4,4*0.,
00023      3 1.0264E-4,1.2948E-3,5.4715E-4,5.555E-3,1.8777E-3,2.5115E-3,
00024      4 5.3421E-3,4.659E-2,2*0.,
00025      5 6.7574E-2,8.0972E-2,5.9.0573E-2,.13639,5.,5.,.18142,2*0.,
00026      6 1.6554E-2,2.845E-2,1.8473E-2,7.5754E-2,.10516,9.2961E-2,
00027      7 .1794,.10675,2*0.,
00028      8 9.755E-2,.10765,.12621,8.1792E-2,8.3684E-2,5*0.,
00029      9 2.0978E-2,4.059E-3,5.7034E-2,6.0208E-2,6.1881E-2,8.4668E-2,
00030      * .13787,.15743,2*0.,
00031      A 2.7426E-2,3.1968E-2,1.0471E-2,5.3424E-2,8.9885E-2,5.6753E-2,
00032      B 5.5162E-2,.18014,7.8215E-2,0.,
00033      C 2.2845E-2,3.435,2.7957E-2,2.8782E-2,.13948,4.34E-2,2.9145E-2,
00034      D 8.0574E-2,2*0.,
00035      E 4.3224E-2,4.1216E-2,3.3588E-2,5.5967E-2,6.3789E-2,.13802,
00036      F 3.8426E-2,.11232,2*0.,
00037      G 1.795E-3,4.156E-4,7.686E-4,1.232E-2,2.384E-2,6.121E-3,4*0.,
00038      H 3.3656E-2,1.6772E-2,4.4847E-2,1.2037E-2,.10331,7.7903E-2,
00039      I 1.068E-1,5.3836E-2,2*0. /
00040      DATA C / .98484,.98415,.98299,.95611,.94826,.85379,.64672,
00041      1 .93511,2*0.,
00042      2 1.,.9867,.98547,.9809,.97286,.9792,4*0.,
00043      3 .99534,.99543,.99067,.98403,.97,.95759,.98276,.982,2*0.,
00044      4 1.,.85463,.87073,.78954,.92354,.80901,.68773,.78314,2*0.,
00045      5 6*1.,.997,1.,2*0.,
00046      6 .998,.964,.897,.7,.845,5*0.,
00047      7 2*1.,.982,.975,.995,.999,2*.98,2*0.,
00048      8 5*1.,.97,.878,.666,1.,0.,
00049      9 .675,3*.65,.659,.601,.591,.825,2*0.,
00050      * 6*1.,.8,1.,2*0.,
00051      A 6*1.,4*0.,
00052      B 8*1.,2*0. /
00053      DATA FO / 1.2374E-2,1.0874E-2,1.09E-2,2.7309E-2,3.3586E-2,
00054      1 1.065E-1,.30829,5.5114E-2,2*0.,
00055      2 2*0.,3.3049E-3,4.4275E-3,1.2182E-2,1.071E-2,4*0.,
00056      3 3.2888E-3,0.,3.531E-3,6.0615E-3,1.8855E-2,2.393E-2,9.6648E-3,

```

```

TAB-A
DMV-A
DMC-A
HC-A
JOV-A
JP-A
JS-A
TJOV-A
TJP-A
TJS-A
SC-A
DWP-A
TAB-B
DMV-B
DMC-B
HC-B
JOV-B
JP-B
JS-B
TJOV-B
TJP-B
TJS-B
SC-B
DWP-B
DWP-B
TAB-C
DMV-C
DMC-C
HC-C
JOV-C
JP-C
JS-C
TJO-C
TJP-C
TJS-C
SC-C
DWP-C
TAB-FO
DMV-FO
DMC-FO

```



```

00057      4 1.8E-2,2*0.,
00058      5 6.675E-3,1.3787E-2,3.5522E-2,3.917E-2,0.,.15677,.26278,
00059      6 .15448,2*0.,
00060      7 6*0.,.003,3*0.,.002,.036,.103,.3,.155,5*0.,
00061      8 2*0.,.018,.025,.005,.001,2*.02,2*0.,
00062      9 5*0.,.03,.122,.334,2*0.,
00063      * .325,3*.35,.341,.399,.409,.375,2*0.,
00064      A 6*0.,.2,3*0.,
00065      B 10*0.,
00066      C 10*0. /
00067      DATA XO / .85782,.881,.88574,.86728,.77458,.74264,.68405,
00068      1 .82309,2*0.,
00069      2 1.,.94926,.89605,.86251,.87141,.90713,4*0.,
00070      3 .94846,.96208,.94603,.95516,.91449,.8603,.94707,.90619,2*0.,
00071      4 .79925,.81671,-.15538,.5782,.64075,-.1288,-.11613,.67424,2*0.,
00072      5 .95426,.92069,.79233,.87465,.74464,.68246,.85074,.77582,2*0.,
00073      6 .75619,.65674,.63092,.63477,.61689,5*0.,
00074      7 .95227,.85861,.89616,.88339,.77941,.80105,.81033,.96565,2*0.,
00075      8 .78807,.7811,.69867,.79545,.76823,.83017,.84578,.17165,.82228,0.
00076      9 .42007,-.11073,.66814,.36493,.1373,.25126,.62822,.22408,2*0.,
00077      * .81326,.81395,.81161,.82824,.78203,.89929,.60499,.84118,2*0.,
00078      A .9882,.9556,.9416,.9528,.9229,.9468,4*0.,
00079      B .94067,.92486,.9427,.94032,.95186,.90952,.89242,.92388,2*0. /
00080      IF (X.LE.XO(I1,L)) GO TO 1
00081      WT=((X-XO(I1,L))*A(I1,L))/B(I1,L)
00082      IF (WT.GT.10) GO TO 2
00083      Y=FO(I1,L)+C(I1,L)*EXP(-WT)
00084      RETURN
00085      1 Y=1.
00086      RETURN
00087      2 Y=FO(I1,L)
00088      RETURN
00089      END

```

SUBPROGRAMS CALLED

EXP.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

B	1#R	*Y	171 R	XO	172#R	FO	382#R	A	552#R
*X	742 R	*L	743 I	*I1	744 I	*WT	745 R	C	746#R

TEMPORARIES

.A0016	1138 R	.A0002	1137 R	.A0003	1140 R	.Q0000	1141 I	.Q0001	1142 I

Y   Y.FOR   FORTRAN V.5A(621) /KI/L 22-AUG-85   13:58   PAGE 1-2

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	-	-
00080	:	11	16	32	34	45	46	47	50	54

Y   OCTAL PROG SIZE=1231 [SCALARS/ARRAYS=1135 + TEMPS/CONS=8 + CODE=61 + ARGS=5]
[NO ERRORS DETECTED]

```
00001      FUNCTION YINTRP(XPTS,YPTS,X,N)
00002 C *****
00003 C LAGRANGIAN INTERPOLATION ROUTINE *
00004 C *
00005 C THE X-VALUES MUST BE MONOTONICALLY NONDECREASING *
00006 C *****
00007      DIMENSION XPTS(N),YPTS(N)
00008      N1=N-1
00009      IF (X.GT.XPTS(1)) GO TO 1
00010 C X VALUE TOO LOW - SET Y EQUAL TO YPTS(1)
00011      YINTRP=YPTS(1)
00012      RETURN
00013      1 IF (X.LT.XPTS(N)) GO TO 2
00014 C X VALUE TOO HIGH - SET Y EQUAL TO YPTS(N)
00015      YINTRP=YPTS(N)
00016      RETURN
00017      2 IF (X.GT.XPTS(2)) GO TO 3
00018 C LINEAR INTERPOLATION BETWEEN FIRST 2 POINTS
00019      YINTRP=YPTS(1)+(X-XPTS(1))*(YPTS(2)-YPTS(1))/(XPTS(2)-XPTS(1))
00020      RETURN
00021      3 IF (X.LT.XPTS(N1)) GO TO 4
00022 C LINEAR INTERPOLATION BETWEEN LAST 2 POINTS
00023      YINTRP=YPTS(N1)+(X-XPTS(N1))*(YPTS(N)-YPTS(N1))/(XPTS(N)-XPTS(N1))
00024      RETURN
00025 C FIND INTERVAL CONTAINING X (X WILL BE BETWEEN XPTS(K) AND XPTS(K+1))
00026      4 DO 5 I=3,N1
00027      IF (X.GT.XPTS(I)) GO TO 5
00028      K=I-1
00029      GO TO 6
00030      5 CONTINUE
00031      YINTRP=1.E+38
00032      RETURN
00033 C TEST FOR INVERSE INTERPOLATION
00034      6 IF (X.GE.10.) GO TO 60
00035 C TEST FOR DISTINCT X-VALUES
00036      IF ((XPTS(K-1).LT.XPTS(K)).AND.(XPTS(K+1).LT.XPTS(K+2))) GO TO 7
00037 C *****
00038 C LINEAR INTERPOLATION THROUGH XPTS(K) AND XPTS(K+1) *
00039 C *****
00040      60 YINTRP=YPTS(K)+(X-XPTS(K))*(YPTS(K+1)-YPTS(K))/(XPTS(K+1)-XPTS(K))
00041      RETURN
00042 C *****
00043 C LAGRANGE INTERPOLATION THROUGH XPTS(K-1), XPTS(K), XPTS(K+1) AND *
00044 C XPTS(K+2) *
00045 C *****
00046      7 YSUM=0.
00047      K1=K-1
00048      K2=K+2
00049      DO 9 I=K1,K2
00050      XNUM=1.
00051      XDENOM=1.
00052      DO 8 J=K1,K2
00053      IF (I.EQ.J) GO TO 8
00054      XNUM=XNUM*(X-XPTS(J))
00055      XDENOM=XDENOM*(XPTS(I)-XPTS(J))
00056      8 CONTINUE
```

```

00057      YSUM=YSUM+(XNUM/XDENOM)*YPTS(I)
00058      9 CONTINUE
00059      YINTRP=YSUM
00060      C TEST FOR MONOTONICITY OF Y-VALUES
00061      IF ((YPTS(K-1).LE.YPTS(K)).AND.(YPTS(K).LE.YPTS(K+1)).AND.
00062      1 (YPTS(K+1).LE.YPTS(K+2))) GO TO 10
00063      IF ((YPTS(K-1).GE.YPTS(K)).AND.(YPTS(K).GE.YPTS(K+1)).AND.
00064      1 (YPTS(K+1).GE.YPTS(K+2))) GO TO 10
00065      RETURN
00066      C Y-VALUES ARE MONOTONIC -
00067      C TEST FOR EXCESSIVE CURVATURE IN INTERPOLATING POLYNOMIAL
00068      10 IF (YSUM.GT.AMAX1(YPTS(K),YPTS(K+1))) GO TO 60
00069      IF (YSUM.LT.AMIN1(YPTS(K),YPTS(K+1))) GO TO 60
00070      RETURN
00071      END

```

SUBPROGRAMS CALLED

AMAX1. AMIN1.

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*N1	1 I	*N	2 I	*YINTRP	3 R	*K1	4 I	*K	5 I
*YSUM	6 R	*XDENOM	7 R	*XNUM	10 R	*J	11 I	YPTS	12#R
*X	13 R	*I	14 I	XPTS	15#R	*K2	16 I		

TEMPORARIES

.I0000	17 I	.I0001	20 I	.I0002	21 I	.I0003	22 I	.S0000	23 I
.S0001	24 I	.S0002	25 I	.A0016	26 R	.A0002	27 R	.A0003	30 R
.A0004	31 R	.A0005	32 R	.A0006	33 R				

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	:	0	-	-	-	-	-	-	22	25
00010	:	31	34	35	-	42	46	47	-	53
00020	:	66	67	74	116	-	117	123	130	133
00030	:	134	136	140	-	141	-	144	-	-
00040	:	154	172	-	-	-	173	174	177	202
00050	:	210	212	213	217	222	227	235	237	245
00060	:	-	252	-	265	-	277	-	300	307
00070	:	-	316							

YINTRP OCTAL PROG SIZE=402 [SCALARS/ARRAYS=16 + TEMPS/CONS=17 + CODE=327 + ARGS=16]
 [NO ERRORS DETECTED]

```

00001      SUBROUTINE ZCHECK(FLOW,WFLOW,NSIZE,NGRAV)
00002  C *****
00003  C THIS SUBROUTINE REPLACES ALL ZERO-VALUED WEIGHT FRACTIONS WITH 1.E-8
00004  C *****
00005      DIMENSION FLOW(23,10,4)
00006      DO 2 I=1,NSIZE
00007      DO 1 J=1,NGRAV
00008      IF (FLOW(I,J,1).EQ.0.) FLOW(I,J,1)=1.E-8
00009      1 CONTINUE
00010      IF (WFLOW.EQ.0.) WFLOW=1.E-8
00011      2 CONTINUE
00012      RETURN
00013      END

```

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*WFLOW	1 R	*J	2 I	*NSIZE	3 I	FLOW	4#R	*I	5 I
*NGRAV	6 I								

TEMPORARIES

.S0000	7 I	.S0001	10 I

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000 :	0	-	-	-	-	-	10	14	18	32
00010 :	34	40	-	43						

ZCHECK OCTAL PROG SIZE=61 [SCALARS/ARRAYS=6 + TEMPS/CONS=4 + CODE=47 + ARGS=0]
[NO ERRORS DETECTED]

END   User: *GOTTFRIED [115412,160171]   Job: MAIN   Seq: 11881   Finished: 22-Aug-85 14:06   Pages: 143   System: B   END
+*****
Images: 143   Sheets: 143

IV. DATA PREPARATION (MAINFRAME)

In order to simulate the performance of a given plant configuration the user must provide the following information:

- The number of units in the plant.
- The number of flowstreams in the plant.
- The number of size increments in the feed stream.
- The number of specific gravity increments in the feed stream.
- The quantity of output data (degree of detail) to be provided by the simulator.
- The maximum number of iterations (trial-and-error calculations) for a plant that contains one or more retreatment streams.
- The manner with which the washability calculations will be carried out (by size increments or composite).
- The number of years (time horizon), if an economic analysis is to be included.
- For each major plant component (unit), the type of unit and the appropriate unit settings ("decision variables").
- The origin and destination of each flowstream.
- The boundaries of the size increments for the feed stream.
- The weight fraction of feed in each size increment.
- The boundaries of the specific gravity increments for the feed stream.
- Parameters required to calculate the energy content of the coal as a function of percent ash.
- The specific gravity analysis (i.e., the distribution of weight, ash, pyritic sulfur and total sulfur) for the feed stream.
- The hourly feed rate and the number of hours per week that the plant is in operation.
- The equivalent uniform annual cost, or (if this is not known), a set of economic parameters that is used to calculate the equivalent uniform annual cost (namely, an appropriate interest rate, the initial capital investment, and the yearly operating cost).

Some of these items can be provided by single numerical values. For others, arrays of data will be required.

Specific instructions for preparing the input data begin on the next page. Standard FORTRAN formats are shown for each line (card) or each group of lines (cards).

(See the sample plant configuration and sample set of input data presented elsewhere in this report.)

Note: All I-field entries are right-adjusted

All A-field entries are left-adjusted

1. TITLE (Format: 20A4)

The line containing the title may contain any desired descriptive information. (This line must be present even if blank).

2. PROGRAM PARAMETERS (Format: 26I3)

NUNITS, NFlows, NSIZE, NGRAV, IOUt, ICMAX, NCOMP, NYRS, PSJ

where

NUNITS is the number of units in the plant configuration (cannot exceed 100).

NFlows is the number of flowstreams in the plant configuration (cannot exceed 200).

NSIZE is the number of size increments for the feed (cannot exceed 22).

NGRAV is the number of specific gravity increments for the feed (cannot exceed 10).

IOUt designates the output level.

IOUt = 0 (blank) causes the printing of the specific gravity analyses of the feed stream and an overall plant summary.

IOUt = 1 causes the printing of the specific gravity analyses of the feed and product stream, summary data for each unit and an overall plant summary.

IOUt = 2 causes the printing of the specific gravity analyses of all flowstreams, summary data for each unit and an overall plant summary.

ICMAX is the maximum number of iterations for a plant configuration containing retreatment streams. (Automatically set equal to 50 if left blank).

NCOMP indicates how separations will be determined.

NCOMP = 0 (blank) causes each separation to be computed by size increments using a different separation for each size increment.

NCOMP = 1 causes the entire separation to be computed using a single separation curve.

NYRS is the number of years to be used in the economic analysis. (If the economic analysis will be based upon a uniform annual cost, then NYRS should be assigned a value of 0. See item X below.)

PSJ determines the amount of output in the unit summaries.

PSJ = 0 (blank) results in abbreviated unit summaries.

PSJ = 1 generates full unit summaries.

3. UNIT DESIGNATIONS (Format: I3, 2X, F5.3, 2X, F5.3, 2X, F5.3)

L(I), D1(I), D2(I), D3(I) (one line per unit)

where L(I) designates the type of the ith unit

- L = 1: Concentrating Table
- L = 2: Dense-Medium Vessel
- L = 3: Dense-Medium Cyclone
- L = 4: Hydrocyclone
- L = 5: Single-Stage Baum Jig
- L = 6: Two-Stage Baum Jig
- L = 7: Single-Stage Batac Jig
- L = 8: Two-Stage Batac Jig
- L = 9: Sand Cone
- L = 10: Dynawhirpool
- L = 19: Froth Flotation
- L = 21: Rotary Breaker
- L = 22: Primary Multiple Roll Crusher
- L = 23: Primary Gyratory/Jaw Crusher
- L = 24: Primary Single Roll Crusher
- L = 25: Primary Cage Mill Crusher
- L = 26: Secondary Multiple Roll Crusher
- L = 27: Secondary Gyratory/Jaw Crusher
- L = 28: Secondary Single Roll Crusher
- L = 29: Secondary Cage Mill Crusher
- L = 31: Dry Upper Screen
- L = 32: Dry Lower Screen
- L = 33: Wet Upper Screen
- L = 34: Wet Lower Screen
- L = 41: Stream Blender
- L = 51: Stream Splitter
- L = 61: Perforated Basket Centrifuge
- L = 62: Vibrating Basket Centrifuge
- L = 63: Solid Bowl Centrifuge
- L = 64: Continuous Disk Filter
- L = 67: Thermal Dryer
- L = 69: Thickener

L = 71: Classifying Hydrocyclone
 L = 72: Sieve bend

D1(I), D2(I) and D3(I) represent the decision variables for the respective units as follows:

Washers (L = 1 through 10):

D1 = Specific gravity of separation
 D2 = Water demand (either fresh water or
       water from thickener, gal/min)
 D3 = Blank

Froth Flotation (L=19):

D1 = Water demand (either fresh water or
       water from thickener, gal/min)
 D2 = Blank
 D3 = Blank

Rotary Breaker (L = 21):

D1 = Length (feet)
 D2 = Diameter (feet)
 D3 = Screen size (inches)
       (D3 should be assigned a value
       of either 6 or 8 inches)

Crushers (L = 22 through 29):

D1 = Crusher setting (inches)
 D2 = Blank
 D3 = Blank

Dry Screens (L = 31 or 32):

D1 = Screen Size (inches)
 D2 = Blank
 D3 = Blank

Wet Screens (L = 33 or 34):

D1 = Screen Size (inches)
 D2 = Water demand (either fresh water or
       water from thickener, gal/min)
 D3 = Blank

Blender (L = 41):

D1 = Blank
 D2 = Blank
 D3 = Blank

Splitter (L = 51):

- D1 = Percent of feed diverted to the overflow stream.
- D2 = Blank
- D3 = Blank

Centrifuges (L = 61, 62, or 63):

- D1 = Diameter of centrifuge basket at discharge (inches)
Default: Centrifugal force set to 300 g
- D2 = Thickness of cake at discharge (inches)
Default: 1 inch
- D3 = Rotational speed of centrifuge (rpm)
Default: Centrifugal force set to 300 g

Continuous Disk Filter (L = 64):

- D1 = Area of filter (square feet)
Default: Determined by feed rate to filter.
75 square feet per (lb/hr) of feed
- D2 = D2 positive: cycle time (minutes)
D2 negative: cake thickness (inches)
Default: Cake thickness equals 1 inch
- D3 = Pressure difference across filter (psi)
Default: 9.8 psi

Fluid Bed Thermal Dryer (L = 67):

- D1 = Moisture content of dried coal (percent - wet basis)
Default: 4 percent
- D2 = Temperature of combustion gases entering dryer (F)
Default: 1000 F
- D3 = D3 positive: Gas temperature leaving dryer (F)
D3 negative: Relative humidity of dryer gas (%)
Default: 150 F

Gravity Thickener (L = 69):

- D1 = Cross sectional area of thickener (square feet)
Default: All solids report to underflow
- D2 = Percent solids in underflow
Default: 35 %
- D3 = Flocculant correction factor
Default: 1.0

Note: Only one thickener is allowed. The overflow and underflow from the thickener must be products leaving the plant (i.e., they cannot be feeds to any other unit)

Classifying hydrocyclone (L = 71):

- D1 = Diameter of cyclone (inches).
- D2 = Water demand (either fresh water or water from thickener, gal/min)
- D3 = Blank

Sieve bend (L = 72):

D1 = Slot width (inches).
D2 = Water demand (either fresh water or
water from thickener, gal/min)
D3 = Blank

Note: The units must be specified in the same order that the calculations will be carried out.

All units will have one input stream and two output streams, with the following exceptions

1. 2-Stage Baum Jig (L = 6)
One input stream, three output streams
2. 2-Stage Batac Jig (L = 8)
One input stream, three output streams
3. Crushers (L = 22, 23, 24, 25, 26, 27, 28, or 29)
One input stream, one output stream
4. Stream Blender (L = 41)
Two input streams, one output stream
5. Thermal Dryer (L = 67)
One input stream, one output stream

4. FLOWSTREAM DESIGNATIONS (Format: 2I3, 2X, A1)

KF (1, J) KF (2, J), S(J) (One line per flowstream)

where KF (1, J) designates the index (I) of the unit from which the jth flowstream originates (0 indicates feed into the plant).

KF (2, J) designates the index (I) of the unit which is the designation of the jth flowstream (0 indicates a product leaving the plant).

S (J) is the symbol for a stream leaving a unit

(blank) indicates a feed stream entering the Ith unit

C indicates a clean coal stream leaving Ith unit

M indicates a middlings stream leaving the Ith unit (2-stage jig)

R indicates a refuse stream leaving the Ith unit

U indicates an upper (overflow) stream leaving the Ith unit (screens, classifying hydrocyclone, sieve bend or splitter)

L indicates a lower (underflow) stream leaving the Ith unit (screens, classifying hydrocyclone, sieve bend or splitter)

For dewatering units (L = 61 through 69) the following optional symbols can be used if desired (C, M or R can also be used)

S indicates a stream which is primarily solid

W indicates a stream which is primarily water

For those units that have only one exit stream (e.g., crushers, blender), a stream symbol is not required (leave blank).

5. SIZE BOUNDARIES (Format: 8(6A1, 4X))

SYMBOL(1), SYMBOL(2), ..., SYMBOL(NSIZE + 1)

where SYMBOL(1) = the lower size boundary for the first size increment, in inches or mesh size.

SYMBOL(2) = the upper size boundary for the first size increment (inches or mesh).

SYMBOL(3) = the upper size boundary for the second size increment (inches or mesh).

.

.

.

SYMBOL(NSIZE + 1) = the upper size boundary for the last size increment (inches or mesh).

Note: The values begin in columns 1, 11, 21, ..., 71. Two or three lines (or cards) may be required, since there can be as many as 23 size boundaries.

Additional Notes: the size boundaries are actually read as characters and converted internally to numerical quantities. Fractional quantities must be written as fractions (not decimals), with a slash between the numerator and denominator. Mixed quantities (whole number and fraction) must have a dash (actually, a minus sign) separating the whole number from the fraction. Thus the quantity 1-5/8 would appear as

1-5/8

Blank spaces cannot appear within the number.

6. WEIGHT DISTRIBUTION (Format: 13(1X, F5.1))

WT(1), WT(2), ..., WT(NSIZE)

where WT(1) = the weight percent of the entire feed stream
in the first size increment

WT(2) = the weight percent of the entire feed stream
in the second size increment

.

.

.

WT(NSIZE) = the weight percent of the entire feed
stream in the last size increment

Note: The sum of these values must equal 100.

