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ORVAC-TF: A FORTRAN CODE FOR THE CALCULATION OF A
DESALINATION PLANT INCORPORATING A VAPOR
COMPRESSOR SYSTEM TOPPING AN MSF PLANT

R.O. Friedrich

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ORVAC-TF: A FORTRAN CODE FOR THE CALCULATION OF A
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The computer code described in this report was developed by the
Operations Analysis Division of the Oak Ridge Gaseous Diffusion
Plant for the ORNL Nuclear Desalination Program.

R. O. Friedrich

JANUARY 1968

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ABSTRACT

A program has been written for the IBM-7090 system which defines the operating characteristics and component costs of a vapor compressor-MSF coupled desalination plant complex. The plant complex consists of a reactor plant for the production of steam and a distillation plant for production of water. The distillation plant consists of a vapor compressor plant (two vertical evaporator effects, compressor, back-pressure turbine and generator) and an MSF plant which is used to preheat the vapor compressor feed stream and utilize the steam from the back-pressure turbine for further water production.

The output from the program consists of all pertinent operating and cost information for the two major coupled plants.

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ORVAC-TF: A FORTRAN CODE FOR THE CALCULATION OF A
DESALINATION PLANT INCORPORATING A VAPOR
COMPRESSOR SYSTEM TOPPING AN MSF PLANT

IDENTIFICATION

ORVAC-TF: Distilled Seawater

Machine: IBM-7090

Language: Fortran IV

Union Carbide Corporation, Nuclear Division

Oak Ridge Gaseous Diffusion Plant

Oak Ridge, Tennessee

PURPOSE

ORVAC-TF was written for a parametric study of the design, capital costs and operating costs of a vapor compressor-MSF coupled desalination plant.

The plant complex consists of:

- 1) A nuclear-powered reactor which supplies heat for the production of steam,
- 2) A turbine-generator plant which produces electricity for use within the plant and mechanical energy for the vapor compressor,
- 3) A vapor compressor,
- 4) VTE evaporator effects associated with the compressor, and
- 5) An MSF preheating and water producing system.

A flow diagram of the vapor compressor-MSF plant complex appears in Figure 1.

The seawater feed is heated by passing through the tube side of the MSF preheater. The feed enters the high temperature (discharge) VTE effect where the compressor discharge vapor is condensed and evaporates an equivalent portion of the feed. The more concentrated feed then enters the lower temperature (suction) VTE effect where more evaporation occurs. Finally, the feed stream is returned to the flash plant where it flashes

Figure 1

down to the blowdown temperature, providing heat for the preheating requirement and producing fresh water. The vapor from the suction effect is compressed by the vapor compressor to the pressure of the discharge effect. The vapor becomes superheated during adiabatic compression. To avoid low heat transfer coefficients, this superheat is removed in a desuperheater before the vapor passes to the discharge VTE effect. A flash tank is used between effects to allow product to "flash" down to the suction effect condensing temperature. The vapor thus formed is used for heating the suction effect. The product formed in the vapor compression system is introduced directly into the first MSF stage product tray; however, the brine blowdown is heated in the brine heater before being introduced into the top stage of the MSF preheater.

RESTRICTIONS

Hardware

The code is written for the IBM-7090 with the following hardware:

- on-line tape units 5 and 6
- off-line card-to-tape
- off-line tape-to-card
- off-line tape-to-printer.

System

The code is written in Fortran IV and contains a main program and thirty-four subroutines arranged in five linkages. The linkage system of overlays was required due to the size of the program. There are no programmed pauses or stops. All input and output is by magnetic tape for use in monitor-type operation.

METHOD

Description of the Problem

It is desired to design and determine the cost of a desalination plant incorporating a vapor compressor operating across VTE evaporating

effects with an MSF preheater. A nuclear reactor provides prime steam to operate the turbo-generator and the vapor compressor drive turbine. The turbines operate with a relatively high back pressure in order to provide exhaust steam for the MSF plant which serves to preheat brine for the VTE effects and, additionally, produces water.