7. SPECIFIC GRAVITY BOUNDARIES (Format: 13(1X, F5.3))

GBOUND(1), GBOUND(2), ..., GBOUND(NGRAV + 1)

where GBOUND(1) = the lower specific gravity boundary for
the first specific gravity increment

GBOUND(2) = the upper specific gravity boundary for
the first specific gravity increment

GBOUND(3) = the upper specific gravity boundary for
the second specific gravity increment

.

.

.

GBOUND(NGRAV + 1) = the upper specific gravity boundary for
the last specific gravity increment

Note: The program may automatically add additional gravity
increments if the last gravity increment spans a
relatively large range (e.g., 1.60 - 2.80).

8. BTU CONTENT (Format: 8(F7.5, 3X))

BTU1, BTU2, BTU3, BTU4

where the above parameters are used to calculate the BTU content of the coal (in BTU/lb) using the formula

$$\text{BTU/lb} = \text{Max} \begin{matrix} \text{BTU1} - \text{BTU2*ASH} + \text{BTU3*ASH**2} \\ \text{BTU4} \end{matrix}$$

and ASH represents percent ash.

Note: If these values are not available, then the BTU content will be calculated by another method, using the atomic constituency of the coal. Specifically, if BTU1 is entered as zero, then BTU2 will be interpreted as the weight percent hydrogen (on a dry, ash-free basis), BTU3 will be the weight percent oxygen, and BTU4 will be the weight percent nitrogen. If the weight percents are not known, then a value of zero should be entered for BTU2. The program will then use its own default values (4 percent hydrogen, 8 percent oxygen and 1 percent nitrogen).

9. SPECIFIC GRAVITY ANALYSIS OF FEED STREAM (Format: 8(F7.5, 3X))

FEED(I, J, 1), FEED(I, J, 2), FEED(I, J, 3), FEED(I, J, 4)

where FEED(I, J, 1) = the weight percent for the Ith size increment, Jth specific gravity increment. (Within each size increment, the sum of these values for all J must equal 100.)

FEED(I, J, 2) = the percent ash for the Ith size increment, Jth specific gravity increment.

FEED(I, J, 3) = the percent pyritic sulfur for the Ith size increment, Jth specific gravity increment.

Notes: The numerical values begin in columns 1, 11, 21, and 31.
There will be a total of

NSIZE x NGRAV

lines or cards (maximum number: $22 \times 10 = 220$).

To arrange the data in the proper order, note that the J subscripts must increase more rapidly than the I subscripts. In other words, the specific gravity data are nested within the size data.

10. PLANT PARAMETERS (Format: 3F10.2)

1. If NYRS was assigned a value of zero (see item 2), then enter

TONAGE, HRS, COST

where TONAGE = tons of feed processed per hour

HRS = the number of hours per week that the plant is in operation

COST = annual total cost (assumed constant from one year to the next - thousands of dollars)

2. If NYRS was assigned a nonzero value (see item 2), then enter

TONAGE, HRS, INTRST

where TONAGE = tons of feed processed per hour

HRS = the number of hours per week that the plant is in operation

INTRST = effective annual interest rate, which expresses the time value of money (percentage)

Note: the computer will calculate an equivalent annual total cost if the second option is selected.

11. INITIAL INVESTMENT AND YEARLY COSTS (Format: 3F10.2)

(Enter only if option 2 was selected in item 10 above.
Enter only one quantity per line.)

INV, YCF(1), YCF(2), ..., YCF(NYRS)

where INV = initial capital investment (thousands of
dollars)

YCF(1) = annual cost for year 1

YCF(2) = annual cost for year 2

.

.

.

YCF(NYRS) = annual cost for the last year (i.e., year NYRS)

V. SAMPLE PROBLEM (MAINFRAME)

Figure 1 presents a flowsheet of a sample plant configuration containing 19 units and 32 flowstreams. The configuration consists of 5 washers, 1 rotary breaker, 1 crusher, 1 classifier, 2 screens, 3 dewatering devices, 1 thickener and 5 blenders. The units are numbered consecutively, as are the flowstreams.

The actual input for this plant configuration is presented below. Notice that the decision variables (i.e., the operating conditions) for each of the units are included in the data (lines 3-21). Zeros are shown for those units that do not require any decision variables (froth flotation cells and blenders). The flowstream interconnections, which tie together the entire plant configuration, is given in lines 22-53. Lines 54-55 contain the size boundaries, lines 56-57 contain weight distributions for the various size increments, line 58 contains the specific gravity boundaries, and line 59 contains BTU data of the incoming coal. This is followed by a lengthy block of data (2 pages) that characterize the incoming coal. Finally, the last 12 lines contain economic data.

COAL PREPARATION PLANT SIMULATOR - SAMPLE PLANT CONFIGURATION (AUGUST, 1985)

```

19 32 14 8 1 0 0 10 1
21 20.00 12.00 6.00
33 1.5 1200. 0.
34 0.375 0. 0.
24 0.023 0. 0.
41 0. 0. 0.
9 1.32 750. 0.
71 14.0 180. 0.
19 0. 150. 0.
3 1.40 0. 0.
2 1.50 500. 0.
4 1.75 0. 0.
61 36.0 1.0 750.
41 0. 0. 0.
64 0. 3.0 10.0
67 5. 1000. 0.
41 0. 0. 0.
41 0. 0. 0.
69 1000. 0.35 1.5
41 0. 0. 0.
0 1 x
1 0 R
1 2 C
2 5 U
2 3 L
3 5 U
3 4 L
5 6 x
4 7 x
7 8 U
7 9 L
6 19 C
9 12 C
6 10 R
12 19 C
10 16 C
12 13 R
13 14 x
9 11 R
8 13 C
8 17 R
11 16 C
11 17 R
14 15 C
14 17 R
10 0 R
16 0 M
17 18 R
18 0 W
18 0 R
15 19 C
19 0 C
18 12 6 4 2 1 1/2 1/4
8 14 28 48 100 200 325
7.0 23.0 17.0 15.0 8.0 7.0 5.0 6.0 3.0 3.0 1.9 1.4 1.2
1.5
1.26 1.30 1.35 1.40 1.50 1.60 1.70 1.80 2.60
14500.0 170.0 0. 2000.

```

19.70	2.80	.21	.79
11.00	4.40	.71	1.57
2.10	7.80	.98	1.59
11.30	15.40	1.10	1.60
2.10	25.00	1.44	1.84
1.90	31.50	2.90	3.50
.80	41.00	5.46	6.13
51.10	84.60	18.43	19.23
16.70	2.90	.18	.80
14.30	4.70	.62	1.22
5.30	9.40	1.05	1.65
5.30	16.70	1.52	2.08
4.10	26.70	1.97	2.47
2.10	35.10	3.23	3.78
1.20	45.70	6.07	6.56
50.90	82.90	17.00	18.14
21.30	2.80	.13	.80
11.80	4.40	.64	1.32
2.20	7.80	1.25	1.85
12.10	15.30	1.88	2.49
1.90	24.90	2.68	3.25
1.70	31.50	4.01	4.66
.70	41.00	5.55	6.30
47.90	84.60	20.13	20.98
20.30	2.80	.80	.74
17.40	4.70	.46	.86
6.40	9.40	1.00	1.52
6.20	16.50	1.58	2.11
4.30	26.30	3.01	3.27
2.10	35.10	4.50	4.65
1.10	45.40	5.69	6.00
41.80	82.70	21.03	21.95
22.00	2.40	.14	.77
19.90	4.70	.49	.99
6.90	9.60	.95	1.40
7.50	16.10	1.41	1.95
4.50	25.90	2.06	2.49
2.20	34.10	3.51	3.97
1.60	42.30	5.56	6.04
35.20	82.60	17.54	20.02
28.00	2.40	.12	.60
21.80	4.70	.29	.79
8.30	9.50	.75	1.20
7.60	15.90	1.18	1.64
3.90	24.70	2.46	2.80
2.20	32.90	3.89	4.21
1.60	42.00	5.50	5.80
26.30	82.80	24.02	24.54
33.40	2.40	.08	.64
23.00	4.80	.11	.69
7.50	9.70	.45	.92
6.90	15.70	.65	1.17
3.20	25.70	1.48	1.86
1.80	33.80	2.79	3.00
1.50	41.40	3.87	4.04
22.40	84.20	21.09	21.89
42.80	2.10	.13	.81
21.50	4.60	.64	1.34
6.90	9.20	1.25	1.87
6.00	15.30	1.86	2.49

15000.
15000.
10000.
10000.
10000.

The corresponding output data (generated by the simulator for the preceding input data) are shown on the succeeding pages. Notice that this volume of output is obtained using output level 1, which is an intermediate output level.

COAL PREPARATION PLANT SIMULATOR

COAL PREPARATION PLANT SIMULATOR - SAMPLE PLANT CONFIGURATION (AUGUST, 1985)

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES		
1	21 (ROTARY BREAKER)	20.00	12.000	8.000
2	33 (WET UPPER SCREEN)	1.500	1200.000	
3	34 (WET LOWER SCREEN)	0.375	0.000	
4	24 (PRIMARY SINGLE ROLL CRUSHER)		0.023	
5	41 (STREAM BLENDER)		0.000	
6	9 (SAND CONE)	1.320	750.000	
7	71 (CLASSIFYING HYDROCYCLONE)	14.000	180.000	
8	19 (FROTH FLOTATION)		0.000	
9	3 (DENSE-MEDIUM CYCLONE)	1.400	0.000	
10	2 (DENSE-MEDIUM VESSEL)	1.500	800.000	
11	4 (HYDROCYCLONE)	1.750	0.000	
12	81 (PERFORATED BASKET CENTRIFUGE)	38.00	1.000	750.000
13	41 (STREAM BLENDER)		0.000	
14	84 (CONTINUOUS DISK FILTER)	0.00	3.000	10.000
15	87 (THERMAL DRYER)	5.00	1000.000	0.000
16	41 (STREAM BLENDER)		0.000	
17	41 (STREAM BLENDER)		0.000	
18	89 (THICKENER)	1000.00	0.350	1.500
19	41 (STREAM BLENDER)		0.000	

FLOWSTREAM NUMBER	ORIGIN - UNIT NUMBER	DESTINATION - UNIT NUMBER
1 (FEED)	0 X	1
2 (REFUSE PRODUCT)	1 R	0

3	1 C	2
4	2 U	5
5	2 L	3
6	3 U	5
7	3 L	4
8	5 x	6
9	4 x	7
10	7 U	8
11	7 L	9
12	6 C	19
13	9 C	12
14	6 R	10
15	12 C	19
16	10 C	16
17	12 R	13
18	13 x	14
19	9 R	11
20	8 C	13
21	8 R	17
22	11 C	16
23	11 R	17
24	14 C	15
25	14 R	17
26 (REFUSE PRODUCT)	10 R	0
27 (MIDLINGS PRODUCT)	16 M	0
28	17 R	18
29	18 W	0
30 (REFUSE PRODUCT)	18 R	0
31	15 C	19
32 (CLEAN COAL PRODUCT)	19 C	0

NUNITS= 19   NFlOWS= 32   NSIZE= 14   NGRAV= 10   IOUT= 1   ICMAX= 50   NCOMP= 0   NYRS= 10

BTU(1)=14500.0   BTU(2)= 170.0   BTU(3)= 0.000   BTU(4)= 2000.0   FEED MOISTURE= 2.0 PERCENT

TONNAGE= 800.00   HRS= 80.00   YCOST= 3008285.40   INTEREST= 15.00 %   INITIAL INVESTMENT= 15000000.00

YEAR= 1   YEARLY CASH FLOW= 20000.00
YEAR= 2   YEARLY CASH FLOW= 20000.00
YEAR= 3   YEARLY CASH FLOW= 20000.00
YEAR= 4   YEARLY CASH FLOW= 20000.00
YEAR= 5   YEARLY CASH FLOW= 20000.00
YEAR= 6   YEARLY CASH FLOW= 15000.00
YEAR= 7   YEARLY CASH FLOW= 15000.00
YEAR= 8   YEARLY CASH FLOW= 10000.00
YEAR= 9   YEARLY CASH FLOW= 10000.00
YEAR= 10   YEARLY CASH FLOW= 10000.00

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 1

ROTARY BREAKER

LENGTH = 20.00 FEET

DIAMETER = 12.00 FEET

SIZE OF OPENING = 8.00 INCHES

SIZE, INCHES OR MESH	18 BY 12	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14
SCREEN ANALYSIS, PERCENT:									
FEED (COAL + ROCK).....	7.0	23.0	17.0	15.0	8.0	7.0	5.0	6.0	3.0
OVERFLOW (REFUSE) STREAM.....	75.3	24.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNDERFLOW (PRODUCT) STREAM.....	0.0	5.1	29.9	22.0	11.1	7.9	5.8	6.2	3.2
ASH, PERCENT:									
FEED (COAL + ROCK).....	47.6	47.2	45.1	40.1	35.1	27.9	24.7	19.1	18.5
OVERFLOW (REFUSE) STREAM.....	47.6	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNDERFLOW (PRODUCT) STREAM.....	0.0	46.4	46.0	42.7	38.0	31.0	26.5	20.6	18.6
PYRITIC SULFUR, PERCENT:									
FEED (COAL + ROCK).....	9.81	9.14	10.20	9.52	6.75	6.88	5.03	4.00	4.06
OVERFLOW (REFUSE) STREAM.....	9.81	9.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERFLOW (PRODUCT) STREAM.....	0.00	9.65	9.65	9.45	7.73	7.04	5.54	4.30	4.02
TOTAL SULFUR, PERCENT:									
FEED (COAL + ROCK).....	10.52	10.01	10.95	10.05	7.97	7.34	5.62	4.71	4.58
OVERFLOW (REFUSE) STREAM.....	10.52	10.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERFLOW (PRODUCT) STREAM.....	0.00	10.45	10.44	10.12	8.71	7.65	6.15	5.00	4.57
BTU PER POUND, MOISTURE FREE:									
FEED (COAL + ROCK).....	7368.	7294.	7732.	8336.	9082.	10171.	10708.	11505.	11620.
OVERFLOW (REFUSE) STREAM.....	7368.	7368.	0.	0.	0.	0.	0.	0.	0.
UNDERFLOW (PRODUCT) STREAM.....	0.	7479.	7532.	7990.	8664.	9711.	10425.	11274.	11582.
COAL PRODUCT/COAL FEED..... PERCENT	0.0	22.2	175.5	146.4	138.3	113.2	111.7	103.9	105.5

*****

SIZE, INCHES OR MESH	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:						
FEED (COAL + ROCK).....	3.0	1.9	1.4	1.2	1.5	100.0
OVERFLOW (REFUSE) STREAM.....	0.0	0.0	0.0	0.0	0.0	100.0
UNDERFLOW (PRODUCT) STREAM.....	2.9	2.0	1.4	1.3	1.4	100.0
ASH, PERCENT:						
FEED (COAL + ROCK).....	12.4	12.4	10.8	13.0	13.2	36.7
OVERFLOW (REFUSE) STREAM.....	0.0	0.0	0.0	0.0	0.0	47.6
UNDERFLOW (PRODUCT) STREAM.....	13.3	12.5	11.3	12.9	13.2	36.7
PYRITIC SULFUR, PERCENT:						
FEED (COAL + ROCK).....	2.44	3.00	2.88	4.45	3.91	7.87
OVERFLOW (REFUSE) STREAM.....	0.00	0.00	0.00	0.00	0.00	9.81

UNDERFLOW (PRODUCT) STREAM.....	2.87	2.98	3.02	4.28	3.95	7.88
TOTAL SULFUR, PERCENT:						
FEED (COAL + ROCK).....	2.98	3.80	3.33	4.73	4.30	8.58
OVERFLOW (REFUSE) STREAM.....	0.00	0.00	0.00	0.00	0.00	10.52
UNDERFLOW (PRODUCT) STREAM.....	3.21	3.55	3.47	4.58	4.34	8.58
BTU PER POUND, MOISTURE FREE:						
FEED (COAL + ROCK).....	12385.	12388.	12880.	12283.	12258.	8888.
OVERFLOW (REFUSE) STREAM.....	0.	0.	0.	0.	0.	7368.
UNDERFLOW (PRODUCT) STREAM.....	12243.	12369.	12584.	12303.	12251.	8888.
COAL PRODUCT/COAL FEED..... PERCENT	97.8	103.3	102.1	108.5	98.1	99.9

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 2

WET UPPER SCREEN

SIZE OF OPENING = 1.50 INCHES

WATER ADDED = 1200.0 GPM

SIZE, INCHES OR MESH	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED.....	5.1	29.9	22.0	11.1	7.9	5.6	6.2	3.2	2.9
OVERFLOW (COARSE) STREAM.....	8.0	48.8	34.4	10.8	0.1	0.0	0.0	0.0	0.0
UNDERFLOW (FINE) STREAM.....	0.0	0.0	0.0	11.9	21.7	15.4	17.2	8.8	8.1
ASH, PERCENT:									
FEED.....	46.4	46.0	42.7	38.0	31.0	26.5	20.6	18.6	13.3
OVERFLOW (COARSE) STREAM.....	46.4	46.0	42.7	38.0	31.0	26.5	20.6	18.6	13.3
UNDERFLOW (FINE) STREAM.....	0.0	0.0	0.0	38.0	31.0	26.5	20.6	18.6	13.3
PYRITIC SULFUR, PERCENT:									
FEED.....	9.65	9.65	9.45	7.73	7.04	5.54	4.30	4.02	2.67
OVERFLOW (COARSE) STREAM.....	9.65	9.65	9.45	7.73	7.04	5.54	4.30	4.02	2.67
UNDERFLOW (FINE) STREAM.....	0.00	0.00	0.00	7.73	7.04	5.54	4.30	4.02	2.67
TOTAL SULFUR, PERCENT:									
FEED.....	10.45	10.44	10.12	8.71	7.65	6.15	5.00	4.57	3.21
OVERFLOW (COARSE) STREAM.....	10.45	10.44	10.12	8.71	7.65	6.15	5.00	4.57	3.21
UNDERFLOW (FINE) STREAM.....	0.00	0.00	0.00	8.71	7.65	6.15	5.00	4.57	3.21
BTU PER POUND, MOISTURE FREE:									
FEED.....	7479.	7532.	7990.	8664.	9711.	10425.	11274.	11582.	12243.
OVERFLOW (COARSE) STREAM.....	7479.	7532.	7990.	8664.	9711.	10425.	11274.	11582.	12243.
UNDERFLOW (FINE) STREAM.....	0.	0.	0.	8664.	9711.	10425.	11274.	11582.	12243.
WEIGHT RATIO, UNDERFLOW TO FEED.... PERCENT	0.0	0.0	0.0	38.8	98.9	99.9	100.0	100.0	100.0
BTU RATIO, UNDERFLOW TO FEED..... DO	0.0	0.0	0.0	38.8	98.9	99.9	100.0	100.0	100.0

*****

SIZE, INCHES OR MESH	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:					
FEED.....	2.0	1.4	1.3	1.4	100.0
OVERFLOW (COARSE) STREAM.....	0.0	0.0	0.0	0.0	100.0
UNDERFLOW (FINE) STREAM.....	5.4	4.0	3.5	4.0	100.0
ASH, PERCENT:					
FEED.....	12.5	11.3	12.9	13.2	36.7
OVERFLOW (COARSE) STREAM.....	12.5	11.3	12.9	13.2	44.0
UNDERFLOW (FINE) STREAM.....	12.5	11.3	12.9	13.2	23.7

PYRITIC SULFUR, PERCENT:

FEED.....	2.98	3.02	4.28	3.95	7.88
OVERFLOW (COARSE) STREAM.....	2.98	3.02	4.28	3.95	9.37
UNDERFLOW (FINE) STREAM.....	2.98	3.02	4.28	3.95	5.20

TOTAL SULFUR, PERCENT:

FEED.....	3.55	3.47	4.58	4.34	8.58
OVERFLOW (COARSE) STREAM.....	3.55	3.47	4.58	4.34	10.14
UNDERFLOW (FINE) STREAM.....	3.55	3.47	4.58	4.34	5.83

BTU PER POUND, MOISTURE FREE:

FEED.....	12389.	12584.	12303.	12251.	8888.
OVERFLOW (COARSE) STREAM.....	12389.	12584.	12303.	12251.	7809.
UNDERFLOW (FINE) STREAM.....	12389.	12584.	12303.	12251.	10788.

WEIGHT RATIO, UNDERFLOW TO FEED.... PERCENT	100.0	100.0	100.0	100.0	38.2
BTU RATIO, UNDERFLOW TO FEED..... DO	100.0	100.0	100.0	100.0	43.9

WATER IN = 1200.0 GALLONS/MIN
WATER OUT = 0.0 GALLONS/MIN

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 3

WET LOWER SCREEN

SIZE OF OPENING = .38 INCHES

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200
SCREEN ANALYSIS, PERCENT:									
FEED.....	11.9	21.7	15.4	17.2	8.8	8.1	5.4	4.0	3.5
OVERFLOW (COARSE) STREAM.....	26.8	48.8	23.2	1.1	0.1	0.0	0.0	0.0	0.0
UNDERFLOW (FINE) STREAM.....	0.0	0.0	9.3	30.2	15.7	14.5	9.7	7.1	6.3
ASH, PERCENT:									
FEED.....	38.0	31.0	26.5	20.6	18.6	13.3	12.5	11.3	12.9
OVERFLOW (COARSE) STREAM.....	38.0	31.0	26.5	20.6	18.6	13.3	12.5	11.3	12.9
UNDERFLOW (FINE) STREAM.....	0.0	0.0	26.5	20.6	18.6	13.3	12.5	11.3	12.9
PYRITIC SULFUR, PERCENT:									
FEED.....	7.73	7.04	5.54	4.30	4.02	2.67	2.96	3.02	4.26
OVERFLOW (COARSE) STREAM.....	7.73	7.04	5.54	4.30	4.02	2.67	2.96	3.02	4.26
UNDERFLOW (FINE) STREAM.....	0.00	0.00	5.54	4.30	4.02	2.67	2.96	3.02	4.26
TOTAL SULFUR, PERCENT:									
FEED.....	8.71	7.65	6.15	5.00	4.57	3.21	3.55	3.47	4.56
OVERFLOW (COARSE) STREAM.....	8.71	7.65	6.15	5.00	4.57	3.21	3.55	3.47	4.56
UNDERFLOW (FINE) STREAM.....	0.00	0.00	6.15	5.00	4.57	3.21	3.55	3.47	4.56
BTU PER POUND, MOISTURE FREE:									
FEED.....	8664.	9711.	10425.	11274.	11582.	12243.	12369.	12584.	12303.
OVERFLOW (COARSE) STREAM.....	8664.	9711.	10425.	11274.	11582.	12243.	12369.	12584.	12303.
UNDERFLOW (FINE) STREAM.....	0.	0.	10425.	11274.	11582.	12243.	12369.	12584.	12303.
WEIGHT RATIO, UNDERFLOW TO FEED.... PERCENT	0.0	0.0	33.4	97.2	99.5	99.7	99.8	99.8	99.9
BTU RATIO, UNDERFLOW TO FEED..... DO	0.0	0.0	33.4	97.2	99.5	99.7	99.8	99.8	99.9

*****

SIZE, INCHES OR MESH	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:		
FEED.....	4.0	100.0
OVERFLOW (COARSE) STREAM.....	0.0	100.0
UNDERFLOW (FINE) STREAM.....	7.2	100.0
ASH, PERCENT:		
FEED.....	13.2	23.7
OVERFLOW (COARSE) STREAM.....	13.2	31.7
UNDERFLOW (FINE) STREAM.....	13.2	17.3

PYRITIC SULFUR, PERCENT:			
FEED.....	3.95	5.20	
OVERFLOW (COARSE) STREAM.....	3.95	6.84	
UNDERFLOW (FINE) STREAM.....	3.95	3.88	
TOTAL SULFUR, PERCENT:			
FEED.....	4.34	5.83	
OVERFLOW (COARSE) STREAM.....	4.34	7.55	
UNDERFLOW (FINE) STREAM.....	4.34	4.45	
BTU PER POUND, MOISTURE FREE:			
FEED.....	12251.	10788.	
OVERFLOW (COARSE) STREAM.....	12251.	9617.	
UNDERFLOW (FINE) STREAM.....	12251.	11720.	