Figure 2 presents an overall program flow of ORVAC-TF. Several initial estimates of variables (vapor compressor shaft power, concentration between VTE effects) are needed to begin the calculation. This enables the vapor compressor characteristics, brine flows and steam flows to be calculated. A better computation of the inter-effect concentration enables the compressor and flow variables to be calculated more accurately. One such iteration is sufficient. The compressor and VTE geometries are determined, together with the variables required to enter the MSF plant calculation. The subroutine ORSEF is called which completely designs the MSF plant. The code ORSEF has been documented¹ and details are therefore not given here. A flag, KOUTPT, determines the program flow. Initially, KOUTPT = 0 and the heat and material balance portion, only, of the MSF plant program is solved to determine the proper scaling for the vapor compressor shaft power. KOUTPT is then set equal to 1 and the next time ORSEF is called the MSF plant program is solved in its entirety. The vapor compressor system and its associated cost equations are also solved. All output is printed after the vapor compressor costs are computed in subroutine COSTVC.

Capital costs of all major equipment items are calculated. The important operating costs are computed and a unit cost of water is determined.

The data input to VAPCOM consists of:

- 1) Steam temperature
- 2) Temperature drop across each VTE effect

¹Mothershed, C. T., ORSEF: A Fortran Code for the Calculation of Multi-Stage Flash Evaporation Desalination Plant Designs, March 1966, (ORNL-TM-1542).

Figure 2

ØRVAC-TF

- 3) Total plant product rate
- 4) Ocean concentration
- 5) VC maximum concentration ratio
- 6) Evaporating temperature for the suction effect
- 7) Prime turbine steam conditions
- 8) VTE tube geometry (length, i.d.)
- 9) Reactor parameters (prime steam conditions, reactor and turbine cycle efficiencies, auxiliary power requirements).

Equations

The following sections contain commented descriptions of ORVAC-TF subroutines. The Fortran equations which require explanations are listed in sequential order preceded by a brief discussion or comment.

1. VAPCØM

This subroutine calculates process characteristics, geometry items and costs of a vapor-compression water plant shown in Figure 1.

After the initial data are read into VAPCØM, several constants are set in the body of the program.

The suction effect chemical boiling-point elevation may be calculated explicitly. One degree is added to the chemical boiling-point elevation to allow for inherent system resistances.

$$CØNSUC = CØ \times CRVC$$

$$CALL 'BØPR (TSE, CØNSUC, ALPHA)$$

$$ALPHAS = ALPHA + 1.0.$$

The suction effect condensing temperature is then calculated.

$$T = TSE - ALPHAS$$

$$CALL PSIA (T, CMPS)$$

$$TSC = TSE + DELTS.$$

The salt concentration of the discharge effluent has to be estimated to calculate the chemical boiling-point elevation of the discharge effect.

$$CRF = \left(1.0 - \frac{1.0}{CRVC}\right)$$

$$C\phi NDIS = C\phi / \left(1.0 - \frac{CRF}{2.0}\right)$$

$$ALPHAS = ALPHAS - 0.4$$

$$TDE = TSC + ALPHAD$$

$$C = C\phi NDIS$$

$$CALL B\phi PR (TDE, C, ALPHA)$$

$$ALPHAD = ALPHA + 1.0.$$

Evaporating and condensing temperatures in the discharge effect are then calculated.

$$TDE = TSC + ALPHAD$$

$$TDC = TDE + DELTAD.$$

Characteristics of the compressor may then be calculated.

$$PR = CMPD / CMPS$$

$$CALL VAPV (TSE, CMPS, SPV\phi L)$$

$$CMP\phi W2 = TB\phi UT2 \times EFFC\phi M.$$

The enthalpy of the inlet and discharge streams is:

$$CALL VAPH (TSE, CMPS, HSUC)$$

$$CALL VAPH (CMTD, CMPD, HDIS).$$

The suction effect vapor flow is:

$$WS2 = TB\phi UT2 / (HDIS - HSUC).$$

The vapor flow from the flash tank is:

$$WVF = \frac{WS2 \times (HTDC - HTSC)}{VAPTSC}.$$

The blowdown flow is:

$$CB = C\phi \times CRVC$$

$$WB2 = \frac{C\phi_{NDIS} \times WS2}{CB - C\phi_{NDIS}}$$

The discharge effect vapor flow is:

$$WD2 = \frac{WB2(HC\phi_N - HBL\phi_W) + WS2(HC\phi_N - HSUC) + WVF(HVSC - HTSC)}{HTSC - HVTDE}$$

The salt concentration of the discharge effect effluent is now recalculated.

$$C\phi_{NDI1} = \frac{C\phi \times WF2}{WB2 + WS2}$$

An iteration is used until $C\phi_{NDI1}$ approaches $C\phi_{NDIS}$.

New values of $WD2$, $WF2$ and $WB2$ are obtained and used to iterate the correct value of $C\phi_{NDIS}$.

Flows and heat content of various streams are now calculated.

$$QDIS = WS2 \times HDIS$$

$$QPR\phi_D = WF2 \times HTSC$$

$$QBL\phi_W = WB2 \times HBL\phi_W$$

$$QFEED = QPR\phi_D + QBL\phi_W - TB\phi_{UT2}$$

The feed stream temperature is determined from the slope of its enthalpy-temperature line.

Compressor volume flows and geometry are calculated.

$$VS = WS2 \times SPV\phi_L / 60.0$$

$$VCGPD2 = 2.90333(WS2 + WD2)$$

$$V\phi_{LDIS} = WS2 \times SPV\phi_{LD} / 60.0$$

$$DIAMCD = \left[\frac{V\phi_{LDIS} \times 4.0}{3.1416 \times 500.0 \times 60.0} \right]^{0.5}$$

The VTE tube heat transfer coefficients are:

$$TSEC = TSE - ALPHAS$$

$$UDELT = TSC - TSEC$$

$$CALL UCALC (UDELT, LENS, TSEC, C\text{ONSUC}, ZUBARS)$$

$$UDELT = TDC - TSC$$

$$CALL UCALC (UDELT, LEND, TSC, C\text{ONDIS}, ZUBARD)$$

The effect areas and tube geometry are next calculated.

$$AD = WS2(HDIS-HTDC)/(ZUBARD \times DELTAD)$$

$$AS = [WD2(HVSUC-HTSC) + WVF(HVSC-HTSC)]/(ZUBARS \times DELTS)$$

$$ND = AD/(LEND \times 3.1416 \times DISID)$$

$$NS = AS/(LENS \times 3.1416 \times SUCID)$$

The vapor-compression performance ratio is:

$$RPVC = \frac{WP2 \times 1.E3}{TB\text{OUT}2}$$

The steam flows required for operating the VC plant and turbo-generator are:

$$WS1 = TB\text{OUT}2/WA$$

and

$$WS3 = \frac{P\text{OBTU}2 + REAP\text{O} \times WS1[HTURBI-HLTRBS]}{WA - REAP\text{O} \times [HTURBI-HLTRBS]}$$

respectively.

Process steam quality is:

$$QUAL = \frac{HTURB\text{O}-HLTRBS}{HVTRBS-HLTRBS}$$

The total heat input at the top of the MSF plant is:

$$QBR = TB\text{OUT}2 + WSTEAM \times (HVTRBS-HLTRBS).$$

The MSF system (O\text{RSEF}) is now called.

The turbine output power is then scaled.

$$TBOUT2 = TBOUT2 \left(\frac{GTOT}{GTOT1} \right)$$

VAPCOM writes out all the pertinent vapor compressor information. COSTVC is then called to furnish the required cost calculations and end the program.

2. ORSEF

ORSEF is actually a complete program for the solution of the MSF system which serves as the preheater for the subject system. In ORVAC-TF, it is used as a subroutine. Since ORSEF has been documented¹ the details of this program will not be repeated here. Since the time of documentation, revisions have been made in ORSEF. Most notable of these changes has been (a) conversion from Fortran II to Fortran IV language, (b) improvement in the associated cost basis, (c) changes in physical properties bases, (d) improvement of a routine for computing the condenser tube bundle geometry, (e) incorporation of a routine for computing the demister requirements, and (f) improvement in the total boiling-point elevation assumptions. The ORSEF code used with ORVAC-TF is this later version.