WEIGHT RATIO, UNDERFLOW TO FEED....	PERCENT	99.9	55.6
BTU RATIO, UNDERFLOW TO FEED.....	DO	99.9	60.4

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 4

PRIMARY SINGLE ROLL CRUSHER

CRUSHER SETTING = .02 INCHES

SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED.....	9.3	30.2	15.7	14.5	9.7	7.1	6.3	7.2	100.0
CRUSHED COAL.....	0.0	5.0	31.7	21.5	15.9	10.1	7.9	7.9	100.0
ASH, PERCENT:									
FEED.....	26.5	20.6	18.6	13.3	12.5	11.3	12.9	13.2	17.3
CRUSHED COAL.....	24.3	21.8	21.1	17.2	14.7	13.2	13.5	13.7	17.3
PYRITIC SULFUR, PERCENT:									
FEED.....	5.54	4.30	4.02	2.67	2.96	3.02	4.26	3.95	3.88
CRUSHED COAL.....	5.07	4.55	4.43	3.60	3.24	3.28	4.05	3.95	3.88
TOTAL SULFUR, PERCENT:									
FEED.....	6.15	5.00	4.57	3.21	3.55	3.47	4.56	4.34	4.45
CRUSHED COAL.....	5.71	5.23	5.09	4.18	3.82	3.77	4.42	4.35	4.45
BTU PER POUND, MOISTURE FREE:									
FEED.....	10425.	11274.	11582.	12243.	12369.	12584.	12303.	12251.	11720.
CRUSHED COAL.....	10749.	11107.	11202.	11708.	12002.	12249.	12197.	12166.	11694.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 5

STREAM BLENDER

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED 1.....	8.0	48.8	34.4	10.8	0.1	0.0	0.0	0.0	0.0
FEED 2.....	0.0	0.0	0.0	28.8	48.8	23.2	1.1	0.1	0.0
PRODUCT.....	8.4	37.4	27.5	13.9	9.9	4.7	0.2	0.0	0.0
ASH, PERCENT:									
FEED 1.....	48.4	48.0	42.7	38.0	31.0	28.5	20.8	18.8	13.3
FEED 2.....	0.0	0.0	0.0	38.0	31.0	28.5	20.8	18.8	13.3
PRODUCT.....	48.4	48.0	42.7	38.0	31.0	28.5	20.8	18.8	13.0
PYRITIC SULFUR, PERCENT:									
FEED 1.....	9.85	9.85	9.45	7.73	7.04	5.54	4.30	4.02	2.87
FEED 2.....	0.00	0.00	0.00	7.73	7.04	5.54	4.30	4.02	2.87
PRODUCT.....	9.85	9.85	9.45	7.73	7.04	5.54	4.30	4.02	2.82
TOTAL SULFUR, PERCENT:									
FEED 1.....	10.45	10.44	10.12	8.71	7.85	6.15	5.00	4.57	3.21
FEED 2.....	0.00	0.00	0.00	8.71	7.85	6.15	5.00	4.57	3.21
PRODUCT.....	10.45	10.44	10.12	8.71	7.85	6.15	5.00	4.57	3.16
BTU PER POUND, MOISTURE FREE:									
FEED 1.....	7479.	7532.	7990.	8684.	9711.	10425.	11274.	11582.	12243.
FEED 2.....	14500.	14500.	14500.	8684.	9711.	10425.	11274.	11582.	12243.
PRODUCT.....	7479.	7532.	7990.	8684.	9711.	10425.	11274.	11582.	12293.

*****

SIZE, INCHES OR MESH	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:					
FEED 1.....	0.0	0.0	0.0	0.0	100.0
FEED 2.....	0.0	0.0	0.0	0.0	100.0
PRODUCT.....	0.0	0.0	0.0	0.0	100.0
ASH, PERCENT:					
FEED 1.....	12.5	11.3	12.9	13.2	44.0
FEED 2.....	12.5	11.3	12.9	13.2	31.7
PRODUCT.....	11.5	8.7	7.3	7.4	41.5
PYRITIC SULFUR, PERCENT:					
FEED 1.....	2.98	3.02	4.28	3.95	9.37
FEED 2.....	2.98	3.02	4.28	3.95	8.84
PRODUCT.....	2.81	1.85	2.31	2.04	8.86

TOTAL SULFUR, PERCENT:

FEED 1.....	3.55	3.47	4.56	4.34	10.14
FEED 2.....	3.55	3.47	4.56	4.34	7.55
PRODUCT.....	3.37	2.03	2.54	2.38	9.62

BTU PER POUND, MOISTURE FREE:

FEED 1.....	12369.	12584.	12303.	12251.	7809.
FEED 2.....	12369.	12584.	12303.	12251.	9617.
PRODUCT.....	12542.	13355.	13265.	13249.	8173.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 8

SAND CONE

SPECIFIC GRAVITY OF SEPARATION = 1.32

WATER ADDED = 750.0 GPM

SIZE, INCHES OR MESH	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED.....	6.4	37.4	27.5	13.9	9.9	4.7	0.2	0.0	0.0
CLEAN COAL.....	4.4	25.9	27.6	16.2	15.8	9.4	0.5	0.0	0.0
REFUSE.....	7.2	41.9	27.5	12.9	7.6	2.8	0.1	0.0	0.0
ASH, PERCENT:									
FEED.....	46.4	46.0	42.7	38.0	31.0	26.5	20.6	18.6	13.0
CLEAN COAL.....	2.9	2.9	3.4	3.5	3.8	4.2	3.6	3.1	3.4
REFUSE.....	56.9	56.5	58.2	55.1	53.4	56.3	52.4	52.7	38.4
PYRITIC SULFUR, PERCENT:									
FEED.....	9.65	9.65	9.45	7.73	7.04	5.54	4.30	4.02	2.62
CLEAN COAL.....	0.17	0.21	0.52	0.35	0.24	0.20	0.36	0.34	0.33
REFUSE.....	11.93	11.85	12.99	11.39	12.61	12.69	11.63	12.10	8.67
TOTAL SULFUR, PERCENT:									
FEED.....	10.45	10.44	10.12	8.71	7.85	6.15	5.00	4.57	3.18
CLEAN COAL.....	0.81	0.81	0.85	0.86	0.75	0.76	1.02	0.85	0.88
REFUSE.....	12.77	12.78	13.80	12.60	13.32	13.35	12.41	12.74	9.21
BTU PER POUND, MOISTURE FREE:									
FEED.....	7479.	7532.	7990.	8664.	9711.	10425.	11274.	11582.	12293.
CLEAN COAL.....	14010.	14010.	13921.	13911.	13862.	13790.	13887.	13969.	13929.
REFUSE.....	5905.	5957.	5639.	6065.	6306.	5929.	6408.	6330.	7964.
ACTUAL RECOVERY..... PERCENT	19.4	19.6	28.4	33.1	45.1	57.2	65.1	68.8	72.6
THEORETICAL RECOVERY..... DO	19.9	20.0	32.0	38.5	50.7	62.2	69.5	72.7	76.6
RECOVERY EFFICIENCY..... DO	97.7	97.7	88.6	85.9	88.9	92.0	93.6	94.5	94.8
BTU RECOVERY..... DO	36.4	36.4	49.5	53.2	64.3	75.7	80.1	82.9	82.2
ASH ERROR..... DO	0.0	0.0	0.2	0.3	0.4	0.5	0.4	0.3	0.3
FLOAT IN REFUSE..... PERCENT OF PRODUCT	1.0	1.1	6.1	8.4	10.0	13.6	15.8	15.9	19.1
SINK IN CLEAN COAL..... DO	2.2	2.3	13.0	10.9	6.0	4.3	3.4	2.8	3.3
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	1.3	1.3	8.0	9.2	8.2	8.3	7.7	6.9	7.7
NEAR GRAVITY 0.1 MATERIAL.. DO	35.8	36.3	42.8	48.7	58.8	41.5	41.1	38.5	38.3
SPECIFIC GRAVITY OF SEPARATION.....	1.30	1.30	1.33	1.34	1.36	1.39	1.39	1.39	1.39
PROBABLE ERROR, SPECIFIC GRAVITY.....	.012	.012	.025	.027	.036	.052	.052	.052	.052
IMPERFECTION.....	.038	.038	.076	.079	.101	.133	.133	.133	.133
ERROR AREA.....	6.	6.	13.	15.	20.	31.	31.	31.	31.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):									
FLOAT 1.30.....	100.0	100.0	99.2	97.6	100.0	100.0	100.0	100.0	100.0
1.30-1.35.....	3.6	3.6	54.8	63.0	76.1	85.6	85.6	85.6	85.6

1.35-1.40.....	0.0	0.0	4.0	13.1	33.7	58.0	58.0	58.0	58.0
1.40-1.50.....	0.0	0.0	0.0	0.1	5.5	24.4	24.4	24.4	24.4
1.50-1.60.....	0.0	0.0	0.0	0.0	0.2	5.0	5.0	5.0	5.0
1.60-1.70.....	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7
1.70-1.80.....	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
1.80-2.00.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00-2.20.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SINK 2.20.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*****

SIZE, INCHES OR MESH	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:					
FEED.....	0.0	0.0	0.0	0.0	100.0
CLEAN COAL.....	0.0	0.0	0.0	0.0	100.0
REFUSE.....	0.0	0.0	0.0	0.0	100.0
ASH, PERCENT:					
FEED.....	11.5	6.7	7.3	7.4	41.5
CLEAN COAL.....	3.1	2.9	2.3	2.3	3.4
REFUSE.....	36.9	17.3	17.3	15.1	56.6
PYRITIC SULFUR, PERCENT:					
FEED.....	2.81	1.85	2.31	2.04	8.86
CLEAN COAL.....	0.33	0.41	0.62	0.25	0.32
REFUSE.....	10.28	5.06	5.76	4.77	12.23
TOTAL SULFUR, PERCENT:					
FEED.....	3.37	2.03	2.54	2.38	9.62
CLEAN COAL.....	0.87	0.77	0.75	0.62	0.82
REFUSE.....	10.92	5.46	6.18	5.06	13.09
BTU PER POUND, MOISTURE FREE:					
FEED.....	12542.	13355.	13265.	13249.	8173.
CLEAN COAL.....	13975.	14010.	14104.	14105.	13925.
REFUSE.....	8226.	11558.	11561.	11939.	5906.
ACTUAL RECOVERY..... PERCENT	75.1	73.3	67.0	60.4	28.3
THEORETICAL RECOVERY..... DO	77.7	77.4	75.1	74.0	34.5
RECOVERY EFFICIENCY..... DO	96.7	94.7	89.2	81.6	82.0
BTU RECOVERY..... DO	83.6	76.9	71.2	64.4	48.2
ASH ERROR..... DO	0.2	0.2	0.2	0.3	0.3
FLOAT IN REFUSE..... PERCENT OF PRODUCT	20.1	25.3	28.6	34.3	4.9
SINK IN CLEAN COAL..... DO	2.6	3.4	4.3	6.4	17.3
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	7.0	9.3	12.3	17.5	8.4
NEAR GRAVITY 0.1 MATERIAL.. DO	36.2	43.6	52.8	68.8	43.3
SPECIFIC GRAVITY OF SEPARATION.....	1.39	1.39	1.39	1.39	1.32
PROBABLE ERROR, SPECIFIC GRAVITY.....	.052	.052	.052	.052	.027
IMPERFECTION.....	.133	.133	.133	.133	.086
ERROR AREA.....	31.	31.	31.	31.	15.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):					
FLOAT 1.30.....	100.0	100.0	100.0	100.0	99.5

1.30-1.35.....	85.6	85.6	85.6	85.6	42.3
1.35-1.40.....	58.0	58.0	58.0	58.0	12.5
1.40-1.50.....	24.4	24.4	24.4	24.4	1.6
1.50-1.60.....	5.0	5.0	5.0	5.0	0.3
1.60-1.70.....	0.7	0.7	0.7	0.7	0.0
1.70-1.80.....	0.1	0.1	0.1	0.1	0.0
1.80-2.00.....	0.0	0.0	0.0	0.0	0.0
2.00-2.20.....	0.0	0.0	0.0	0.0	0.0
SINK 2.20.....	0.0	0.0	0.0	0.0	0.0

NUMBER OF ITERATIONS REQUIRED TO OBTAIN DESIRED OVERALL SPECIFIC GRAVITY OF SEPARATION = 2

WATER IN = 750.0 GALLONS/MIN
WATER OUT = 733.8 GALLONS/MIN

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 7

CLASSIFYING HYDROCYCLONE

CYCLONE DIAMETER = 14.0 INCHES

WATER ADDED = 180.0 GPM

SIZE, INCHES OR MESH	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:								
FEED.....	5.0	31.7	21.5	15.9	10.1	7.9	7.9	100.0
FINE COAL STREAM.....	0.0	0.0	0.0	0.1	4.4	31.2	64.3	100.0
COARSE COAL STREAM.....	7.2	30.8	23.3	17.0	10.8	6.8	4.0	100.0
ASH, PERCENT:								
FEED.....	21.8	21.1	17.2	14.7	13.2	13.5	13.7	17.3
FINE COAL STREAM.....	21.8	20.9	2.0	2.5	3.1	5.1	8.5	7.2
COARSE COAL STREAM.....	21.8	20.9	17.5	14.9	13.7	18.1	19.2	18.0
PYRITIC SULFUR, PERCENT:								
FEED.....	4.55	4.43	3.60	3.24	3.28	4.05	3.85	3.88
FINE COAL STREAM.....	4.51	4.38	0.18	0.31	0.49	1.18	2.15	1.77
COARSE COAL STREAM.....	4.51	4.38	3.68	3.28	3.39	4.81	5.84	4.02
TOTAL SULFUR, PERCENT:								
FEED.....	5.23	5.09	4.18	3.82	3.77	4.42	4.35	4.45
FINE COAL STREAM.....	5.18	5.03	0.74	0.76	0.87	1.48	2.54	2.14
COARSE COAL STREAM.....	5.18	5.03	4.27	3.86	3.90	5.22	6.25	4.61
BTU PER POUND, MOISTURE FREE:								
FEED.....	11107.	11202.	11708.	12002.	12249.	12197.	12166.	11694.
FINE COAL STREAM.....	11141.	11235.	14157.	14083.	13972.	13634.	13061.	13280.
COARSE COAL STREAM.....	11141.	11235.	11661.	11975.	12169.	11766.	11239.	11589.
WATER IN = 180.0 GALLONS/MIN								
WATER OUT = 0.0 GALLONS/MIN								

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 8

FROTH FLOTATION

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:				
FEED.....	4.4	31.2	84.3	100.0
CLEAN COAL.....	4.8	32.4	82.8	100.0
REFUSE.....	0.5	19.7	79.8	100.0
ASH, PERCENT:				
FEED.....	3.1	5.1	8.5	7.2
CLEAN COAL.....	3.1	3.1	3.3	3.2
REFUSE.....	3.1	37.7	49.4	48.9
PYRITIC SULFUR, PERCENT:				
FEED.....	0.49	1.18	2.15	1.77
CLEAN COAL.....	0.49	0.54	0.43	0.47
REFUSE.....	0.49	11.67	15.82	14.93
TOTAL SULFUR, PERCENT:				
FEED.....	0.87	1.48	2.54	2.14
CLEAN COAL.....	0.87	0.84	0.81	0.82
REFUSE.....	0.87	12.16	16.29	15.40
BTU PER POUND, MOISTURE FREE:				
FEED.....	13972.	13634.	13081.	13280.
CLEAN COAL.....	13972.	13968.	13938.	13949.
REFUSE.....	13972.	8098.	8103.	8534.
ACTUAL RECOVERY..... PERCENT	99.0	94.3	88.8	91.0
BTU RECOVERY..... DO	99.0	96.6	94.8	95.6

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 9

DENSE-MEDIUM CYCLONE

SPECIFIC GRAVITY OF SEPARATION = 1.40

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED.....	0.5	7.2	30.6	23.3	17.0	10.8	6.8	4.0	100.0
CLEAN COAL.....	0.3	5.6	27.0	22.9	20.0	12.8	7.4	4.0	100.0
REFUSE.....	0.7	10.1	37.4	24.1	11.3	7.0	5.5	4.0	100.0
ASH, PERCENT:									
FEED.....	22.0	21.6	20.9	17.5	14.9	13.7	16.1	19.2	18.0
CLEAN COAL.....	2.7	3.1	3.7	3.8	3.7	3.4	3.0	2.9	3.6
REFUSE.....	38.0	41.2	44.6	42.4	52.9	49.4	49.7	50.7	45.5
PYRITIC SULFUR, PERCENT:									
FEED.....	4.59	4.51	4.38	3.68	3.28	3.39	4.81	5.84	4.02
CLEAN COAL.....	0.21	0.28	0.41	0.45	0.41	0.46	0.55	0.39	0.43
REFUSE.....	8.23	8.98	9.85	9.54	13.01	13.61	15.82	16.39	10.88
TOTAL SULFUR, PERCENT:									
FEED.....	5.27	5.18	5.03	4.27	3.86	3.90	5.22	6.25	4.61
CLEAN COAL.....	0.86	0.92	1.02	1.01	0.95	0.89	0.85	0.77	0.96
REFUSE.....	8.94	9.69	10.55	10.18	13.71	14.34	16.49	16.87	11.56
BTU PER POUND, MOISTURE FREE:									
FEED.....	11078.	11141.	11235.	11661.	11975.	12169.	11766.	11239.	11589.
CLEAN COAL.....	14036.	13982.	13885.	13854.	13875.	13915.	13982.	14002.	13898.
REFUSE.....	8614.	8132.	7583.	7687.	5539.	6099.	6043.	5888.	7185.
ACTUAL RECOVERY..... PERCENT	45.4	51.4	57.9	64.4	77.2	77.7	72.1	66.0	65.6
THEORETICAL RECOVERY..... DO	54.3	62.3	70.1	76.2	79.0	79.8	75.7	71.2	74.1
RECOVERY EFFICIENCY..... DO	83.7	82.5	82.7	84.6	97.7	97.3	95.2	92.6	88.6
BTU RECOVERY..... DO	57.6	64.6	71.6	76.6	89.5	88.8	85.7	82.2	78.7
ASH ERROR..... DO	0.3	0.5	0.9	1.1	0.2	0.2	0.3	0.4	0.7
FLOAT IN REFUSE..... PERCENT OF PRODUCT	12.5	15.4	19.0	25.8	7.5	8.7	8.7	8.5	22.3
SINK IN CLEAN COAL..... DO	13.2	11.1	5.0	4.2	1.9	2.0	2.4	3.0	2.2
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	12.8	13.2	10.9	11.9	3.2	3.5	4.1	4.9	9.1
NEAR GRAVITY 0.1 MATERIAL.. DO	68.6	70.1	72.5	44.8	21.7	25.1	32.8	40.3	33.8
SPECIFIC GRAVITY OF SEPARATION.....	1.32	1.33	1.36	1.39	1.43	1.43	1.43	1.43	1.40
PROBABLE ERROR, SPECIFIC GRAVITY.....	.025	.030	.039	.051	.038	.038	.038	.038	.045
IMPERFECTION.....	.019	.022	.029	.037	.027	.027	.027	.027	.032
ERROR AREA.....	14.	20.	32.	42.	24.	24.	24.	24.	34.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):									
FLOAT 1.30.....	93.5	96.2	95.1	93.2	100.0	100.0	100.0	100.0	96.6
1.30-1.35.....	39.8	54.6	73.6	80.5	100.0	100.0	100.0	100.0	83.3

1.35-1.40.....	3.2	15.2	35.7	58.4	91.9	91.9	91.9	91.9	66.6
1.40-1.50.....	0.2	1.3	4.9	19.2	31.7	31.7	31.7	31.7	18.1
1.50-1.60.....	0.2	0.6	1.9	3.0	2.2	2.2	2.2	2.2	2.1
1.60-1.70.....	0.2	0.6	1.9	2.4	1.0	1.0	1.0	1.0	1.6
1.70-1.80.....	0.2	0.6	1.9	2.4	1.0	1.0	1.0	1.0	1.6
1.80-2.00.....	0.2	0.6	1.9	2.4	1.0	1.0	1.0	1.0	1.6
2.00-2.20.....	0.2	0.6	1.9	2.4	1.0	1.0	1.0	1.0	1.6
SINK 2.20.....	0.2	0.6	1.9	2.4	1.0	1.0	1.0	1.0	1.6

NUMBER OF ITERATIONS REQUIRED TO OBTAIN DESIRED OVERALL SPECIFIC GRAVITY OF SEPARATION = 3

WATER IN = 0.0 GALLONS/MIN
WATER OUT = 1225.1 GALLONS/MIN

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 10

DENSE-MEDIUM VESSEL

SPECIFIC GRAVITY OF SEPARATION = 1.50

WATER ADDED = 500.0 GPM

SIZE, INCHES OR MESH	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED.....	7.2	41.9	27.5	12.9	7.6	2.8	0.1	0.0	0.0
CLEAN COAL.....	7.6	44.9	23.8	12.7	8.1	2.9	0.1	0.0	0.0
REFUSE.....	7.0	40.7	29.1	13.0	7.4	2.7	0.1	0.0	0.0
ASH, PERCENT:									
FEED.....	56.9	56.5	58.2	55.1	53.4	56.3	52.4	52.7	38.4
CLEAN COAL.....	9.1	9.1	9.8	10.4	11.8	14.5	13.5	13.3	13.1
REFUSE.....	78.3	78.1	74.6	73.0	72.3	74.6	72.1	72.2	56.9
PYRITIC SULFUR, PERCENT:									
FEED.....	11.93	11.95	12.99	11.39	12.61	12.69	11.63	12.10	8.66
CLEAN COAL.....	1.06	1.05	1.00	1.04	1.03	1.23	1.74	1.62	1.53
REFUSE.....	16.79	16.92	17.02	15.55	17.87	17.67	16.64	17.30	13.87
TOTAL SULFUR, PERCENT:									
FEED.....	12.77	12.78	13.80	12.60	13.32	13.35	12.41	12.74	9.20
CLEAN COAL.....	1.68	1.66	1.53	1.56	1.52	1.75	2.36	2.15	2.06
REFUSE.....	17.73	17.85	17.92	17.03	18.67	18.40	17.50	17.99	14.42
BTU PER POUND, MOISTURE FREE:									
FEED.....	5905.	5957.	5639.	6065.	6306.	5929.	6408.	6331.	7966.
CLEAN COAL.....	12948.	12955.	12872.	12750.	12506.	12075.	12238.	12269.	12272.
REFUSE.....	2754.	2766.	3210.	3382.	3494.	3254.	3453.	3388.	4824.
ACTUAL RECOVERY..... PERCENT	30.9	31.3	25.1	28.6	31.2	30.3	33.6	33.1	42.2
THEORETICAL RECOVERY..... DO	30.9	31.3	26.1	30.5	33.7	34.9	38.2	37.5	46.0
RECOVERY EFFICIENCY..... DO	100.0	100.0	96.3	93.8	92.5	87.0	88.0	88.3	91.6
BTU RECOVERY..... DO	67.8	68.1	57.4	60.2	61.9	61.8	64.2	64.2	65.0
ASH ERROR..... DO	0.0	0.0	0.3	0.7	1.0	2.0	1.7	1.7	1.0
FLOAT IN REFUSE..... PERCENT OF PRODUCT	0.0	0.0	2.6	2.2	2.5	3.9	4.3	4.1	6.1
SINK IN CLEAN COAL..... DO	0.0	0.0	4.5	3.6	4.6	9.5	8.7	8.6	7.7
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	0.0	0.0	3.1	2.6	3.2	5.6	5.8	5.6	6.8
NEAR GRAVITY 0.1 MATERIAL... DO	14.6	14.6	16.8	17.9	19.4	16.0	17.0	16.4	21.6
SPECIFIC GRAVITY OF SEPARATION.....	1.50	1.50	1.49	1.49	1.51	1.55	1.55	1.55	1.55
PROBABLE ERROR, SPECIFIC GRAVITY.....	.025	.025	.032	.030	.034	.057	.057	.057	.057
IMPERFECTION.....	.017	.017	.022	.020	.022	.037	.037	.037	.037
ERROR AREA.....	12.	12.	17.	18.	22.	34.	34.	34.	34.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):									
FLOAT 1.30.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1.30-1.35.....	100.0	100.0	100.0	100.0	98.5	100.0	100.0	100.0	100.0

1.35-1.40.....	100.0	100.0	100.0	98.8	98.4	98.5	98.5	98.5	98.5
1.40-1.50.....	100.0	100.0	77.8	85.5	91.7	92.8	92.8	92.8	92.8
1.50-1.60.....	0.0	0.0	0.2	2.4	17.8	47.8	47.8	47.8	47.8
1.60-1.70.....	0.0	0.0	0.0	0.3	0.4	5.1	5.1	5.1	5.1
1.70-1.80.....	0.0	0.0	0.0	0.3	0.4	1.2	1.2	1.2	1.2
1.80-2.00.....	0.0	0.0	0.0	0.3	0.4	1.2	1.2	1.2	1.2
2.00-2.20.....	0.0	0.0	0.0	0.3	0.4	1.2	1.2	1.2	1.2
SINK 2.20.....	0.0	0.0	0.0	0.3	0.4	1.2	1.2	1.2	1.2

*****

SIZE, INCHES OR MESH	28	48	100	200	COMP
	8Y	8Y	8Y	8Y	
	48	100	200	325	
SCREEN ANALYSIS, PERCENT:					
FEED.....	0.0	0.0	0.0	0.0	100.0
CLEAN COAL.....	0.0	0.0	0.0	0.0	100.0
REFUSE.....	0.0	0.0	0.0	0.0	100.0
ASH, PERCENT:					
FEED.....	38.9	17.3	17.3	15.1	58.6
CLEAN COAL.....	10.2	7.7	5.6	4.3	9.8
REFUSE.....	54.5	26.0	28.0	27.9	75.9
PYRITIC SULFUR, PERCENT:					
FEED.....	10.27	5.08	5.75	4.77	12.23
CLEAN COAL.....	1.43	1.01	0.67	0.48	1.04
REFUSE.....	16.10	8.73	10.39	9.93	16.85
TOTAL SULFUR, PERCENT:					
FEED.....	10.91	5.46	6.17	5.06	13.09
CLEAN COAL.....	1.90	1.45	1.16	0.86	1.61
REFUSE.....	16.85	9.11	10.75	10.09	17.83
BTU PER POUND, MOISTURE FREE:					
FEED.....	8229.	11580.	11564.	11941.	5908.