3. BOPR

This subroutine calculates the boiling-point elevation of saline solutions as a function of temperature and salt concentration.² The data were obtained and fitted to an equation by Stoughton and Lietzke.³

²Ayers, W. D., Physical Properties of Brine and Product Water, Internal Correspondence to D. M. Eissenberg, Y-12, December 16, 1966.

³Stoughton, R. W. and Lietzke, M. H., "Calculation of Some Thermodynamic Properties of Sea-Salt Solutions at Elevated Temperatures from Data on NaCl Solutions," Journal of Chemical and Engineering Data, Vol. 10, No. 3, pp 254-260, (July 1965).

$$\begin{aligned} \text{BPE} &= [565.757/\text{TC}\phi\text{R} - 9.81559 + 1.54739 \times \ln \text{TC}\phi\text{R} \\ &\quad - (337.178/\text{TC}\phi\text{R} - 6.41981 + 0.922753 \times \ln \text{TC}\phi\text{R})\text{CC}\phi\text{R} \\ &\quad + (32.681/\text{TC}\phi\text{R} - 0.55368 + 0.079022 \times \ln \text{TC}\phi\text{R})\text{CC}\phi\text{R}^2] \\ &\quad \times \text{CC}\phi\text{R}/(266,919.6/\text{TC}\phi\text{R}^2 - 379.669/\text{TC}\phi\text{R} + 0.334169) \end{aligned}$$

$$\text{BPR} = 1.8 \times \text{BPE}$$

where:

BPR = boiling-point elevation in °F

TC ϕ R = (t(°F) + 460.0)/1.8

CC ϕ R = 19.819 $\times$ C/(1.0-C)

C = salt concentration, weight fraction.

4. DINTPL

This subroutine calculates various physical properties of saline solutions as a function of temperature and salt concentration.² A flag, II, determines which physical property will be calculated.

a) If II = 1, the specific heat branch is entered. If the salt concentration is < 0.005, the specific heat of pure water is calculated.

$$\text{CP} = 1.0121559 - 0.00024618473(\text{T}) + 0.10282155\text{E-}5(\text{T}^2).$$

For salt concentrations > 0.005, the following equation is used:

$$\begin{aligned} \text{CP} &= 0.96946859 + 2.0(0.00010404965)(\text{T}) - 0.91199294(\text{C}) \\ &\quad + 2.0(-0.00064829659)(\text{C})(\text{T}) - 1.555779(\text{C}^2) \\ &\quad + 2.0(0.0076721469)(\text{C}^2)(\text{T}) + 6.7981008(\text{C}^3) \\ &\quad + 2.0(-0.012610354)(\text{C}^3)(\text{T}) \end{aligned}$$

where

CP = specific heat, Btu/lb-°F

T = temperature, °F

C = salt concentration, weight fraction.

b) If II = 2, the enthalpy branch is entered. If the salt concentration is < 0.005, a subroutine WATH is called which calculates the enthalpy of pure water.

For salt concentrations > 0.005 , the following equation is used:

$$\begin{aligned} H = & - 30.234836 + 0.96946859(T) + 0.00010404965(T^2) \\ & + 72.470209(C) - 0.91199294(C)(T) - 0.00064829659(C)(T^2) \\ & - 25.739723(C^2) - 1.5557791(C^2)(T) + 0.0076721469(C^2)(T^2) \\ & - 386.23682(C^3) + 6.7981008(C^3)(T) - 0.012610354(C^3)(T^2) \end{aligned}$$

where

H = enthalpy, Btu/lb

T = temperature, °F

C = salt concentration, weight fraction.

c) The branches, II = 3 and 4, are dummy branches and not used.