CLEAN COAL.....	12773.	13187.	13553.	13770.	12846.
REFUSE.....	5234.	10080.	9746.	9751.	3043.
ACTUAL RECOVERY..... PERCENT	39.7	47.6	47.7	54.5	29.2
THEORETICAL RECOVERY..... DO	34.8	40.9	43.9	51.3	30.1
RECOVERY EFFICIENCY..... DO	114.3	116.3	108.9	106.2	97.1
BTU RECOVERY..... DO	61.7	54.3	56.0	62.8	63.5
ASH ERROR..... DO	-0.3	-0.5	-0.2	-0.1	0.3
FLOAT IN REFUSE..... PERCENT OF PRODUCT	5.2	6.4	5.5	6.5	1.3
SINK IN CLEAN COAL..... DO	7.4	6.0	5.2	4.3	1.8
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	6.1	6.2	5.4	5.3	1.5
NEAR GRAVITY 0.1 MATERIAL.. DO	17.7	18.8	15.6	15.7	15.9
SPECIFIC GRAVITY OF SEPARATION.....	1.55	1.55	1.55	1.55	1.50
PROBABLE ERROR, SPECIFIC GRAVITY.....	.057	.057	.057	.057	.029
IMPERFECTION.....	.037	.037	.037	.037	.019
ERROR AREA.....	34.	34.	34.	34.	16.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):					
FLOAT 1.30.....	100.0	100.0	100.0	100.0	100.0

1.30-1.35.....	100.0	100.0	100.0	100.0	99.9
1.35-1.40.....	98.5	98.5	98.5	98.5	99.8
1.40-1.50.....	92.8	92.8	92.8	92.8	91.4
1.50-1.60.....	47.8	47.8	47.8	47.8	4.5
1.60-1.70.....	5.1	5.1	5.1	5.1	0.3
1.70-1.80.....	1.2	1.2	1.2	1.2	0.2
1.80-2.00.....	1.2	1.2	1.2	1.2	0.1
2.00-2.20.....	1.2	1.2	1.2	1.2	0.1
SINK 2.20.....	1.2	1.2	1.2	1.2	0.1

NUMBER OF ITERATIONS REQUIRED TO OBTAIN DESIRED OVERALL SPECIFIC GRAVITY OF SEPARATION = 1

WATER IN = 500.0 GALLONS/MIN
WATER OUT = 500.0 GALLONS/MIN

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 11

HYDROCYCLONE

SPECIFIC GRAVITY OF SEPARATION = 1.75

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED.....	0.7	10.1	37.4	24.1	11.3	7.0	5.5	4.0	100.0
CLEAN COAL.....	0.7	8.7	29.4	23.8	12.0	9.8	9.2	8.8	100.0
REFUSE.....	0.8	11.6	45.4	24.5	10.4	4.3	1.7	1.3	100.0
ASH, PERCENT:									
FEED.....	38.0	41.2	44.6	42.4	52.9	49.4	49.7	50.7	45.5
CLEAN COAL.....	9.8	12.1	17.3	21.8	39.8	41.5	47.4	48.2	27.7
REFUSE.....	62.1	63.4	62.5	62.4	68.2	67.2	62.9	63.7	63.4
PYRITIC SULFUR, PERCENT:									
FEED.....	8.23	8.98	9.85	9.54	13.01	13.81	15.82	16.39	10.88
CLEAN COAL.....	1.12	1.58	2.66	3.87	8.74	10.73	14.87	15.40	6.33
REFUSE.....	14.28	14.63	14.57	15.04	17.97	20.07	21.13	21.58	15.48
TOTAL SULFUR, PERCENT:									
FEED.....	8.94	9.69	10.55	10.18	13.71	14.34	16.49	16.87	11.56
CLEAN COAL.....	1.74	2.18	3.25	4.44	9.39	11.41	15.52	15.88	6.93
REFUSE.....	15.04	15.42	15.33	15.75	18.75	20.90	21.87	22.06	16.24
BTU PER POUND, MOISTURE FREE:									
FEED.....	8614.	8132.	7583.	7687.	5539.	6099.	6043.	5888.	7185.
CLEAN COAL.....	12883.	12490.	11668.	10915.	7754.	7450.	6444.	6311.	9853.
REFUSE.....	4996.	4804.	4903.	4551.	2958.	3068.	3809.	3668.	4489.
ACTUAL RECOVERY..... PERCENT	45.9	43.3	39.6	49.3	53.8	69.2	84.8	84.0	50.3
THEORETICAL RECOVERY..... DO	58.0	57.8	58.4	64.3	62.4	73.6	91.9	91.5	64.7
RECOVERY EFFICIENCY..... DO	79.1	75.0	67.9	76.7	86.2	94.0	92.3	91.8	77.6
BTU RECOVERY..... DO	68.6	66.5	61.0	70.0	75.3	84.5	90.4	90.0	68.9
ASH ERROR..... DO	2.9	4.4	8.8	10.7	5.1	1.6	2.1	2.2	13.4
FLOAT IN REFUSE..... PERCENT OF PRODUCT	18.7	19.0	23.6	25.9	24.2	34.9	65.0	63.8	24.7
SINK IN CLEAN COAL..... DO	7.9	10.5	14.3	14.2	19.8	11.0	12.7	13.9	25.2
TOTAL MISPLACED MATERIAL... PERCENT OF FEED	13.7	15.3	19.9	20.2	21.8	18.3	20.6	21.9	24.9
NEAR GRAVITY 0.1 MATERIAL.. DO	16.4	15.2	10.8	8.2	15.0	14.8	16.1	17.4	8.2
SPECIFIC GRAVITY OF SEPARATION.....	1.50	1.54	1.60	1.77	1.99	2.23	2.40	2.40	1.75
PROBABLE ERROR, SPECIFIC GRAVITY.....	.123	.146	.227	.257	.260	.221	.109	.109	.334
IMPERFECTION.....	.245	.273	.381	.333	.262	.181	.078	.078	.446
ERROR AREA.....	73.	87.	121.	146.	156.	143.	117.	117.	185.
DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):									
FLOAT 1.30.....	95.2	90.3	79.2	81.9	92.4	96.3	95.0	95.0	81.5
1.30-1.35.....	88.4	86.3	76.5	81.2	92.3	96.2	95.0	95.0	80.0

1.35-1.40.....	78.6	79.5	72.9	80.0	91.9	98.1	95.0	95.0	78.4
1.40-1.50.....	61.9	66.3	68.5	77.2	90.5	95.8	95.0	95.0	77.4
1.50-1.60.....	40.1	47.1	55.8	71.5	87.0	95.0	94.9	94.9	71.8
1.60-1.70.....	23.0	30.3	43.3	63.2	81.4	93.6	94.8	94.8	62.3
1.70-1.80.....	11.8	17.9	30.3	52.7	73.7	91.2	94.5	94.5	49.7
1.80-2.00.....	3.8	7.3	14.3	35.1	59.6	84.4	93.5	93.5	40.0
2.00-2.20.....	1.0	2.3	4.8	15.6	39.0	66.5	89.3	89.3	27.4
SINK 2.20.....	0.7	1.1	3.6	4.8	14.8	27.4	66.8	66.8	15.4

NUMBER OF ITERATIONS REQUIRED TO OBTAIN DESIRED OVERALL SPECIFIC GRAVITY OF SEPARATION = 4

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 12

PERFORATED BASKET CENTRIFUGE

CAKE THICKNESS = 1.00 INCHES		DIAMETER OF CENTRIFUGE BASKET = 36.0 INCHES					ROTATIONAL SPEED OF BASKET = 750.0 RPM		
SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED.....	0.3	5.6	27.0	22.9	20.0	12.8	7.4	4.0	100.0
CENTRIFUGED PRODUCT.....	0.0	3.5	24.8	24.9	23.6	13.8	6.3	3.1	100.0
SOLIDS IN EFFLUENT LIQUID.....	0.0	0.0	0.0	0.0	0.0	28.9	42.9	28.2	100.0
ASH, PERCENT:									
FEED.....	2.7	3.1	3.7	3.8	3.7	3.4	3.0	2.9	3.6
CENTRIFUGED PRODUCT.....	2.7	3.1	3.6	3.8	3.6	3.4	3.2	3.2	3.6
PYRITIC SULFUR, PERCENT:									
FEED.....	0.21	0.28	0.41	0.45	0.41	0.46	0.55	0.39	0.43
CENTRIFUGED PRODUCT.....	0.21	0.28	0.41	0.45	0.40	0.44	0.53	0.42	0.42
TOTAL SULFUR, PERCENT:									
FEED.....	0.88	0.92	1.02	1.01	0.95	0.89	0.85	0.77	0.96
CENTRIFUGED PRODUCT.....	0.88	0.92	1.02	1.01	0.95	0.90	0.88	0.83	0.97
BTU PER POUND, MOISTURE FREE:									
FEED.....	14036.	13982.	13885.	13854.	13875.	13915.	13982.	14002.	13898.
CENTRIFUGED PRODUCT.....	14036.	13982.	13889.	13859.	13886.	13918.	13958.	13952.	13894.
PERCENT MOISTURE OF FEED (WET BASIS).....	12.62								
PERCENT MOISTURE OF CENTRIFUGED PRODUCT (WET BASIS).....	7.05								
PERCENT SOLID IN EFFLUENT LIQUID.....	48.06								
PERCENT OF FEED IN CENTRIFUGED CAKE.....	93.17								
BTU RECOVERY IN CENTRIFUGED CAKE.....	93.15								

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 13

STREAM BLENDER

SIZE, INCHES OR MESH	WATER ADDED = 0.0 GPM			
	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:				
FEED 1.....	28.9	42.9	28.2	100.0
FEED 2.....	4.8	32.4	62.8	100.0
PRODUCT.....	15.2	36.9	47.9	100.0
ASH, PERCENT:				
FEED 1.....	3.4	3.2	3.2	3.3
FEED 2.....	3.1	3.1	3.3	3.2
PRODUCT.....	3.4	3.2	3.3	3.3
PYRITIC SULFUR, PERCENT:				
FEED 1.....	0.44	0.53	0.42	0.47
FEED 2.....	0.49	0.54	0.43	0.47
PRODUCT.....	0.45	0.54	0.43	0.47
TOTAL SULFUR, PERCENT:				
FEED 1.....	0.90	0.88	0.83	0.87
FEED 2.....	0.87	0.84	0.81	0.82
PRODUCT.....	0.89	0.86	0.81	0.84
BTU PER POUND, MOISTURE FREE:				
FEED 1.....	13918.	13958.	13952.	13944.
FEED 2.....	13972.	13968.	13938.	13949.
PRODUCT.....	13929.	13963.	13941.	13947.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 14

CONTINUOUS DISK FILTER

PRESSURE DIFFERENCE ACROSS CAKE = 10.0(PSI)
CYCLE TIME = 3.0 MINUTES

CAKE THICKNESS = 1 INCH

SIZE, INCHES OR MESH	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:				
FEED.....	15.2	36.9	47.9	100.0
FILTER CAKE.....	19.0	37.0	44.0	100.0
SOLIDS IN FILTRATE.....	3.0	36.7	60.3	100.0
ASH, PERCENT:				
FEED.....	3.4	3.2	3.3	3.3
FILTER CAKE.....	3.4	3.2	3.3	3.3
SOLIDS IN FILTRATE.....	3.4	3.2	3.3	3.2
PYRITIC SULFUR, PERCENT:				
FEED.....	0.45	0.54	0.43	0.47
FILTER CAKE.....	0.45	0.54	0.43	0.47
SOLIDS IN FILTRATE.....	0.45	0.54	0.43	0.47
TOTAL SULFUR, PERCENT:				
FEED.....	0.89	0.88	0.81	0.84
FILTER CAKE.....	0.89	0.88	0.81	0.85
SOLIDS IN FILTRATE.....	0.89	0.88	0.81	0.83
BTU PER POUND, MOISTURE FREE:				
FEED.....	13929.	13963.	13941.	13947.
FILTER CAKE.....	13929.	13963.	13941.	13947.
SOLIDS IN FILTRATE.....	13929.	13963.	13941.	13949.
PERCENT MOISTURE OF FEED (WET BASIS).....				88.50
PERCENT MOISTURE OF FILTER PRODUCT (WET BASIS).....				17.01
PERCENT SOLID IN FILTRATE.....				10.58
PERCENT OF FEED IN FILTER CAKE.....				76.18
BTU RECOVERY IN FILTER CAKE.....				76.18

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 15

THERMAL DRYER

MOISTURE CONTENT OF DRIED COAL (PERCENT).....	5.00	(DECISION)		
COMBUSTION GAS TEMPERATURE (F).....	1000.0	(DECISION)		
EXIT GAS TEMPERATURE (F).....	150.00	(DEFAULT)		
RELATIVE HUMIDITY OF EXIT GAS (PERCENT).....	98.02			
RATE OF COAL CONSUMPTION IN DRYER (TONS/HR)	0.15			
TOTAL FLOW OF COMBUSTION GASES (SCFM).....	4087.			
SO2 CONTENT IN DRYER GASES (PPM).....	118.183			
SIZE, INCHES OR MESH	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:				
FEED AND DRIED COAL.....	19.0	37.0	44.0	100.0
ASH, PERCENT:				
FEED AND DRIED COAL.....	3.4	3.2	3.3	3.3
PYRITIC SULFUR, PERCENT:				
FEED AND DRIED COAL.....	0.45	0.54	0.43	0.47
TOTAL SULFUR, PERCENT:				
FEED AND DRIED COAL.....	0.89	0.88	0.81	0.85
BTU PER POUND, MOISTURE FREE:				
FEED AND DRIED COAL.....	13929.	13963.	13941.	13947.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 18

STREAM BLENDER

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	12 BY 6	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED 1.....	7.6	44.9	23.6	12.7	8.1	2.9	0.1	0.0	0.0
FEED 2.....	0.0	0.0	0.0	0.0	0.0	0.7	8.7	29.4	23.6
PRODUCT.....	6.4	37.6	19.8	10.6	6.8	2.5	1.5	4.8	3.9
ASH, PERCENT:									
FEED 1.....	9.1	9.1	9.6	10.4	11.8	14.5	13.5	13.3	13.1
FEED 2.....	0.0	0.0	0.0	11.2	10.9	9.6	12.1	17.3	21.8
PRODUCT.....	9.1	9.1	9.6	10.4	11.8	14.3	12.2	17.3	21.8
PYRITIC SULFUR, PERCENT:									
FEED 1.....	1.06	1.05	1.00	1.04	1.03	1.23	1.74	1.62	1.53
FEED 2.....	0.00	0.00	0.00	0.94	1.06	1.12	1.58	2.66	3.87
PRODUCT.....	1.06	1.05	1.00	1.04	1.03	1.23	1.59	2.66	3.87
TOTAL SULFUR, PERCENT:									
FEED 1.....	1.88	1.66	1.53	1.58	1.52	1.75	2.36	2.15	2.06
FEED 2.....	0.00	0.00	0.00	1.47	1.62	1.74	2.18	3.25	4.44
PRODUCT.....	1.88	1.66	1.53	1.56	1.52	1.75	2.19	3.25	4.44
BTU PER POUND, MOISTURE FREE:									
FEED 1.....	12948.	12955.	12872.	12750.	12506.	12075.	12238.	12269.	12272.
FEED 2.....	14500.	14500.	14500.	12621.	12667.	12883.	12480.	11668.	10915.
PRODUCT.....	12948.	12955.	12872.	12750.	12506.	12109.	12473.	11669.	10916.

*****

SIZE, INCHES OR MESH	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:					
FEED 1.....	0.0	0.0	0.0	0.0	100.0
FEED 2.....	12.0	9.6	9.2	6.6	100.0
PRODUCT.....	2.0	1.6	1.5	1.1	100.0
ASH, PERCENT:					
FEED 1.....	10.2	7.7	5.6	4.3	9.8
FEED 2.....	39.8	41.5	47.4	48.2	27.7
PRODUCT.....	39.8	41.4	47.3	48.1	12.7
PYRITIC SULFUR, PERCENT:					
FEED 1.....	1.43	1.01	0.87	0.48	1.04
FEED 2.....	8.74	10.73	14.87	15.40	6.33
PRODUCT.....	8.74	10.72	14.85	15.37	1.91

TOTAL SULFUR, PERCENT:

FEED 1.....	1.90	1.45	1.16	0.88	1.61
FEED 2.....	9.39	11.41	15.52	15.88	6.93
PRODUCT.....	9.38	11.40	15.51	15.84	2.48

BTU PER POUND, MOISTURE FREE:

FEED 1.....	12773.	13187.	13553.	13770.	12848.
FEED 2.....	7754.	7450.	6444.	6311.	9853.
PRODUCT.....	7759.	7458.	6452.	6327.	12357.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 17

STREAM BLENDER

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED 1.....	0.0	0.0	0.0	0.0	0.0	3.0	38.7	60.3	100.0
FEED 2.....	0.8	11.2	43.9	23.7	10.1	4.2	2.3	3.9	100.0
PRODUCT.....	0.7	9.8	38.5	20.8	8.9	4.1	6.5	10.8	100.0
ASH, PERCENT:									
FEED 1.....	0.0	0.0	0.0	0.0	0.2	3.4	3.2	3.3	3.2
FEED 2.....	62.1	63.4	62.5	62.4	68.2	67.0	55.6	54.0	62.9
PRODUCT.....	62.1	63.4	62.5	62.4	68.2	61.1	19.3	19.3	55.5
PYRITIC SULFUR, PERCENT:									
FEED 1.....	0.00	0.00	0.00	0.00	0.02	0.45	0.54	0.43	0.47
FEED 2.....	14.26	14.63	14.57	15.04	17.97	19.99	18.41	17.65	15.46
PRODUCT.....	14.26	14.63	14.57	15.04	17.97	18.19	6.02	5.86	13.62
TOTAL SULFUR, PERCENT:									
FEED 1.....	0.00	0.00	0.00	0.00	0.07	0.89	0.86	0.81	0.83
FEED 2.....	15.04	15.42	15.33	15.75	18.75	20.83	19.07	18.13	16.21
PRODUCT.....	15.04	15.42	15.33	15.75	18.75	18.99	6.45	6.27	14.32
BTU PER POUND, MOISTURE FREE:									
FEED 1.....	14500.	14500.	14500.	14500.	14470.	13929.	13963.	13941.	13949.
FEED 2.....	4998.	4804.	4903.	4551.	2958.	3110.	5042.	5327.	4557.
PRODUCT.....	4998.	4804.	4903.	4551.	2958.	4105.	11224.	11227.	5712.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 19

STREAM BLENDER

WATER ADDED = 0.0 GPM

SIZE, INCHES OR MESH	12 BY 8	8 BY 4	4 BY 2	2 BY 1	1 BY 1/2	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28
SCREEN ANALYSIS, PERCENT:									
FEED 1.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEED 2.....	2.9	17.1	18.3	10.7	10.5	6.3	1.5	8.4	8.4
PRODUCT.....	2.8	16.4	17.5	10.3	10.0	6.0	1.4	8.1	8.1
ASH, PERCENT:									
FEED 1.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEED 2.....	2.9	2.9	3.4	3.5	3.8	4.2	3.2	3.6	3.8
PRODUCT.....	2.9	2.9	3.4	3.5	3.8	4.2	3.2	3.6	3.8
PYRITIC SULFUR, PERCENT:									
FEED 1.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEED 2.....	0.17	0.21	0.52	0.35	0.24	0.20	0.30	0.41	0.45
PRODUCT.....	0.17	0.21	0.52	0.35	0.24	0.20	0.30	0.41	0.45
TOTAL SULFUR, PERCENT:									
FEED 1.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEED 2.....	0.81	0.81	0.85	0.88	0.75	0.76	0.94	1.02	1.01
PRODUCT.....	0.81	0.81	0.85	0.88	0.75	0.76	0.94	1.02	1.01
BTU PER POUND, MOISTURE FREE:									
FEED 1.....	14500.	14500.	14500.	14500.	14500.	14500.	14500.	14500.	14500.
FEED 2.....	14010.	14010.	13921.	13911.	13862.	13791.	13962.	13889.	13859.
PRODUCT.....	14010.	14010.	13921.	13911.	13862.	13791.	13962.	13889.	13859.

*****

SIZE, INCHES OR MESH	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:					
FEED 1.....	0.0	19.0	37.0	44.0	100.0
FEED 2.....	8.0	4.7	2.1	1.1	100.0
PRODUCT.....	7.7	5.3	3.6	2.8	100.0
ASH, PERCENT:					
FEED 1.....	1.5	3.4	3.2	3.3	3.3
FEED 2.....	3.6	3.4	3.2	3.2	3.5
PRODUCT.....	3.6	3.4	3.2	3.3	3.4
PYRITIC SULFUR, PERCENT:					
FEED 1.....	0.20	0.45	0.54	0.43	0.47
FEED 2.....	0.40	0.44	0.53	0.42	0.35
PRODUCT.....	0.40	0.44	0.53	0.43	0.36

TOTAL SULFUR, PERCENT:

FEED 1.....	0.57	0.89	0.86	0.81	0.85
FEED 2.....	0.95	0.90	0.88	0.83	0.87
PRODUCT.....	0.95	0.90	0.87	0.82	0.87

BTU PER POUND, MOISTURE FREE:

FEED 1.....	14248.	13929.	13963.	13941.	13947.
FEED 2.....	13888.	13918.	13958.	13954.	13914.
PRODUCT.....	13888.	13920.	13960.	13946.	13916.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 18

THICKENER

AREA OF THICKENER = 1000.0 SQUARE FEET	FRACTION SOLID IN UNDERFLOW = .350					FLOCCULANT CORRECTION FACTOR = 1.50			
SIZE, INCHES OR MESH	1/2 BY 1/4	1/4 BY 8	8 BY 14	14 BY 28	28 BY 48	48 BY 100	100 BY 200	200 BY 325	COMP
SCREEN ANALYSIS, PERCENT:									
FEED.....	0.7	9.8	38.5	20.8	8.9	4.1	6.5	10.8	100.0
SOLIDS IN THICKENER OVERFLOW.....	0.0	0.0	0.0	0.0	0.0	0.1	17.3	82.8	100.0
SOLIDS IN THICKENER UNDERFLOW.....	0.7	10.5	41.2	22.3	9.5	4.3	5.7	5.8	100.0
ASH, PERCENT:									
FEED.....	62.1	63.4	62.5	62.4	68.2	61.1	19.3	19.3	55.5
SOLIDS IN THICKENER OVERFLOW.....	0.0	0.0	0.0	0.0	8.1	3.4	4.1	10.1	9.0
SOLIDS IN THICKENER UNDERFLOW.....	62.1	63.4	62.5	62.4	68.2	61.2	22.5	28.4	58.8
PYRITIC SULFUR, PERCENT:									
FEED.....	14.28	14.63	14.57	15.04	17.97	18.19	6.02	5.88	13.62
SOLIDS IN THICKENER OVERFLOW.....	0.00	0.00	0.00	0.00	0.94	0.47	0.90	2.68	2.35
SOLIDS IN THICKENER UNDERFLOW.....	14.28	14.63	14.57	15.04	17.97	18.22	7.10	9.03	14.41
TOTAL SULFUR, PERCENT:									
FEED.....	15.04	15.42	15.33	15.75	18.75	18.99	6.45	6.27	14.32
SOLIDS IN THICKENER OVERFLOW.....	0.00	0.00	0.00	0.00	1.42	0.91	1.20	3.08	2.73
SOLIDS IN THICKENER UNDERFLOW.....	15.04	15.42	15.33	15.75	18.75	19.02	7.58	9.48	15.13
BTU PER POUND, MOISTURE FREE:									
FEED.....	4998.	4804.	4903.	4551.	2958.	4105.	11224.	11227.	5712.
SOLIDS IN THICKENER OVERFLOW.....	0.	0.	0.	0.	13120.	13917.	13797.	12790.	12965.
SOLIDS IN THICKENER UNDERFLOW.....	4998.	4804.	4903.	4551.	2958.	4092.	10681.	9672.	5205.
PERCENT OF FEED TO OVERFLOW.....	0.0	0.0	0.0	0.0	0.0	0.1	17.4	49.9	6.5
SOLIDS IN THICKENER OVERFLOW (PERCENT).....	0.247								
SOLIDS IN THICKENER UNDERFLOW (PERCENT).....	35.000								
SOLIDS IN THICKENER FEED (PERCENT).....	3.435								
TOTAL WATER FLOW INTO THICKENER (GPM).....	2563.75								
CLARIFIED WATER PRODUCED FROM THICKENER (GPM).....	2405.48								
WATER DEMAND FROM OTHER UNITS (GPM).....	2630.00								
NET DEFICIT WATER (GPM).....	224.54								

SPECIFIC GRAVITY ANALYSIS OF FEED

SIZE FRACTION AND WEIGHT	SPECIFIC GRAVITY	WEIGHT	DIRECT, PERCENT			BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT			MOISTURE
			ASH	PYRITIC SULFUR	TOTAL SULFUR				PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	
18 BY 12	7.0 PERCENT	FLOAT 1.30	19.7	2.8	0.21	0.79	14024.	19.7	2.8	0.21	0.79	14024.
		1.30-1.35	11.0	4.4	0.71	1.57	13752.	30.7	3.4	0.39	1.07	13927.
		1.35-1.40	2.1	7.8	0.88	1.59	13174.	32.8	3.7	0.43	1.10	13878.
		1.40-1.50	11.3	15.4	1.10	1.80	11882.	44.1	6.7	0.80	1.23	13387.
		1.50-1.80	2.1	25.0	1.44	1.84	10250.	46.2	7.5	0.64	1.26	13225.
		1.80-1.70	1.9	31.5	2.80	3.50	9145.	48.1	8.4	0.73	1.35	13064.
		1.70-1.80	0.8	41.0	5.46	6.13	7530.	48.9	9.0	0.80	1.42	12973.
		1.80-2.00	12.8	84.6	18.43	19.23	2000.	61.7	24.6	4.46	5.11	10700.
		2.00-2.20	12.8	84.6	18.43	19.23	2000.	74.5	34.9	8.85	7.54	9208.
		SINK 2.20	25.5	84.6	18.43	19.23	2000.	100.0	47.6	9.81	10.52	7366.
12 BY 6	23.0 PERCENT	FLOAT 1.30	16.7	2.9	0.18	0.80	14007.	16.7	2.9	0.18	0.80	14007.
		1.30-1.35	14.3	4.7	0.62	1.22	13701.	31.0	3.7	0.38	0.99	13866.
		1.35-1.40	5.3	9.4	1.05	1.85	12902.	36.3	4.6	0.48	1.09	13725.
		1.40-1.50	5.3	16.7	1.52	2.08	11661.	41.6	6.1	0.61	1.22	13462.
		1.50-1.80	4.1	26.7	1.97	2.47	9981.	45.7	8.0	0.73	1.33	13148.
		1.80-1.70	2.1	35.1	3.23	3.78	8533.	47.8	9.1	0.84	1.44	12945.
		1.70-1.80	1.2	45.7	6.07	6.56	6731.	49.0	10.0	0.97	1.56	12793.
		1.80-2.00	12.7	82.9	17.00	18.14	2000.	61.8	25.1	4.28	4.98	10568.
		2.00-2.20	12.7	82.9	17.00	18.14	2000.	74.5	34.9	8.45	7.23	9104.
		SINK 2.20	25.5	82.9	17.00	18.14	2000.	100.0	47.2	9.14	10.01	7294.
6 BY 4	17.0 PERCENT	FLOAT 1.30	21.4	2.8	0.13	0.80	14024.	21.4	2.8	0.13	0.80	14024.
		1.30-1.35	11.8	4.4	0.64	1.32	13752.	33.2	3.4	0.31	0.99	13927.
		1.35-1.40	2.2	7.8	1.25	1.85	13174.	35.4	3.6	0.37	1.04	13880.
		1.40-1.50	12.1	15.3	1.88	2.49	11899.	47.6	6.6	0.78	1.41	13374.
		1.50-1.80	1.9	24.9	2.68	3.25	10267.	49.5	7.3	0.83	1.48	13255.
		1.80-1.70	1.7	31.5	4.01	4.66	9145.	51.2	8.1	0.94	1.59	13118.
		1.70-1.80	0.7	41.0	5.55	6.30	7530.	51.9	8.6	1.00	1.65	13042.
		1.80-2.00	12.0	84.6	20.13	20.98	2000.	63.9	22.9	4.60	5.29	10965.
		2.00-2.20	12.0	84.6	20.13	20.98	2000.	76.0	32.6	7.06	7.77	8546.
		SINK 2.20	24.0	84.6	20.13	20.98	2000.	100.0	45.1	10.20	10.95	7732.
4 BY 2	15.0 PERCENT	FLOAT 1.30	20.4	2.8	0.80	0.74	14024.	20.4	2.8	0.80	0.74	14024.
		1.30-1.35	17.5	4.7	0.48	0.86	13701.	37.9	3.7	0.64	0.80	13875.
		1.35-1.40	6.4	9.4	1.00	1.52	12902.	44.3	4.5	0.69	0.90	13734.
		1.40-1.50	6.2	16.5	1.58	2.11	11695.	50.5	6.0	0.80	1.05	13482.
		1.50-1.80	4.3	26.3	3.01	3.27	10029.	54.8	7.6	0.98	1.22	13210.
		1.80-1.70	2.1	35.1	4.50	4.65	8533.	56.9	8.6	1.11	1.35	13037.
		1.70-1.80	1.1	45.4	5.69	6.00	6782.	58.0	9.3	1.20	1.44	12818.
		1.80-2.00	10.5	82.7	21.03	21.95	2000.	68.5	20.5	4.23	4.58	11246.
		2.00-2.20	10.5	82.7	21.03	21.95	2000.	79.0	28.8	6.46	6.89	10019.
		SINK 2.20	21.0	82.7	21.03	21.95	2000.	100.0	40.1	9.52	10.05	8336.
2 BY 1	8.0 PERCENT	FLOAT 1.30	22.0	2.4	0.14	0.77	14092.	22.0	2.4	0.14	0.77	14092.
		1.30-1.35	19.9	4.7	0.49	0.99	13701.	42.0	3.5	0.31	0.87	13906.
		1.35-1.40	6.9	9.6	0.95	1.40	12868.	48.9	4.4	0.40	0.95	13759.
		1.40-1.50	7.5	16.1	1.41	1.95	11763.	56.4	5.9	0.53	1.08	13494.
		1.50-1.80	4.5	25.9	2.06	2.49	10097.	60.9	7.4	0.65	1.19	13242.
		1.80-1.70	2.2	34.1	3.51	3.97	8703.	63.1	8.3	0.75	1.28	13084.
		1.70-1.80	1.6	42.3	5.56	6.04	7309.	64.7	9.2	0.86	1.40	12941.
		1.80-2.00	8.8	82.6	17.54	20.02	2000.	73.5	18.0	2.86	3.63	11629.
		2.00-2.20	8.8	82.6	17.54	20.02	2000.	82.4	24.9	4.43	5.39	10598.

		SINK 2.20	17.6	82.6	17.54	20.02	2000.	100.0	35.1	6.75	7.97	9082.
1 BY 1/2	7.0 PERCENT	FLOAT 1.30	28.1	2.4	0.12	0.60	14092.	28.1	2.4	0.12	0.60	14082.
		1.30-1.35	21.9	4.7	0.29	0.79	13701.	49.9	3.4	0.19	0.68	13921.
		1.35-1.40	8.3	9.5	0.75	1.20	12885.	58.3	4.3	0.27	0.76	13773.
		1.40-1.50	7.6	15.9	1.18	1.64	11797.	65.9	5.6	0.38	0.88	13544.
		1.50-1.60	3.9	24.7	2.46	2.80	10301.	69.8	6.7	0.50	0.97	13363.
		1.60-1.70	2.2	32.9	3.89	4.21	8907.	72.0	7.5	0.60	1.07	13226.
		1.70-1.80	1.6	42.0	5.50	5.80	7360.	73.6	8.2	0.71	1.17	13088.
		1.80-2.00	6.6	82.8	24.02	24.54	2000.	80.2	14.4	2.62	3.09	12186.
		2.00-2.20	6.6	82.8	24.02	24.54	2000.	86.8	19.6	4.25	4.72	11412.
		SINK 2.20	13.2	82.8	24.02	24.54	2000.	100.0	27.9	6.86	7.34	10171.
1/2 BY 1/4	5.0 PERCENT	FLOAT 1.30	33.5	2.4	0.08	0.64	14092.	33.5	2.4	0.08	0.64	14092.
		1.30-1.35	23.1	4.8	0.11	0.69	13684.	56.6	3.4	0.09	0.66	13926.
		1.35-1.40	7.5	9.7	0.45	0.92	12851.	64.1	4.1	0.13	0.69	13799.
		1.40-1.50	6.9	15.7	0.85	1.17	11831.	71.0	5.2	0.18	0.74	13608.
		1.50-1.60	3.2	25.7	1.48	1.86	10131.	74.2	6.1	0.24	0.79	13457.
		1.60-1.70	1.8	33.8	2.79	3.00	8754.	76.0	6.8	0.30	0.84	13346.
		1.70-1.80	1.5	41.4	3.87	4.04	7462.	77.5	7.5	0.37	0.90	13231.
		1.80-2.00	5.6	84.2	21.09	21.89	2000.	83.1	12.6	1.77	2.32	12473.
		2.00-2.20	5.6	84.2	21.09	21.89	2000.	88.8	17.2	2.99	3.56	11810.
		SINK 2.20	11.2	84.2	21.09	21.89	2000.	100.0	24.7	5.03	5.62	10708.
1/4 BY 8	6.0 PERCENT	FLOAT 1.30	42.9	2.1	0.13	0.81	14143.	42.9	2.1	0.13	0.81	14143.
		1.30-1.35	21.5	4.6	0.64	1.34	13718.	64.4	2.9	0.30	0.89	14001.
		1.35-1.40	6.9	9.2	1.25	1.87	12936.	71.3	3.5	0.39	1.07	13898.
		1.40-1.50	6.0	15.3	1.86	2.49	11899.	77.4	4.5	0.51	1.18	13742.
		1.50-1.60	2.7	23.5	2.87	3.15	10505.	80.1	5.1	0.58	1.25	13633.
		1.60-1.70	1.7	32.5	4.00	4.62	8975.	81.8	5.7	0.65	1.32	13536.
		1.70-1.80	1.3	40.7	5.45	6.28	7581.	83.1	6.2	0.73	1.40	13443.
		1.80-2.00	4.2	82.0	20.03	20.97	2000.	87.3	9.9	1.66	2.35	12888.
		2.00-2.20	4.2	82.0	20.03	20.97	2000.	91.5	13.2	2.51	3.21	12384.
		SINK 2.20	8.5	82.0	20.03	20.97	2000.	100.0	19.1	4.00	4.71	11505.
8 BY 14	3.0 PERCENT	FLOAT 1.30	48.0	1.8	0.20	0.68	14194.	48.0	1.8	0.20	0.68	14194.
		1.30-1.35	19.5	4.3	0.48	0.98	13769.	67.5	2.5	0.28	0.77	14071.
		1.35-1.40	5.8	8.8	1.00	1.50	13004.	73.3	3.0	0.34	0.82	13987.
		1.40-1.50	4.9	15.4	1.50	2.02	11882.	78.2	3.8	0.41	0.90	13854.
		1.50-1.60	2.3	24.4	2.20	2.67	10352.	80.5	4.4	0.46	0.95	13754.
		1.60-1.70	1.4	33.3	3.45	4.06	8839.	81.9	4.9	0.51	1.00	13669.
		1.70-1.80	1.1	41.7	6.28	6.70	7411.	83.0	5.4	0.59	1.08	13586.
		1.80-2.00	4.2	82.8	21.02	21.72	2000.	87.3	9.1	1.58	2.08	13023.
		2.00-2.20	4.2	82.8	21.02	21.72	2000.	91.5	12.6	2.48	2.99	12512.
		SINK 2.20	8.5	82.8	21.02	21.72	2000.	100.0	18.5	4.06	4.58	11620.
14 BY 28	3.0 PERCENT	FLOAT 1.30	54.3	2.0	0.17	0.73	14160.	54.3	2.0	0.17	0.73	14160.
		1.30-1.35	13.5	5.8	0.62	1.13	13514.	67.8	2.8	0.26	0.81	14032.
		1.35-1.40	9.4	8.1	0.92	1.39	13123.	77.2	3.4	0.34	0.88	13921.
		1.40-1.50	6.6	15.7	1.65	2.25	11831.	83.8	4.4	0.44	0.89	13757.
		1.50-1.60	2.6	23.8	2.37	2.85	10454.	86.4	5.0	0.50	1.04	13657.
		1.60-1.70	2.1	28.6	3.28	3.98	9638.	88.5	5.5	0.57	1.11	13562.
		1.70-1.80	0.8	34.9	6.00	6.11	8567.	89.3	5.8	0.62	1.16	13517.
		1.80-2.00	2.7	68.1	17.67	18.17	2923.	92.0	7.8	1.11	1.65	13210.
		2.00-2.20	2.7	68.1	17.67	18.17	2923.	94.7	9.3	1.58	2.12	12919.
		SINK 2.20	5.3	68.1	17.67	18.17	2923.	100.0	12.4	2.44	2.98	12385.
28 BY 48	1.9 PERCENT	FLOAT 1.30	59.0	1.8	0.16	0.73	14194.	59.0	1.8	0.16	0.73	14194.
		1.30-1.35	12.5	6.4	0.73	1.24	13412.	71.5	2.6	0.26	0.82	14057.
		1.35-1.40	8.5	8.3	1.02	1.49	13089.	80.0	3.2	0.34	0.89	13954.

		1.40-1.50	4.2	15.5	2.05	2.83	11885.	84.2	3.8	0.43	0.98	13850.	
		1.50-1.60	2.0	22.8	3.27	3.73	10624.	86.2	4.3	0.49	1.04	13775.	
		1.60-1.70	1.0	28.4	4.51	5.17	9672.	87.2	4.5	0.54	1.09	13728.	
		1.70-1.80	0.6	34.3	6.44	7.22	8669.	87.8	4.7	0.58	1.13	13694.	
		1.80-2.00	3.0	67.7	20.43	21.41	2991.	90.8	6.9	1.24	1.81	13334.	
		2.00-2.20	3.0	67.7	20.43	21.41	2991.	93.9	8.8	1.87	2.45	12998.	
		SINK 2.20	6.1	67.7	20.43	21.41	2991.	100.0	12.4	3.00	3.60	12388.	
48 BY 100	1.4 PERCENT	FLOAT 1.30	50.0	1.6	0.30	0.60	14228.	50.0	1.6	0.30	0.60	14228.	
		1.30-1.35	17.7	4.7	0.49	0.98	13701.	67.6	2.4	0.35	0.70	14090.	
		1.35-1.40	11.9	6.4	0.69	1.17	13412.	79.5	3.0	0.40	0.77	13989.	
		1.40-1.50	6.1	12.3	1.65	2.10	12409.	85.6	3.7	0.49	0.88	13876.	
		1.50-1.60	2.3	19.6	2.77	3.42	11168.	87.9	4.1	0.55	0.93	13806.	
		1.60-1.70	1.0	26.8	3.92	4.64	9944.	88.9	4.3	0.59	0.97	13762.	
		1.70-1.80	0.5	33.4	6.42	7.05	8822.	89.4	4.5	0.62	1.01	13735.	
		1.80-2.00	2.6	64.2	22.00	22.90	3586.	92.1	6.2	1.23	1.64	13443.	
		2.00-2.20	2.6	64.2	22.00	22.90	3586.	94.7	7.8	1.81	2.23	13167.	
		SINK 2.20	5.3	64.2	22.00	22.90	3586.	100.0	10.8	2.88	3.33	12660.	
100 BY 200	1.2 PERCENT	FLOAT 1.30	36.4	1.2	1.00	0.64	14296.	36.4	1.2	1.00	0.64	14296.	
		1.30-1.35	24.0	2.7	0.28	0.84	14041.	60.3	1.8	0.71	0.72	14195.	
		1.35-1.40	15.6	4.2	0.41	1.01	13786.	75.9	2.3	0.65	0.78	14111.	
		1.40-1.50	5.6	11.0	1.14	1.66	12630.	81.5	2.8	0.69	0.84	14009.	
		1.50-1.60	2.3	17.6	2.38	2.98	11508.	83.8	3.3	0.73	0.90	13941.	
		1.60-1.70	1.0	24.1	4.09	4.32	10403.	84.8	3.5	0.77	0.94	13899.	
		1.70-1.80	0.5	32.2	7.44	8.06	9026.	85.3	3.7	0.81	0.98	13870.	
		1.80-2.00	3.7	67.3	25.60	26.50	3059.	89.0	6.3	1.83	2.03	13424.	
		2.00-2.20	3.7	67.3	25.60	26.50	3059.	92.7	8.7	2.77	3.00	13014.	
		SINK 2.20	7.3	67.3	25.60	26.50	3059.	100.0	13.0	4.45	4.73	12283.	
200 BY 325	1.5 PERCENT	FLOAT 1.30	12.4	1.3	0.14	0.50	14279.	12.4	1.3	0.14	0.50	14279.	
		1.30-1.35	37.1	2.0	0.18	0.58	14160.	49.5	1.8	0.17	0.56	14190.	
		1.35-1.40	23.8	3.2	0.26	0.68	13956.	73.3	2.3	0.20	0.60	14114.	
		1.40-1.50	7.6	8.4	0.80	1.21	13072.	80.9	2.8	0.26	0.66	14016.	
		1.50-1.60	2.8	15.4	1.62	1.88	11882.	83.7	3.3	0.30	0.70	13945.	
		1.60-1.70	1.1	20.3	2.53	3.14	10947.	84.8	3.5	0.33	0.73	13906.	
		1.70-1.80	0.5	30.6	7.37	8.01	9298.	85.3	3.7	0.37	0.77	13879.	
		1.80-2.00	3.7	68.6	24.46	24.80	2838.	89.0	6.3	1.37	1.76	13423.	
		2.00-2.20	3.7	68.6	24.46	24.80	2838.	92.7	8.8	2.28	2.68	13003.	
		SINK 2.20	7.4	68.6	24.46	24.80	2838.	100.0	13.2	3.81	4.30	12256.	
COMPOSITE	100.0 PERCENT	FLOAT 1.30	25.4	2.4	0.25	0.74	14086.	25.4	2.4	0.25	0.74	14086.	2.00
		1.30-1.35	16.6	4.6	0.50	1.06	13725.	42.0	3.3	0.35	0.87	13943.	
		1.35-1.40	6.0	8.8	0.90	1.43	13044.	48.0	3.9	0.42	0.94	13831.	
		1.40-1.50	7.5	15.6	1.52	2.07	11840.	55.5	5.5	0.57	1.09	13561.	
		1.50-1.60	3.3	25.5	2.32	2.74	10172.	58.8	6.6	0.66	1.18	13370.	
		1.60-1.70	1.9	33.3	3.66	4.13	8846.	60.7	7.5	0.76	1.28	13228.	
		1.70-1.80	1.1	42.8	5.64	6.12	7232.	61.8	8.1	0.85	1.36	13121.	
		1.80-2.00	9.5	82.9	19.23	20.28	2030.	71.4	18.1	3.30	3.89	11637.	
		2.00-2.20	9.5	82.9	19.23	20.28	2030.	80.9	25.8	5.18	5.83	10504.	
		SINK 2.20	19.1	82.9	19.23	20.28	2030.	100.0	36.7	7.87	8.58	8886.	

FLOWSTREAM SUMMARY

FLOWRATE = 800. TONS PER HOUR   ASH = 38.7 PERCENT   PYRITIC SULFUR = 7.87 PERCENT   TOTAL SULFUR = 8.58 PERCENT
 BTU CONTENT = 8886. BTU/LB   SO2 CONTENT = 19.32 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 2.00 PERCENT

SPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT FROM UNIT NUMBER 19

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	WEIGHT	ASH	DIRECT, PERCENT		BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT		BTU/LB	MOISTURE
					PYRITIC	TOTAL				PYRITIC	TOTAL		
					SULFUR	SULFUR				SULFUR	SULFUR		
12 BY 6	2.8 PERCENT	FLOAT 1.30	97.8	2.8	0.16	0.80	14017.	97.8	2.8	0.16	0.80	14017.	
		1.30-1.35	2.4	4.6	0.64	1.29	13725.	100.0	2.9	0.17	0.81	14010.	
		1.35-1.40	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		1.40-1.50	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.17	0.81	14010.	
6 BY 4	16.4 PERCENT	FLOAT 1.30	97.8	2.8	0.20	0.80	14017.	97.8	2.8	0.20	0.80	14017.	
		1.30-1.35	2.4	4.6	0.62	1.28	13724.	100.0	2.9	0.21	0.81	14010.	
		1.35-1.40	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		1.40-1.50	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	2.9	0.21	0.81	14010.	
4 BY 2	17.5 PERCENT	FLOAT 1.30	69.2	2.8	0.51	0.77	14024.	69.2	2.8	0.51	0.77	14024.	
		1.30-1.35	30.1	4.6	0.53	1.02	13710.	99.3	3.4	0.52	0.84	13929.	
		1.35-1.40	0.7	9.3	1.02	1.58	12928.	100.0	3.4	0.52	0.85	13921.	
		1.40-1.50	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.4	0.52	0.85	13921.	
2 BY 1	10.3 PERCENT	FLOAT 1.30	62.7	2.5	0.24	0.75	14068.	62.7	2.5	0.24	0.75	14068.	
		1.30-1.35	34.8	4.7	0.49	1.00	13703.	97.5	3.3	0.33	0.84	13938.	
		1.35-1.40	2.5	9.5	0.95	1.44	12885.	100.0	3.5	0.35	0.86	13911.	
		1.40-1.50	0.0	18.1	1.40	1.93	11757.	100.0	3.5	0.35	0.86	13911.	
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.5	0.35	0.86	13911.	
1 BY 1/2	10.0 PERCENT	FLOAT 1.30	58.6	2.4	0.12	0.64	14085.	58.6	2.4	0.12	0.64	14085.	
		1.30-1.35	34.8	4.7	0.33	0.85	13701.	93.4	3.3	0.20	0.72	13942.	
		1.35-1.40	5.7	9.5	0.77	1.23	12885.	99.1	3.6	0.23	0.75	13881.	
		1.40-1.50	0.9	15.9	1.19	1.67	11791.	100.0	3.8	0.24	0.75	13862.	
		1.50-1.60	0.0	25.1	2.28	2.65	10230.	100.0	3.8	0.24	0.75	13862.	
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	3.8	0.24	0.75	13862.	
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	3.8	0.24	0.75	13862.	
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	3.8	0.24	0.75	13862.	
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.8	0.24	0.75	13862.	

		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	3.8	0.24	0.75	13862.
1/2 BY 1/4	6.0 PERCENT	FLOAT 1.30	58.4	2.4	0.10	0.66	14094.	58.4	2.4	0.10	0.66	14094.
		1.30-1.35	32.9	4.8	0.21	0.79	13691.	89.3	3.3	0.14	0.71	13946.
		1.35-1.40	7.4	9.8	0.59	1.08	12867.	96.7	3.7	0.17	0.74	13863.
		1.40-1.50	3.0	15.7	0.88	1.40	11825.	99.7	4.1	0.19	0.76	13802.