d) If II = 5, the density branch is entered and the following equation used:

$$\begin{aligned} \text{DEN} = & 62.707172 + 49.364088(C) - 0.43955304E-2(T) \\ & - [0.032554667(C)](T) - 0.46076921E-4(T^2) \\ & + [0.63240299E-4(C)](T^2) \end{aligned}$$

where

DEN = density, lb/ft³

T = temperature, °F

C = salt concentration, weight fraction.

e) If II = 6, the thermal conductivity branch is entered and the following equation used:

$$\begin{aligned} C\phi\text{ND} = & [0.30157913 + 0.697989E-3(T) - 0.12506E-5(T^2) \\ & - 0.2072E-10(T^3)] \times [-0.1687109(C) + 1.0] \end{aligned}$$

where

C ϕ ND = thermal conductivity, Btu/hr-ft-°F

T = temperature, °F

C = salt concentration, weight fraction.

f) If II = 7, the viscosity branch is entered and the following equation used:

$$\text{VIS} = e^{[-10.592566 + 0.4606532E-2(R) - 11.591155(C) + (0.012602329)(C)(R) + 4759.5941/R + 3863.7378(C)/R]}$$

where

VIS = viscosity, lb/hr-ft

R = temperature, °R

C = salt concentration, weight fraction.

5. WATH

This subroutine calculates the enthalpy² of pure water as a function of temperature using the following equations:

If $T < 360^\circ\text{F}$,

$$\begin{aligned} H = & -32.179105 + 1.0088084(T) - 1.1516996E-4(T^2) \\ & + 4.8553836E-7(T^3) - 7.3618778E-10(T^4) \\ & + 9.6350315E-13(T^5) . \end{aligned}$$

If $T \geq 360^\circ\text{F}$,

$$\begin{aligned} H = & -9.0411706E2 + 10.673802(T) - 4.2753836E-2(T^2) \\ & + 9.41244E-5(T^3) - 1.0315357E-7(T^4) + 4.560246E-11(T^5) \end{aligned}$$

where

H = enthalpy, Btu/lb

T = temperature, °F.

6. PSIA

This subroutine calculates the saturated pressure of water vapor as a function of the saturated vapor temperature.

$$T = (TF + 459.69)/1.8.$$

If $TF \leq 122^\circ\text{F}$,

$$P = \frac{14.6959(218.167)}{\text{Exp} \left[2.3025851(X/T) \left(\frac{A+BX+CX^3}{1.0+DX} \right) \right]}$$

where

TF = saturation temperature, °F

P = saturation pressure, psia

X = 647.27 - T

A = 3.2437814

B = 5.86826E-3

C = 1.1702379E-8

D = 2.1878462E-3

If TF > 122°F,

$$P = \frac{14.6959(218.167)}{\text{Exp} \left[2.3025851(X/T) \left(\frac{A+BX+CX^3+EX^4}{1.0+DX} \right) \right]}$$

where

TF = saturation temperature, °F

P = saturation pressure, psia

X = 647.27 - T

A = 3.346313

B = 4.14113E-2

C = 7.515484E-9

D = 1.3794481E-2

E = 6.56444E-11

7. VAPTS

This subroutine calculates the temperature of water vapor as a function of pressure and entropy.

$$ZED = 0.57477 \times A \log_{10}(P) - 3.2949 + 0.93551(S) + 0.32531(S^2)$$

$$A0 = 203.0$$

$$A1 = 477.3 + 70.0(S)$$

$$A2 = 440.0 - 24.86(S)$$

$$T = A0 + A1(ZED) + A2(ZED^2)$$

$$CP = \frac{1.0}{[-9.513 + 11.342(S) - 2.736(S^2)]}$$

The subroutine VAPS is then called to obtain an entropy check value:

CALL VAPS (T,P,SC)

DELS = SC - S

$$\text{DELT} = - (T + 459.69)(\text{DELS}) \left[1.0 + \frac{\text{DELS}}{2.0(\text{CP})} \right] / \text{CP}$$

If $|\text{DELT}| < 0.005$, the calculated temperature, T, is used as the answer and control is returned to the calling program.