		1.50-1.60	0.3	25.4	1.76	2.15	10175.	100.0	4.2	0.20	0.76	13792.
		1.60-1.70	0.0	33.8	3.10	3.39	8791.	100.0	4.2	0.20	0.76	13791.
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	4.2	0.20	0.76	13791.
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	4.2	0.20	0.76	13791.
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	4.2	0.20	0.76	13791.
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	4.2	0.20	0.76	13791.
1/4 BY 8	1.4 PERCENT	FLOAT 1.30	72.5	2.1	0.13	0.77	14138.	72.5	2.1	0.13	0.77	14138.
		1.30-1.35	23.7	4.6	0.52	1.18	13714.	96.2	2.7	0.23	0.87	14033.
		1.35-1.40	2.9	9.3	1.09	1.67	12927.	99.1	2.8	0.25	0.89	14000.
		1.40-1.50	0.6	15.4	1.67	2.27	11883.	99.7	3.0	0.26	0.90	13987.
		1.50-1.60	0.1	24.0	2.43	2.89	10414.	99.8	3.0	0.26	0.90	13985.
		1.60-1.70	0.0	32.8	3.68	4.22	8918.	99.8	3.0	0.26	0.90	13984.
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	99.8	3.0	0.26	0.90	13984.
		1.80-2.00	0.0	82.7	20.18	21.06	2000.	99.9	3.1	0.27	0.91	13978.
		2.00-2.20	0.0	82.7	20.18	21.06	2000.	99.9	3.1	0.28	0.92	13973.
		SINK 2.20	0.1	82.7	20.18	21.06	2000.	100.0	3.2	0.30	0.94	13962.
8 BY 14	8.1 PERCENT	FLOAT 1.30	68.6	2.1	0.14	0.75	14146.	68.6	2.1	0.14	0.75	14146.
		1.30-1.35	26.0	4.6	0.50	1.13	13713.	94.6	2.8	0.24	0.85	14027.
		1.35-1.40	4.1	9.2	1.02	1.57	12944.	98.7	3.1	0.27	0.88	13981.
		1.40-1.50	0.5	15.5	1.51	2.09	11870.	99.2	3.1	0.28	0.89	13971.
		1.50-1.60	0.1	24.3	2.30	2.75	10372.	99.3	3.1	0.28	0.89	13968.
		1.60-1.70	0.1	32.7	3.61	4.14	8942.	99.4	3.1	0.28	0.89	13965.
		1.70-1.80	0.0	41.0	5.31	5.89	7532.	99.4	3.2	0.29	0.89	13962.
		1.80-2.00	0.2	82.3	20.19	21.05	2000.	99.5	3.3	0.32	0.93	13944.
		2.00-2.20	0.2	82.3	20.19	21.05	2000.	99.7	3.4	0.35	0.96	13926.
		SINK 2.20	0.3	82.3	20.19	21.05	2000.	100.0	3.6	0.41	1.02	13889.
14 BY 28	8.1 PERCENT	FLOAT 1.30	69.2	2.0	0.16	0.73	14161.	69.2	2.0	0.16	0.73	14161.
		1.30-1.35	22.2	4.9	0.53	1.11	13670.	91.4	2.7	0.25	0.82	14042.
		1.35-1.40	6.2	8.7	0.98	1.49	13029.	97.5	3.1	0.30	0.86	13978.
		1.40-1.50	1.8	15.5	1.58	2.15	11860.	99.2	3.3	0.32	0.89	13943.
		1.50-1.60	0.1	24.1	2.34	2.81	10403.	99.3	3.3	0.32	0.89	13939.
		1.60-1.70	0.1	31.3	3.51	4.11	9178.	99.3	3.3	0.32	0.89	13936.
		1.70-1.80	0.0	39.7	5.63	6.10	7747.	99.4	3.3	0.32	0.89	13933.
		1.80-2.00	0.2	79.3	19.85	20.63	2000.	99.5	3.5	0.35	0.92	13914.
		2.00-2.20	0.2	79.3	19.85	20.63	2000.	99.7	3.6	0.39	0.95	13896.
		SINK 2.20	0.3	79.3	19.85	20.63	2000.	100.0	3.8	0.45	1.01	13859.
28 BY 48	7.7 PERCENT	FLOAT 1.30	68.4	1.9	0.17	0.72	14174.	68.4	1.9	0.17	0.72	14174.
		1.30-1.35	20.1	5.3	0.58	1.13	13803.	88.4	2.7	0.26	0.82	14044.
		1.35-1.40	9.2	8.2	0.95	1.44	13101.	97.8	3.2	0.33	0.87	13955.
		1.40-1.50	2.1	15.3	1.70	2.27	11901.	99.7	3.5	0.36	0.90	13913.
		1.50-1.60	0.1	23.4	2.57	3.05	10516.	99.8	3.5	0.36	0.91	13911.
		1.60-1.70	0.0	30.3	3.66	4.28	9347.	99.8	3.5	0.36	0.91	13910.
		1.70-1.80	0.0	38.2	5.81	6.30	8006.	99.8	3.5	0.36	0.91	13909.
		1.80-2.00	0.0	75.4	19.92	20.73	2000.	99.9	3.5	0.37	0.92	13903.
		2.00-2.20	0.0	75.4	19.92	20.73	2000.	99.9	3.5	0.38	0.93	13897.
		SINK 2.20	0.1	75.4	19.92	20.73	2000.	100.0	3.6	0.40	0.95	13886.
48 BY 100	5.3 PERCENT	FLOAT 1.30	63.9	1.8	0.26	0.68	14197.	63.9	1.8	0.26	0.68	14197.
		1.30-1.35	22.3	4.7	0.50	1.04	13707.	86.2	2.5	0.32	0.77	14071.
		1.35-1.40	11.3	8.9	0.76	1.26	13333.	97.5	3.0	0.37	0.83	13985.

			1.40-1.50	2.2	13.6	1.61	2.12	12180.	99.7	3.3	0.40	0.86	13945.	
			1.50-1.60	0.1	21.4	2.57	3.11	10866.	99.8	3.3	0.40	0.86	13943.	
			1.60-1.70	0.0	28.9	3.75	4.35	9595.	99.8	3.3	0.40	0.86	13942.	
			1.70-1.80	0.0	28.7	4.60	5.03	9622.	99.8	3.3	0.40	0.86	13941.	
			1.80-2.00	0.0	72.6	21.14	21.98	2155.	99.9	3.3	0.41	0.87	13936.	
			2.00-2.20	0.0	72.7	21.05	21.90	2134.	99.9	3.4	0.42	0.88	13930.	
			SINK 2.20	0.1	72.8	21.01	21.88	2122.	100.0	3.4	0.44	0.90	13920.	
100 BY 200	3.6 PERCENT	FLOAT 1.30	47.3	1.6	0.52	0.66	14235.	47.3	1.6	0.52	0.66	14235.		
		1.30-1.35	31.7	3.2	0.33	0.85	13953.	79.0	2.2	0.44	0.73	14122.		
		1.35-1.40	17.4	4.8	0.48	1.00	13686.	96.4	2.7	0.45	0.78	14043.		
		1.40-1.50	3.0	11.4	1.22	1.71	12557.	99.4	3.0	0.47	0.81	13998.		
		1.50-1.60	0.3	18.4	2.19	2.67	11372.	99.7	3.0	0.48	0.81	13990.		
		1.60-1.70	0.1	25.5	3.51	3.99	10162.	99.7	3.0	0.48	0.82	13988.		
		1.70-1.80	0.0	22.0	4.34	4.72	10761.	99.8	3.0	0.48	0.82	13988.		
		1.80-2.00	0.1	71.4	23.09	23.84	2366.	99.8	3.1	0.49	0.83	13980.		
		2.00-2.20	0.1	71.7	22.94	23.71	2312.	99.9	3.1	0.51	0.85	13973.		
		SINK 2.20	0.1	71.8	22.92	23.69	2294.	100.0	3.2	0.53	0.87	13960.		
200 BY 325	2.8 PERCENT	FLOAT 1.30	27.6	1.5	0.35	0.62	14240.	27.6	1.5	0.35	0.62	14240.		
		1.30-1.35	42.3	2.5	0.24	0.69	14075.	69.8	2.1	0.29	0.66	14140.		
		1.35-1.40	24.2	3.8	0.34	0.79	13854.	94.0	2.6	0.30	0.69	14066.		
		1.40-1.50	4.7	9.6	0.95	1.40	12861.	98.7	2.9	0.33	0.73	14009.		
		1.50-1.60	0.7	16.8	1.82	2.15	11645.	99.5	3.0	0.34	0.74	13991.		
		1.60-1.70	0.2	22.0	2.78	3.29	10768.	99.6	3.0	0.35	0.74	13986.		
		1.70-1.80	0.0	29.0	6.12	6.65	9568.	99.7	3.0	0.35	0.74	13985.		
		1.80-2.00	0.1	70.7	23.58	24.10	2481.	99.8	3.1	0.37	0.77	13972.		
		2.00-2.20	0.1	71.2	23.39	23.92	2401.	99.9	3.2	0.39	0.79	13963.		
		SINK 2.20	0.1	71.4	23.31	23.86	2383.	100.0	3.3	0.43	0.82	13946.		
COMPOSITE	100.0 PERCENT	FLOAT 1.30	69.8	2.4	0.25	0.74	14084.	69.8	2.4	0.25	0.74	14084.	5.65	
		1.30-1.35	24.1	4.6	0.44	0.98	13726.	93.9	3.0	0.30	0.80	13992.		
		1.35-1.40	4.9	7.5	0.74	1.23	13227.	98.8	3.2	0.32	0.82	13955.		
		1.40-1.50	1.0	14.1	1.31	1.83	12109.	99.7	3.3	0.33	0.83	13937.		
		1.50-1.60	0.1	21.6	2.08	2.49	10835.	99.8	3.3	0.33	0.83	13934.		
		1.60-1.70	0.0	29.0	3.37	3.91	9574.	99.8	3.3	0.33	0.84	13933.		
		1.70-1.80	0.0	36.0	5.30	5.79	8381.	99.9	3.3	0.33	0.84	13933.		
		1.80-2.00	0.0	78.3	20.58	21.37	2076.	99.9	3.4	0.34	0.84	13928.		
		2.00-2.20	0.0	78.6	20.45	21.25	2054.	99.9	3.4	0.35	0.85	13924.		
		SINK 2.20	0.1	78.7	20.43	21.23	2047.	100.0	3.4	0.36	0.87	13916.		

FLOWSTREAM SUMMARY

FLOWRATE = 213. TONS PER HOUR   ASH = 3.4 PERCENT   PYRITIC SULFUR = 0.36 PERCENT   TOTAL SULFUR = 0.87 PERCENT
 BTU CONTENT = 13916. BTU/LB   SO2 CONTENT = 1.24 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 5.65 PERCENT

SPECIFIC GRAVITY ANALYSIS OF MIDDINGS PRODUCT FROM UNIT NUMBER 16

SIZE FRACTION AND WEIGHT	SPECIFIC GRAVITY	DIRECT, PERCENT					BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT			BTU/LB	MOISTURE
		WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR					PYRITIC SULFUR	TOTAL SULFUR			
12 BY 6	6.4 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.		
		1.30-1.35	50.0	4.8	0.64	1.29	13725.	50.0	4.8	0.64	1.29	13725.		
		1.35-1.40	14.8	8.9	1.09	1.69	12986.	64.8	5.5	0.74	1.38	13557.		
		1.40-1.50	35.2	15.7	1.66	2.23	11828.	100.0	9.1	1.06	1.68	12948.		
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.06	1.68	12948.		
6 BY 4	37.8 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.		
		1.30-1.35	50.3	4.8	0.62	1.26	13724.	50.3	4.8	0.62	1.26	13724.		
		1.35-1.40	15.1	8.9	1.09	1.68	12981.	65.4	5.6	0.73	1.36	13553.		
		1.40-1.50	34.6	15.7	1.66	2.23	11825.	100.0	9.1	1.05	1.66	12955.		
		1.50-1.60	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.1	1.05	1.66	12955.		
4 BY 2	19.8 PERCENT	FLOAT 1.30	0.9	2.8	0.51	0.77	14024.	0.9	2.8	0.51	0.77	14024.		
		1.30-1.35	39.2	4.8	0.53	1.02	13710.	40.1	4.8	0.53	1.02	13717.		
		1.35-1.40	28.0	8.3	1.02	1.58	12928.	68.1	6.5	0.73	1.24	13391.		
		1.40-1.50	31.8	16.1	1.58	2.13	11765.	100.0	9.6	1.00	1.53	12873.		
		1.50-1.60	0.0	26.2	2.64	2.89	10045.	100.0	9.6	1.00	1.53	12872.		
		1.60-1.70	0.0	0.0	0.00	0.00	14500.	100.0	9.6	1.00	1.53	12872.		
		1.70-1.80	0.0	0.0	0.00	0.00	14500.	100.0	9.6	1.00	1.53	12872.		
		1.80-2.00	0.0	0.0	0.00	0.00	14500.	100.0	9.6	1.00	1.53	12872.		
		2.00-2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.6	1.00	1.53	12872.		
		SINK 2.20	0.0	0.0	0.00	0.00	14500.	100.0	9.6	1.00	1.53	12872.		
2 BY 1	10.6 PERCENT	FLOAT 1.30	2.6	2.5	0.24	0.75	14068.	2.6	2.5	0.24	0.75	14068.		
		1.30-1.35	35.3	4.7	0.49	1.00	13703.	37.9	4.5	0.48	0.99	13728.		
		1.35-1.40	28.6	8.5	0.95	1.44	12885.	66.5	6.7	0.68	1.18	13365.		
		1.40-1.50	32.2	16.1	1.40	1.93	11757.	98.7	9.8	0.91	1.42	12841.		
		1.50-1.60	0.5	26.0	2.20	2.61	10084.	99.3	9.8	0.92	1.43	12826.		
		1.60-1.70	0.0	34.2	3.61	4.03	8691.	99.3	9.9	0.92	1.43	12824.		
		1.70-1.80	0.0	43.0	5.63	6.09	7183.	99.3	9.9	0.92	1.43	12823.		
		1.80-2.00	0.2	82.8	18.38	20.11	2000.	99.5	10.0	0.95	1.46	12805.		
		2.00-2.20	0.2	82.8	18.38	20.11	2000.	99.7	10.1	0.98	1.50	12786.		
		SINK 2.20	0.3	82.8	18.38	20.11	2000.	100.0	10.4	1.04	1.56	12750.		
1 BY 1/2	6.8 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.		
		1.30-1.35	28.4	4.7	0.33	0.85	13701.	28.4	4.7	0.33	0.85	13701.		
		1.35-1.40	28.9	9.5	0.77	1.23	12885.	57.3	7.1	0.55	1.04	13289.		
		1.40-1.50	37.8	15.9	1.19	1.67	11791.	95.1	10.6	0.81	1.29	12693.		
		1.50-1.60	4.0	25.1	2.28	2.65	10230.	99.1	11.2	0.87	1.35	12593.		
		1.60-1.70	0.1	33.2	3.69	4.05	8848.	99.2	11.2	0.87	1.35	12591.		
		1.70-1.80	0.0	42.2	5.43	5.77	7319.	99.2	11.2	0.87	1.35	12589.		
		1.80-2.00	0.2	83.0	21.56	22.46	2000.	99.4	11.4	0.91	1.39	12568.		
		2.00-2.20	0.2	83.0	21.56	22.46	2000.	99.6	11.5	0.95	1.43	12548.		

		SINK 2.20	0.4	83.0	21.58	22.48	2000.	100.0	11.8	1.03	1.52	12508.
1/2 BY 1/4	2.5 PERCENT	FLOAT 1.30	0.4	2.2	0.12	0.78	14132.	0.4	2.2	0.12	0.78	14132.
		1.30-1.35	25.3	4.8	0.23	0.82	13692.	25.7	4.7	0.23	0.81	13699.
		1.35-1.40	23.2	9.6	0.81	1.09	12869.	48.9	7.0	0.41	0.95	13305.
		1.40-1.50	38.7	15.7	0.89	1.41	11826.	85.6	10.8	0.61	1.14	12671.
		1.50-1.60	11.2	25.4	1.77	2.18	10178.	96.8	12.5	0.75	1.26	12382.
		1.60-1.70	0.8	33.5	3.14	3.45	8801.	97.6	12.6	0.77	1.28	12354.
		1.70-1.80	0.2	41.6	4.48	4.80	7436.	97.7	12.7	0.77	1.29	12346.
		1.80-2.00	0.6	83.7	20.82	21.63	2000.	98.3	13.1	0.89	1.41	12284.
		2.00-2.20	0.6	83.7	20.84	21.65	2000.	98.9	13.5	1.01	1.52	12225.
		SINK 2.20	1.1	83.7	20.85	21.66	2000.	100.0	14.3	1.23	1.75	12109.
1/4 BY 8	1.5 PERCENT	FLOAT 1.30	6.1	2.1	0.13	0.78	14137.	6.1	2.1	0.13	0.78	14137.
		1.30-1.35	38.6	4.6	0.50	1.15	13713.	44.7	4.3	0.45	1.10	13771.
		1.35-1.40	22.2	9.3	1.04	1.61	12925.	66.9	5.9	0.65	1.27	13490.
		1.40-1.50	20.4	15.5	1.53	2.12	11873.	87.3	8.2	0.85	1.47	13112.
		1.50-1.60	6.6	24.2	2.33	2.78	10380.	93.9	9.3	0.96	1.56	12920.
		1.60-1.70	2.4	32.9	3.65	4.17	8911.	96.2	9.9	1.02	1.62	12821.
		1.70-1.80	1.0	41.1	5.18	5.80	7515.	97.3	10.2	1.07	1.67	12764.
		1.80-2.00	1.6	82.7	20.17	21.06	2000.	98.9	11.4	1.38	1.99	12589.
		2.00-2.20	0.5	82.6	20.16	21.05	2000.	99.4	11.8	1.48	2.09	12532.
		SINK 2.20	0.6	82.6	20.15	21.03	2000.	100.0	12.2	1.59	2.19	12473.
8 BY 14	4.8 PERCENT	FLOAT 1.30	9.6	2.1	0.14	0.75	14146.	9.6	2.1	0.14	0.75	14146.
		1.30-1.35	25.0	4.6	0.50	1.13	13713.	34.6	3.9	0.40	1.02	13833.
		1.35-1.40	19.3	9.2	1.02	1.57	12944.	54.0	5.8	0.62	1.22	13514.
		1.40-1.50	23.0	15.5	1.51	2.09	11870.	76.9	8.7	0.89	1.48	13023.
		1.50-1.60	9.1	24.3	2.30	2.75	10372.	86.0	10.3	1.04	1.61	12743.
		1.60-1.70	4.3	32.7	3.60	4.14	8942.	90.4	11.4	1.16	1.74	12560.
		1.70-1.80	2.3	41.0	5.31	5.89	7532.	92.6	12.1	1.26	1.84	12438.
		1.80-2.00	4.0	82.3	20.19	21.05	2000.	96.6	15.0	2.05	2.64	12004.
		2.00-2.20	1.4	82.3	20.19	21.05	2000.	98.0	16.0	2.30	2.89	11866.
		SINK 2.20	2.0	82.3	20.19	21.05	2000.	100.0	17.3	2.66	3.25	11669.
14 BY 28	3.9 PERCENT	FLOAT 1.30	15.0	2.0	0.16	0.73	14163.	15.0	2.0	0.16	0.73	14163.
		1.30-1.35	16.0	4.9	0.53	1.10	13665.	31.0	3.5	0.35	0.92	13906.
		1.35-1.40	15.0	8.6	0.98	1.48	13032.	46.1	5.2	0.56	1.11	13621.
		1.40-1.50	21.1	15.5	1.58	2.15	11860.	67.2	8.4	0.88	1.44	13067.
		1.50-1.60	10.3	24.1	2.35	2.81	10405.	77.4	10.5	1.07	1.62	12714.
		1.60-1.70	6.1	31.1	3.49	4.10	9209.	83.5	12.0	1.25	1.80	12459.
		1.70-1.80	3.1	39.5	5.69	6.13	7785.	86.6	13.0	1.41	1.95	12292.
		1.80-2.00	7.8	78.8	19.80	20.58	2000.	94.4	18.4	2.92	3.49	11443.
		2.00-2.20	3.5	78.8	19.80	20.58	2000.	97.9	20.6	3.52	4.09	11109.
		SINK 2.20	2.1	78.8	19.80	20.58	2000.	100.0	21.8	3.87	4.44	10916.
28 BY 48	2.0 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.
		1.30-1.35	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.
		1.35-1.40	5.2	8.2	0.95	1.44	13108.	5.2	8.2	0.94	1.43	13113.
		1.40-1.50	27.6	15.3	1.70	2.27	11903.	32.8	14.2	1.58	2.14	12094.
		1.50-1.60	16.6	23.4	2.62	3.10	10527.	49.4	17.2	1.93	2.46	11568.
		1.60-1.70	9.8	29.9	3.69	4.33	9422.	59.2	19.3	2.22	2.77	11213.
		1.70-1.80	5.0	37.5	5.91	6.41	8127.	64.2	20.7	2.51	3.05	10974.
		1.80-2.00	16.6	73.8	19.89	20.71	2000.	80.8	31.7	6.09	6.69	9127.
		2.00-2.20	10.9	73.8	19.89	20.71	2000.	91.7	36.7	7.73	8.35	8279.
		SINK 2.20	8.3	73.8	19.89	20.71	2000.	100.0	39.8	8.74	9.38	7759.
48 BY 100	1.6 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.
		1.30-1.35	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.
		1.35-1.40	5.4	6.7	0.74	1.24	13353.	5.4	6.7	0.74	1.24	13357.

			1.40-1.50	24.6	13.5	1.61	2.13	12198.	30.0	12.3	1.46	1.97	12407.	
			1.50-1.60	14.4	21.3	2.64	3.19	10876.	44.4	15.2	1.84	2.36	11909.	
			1.60-1.70	7.5	28.6	3.81	4.44	9645.	51.9	17.2	2.13	2.66	11581.	
			1.70-1.80	4.1	36.2	6.13	6.70	8348.	56.0	18.6	2.42	2.96	11345.	
			1.80-2.00	18.0	70.6	21.30	22.16	2500.	74.1	31.2	7.02	7.64	9191.	
			2.00-2.20	14.2	70.6	21.30	22.16	2500.	88.3	37.6	9.32	9.97	8114.	
			SINK 2.20	11.7	70.6	21.30	22.16	2500.	100.0	41.4	10.72	11.40	7456.	
100 BY 200	1.5 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.	
		1.30-1.35	0.0	0.0	0.00	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.	
		1.35-1.40	5.0	4.6	0.45	0.98	13720.	5.0	4.6	0.45	0.97	13724.		
		1.40-1.50	17.6	11.4	1.22	1.71	12569.	22.6	9.9	1.05	1.55	12824.		
		1.50-1.60	10.6	18.6	2.28	2.79	11336.	33.2	12.7	1.45	1.95	12348.		
		1.60-1.70	5.2	25.7	3.64	4.11	10134.	38.4	14.4	1.74	2.24	12050.		
		1.70-1.80	2.8	34.3	6.74	7.33	8673.	41.1	15.7	2.08	2.58	11823.		
		1.80-2.00	17.0	69.4	23.77	24.54	2700.	58.1	31.4	8.41	8.99	9159.		
		2.00-2.20	16.6	69.4	23.77	24.54	2700.	74.7	39.9	11.82	12.44	7724.		
		SINK 2.20	25.3	69.4	23.78	24.54	2700.	100.0	47.3	14.85	15.51	6452.		
200 BY 325	1.1 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.	
		1.30-1.35	0.1	2.0	0.18	0.59	14155.	0.1	2.0	0.18	0.59	14156.		
		1.35-1.40	5.3	3.8	0.31	0.76	13890.	5.3	3.8	0.31	0.76	13892.		
		1.40-1.50	16.5	9.5	0.93	1.37	12888.	21.8	8.0	0.78	1.22	13133.		
		1.50-1.60	9.8	16.7	1.82	2.16	11654.	31.6	10.7	1.11	1.51	12673.		
		1.60-1.70	4.6	23.2	2.93	3.49	10551.	36.2	12.3	1.34	1.76	12405.		
		1.70-1.80	2.4	32.9	6.97	7.57	8911.	38.6	13.6	1.68	2.12	12189.		
		1.80-2.00	16.6	69.7	23.97	24.46	2645.	55.2	30.5	8.39	8.85	9316.		
		2.00-2.20	17.1	69.7	23.97	24.46	2645.	72.3	39.8	12.08	12.54	7738.		
		SINK 2.20	27.7	69.7	23.97	24.46	2645.	100.0	48.1	15.37	15.84	6327.		
COMPOSITE	100.0 PERCENT	FLOAT 1.30	1.6	2.2	0.21	0.74	14124.	1.6	2.2	0.21	0.74	14124.	5.30	
		1.30-1.35	38.6	4.6	0.56	1.16	13716.	40.2	4.5	0.55	1.14	13732.		
		1.35-1.40	19.9	9.1	0.99	1.53	12945.	60.1	6.1	0.70	1.27	13471.		
		1.40-1.50	32.1	15.7	1.54	2.08	11824.	82.1	9.4	0.99	1.56	12898.		
		1.50-1.60	2.4	23.4	2.30	2.74	10523.	94.5	9.8	1.02	1.59	12838.		
		1.60-1.70	0.9	30.2	3.58	4.16	9372.	95.5	10.0	1.05	1.61	12804.		
		1.70-1.80	0.5	38.3	5.84	6.37	7992.	98.0	10.1	1.07	1.64	12780.		
		1.80-2.00	1.6	74.5	21.24	22.03	2272.	97.6	11.2	1.40	1.97	12606.		
		2.00-2.20	1.1	73.1	21.72	22.49	2361.	98.7	11.9	1.64	2.21	12489.		
		SINK 2.20	1.3	72.8	22.20	22.96	2423.	100.0	12.7	1.91	2.48	12357.		

FLOWSTREAM SUMMARY

FLOWRATE = 120. TONS PER HOUR   ASH = 12.7 PERCENT   PYRITIC SULFUR = 1.91 PERCENT   TOTAL SULFUR = 2.48 PERCENT
 BTU CONTENT = 12357. BTU/LB   SO2 CONTENT = 4.01 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 5.30 PERCENT

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 1

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	WEIGHT	DIRECT, PERCENT			BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT			BTU/LB	MOISTURE
				ASH	PYRITIC SULFUR	TOTAL SULFUR				PYRITIC SULFUR	TOTAL SULFUR			
18 BY 12	75.3 PERCENT	FLOAT 1.30	19.7	2.8	0.21	0.79	14024.	19.7	2.8	0.21	0.79	14024.		
		1.30-1.35	11.0	4.4	0.71	1.57	13752.	30.7	3.4	0.39	1.07	13927.		
		1.35-1.40	2.1	7.8	0.98	1.59	13174.	32.8	3.7	0.43	1.10	13878.		
		1.40-1.50	11.3	15.4	1.10	1.60	11882.	44.1	8.7	0.60	1.23	13367.		
		1.50-1.60	2.1	25.0	1.44	1.84	10250.	46.2	7.5	0.64	1.26	13225.		
		1.60-1.70	1.9	31.5	2.90	3.50	9145.	48.1	8.4	0.73	1.35	13064.		
		1.70-1.80	0.8	41.0	5.46	6.13	7530.	48.9	9.0	0.80	1.42	12973.		
		1.80-2.00	12.8	84.6	18.43	19.23	2000.	61.7	24.6	4.46	5.11	10700.		
		2.00-2.20	12.8	84.6	18.43	19.23	2000.	74.5	34.9	6.85	7.54	9208.		
		SINK 2.20	25.5	84.6	18.43	19.23	2000.	100.0	47.6	9.81	10.52	7366.		
12 BY 6	24.7 PERCENT	FLOAT 1.30	19.7	2.8	0.21	0.79	14024.	19.7	2.8	0.21	0.79	14024.		
		1.30-1.35	11.0	4.4	0.71	1.57	13752.	30.7	3.4	0.39	1.07	13927.		
		1.35-1.40	2.1	7.8	0.98	1.59	13174.	32.8	3.7	0.43	1.10	13878.		
		1.40-1.50	11.3	15.4	1.10	1.60	11882.	44.1	8.7	0.60	1.23	13367.		
		1.50-1.60	2.1	25.0	1.44	1.84	10250.	46.2	7.5	0.64	1.26	13225.		
		1.60-1.70	1.9	31.5	2.90	3.50	9145.	48.1	8.4	0.73	1.35	13064.		
		1.70-1.80	0.8	41.0	5.46	6.13	7529.	48.9	9.0	0.80	1.42	12973.		
		1.80-2.00	12.8	84.6	18.43	19.23	2000.	61.7	24.6	4.46	5.11	10700.		
		2.00-2.20	12.8	84.6	18.43	19.23	2000.	74.5	34.9	6.85	7.54	9207.		
		SINK 2.20	25.5	84.6	18.43	19.23	2000.	100.0	47.6	9.81	10.52	7366.		
COMPOSITE	100.0 PERCENT	FLOAT 1.30	19.7	2.8	0.21	0.79	14024.	19.7	2.8	0.21	0.79	14024.		2.00
		1.30-1.35	11.0	4.4	0.71	1.57	13752.	30.7	3.4	0.39	1.07	13927.		
		1.35-1.40	2.1	7.8	0.98	1.59	13174.	32.8	3.7	0.43	1.10	13878.		
		1.40-1.50	11.3	15.4	1.10	1.60	11882.	44.1	8.7	0.60	1.23	13367.		
		1.50-1.60	2.1	25.0	1.44	1.84	10250.	46.2	7.5	0.64	1.26	13225.		
		1.60-1.70	1.9	31.5	2.90	3.50	9145.	48.1	8.4	0.73	1.35	13064.		
		1.70-1.80	0.8	41.0	5.46	6.13	7530.	48.9	9.0	0.80	1.42	12973.		
		1.80-2.00	12.8	84.6	18.43	19.23	2000.	61.7	24.6	4.46	5.11	10700.		
		2.00-2.20	12.8	84.6	18.43	19.23	2000.	74.5	34.9	6.85	7.54	9208.		
		SINK 2.20	25.5	84.6	18.43	19.23	2000.	100.0	47.6	9.81	10.52	7366.		

FLOWSTREAM SUMMARY

FLOWRATE = 1. TONS PER HOUR   ASH = 47.6 PERCENT   PYRITIC SULFUR = 9.81 PERCENT   TOTAL SULFUR = 10.52 PERCENT
 BTU CONTENT = 7367. BTU/LB   SO2 CONTENT = 28.57 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 2.00 PERCENT

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 10

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	WEIGHT	ASH	DIRECT, PERCENT		BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT		BTU/LB	MOISTURE
					PYRITIC SULFUR	TOTAL SULFUR				PYRITIC SULFUR	TOTAL SULFUR		
12 BY 6	7.0 PERCENT	FLOAT 1.30	0.0	2.8	0.16	0.80	14017.	0.0	2.8	0.16	0.80	14017.	
		1.30-1.35	0.0	4.6	0.64	1.29	13725.	0.0	3.7	0.40	1.05	13871.	
		1.35-1.40	0.0	8.9	1.09	1.69	12986.	0.0	5.4	0.63	1.26	13576.	
		1.40-1.50	0.0	15.7	1.66	2.23	11828.	0.0	8.0	0.89	1.51	13139.	
		1.50-1.60	5.4	26.1	2.11	2.62	10064.	5.4	26.1	2.11	2.62	10064.	
		1.60-1.70	3.4	33.4	3.47	4.06	8824.	8.8	28.9	2.64	3.18	9579.	
		1.70-1.80	1.7	43.8	5.85	6.44	7048.	10.5	31.4	3.16	3.71	9167.	
		1.80-2.00	22.4	83.8	18.39	19.38	2000.	32.9	67.0	13.52	14.37	4291.	
		2.00-2.20	22.4	83.8	18.39	19.38	2000.	55.3	73.8	15.49	16.40	3364.	
		SINK 2.20	44.7	83.8	18.39	19.38	2000.	100.0	78.3	16.79	17.73	2754.	
6 BY 4	40.7 PERCENT	FLOAT 1.30	0.0	2.8	0.20	0.80	14017.	0.0	2.8	0.20	0.80	14017.	
		1.30-1.35	0.0	4.6	0.62	1.26	13724.	0.0	3.7	0.41	1.03	13871.	
		1.35-1.40	0.0	8.9	1.09	1.68	12981.	0.0	5.4	0.64	1.25	13574.	
		1.40-1.50	0.0	15.7	1.66	2.23	11825.	0.0	8.0	0.89	1.49	13137.	
		1.50-1.60	5.5	26.1	2.19	2.68	10065.	5.5	26.1	2.19	2.68	10065.	
		1.60-1.70	3.5	33.4	3.54	4.11	8814.	9.0	28.9	2.71	3.23	9579.	
		1.70-1.80	1.7	43.9	5.84	6.41	7041.	10.7	31.4	3.22	3.75	9169.	
		1.80-2.00	22.3	83.7	18.56	19.54	2000.	33.0	66.8	13.59	14.42	4321.	
		2.00-2.20	22.3	83.7	18.56	19.54	2000.	55.3	73.6	15.59	16.49	3385.	
		SINK 2.20	44.7	83.7	18.56	19.54	2000.	100.0	78.1	16.92	17.85	2766.	
4 BY 2	29.1 PERCENT	FLOAT 1.30	0.0	2.8	0.51	0.77	14024.	0.0	2.8	0.51	0.77	14024.	
		1.30-1.35	0.0	4.6	0.53	1.02	13710.	0.0	3.7	0.52	0.89	13867.	
		1.35-1.40	0.0	9.3	1.02	1.56	12926.	0.0	5.6	0.69	1.12	13553.	
		1.40-1.50	3.0	16.1	1.58	2.13	11765.	3.0	16.1	1.58	2.13	11765.	
		1.50-1.60	7.0	26.2	2.64	2.99	10045.	10.0	23.1	2.32	2.73	10567.	
		1.60-1.70	3.8	34.3	4.01	4.36	8661.	13.8	26.2	2.78	3.18	10043.	
		1.70-1.80	2.0	44.6	5.74	6.17	6920.	15.8	28.5	3.15	3.55	9652.	
		1.80-2.00	21.0	83.2	19.62	20.62	2000.	36.9	59.8	12.56	13.30	5282.	
		2.00-2.20	21.0	83.2	19.62	20.62	2000.	57.9	68.3	15.13	15.96	4089.	
		SINK 2.20	42.1	83.2	19.62	20.62	2000.	100.0	74.6	17.02	17.92	3210.	
2 BY 1	13.0 PERCENT	FLOAT 1.30	0.0	2.5	0.24	0.75	14068.	0.0	2.5	0.24	0.75	14068.	
		1.30-1.35	0.0	4.7	0.49	1.00	13703.	0.0	3.6	0.37	0.88	13885.	
		1.35-1.40	0.1	9.5	0.95	1.44	12885.	0.1	9.5	0.95	1.44	12885.	
		1.40-1.50	2.2	16.1	1.40	1.93	11757.	2.3	15.7	1.37	1.90	11823.	
		1.50-1.60	8.8	26.0	2.20	2.61	10084.	11.0	23.8	2.03	2.46	10453.	
		1.60-1.70	4.5	34.2	3.61	4.03	8691.	15.5	26.8	2.49	2.92	9941.	
		1.70-1.80	3.0	43.0	5.63	6.09	7183.	18.4	29.4	2.99	3.43	9498.	
		1.80-2.00	20.4	82.8	18.38	20.11	2000.	38.8	57.5	11.08	12.19	5560.	
		2.00-2.20	20.4	82.8	18.38	20.11	2000.	59.2	66.2	13.59	14.92	4334.	
		SINK 2.20	40.8	82.8	18.38	20.11	2000.	100.0	73.0	15.55	17.03	3382.	
1 BY 1/2	7.4 PERCENT	FLOAT 1.30	0.0	2.4	0.12	0.64	14085.	0.0	2.4	0.12	0.64	14085.	
		1.30-1.35	0.2	4.7	0.33	0.85	13701.	0.2	4.7	0.33	0.85	13701.	
		1.35-1.40	0.2	9.5	0.77	1.23	12885.	0.4	7.2	0.56	1.05	13278.	
		1.40-1.50	1.6	15.9	1.19	1.67	11791.	2.0	14.2	1.06	1.54	12094.	
		1.50-1.60	8.4	25.1	2.28	2.65	10230.	10.4	23.1	2.05	2.44	10581.	
		1.60-1.70	5.7	33.2	3.69	4.05	8848.	16.1	26.7	2.63	3.01	9968.	
		1.70-1.80	4.0	42.2	5.43	5.77	7319.	20.1	29.8	3.19	3.56	9436.	
		1.80-2.00	20.0	83.0	21.56	22.46	2000.	40.1	58.3	12.35	12.99	5729.	
		2.00-2.20	20.0	83.0	21.56	22.46	2000.	60.0	65.2	15.41	16.14	4488.	

		SINK 2.20	40.0	83.0	21.56	22.46	2000.	100.0	72.3	17.87	18.67	3494.	
1/2 BY 1/4	2.7 PERCENT	FLOAT 1.30	0.0	2.4	0.10	0.66	14094.	0.0	2.4	0.10	0.66	14094.	
		1.30-1.35	0.0	4.8	0.21	0.79	13691.	0.0	3.6	0.15	0.72	13892.	
		1.35-1.40	0.2	9.6	0.59	1.08	12867.	0.2	9.6	0.59	1.08	12868.	
		1.40-1.50	1.3	15.7	0.88	1.40	11825.	1.4	15.0	0.84	1.36	11942.	
		1.50-1.60	5.5	25.4	1.76	2.15	10175.	6.9	23.3	1.57	1.99	10540.	
		1.60-1.70	5.9	33.6	3.10	3.39	8791.	12.8	28.0	2.28	2.63	9732.	
		1.70-1.80	4.9	41.6	4.36	4.62	7422.	17.7	31.8	2.85	3.18	8097.	
		1.80-2.00	20.6	83.7	20.85	21.66	2000.	38.3	59.7	12.54	13.13	5278.	
		2.00-2.20	20.6	83.7	20.85	21.66	2000.	58.8	68.1	15.45	16.11	4131.	
		SINK 2.20	41.2	83.7	20.85	21.66	2000.	100.0	74.6	17.67	18.40	3254.	
1/4 BY 8	0.1 PERCENT	FLOAT 1.30	0.0	2.1	0.13	0.79	14139.	0.0	2.1	0.13	0.79	14139.	
		1.30-1.35	0.0	4.6	0.58	1.26	13716.	0.0	3.4	0.36	1.03	13928.	
		1.35-1.40	0.2	9.2	1.16	1.76	12930.	0.2	9.2	1.15	1.75	12940.	
		1.40-1.50	1.4	15.4	1.70	2.31	11885.	1.6	14.6	1.64	2.25	12011.	
		1.50-1.60	5.9	23.9	2.49	2.96	10437.	7.5	21.9	2.31	2.81	10775.	
		1.60-1.70	7.0	32.7	3.83	4.41	8937.	14.5	27.1	3.04	3.58	9892.	
		1.70-1.80	5.6	40.9	5.33	6.07	7541.	20.1	30.9	3.67	4.27	9241.	
		1.80-2.00	20.0	82.4	19.90	20.83	2000.	40.0	56.6	11.77	12.53	5628.	
		2.00-2.20	20.0	82.4	19.90	20.83	2000.	60.0	65.2	14.48	15.29	4420.	
		SINK 2.20	40.0	82.4	19.90	20.83	2000.	100.0	72.1	16.64	17.50	3453.	
COMPOSITE	100.0 PERCENT	FLOAT 1.30	0.0	2.0	0.25	0.65	14163.	0.0	2.0	0.25	0.65	14163.	3.15
		1.30-1.35	0.0	4.7	0.33	0.85	13701.	0.0	4.7	0.33	0.85	13701.	
		1.35-1.40	0.0	9.5	0.84	1.31	12884.	0.1	8.2	0.70	1.19	13107.	
		1.40-1.50	1.3	16.1	1.49	2.03	11767.	1.4	15.8	1.46	2.00	11818.	
		1.50-1.60	6.5	26.0	2.32	2.74	10081.	7.9	24.2	2.17	2.61	10382.	
		1.60-1.70	3.9	33.8	3.68	4.13	8757.	11.9	27.4	2.67	3.12	9842.	
		1.70-1.80	2.2	43.5	5.63	6.10	7097.	14.1	29.9	3.14	3.59	9409.	
		1.80-2.00	21.5	83.4	19.09	20.16	2000.	35.6	62.3	12.78	13.60	4932.	
		2.00-2.20	21.5	83.4	19.09	20.16	2000.	57.0	70.2	15.16	16.07	3828.	
		SINK 2.20	43.0	83.4	19.10	20.16	2000.	100.0	75.9	16.85	17.83	3043.	

FLOWSTREAM SUMMARY

FLOWRATE = 243. TONS PER HOUR   ASH = 75.9 PERCENT   PYRITIC SULFUR = 16.85 PERCENT   TOTAL SULFUR = 17.83 PERCENT
 BTU CONTENT = 3043. BTU/LB   SO2 CONTENT = 117.20 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 3.15 PERCENT

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 18

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	WEIGHT	DIRECT, PERCENT			BTU/LB	WEIGHT	ASH	CUMULATIVE, PERCENT			BTU/LB	MOISTURE
				ASH	PYRITIC SULFUR	TOTAL SULFUR				PYRITIC SULFUR	TOTAL SULFUR			
1/2 BY 1/4	0.7 PERCENT	FLOAT 1.30	0.4	2.2	0.12	0.78	14132.	0.4	2.2	0.12	0.78	14132.		
		1.30-1.35	5.1	4.8	0.49	1.14	13711.	5.5	4.5	0.48	1.11	13742.		
		1.35-1.40	4.9	9.3	1.01	1.58	12918.	10.3	6.7	0.72	1.33	13354.		
		1.40-1.50	8.1	15.5	1.48	2.07	11889.	18.4	10.6	1.05	1.68	12702.		
		1.50-1.60	5.8	24.3	2.29	2.74	10385.	24.3	13.9	1.35	1.92	12139.		
		1.60-1.70	4.6	32.9	3.64	4.14	8900.	28.8	16.9	1.71	2.27	11628.		
		1.70-1.80	4.0	41.1	5.09	5.70	7509.	32.8	19.8	2.12	2.69	11127.		
		1.80-2.00	16.4	82.8	20.19	21.08	2000.	49.2	40.8	8.15	8.82	8085.		
		2.00-2.20	16.9	82.8	20.19	21.08	2000.	66.1	51.5	11.22	11.95	6532.		
		SINK 2.20	33.8	82.8	20.19	21.08	2000.	100.0	82.1	14.28	15.04	4988.		
1/4 BY 8	10.5 PERCENT	FLOAT 1.30	0.5	2.1	0.13	0.78	14137.	0.5	2.1	0.13	0.78	14137.		
		1.30-1.35	4.8	4.8	0.50	1.15	13713.	5.3	4.4	0.48	1.11	13758.		
		1.35-1.40	4.3	9.3	1.03	1.60	12925.	9.6	8.6	0.72	1.33	13382.		
		1.40-1.50	7.5	15.5	1.51	2.10	11871.	17.1	10.5	1.06	1.66	12722.		
		1.50-1.60	5.4	24.3	2.31	2.78	10373.	22.5	13.8	1.38	1.93	12158.		
		1.60-1.70	4.3	32.9	3.64	4.17	8911.	26.9	16.9	1.73	2.29	11633.		
		1.70-1.80	3.9	41.1	5.18	5.79	7514.	30.8	19.9	2.17	2.73	11111.		
		1.80-2.00	16.5	82.7	20.18	21.08	2000.	47.3	41.9	8.48	9.14	7927.		
		2.00-2.20	17.4	82.7	20.18	21.08	2000.	64.7	52.8	11.82	12.35	6332.		
		SINK 2.20	35.3	82.7	20.18	21.08	2000.	100.0	83.4	14.63	15.42	4804.		
8 BY 14	41.2 PERCENT	FLOAT 1.30	1.7	2.1	0.14	0.75	14148.	1.7	2.1	0.14	0.75	14148.		
		1.30-1.35	5.0	4.8	0.50	1.13	13713.	6.7	4.0	0.41	1.03	13820.		
		1.35-1.40	4.7	9.2	1.02	1.57	12944.	11.4	8.1	0.88	1.28	13458.		
		1.40-1.50	7.6	15.5	1.51	2.09	11870.	19.0	9.9	1.00	1.59	12823.		
		1.50-1.60	4.7	24.3	2.30	2.75	10372.	23.7	12.7	1.28	1.82	12335.		
		1.60-1.70	3.7	32.7	3.60	4.14	8942.	27.5	15.5	1.58	2.14	11873.		
		1.70-1.80	3.4	41.0	5.31	5.89	7532.	30.9	18.3	1.99	2.55	11394.		
		1.80-2.00	15.8	82.3	20.19	21.05	2000.	46.7	40.0	8.18	8.82	8210.		
		2.00-2.20	17.6	82.3	20.19	21.05	2000.	64.3	51.8	11.45	12.18	6511.		
		SINK 2.20	35.7	82.3	20.19	21.05	2000.	100.0	82.5	14.57	15.33	4903.		
14 BY 28	22.3 PERCENT	FLOAT 1.30	3.2	2.0	0.16	0.73	14183.	3.2	2.0	0.16	0.73	14183.		
		1.30-1.35	3.6	4.9	0.53	1.10	13685.	6.8	3.5	0.38	0.93	13900.		
		1.35-1.40	3.7	8.6	0.98	1.49	13032.	10.5	5.3	0.57	1.12	13598.		
		1.40-1.50	6.0	15.5	1.58	2.15	11860.	16.5	9.0	0.94	1.50	12963.		
		1.50-1.60	4.0	24.1	2.35	2.81	10405.	20.5	12.0	1.21	1.75	12467.		
		1.60-1.70	3.4	31.1	3.49	4.10	9209.	24.0	14.7	1.54	2.09	11998.		
		1.70-1.80	2.7	39.5	5.69	6.13	7785.	26.7	17.2	1.98	2.50	11572.		
		1.80-2.00	14.0	78.8	19.80	20.58	2000.	40.7	38.5	8.11	8.72	8273.		
		2.00-2.20	18.2	78.8	19.80	20.58	2000.	58.9	50.9	11.72	12.39	6332.		
		SINK 2.20	41.1	78.8	19.80	20.58	2000.	100.0	82.4	15.04	15.75	4551.		
28 BY 48	9.5 PERCENT	FLOAT 1.30	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.		
		1.30-1.35	0.0	0.0	0.00	0.00	14500.	0.0	0.0	0.00	0.00	14500.		
		1.35-1.40	0.5	8.2	0.95	1.44	13108.	0.5	8.2	0.95	1.44	13108.		
		1.40-1.50	3.4	15.3	1.70	2.27	11903.	3.9	14.3	1.60	2.18	12067.		
		1.50-1.60	2.9	23.4	2.62	3.10	10525.	6.8	18.2	2.04	2.56	11410.		
		1.60-1.70	2.6	29.9	3.69	4.33	9421.	9.4	21.4	2.50	3.05	10856.		
		1.70-1.80	2.1	37.5	5.91	6.41	8127.	11.5	24.3	3.11	3.68	10364.		
		1.80-2.00	13.2	73.8	19.89	20.71	2000.	24.6	50.8	12.09	12.78	5890.		
		2.00-2.20	19.9	73.8	19.89	20.71	2000.	44.5	61.1	15.57	16.32	4153.		

		SINK 2.20	55.5	73.8	19.89	20.71	2000.	100.0	68.2	17.97	18.75	2958.	
48 BY 100	4.3 PERCENT	FLOAT 1.30	6.1	1.8	0.28	0.68	14201.	6.1	1.8	0.28	0.68	14201.	
		1.30-1.35	2.1	4.6	0.49	1.02	13726.	8.1	2.5	0.33	0.76	14080.	
		1.35-1.40	1.5	6.7	0.74	1.24	13358.	9.8	3.1	0.39	0.84	13869.	
		1.40-1.50	2.4	13.5	1.81	2.12	12199.	12.0	5.2	0.64	1.10	13813.	
		1.50-1.60	1.6	21.3	2.64	3.19	10876.	13.6	7.1	0.87	1.34	13298.	
		1.60-1.70	1.1	28.6	3.81	4.43	9646.	14.7	8.6	1.08	1.58	13035.	
		1.70-1.80	0.8	36.1	6.12	6.69	8360.	15.5	10.1	1.34	1.83	12791.	
		1.80-2.00	6.8	70.6	21.30	22.16	2500.	22.2	28.5	7.42	8.02	9658.	
		2.00-2.20	14.6	70.6	21.30	22.16	2500.	36.8	45.2	12.92	13.82	6823.	
		SINK 2.20	63.2	70.6	21.30	22.16	2500.	100.0	61.2	18.22	19.02	4092.	
100 BY 200	5.7 PERCENT	FLOAT 1.30	30.1	1.5	0.54	0.65	14241.	30.1	1.5	0.54	0.65	14241.	
		1.30-1.35	20.6	3.1	0.32	0.82	13975.	50.7	2.2	0.45	0.72	14133.	
		1.35-1.40	12.5	4.6	0.46	0.97	13716.	63.2	2.6	0.45	0.77	14050.	
		1.40-1.50	4.9	11.2	1.18	1.67	12604.	68.1	3.3	0.50	0.84	13946.	
		1.50-1.60	3.3	18.3	2.20	2.68	11393.	70.4	3.7	0.56	0.90	13863.	
		1.60-1.70	1.1	25.2	3.53	4.00	10216.	71.6	4.1	0.61	0.94	13805.	
		1.70-1.80	0.6	34.0	6.80	7.39	8722.	72.2	4.3	0.66	1.00	13763.	
		1.80-2.00	3.6	69.5	23.87	24.59	2692.	75.7	7.4	1.75	2.11	13240.	
		2.00-2.20	4.2	69.5	23.83	24.57	2693.	80.0	10.7	2.92	3.30	12683.	
		SINK 2.20	20.0	69.4	23.79	24.55	2697.	100.0	22.5	7.10	7.56	10681.	
200 BY 325	5.8 PERCENT	FLOAT 1.30	13.3	1.5	0.36	0.61	14245.	13.3	1.5	0.36	0.61	14245.	
		1.30-1.35	22.4	2.4	0.23	0.67	14093.	35.7	2.1	0.28	0.64	14149.	
		1.35-1.40	15.4	3.7	0.32	0.77	13875.	51.1	2.5	0.29	0.68	14067.	
		1.40-1.50	6.5	8.5	0.93	1.37	12886.	57.8	3.3	0.36	0.78	13933.	
		1.50-1.60	3.5	16.7	1.81	2.14	11657.	61.1	4.1	0.45	0.84	13804.	
		1.60-1.70	1.8	23.2	2.91	3.48	10561.	63.0	4.7	0.52	0.92	13709.	
		1.70-1.80	1.0	32.8	6.97	7.57	8917.	64.0	5.1	0.62	1.02	13633.	
		1.80-2.00	7.0	69.8	23.97	24.45	2641.	70.9	11.5	2.92	3.32	12553.	
		2.00-2.20	7.3	69.8	23.96	24.45	2641.	78.3	16.9	4.89	5.30	11624.	
		SINK 2.20	21.7	69.8	23.97	24.45	2642.	100.0	28.4	9.03	9.46	9672.	
COMPOSITE	100.0 PERCENT	FLOAT 1.30	4.2	1.7	0.36	0.68	14209.	4.2	1.7	0.36	0.68	14209.	85.00
		1.30-1.35	6.0	3.9	0.41	0.96	13841.	10.2	3.0	0.39	0.84	13993.	
		1.35-1.40	5.0	7.4	0.80	1.32	13243.	15.2	4.4	0.52	1.00	13748.	
		1.40-1.50	6.4	14.9	1.49	2.05	11968.	21.6	7.5	0.81	1.31	13220.	
		1.50-1.60	4.1	23.6	2.31	2.76	10494.	25.7	10.1	1.05	1.55	12784.	
		1.60-1.70	3.3	31.6	3.57	4.13	9126.	29.0	12.5	1.33	1.84	12372.	
		1.70-1.80	2.8	40.1	5.48	6.03	7682.	31.7	14.9	1.69	2.20	11963.	
		1.80-2.00	13.6	80.0	20.26	21.08	2042.	45.4	34.5	7.28	7.88	8979.	
		2.00-2.20	16.4	79.5	20.25	21.07	2048.	61.8	46.5	10.73	11.39	7137.	
		SINK 2.20	38.2	78.7	20.37	21.18	2078.	100.0	58.8	14.41	15.13	5205.	

FLOWSTREAM SUMMARY

FLOWRATE = 21. TONS PER HOUR   ASH = 58.8 PERCENT   PYRITIC SULFUR = 14.41 PERCENT   TOTAL SULFUR = 15.13 PERCENT
 BTU CONTENT = 5205. BTU/LB   SO2 CONTENT = 58.12 LBS SO2/MILLION BTU
 MOISTURE CONTENT = 85.00 PERCENT

SUMMARY DATA FOR UNITS

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES			YIELD (PERCENT)	BTU RECOVERY (PERCENT)	WATER IN (GPM)	WATER OUT (GPM)
1	21 (ROTARY BREAKER)	20.000	12.000	8.000				
2	33 (WET UPPER SCREEN)	1.500	1200.000				1200.000	0.000
3	34 (WET LOWER SCREEN)	0.375	0.000					
4	24 (PRIMARY SINGLE ROLL CRUSHER)		0.023					
5	41 (STREAM BLENDER)		0.000					
6	9 (SAND CONE)	1.320	750.000		28.3	48.2	750.000	733.580
7	71 (CLASSIFYING HYDROCYCLONE)	14.000	180.000		8.1	8.9	180.000	0.000
8	19 (FROTH FLOTATION)		0.000		91.0	95.8		
9	3 (DENSE-MEDIUM CYCLONE)	1.400	0.000		85.8	78.7	0.000	1225.075
10	2 (DENSE-MEDIUM VESSEL)	1.500	500.000		28.2	83.5	500.000	500.000
11	4 (HYDROCYCLONE)	1.750	0.000		50.3	88.9		
12	81 (PERFORATED BASKET CENTRIFUGE)	38.000	1.000	750.000	93.2	93.2		
13	41 (STREAM BLENDER)		0.000					
14	84 (CONTINUOUS DISK FILTER)	0.000	3.000	10.000	78.2	78.2		
15	87 (THERMAL DRYER)	8.000	1000.000	0.000	98.3	98.3		
16	41 (STREAM BLENDER)		0.000					
17	41 (STREAM BLENDER)		0.000					
18	89 (THICKENER)	1000.000	0.350	1.500			2583.745	2405.480
19	41 (STREAM BLENDER)		0.000					

SUMMARY DATA FOR FLOWSTREAMS

FLOWSTREAM NUMBER	ORIGIN UNIT NO.	DESTINATION UNIT NO.	FLOWRATE TONS/HR.	ASH (PERCENT)	PYRITIC SULFUR (PERCENT)	TOTAL SULFUR (PERCENT)	BTU/LB.	LBS SO2/ MILLION BTU	MOISTURE (PERCENT)
1 (FEED)	0 x	1	600.0	36.7	7.87	8.58	8886.	19.32	2.00
2 (REFUSE PRODUCT)	1 R	0	0.6	47.6	9.81	10.52	7387.	28.57	2.00
3	1 C	2	599.4	36.7	7.86	8.58	8886.	19.32	2.00
4	2 U	5	382.5	44.0	9.37	10.14	7809.	25.98	3.14
5	2 L	3	216.9	23.7	5.20	5.83	10786.	10.81	58.02
6	3 U	5	96.4	31.7	6.84	7.55	9617.	15.71	3.37
7	3 L	4	120.5	17.3	3.88	4.45	11720.	7.60	71.09
8	5 x	6	478.9	41.5	8.86	9.62	8173.	23.54	3.19
9	4 x	7	120.5	17.3	3.88	4.45	11694.	7.62	71.09
10	7 U	8	7.4	7.2	1.77	2.14	13280.	3.22	73.91
11	7 L	9	113.2	18.0	4.02	4.61	11589.	7.95	73.91
12	6 C	19	135.4	3.4	0.32	0.82	13925.	1.17	4.95
13	9 C	12	74.2	3.6	0.43	0.96	13898.	1.38	12.62
14	6 R	10	343.5	56.6	12.23	13.09	5906.	44.33	3.60
15	12 C	19	69.2	3.6	0.42	0.97	13894.	1.39	7.05
16	10 C	16	100.3	9.8	1.04	1.61	12846.	2.51	4.66
17	12 R	13	5.1	3.3	0.47	0.87	13945.	1.25	51.94
18	13 x	14	11.8	3.3	0.47	0.84	13947.	1.21	68.50
19	9 R	11	38.9	45.5	10.88	11.56	7185.	32.17	8.43
20	8 C	13	6.7	3.2	0.47	0.82	13949.	1.18	75.00
21	8 R	17	0.7	46.9	14.93	15.40	6534.	47.13	53.41
22	11 C	16	19.6	27.7	6.33	6.93	9853.	14.07	8.43
23	11 R	17	19.4	63.4	15.48	16.24	4489.	72.34	8.43
24	14 C	15	9.0	3.3	0.47	0.85	13947.	1.21	17.01
25	14 R	17	2.8	3.2	0.47	0.83	13949.	1.19	89.44
26 (REFUSE PRODUCT)	10 R	0	243.2	75.9	16.85	17.83	3043.	117.20	3.15
27 (MIDDINGS PRODUCT)	16 M	0	119.9	12.7	1.91	2.48	12357.	4.01	5.30

28		17 R	18	22.8	55.5	13.82	14.32	5712.	50.13	53.54
29	(WATER PRODUCT)	18 W	0	1.5	9.0	2.35	2.73	12985.	4.22	99.75
30	(REFUSE PRODUCT)	18 R	0	21.3	58.8	14.41	15.13	5205.	58.12	65.00
31		15 C	19	8.8	3.3	0.47	0.85	13947.	1.21	5.00
32	(CLEAN COAL PRODUCT)	19 C	0	213.4	3.4	0.38	0.87	13918.	1.24	5.65

OVERALL PLANT SUMMARY

FLOWSTREAM	FLOWRATE TONS/HR.	ASH (PERCENT)	PYRITIC SULFUR (PERCENT)	TOTAL SULFUR (PERCENT)	BTU/LB.	LBS SO2/ MILLION BTU	MOISTURE (PERCENT)
FEED	600.0	38.7	7.87	8.58	8886.	19.32	2.00
CLEAN COAL	213.4	3.4	0.36	0.87	13916.	1.24	5.65
MIDDLEINGS	119.9	12.7	1.91	2.48	12357.	4.01	5.30
REFUSE	285.1	74.5	16.64	17.60	3226.	109.09	15.21
SOLIDS IN WATER PRODUCTS	1.5	9.0	2.35	2.73	12965.	4.22	
DRYER FUEL	0.15	3.3	0.47	0.85	13947.		

OVERALL YIELD DATA

CLEAN COAL: 35.56 PERCENT

CLEAN COAL + MIDDLEINGS: 55.55 PERCENT

WATER BALANCE SUMMARY

TOTAL DEMAND FOR WATER (GPM).....2630.00
WATER AVAILABLE FROM CLARIFIER (GPM).....2405.46

MAKEUP WATER NEEDED (GPM)..... 224.54

COAL WASHING COST DATA

\$ 1.25 PER TON OF FEED

\$ 3.52 PER TON OF CLEAN COAL

BASED UPON AN ANNUALIZED COST OF \$ 3008265.40

A FEED RATE OF 600.00 TONS PER HOUR

AND 80.00 HOURS OF OPERATION PER WEEK

VI. MICROCOMPUTER VERSION OF THE SIMULATOR

The microcomputer version of the simulator is similar to the mainframe version, though it does contain a few Fortran-77 features and there are a few areas where interactive prompts have been added. The results generated are essentially the same as those generated by the mainframe version. There may be small differences in some values, however, due to differences in precision between computers.

The simulator is intended to be implemented on an IBM PC-AT, an IBM PC-XT, or equivalent. The computer should be equipped with at least 512 KB of memory (640 KB is preferred), a printer and a hard disk. The addition of a numerical coprocessor is strongly recommended, as it will speed up the execution time significantly.

The microcomputer version of the simulator has been compiled and run successfully using Microsoft Fortran-77, versions 3.13, 3.20 and 3.30. A listing of the microcomputer version of the program is not included in this report, since the program is provided in its entirety on a floppy disk.

The sample program described in this report has been tested on both an IBM PC-AT and an IBM PC-XT, with and without a numerical coprocessor. The following execution times have been obtained in each case, using object code compiled from Microsoft Fortran version 3.20.

IBM PC-AT With Numerical Coprocessor	IBM PC-XT With Numerical Coprocessor	IBM PC-XT Without Numerical Coprocessor
8 min	18 min	86 min

VII. DATA PREPARATION (MICROCOMPUTER)

The input data requirements for the microcomputer version of the simulator are exactly the same as the input data requirements for the mainframe version. Thus the input data can be placed in a data file, using a text editor or word processor, in accordance with the instructions given in Section IV of this report.

An alternate way to enter or edit data, which may be preferable under most circumstances, is to use the interactive, "user-friendly" program DATAPREP, which is supplied on the same floppy disk as the microcomputer version of the simulator. This program prompts the user for all of the required data in an orderly and straightforward manner. The limiting values are shown for most parameters, and error traps prevent the user from entering incorrect data. (The only exception to this is in the size boundaries, where the nature of the data prevents effective error trapping.)

The program begins by requesting the name of a data set (e.g., SAMPLE). If the user responds by supplying the name of an existing data set, then the old values for the various input parameters will be shown in one column, and a new set of values will be requested in another column. If the user responds by supplying the name of a new data set, however, then the old values will appear as zeros. Thus, the DATAPREP program can accommodate either old data or new data in essentially the same manner.

When editing an old data file, it is not necessary to retype all of the requested entries into the new file. If an old value is to remain unchanged, then the user may simply enter a carriage return (i.e., press ENTER) in response to the request for a new

value. By proceeding in this manner, the only data items that must actually be typed are those that are to be changed. This simplifies the data entry considerably, especially when making small changes in an existing data set.

DATAPREP is written in BASIC, and therefore is able to take advantage of the many error-trapping and screen display features supported by the IBM Personal Computer. Two versions of DATAPREP are supplied - the BASIC source program (DATAPREP.BAS), and a compiled version, in machine language (DATAPREP.EXE).

VIII. SAMPLE PROBLEM (MICROCOMPUTER)

The sample plant configuration shown in Figure 1 has been simulated on an IBM PC-XT, using the same data set shown in Section V. To do this the data were transferred to a floppy disk, for direct access by the microcomputer version of the simulator. The sample data set is referred to as SAMPLE.DAT on the distribution disk. The contents of this file can be listed on the screen or a printer if desired.

The output data generated by the microcomputer are shown on the succeeding pages. It is interesting to compare this output with the data given in Section V, which were generated by the mainframe version of the simulator. The numerical results are similar, though not identical. The variations are attributed to the differences in hardware and the differences in the compilers.

This problem required 18 minutes of execution time on an IBM PC-XT equipped with a numerical coprocessor (see the other running times given in Section VI, for other machine configurations).

COAL PREPARATION PLANT SIMULATOR

COAL PREPARATION PLANT SIMULATOR - SAMPLE PLANT CONFIGURATION (AUGUST, 1985)

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES		
1	21 (ROTARY BREAKER)	20.00	12.000	6.000
2	33 (WET UPPER SCREEN)	1.500	1200.000	
3	34 (WET LOWER SCREEN)	.375	.000	
4	24 (PRIMARY SINGLE ROLL CRUSHER)		.023	
5	41 (STREAM BLENDER)		.000	
6	9 (SAND CONE)	1.320	750.000	
7	71 (CLASSIFYING HYDROCYCLONE)	14.000	180.000	
8	19 (FROTH FLOTATION)		.000	
9	3 (DENSE-MEDIUM CYCLONE)	1.400	.000	
10	2 (DENSE-MEDIUM VESSEL)	1.500	500.000	
11	4 (HYDROCYCLONE)	1.750	.000	
12	61 (PERFORATED BASKET CENTRIFUGE)	36.00	1.000	750.000
13	41 (STREAM BLENDER)		.000	
14	64 (CONTINUOUS DISK FILTER)	.00	3.000	10.000
15	67 (THERMAL DRYER)	5.00	1000.000	.000
16	41 (STREAM BLENDER)		.000	
17	41 (STREAM BLENDER)		.000	
18	69 (THICKENER)	1000.00	.350	1.500
19	41 (STREAM BLENDER)		.000	

FLOWSTREAM NUMBER	ORIGIN - UNIT NUMBER	DESTINATION - UNIT NUMBER
1 (FEED)	0 x	1
2 (REFUSE PRODUCT)	1 R	0

3	1 C	2
4	2 U	5
5	2 L	3
6	3 U	5
7	3 L	4
8	5 x	6
9	4 x	7
10	7 U	8
11	7 L	9
12	6 C	19
13	9 C	12
14	6 R	10
15	12 C	19
16	10 C	16
17	12 R	13
18	13 x	14
19	9 R	11
20	8 C	13
21	8 R	17
22	11 C	16
23	11 R	17
24	14 C	15
25	14 R	17
26 (REFUSE PRODUCT)	10 R	0
27 (MIDDINGS PRODUCT)	16 M	0
28	17 R	18
29	18 M	0
30 (REFUSE PRODUCT)	18 R	0
31	15 C	19
32 (CLEAN COAL PRODUCT)	19 C	0

NUNITS= 19   MFLWS= 32   NSIZE= 14   NGRAV= 10   IOUT= 0   ICMAX= 50   NCOMP= 0   NYRS= 10

BTU(1)=14500.0   BTU(2)= 170.0   BTU(3)= .000   BTU(4)= 2000.0   FEED MOISTURE= 2.0 PERCENT

TONNAGE= 600.00   HRS= 80.00   YCOST= 3006266.00   INTEREST= 15.00 %   INITIAL INVESTMENT= 15000000.00

YEAR= 1	YEARLY CASH FLOW=	20000.00
YEAR= 2	YEARLY CASH FLOW=	20000.00
YEAR= 3	YEARLY CASH FLOW=	20000.00
YEAR= 4	YEARLY CASH FLOW=	20000.00
YEAR= 5	YEARLY CASH FLOW=	20000.00
YEAR= 6	YEARLY CASH FLOW=	15000.00
YEAR= 7	YEARLY CASH FLOW=	15000.00
YEAR= 8	YEARLY CASH FLOW=	10000.00
YEAR= 9	YEARLY CASH FLOW=	10000.00
YEAR= 10	YEARLY CASH FLOW=	10000.00

SUMMARY DATA FOR UNITS

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES			YIELD (PERCENT)	BTU RECOVERY (PERCENT)	WATER IN (GPM)	WATER OUT (GPM)
1	21 (ROTARY BREAKER)	20.000	12.000	6.000				
2	33 (WET UPPER SCREEN)	1.500	1200.000				1200.000	.000
3	34 (WET LOWER SCREEN)	.375	.000					
4	24 (PRIMARY SINGLE ROLL CRUSHER)		.023					
5	41 (STREAM BLENDER)		.000					
6	9 (SAND CONE)	1.320	750.000		28.3	48.2	750.000	733.531
7	71 (CLASSIFYING HYDROCYCLONE)	14.000	180.000		5.1	5.8	180.000	.000
8	19 (FROTH FLOTATION)		.000		91.5	95.8		
9	3 (DENSE-MEDIUM CYCLONE)	1.400	.000		65.8	78.9	.000	1237.425
10	2 (DENSE-MEDIUM VESSEL)	1.500	500.000		29.2	63.5	500.000	500.000
11	4 (HYDROCYCLONE)	1.750	.000		49.8	68.7		
12	61 (PERFORATED BASKET CENTRIFUGE)	36.000	1.000	750.000	93.6	93.6		
13	41 (STREAM BLENDER)		.000					
14	64 (CONTINUOUS DISK FILTER)	.000	3.000	10.000	77.0	77.0		
15	67 (THERMAL DRYER)	5.000	1000.000	.000	98.4	98.4		
16	41 (STREAM BLENDER)		.000					
17	41 (STREAM BLENDER)		.000					
18	69 (THICKENER)	1000.000	.350	1.500			2563.930	2407.699
19	41 (STREAM BLENDER)		.000					

SUMMARY DATA FOR FLOWSTREAMS

FLOWSTREAM NUMBER	ORIGIN UNIT NO.	DESTINATION UNIT NO.	FLOWRATE TONS/HR.	ASH (PERCENT)	PYRITIC SULFUR (PERCENT)	TOTAL SULFUR (PERCENT)	BTU/LB.	LBS SO ₂ / MILLION BTU	MOISTURE (PERCENT)
1 (FEED)	0 x	1	600.0	36.7	7.87	8.58	8886.	19.32	2.00
2 (REFUSE PRODUCT)	1 R	0	.6	47.6	9.81	10.52	7367.	28.57	2.00
3	1 C	2	599.4	36.8	7.88	8.60	8874.	19.38	2.00
4	2 U	5	383.9	44.0	9.37	10.14	7807.	25.98	3.14
5	2 L	3	215.5	23.8	5.21	5.84	10773.	10.85	58.17
6	3 U	5	96.5	31.7	6.85	7.56	9614.	15.72	3.37
7	3 L	4	119.1	17.4	3.89	4.46	11712.	7.61	71.35
8	5 x	6	480.4	41.6	8.87	9.62	8171.	23.56	3.19
9	4 x	7	119.1	17.2	3.85	4.41	11562.	7.63	71.35
10	7 U	8	6.0	7.0	1.71	2.06	13312.	3.10	74.15
11	7 L	9	113.0	18.0	4.00	4.59	11591.	7.91	74.15
12	6 C	19	135.7	3.4	.32	.82	13925.	1.17	4.95
13	9 C	12	74.4	3.6	.43	.96	13895.	1.39	12.46
14	6 R	10	344.6	56.6	12.23	13.09	5904.	44.35	3.60
15	12 C	19	69.6	3.6	.42	.97	13892.	1.39	6.86
16	10 C	16	100.6	9.8	1.04	1.61	12846.	2.51	4.66
17	12 R	13	4.8	3.3	.48	.88	13939.	1.27	53.41
18	13 x	14	10.3	3.3	.49	.86	13942.	1.23	68.17
19	9 R	11	38.6	45.7	10.88	11.56	7154.	32.33	9.71
20	8 C	13	5.5	3.3	.49	.84	13945.	1.20	75.00
21	8 R	17	.5	46.9	14.74	15.24	6519.	46.76	59.15
22	11 C	16	19.3	27.7	6.23	6.83	9865.	13.86	9.71
23	11 R	17	19.4	63.6	15.51	16.27	4460.	72.95	9.71
24	14 C	15	7.9	3.3	.49	.86	13942.	1.23	16.67
25	14 R	17	2.4	3.3	.49	.85	13943.	1.22	89.63
26 (REFUSE PRODUCT)	10 R	0	244.0	75.9	16.85	17.83	3042.	117.19	3.15
27 (MIDDINGS PRODUCT)	16 M	0	119.9	12.6	1.88	2.45	12367.	3.96	5.51

28	17	R	18	22.3	56.8	13.90	14.60	5516.	52.95	51.13
29 (WATER PRODUCT)	18	W	0	1.2	8.8	2.27	2.65	12998.	4.08	99.80
30 (REFUSE PRODUCT)	18	R	0	21.1	59.5	14.55	15.28	5094.	59.99	65.00
31	15	C	19	7.8	3.3	.49	.86	13942.	1.23	5.00
32 (CLEAN COAL PRODUCT)	19	C	0	213.2	3.5	.36	.87	13915.	1.25	5.59

OVERALL PLANT SUMMARY

FLOWSTREAM	FLOWRATE TONS/HR.	ASH (PERCENT)	PYRITIC SULFUR (PERCENT)	TOTAL SULFUR (PERCENT)	BTU/LB.	LBS SO ₂ / MILLION BTU	MOISTURE (PERCENT)
FEED	600.0	36.7	7.87	8.58	8886.	19.32	2.00
CLEAN COAL	213.2	3.5	.36	.87	13915.	1.25	5.59
MIDDLINGS	119.9	12.6	1.88	2.45	12367.	3.96	5.51
REFUSE	265.7	74.5	16.65	17.61	3214.	109.56	15.05
SOLIDS IN WATER PRODUCTS	1.2	8.8	2.27	2.65	12998.	4.08	
DRYER FUEL	.13	3.3	.49	.86	13942.		

OVERALL YIELD DATA

CLEAN COAL: 35.53 PERCENT

CLEAN COAL + MIDDLINGS: 55.50 PERCENT

WATER BALANCE SUMMARY

TOTAL DEMAND FOR WATER (GPM).....2630.00

WATER AVAILABLE FROM CLARIFIER (GPM).....2407.70

MAKEUP WATER NEEDED (GPM)..... 222.30

COAL WASHING COST DATA

\$ 1.25 PER TON OF FEED

\$ 3.53 PER TON OF CLEAN COAL

BASED UPON AN ANNUALIZED COST OF \$ 3006266.00

A FEED RATE OF 600.00 TONS PER HOUR

AND 80.00 HOURS OF OPERATION PER WEEK