If $|\text{DELT}| \geq 0.005$, $T = T + \text{DELT}$ and control is returned to:

CALL VAPS (T,P,SC)

where

P = pressure of water vapor, psia

S = entropy of water vapor, Btu/°F-lb

SC = entropy of water vapor, Btu/°F-lb

T = temperature of water vapor, °F.

8. VAPTH

This subroutine calculates the temperature of water vapor as a function of pressure and enthalpy.

$$T = A0 + A1(H) + A2(H^2) + \left[\frac{P}{(B0+B1(H)+B2(H^2))} \right]$$

$$\text{CPIV} = A1 + 2.0(A2)(H) - P[(B1+2.0(B2)(H))]/[(B0+B1(H)+B2(H)^2)]^2$$

where

A0 = - 2.8277E3

A1 = 3.0391

A2 = - 3.5413E-4

B0 = 2.4318E1

B1 = - 7.1479E-2

B2 = 0.45305E-4

T = temperature, °F

H = enthalpy, Btu/lb

P = pressure, psia.

The subroutine VAPH is called to obtain an enthalpy check value:

CALL VAPH (T,P,HC)

DELT = CPIV(H-HC) .

If $|\text{DELT}| < 0.005$, the calculated value of T is used as the answer and control is returned to the calling program.

If $|\text{DELT}| \geq 0.005$, $T = T + \text{DELT}$ and control is returned to:

CALL VAPH (T,P,HC).

9. VAPV

This subroutine calculates the specific volume of water vapor as a function of temperature and pressure.

P = PS/14.6959

T = (TS + 459.69)/1.8

TAU = 1.0/T

where

PS = pressure, psia

TS = temperature, °F.

Then

VC = $4.55504(T/P) + [BO + PHE1(P) + PHE3(P^3) + PHE12(P^{12})]$

V = $\frac{VC}{62.428}$

where

V = specific volume, ft^3/lb

BO, PHE1, PHE3, PHE12 are functions of TAU.

10. VAPH

This subroutine calculates the enthalpy of water vapor as a function of temperature and pressure.

P = PS/14.6959

T = (TS + 459.69)/1.8

TAU = 1.0/T .

Then

$$\begin{aligned} \text{HC} &= \text{FO}(\text{P}) + \frac{\text{F1}(\text{P}^2)}{2.0} + \frac{\text{F3}(\text{P}^4)}{4.0} + \frac{\text{F12}(\text{P}^{13})}{13.0} + \text{FP} \\ \text{H} &= 0.043557(\text{HC}) \end{aligned}$$

where

PS = pressure, psia

TS = temperature, °F

H = enthalpy, Btu/lb

FO, F1, F3 and F12 are functions of TAU. FP is a function of T.

11. VAPS

This subroutine calculates the entropy of water vapor as a function of temperature and pressure.

$$\text{P} = \text{PS}/14.6959$$

$$\text{T} = (\text{TS} + 459.69)/1.8$$

$$\text{TAU} = 1.0/\text{T}$$

Then

$$\begin{aligned} \text{SC} &= -4.55504 \times \text{Alog}(\text{P}) + \text{MO}(\text{P}) + \frac{\text{M1}(\text{P}^2)}{2.0} \\ &+ \frac{\text{M3}(\text{P}^4)}{4.0} + \frac{\text{M12}(\text{P}^{13})}{13.0} + \frac{10,000.0}{1012.95} \left[1.472 \text{Alog}(\text{T}) \right. \\ &\left. + 7.5566\text{E-4}(\text{T}) - \frac{47.8365}{\text{T}} - 1.48847 \right] \end{aligned}$$

$$\text{S} = \left(\frac{435.57}{18,000.0} \right) (\text{SC})$$

where

PS = pressure, psia

TS = temperature, °F

S = entropy, Btu/°F-lb

MO, M1, M3 and M12 are functions of TAU.

12. UCALC

This subroutine calculates the overall heat transfer coefficients of the G-E fluted VTE tubes in the suction and discharge effects. The coefficients were obtained and corrected according to procedures followed in interpretation of data obtained from the General Electric pilot plant at Wrightsville Beach, North Carolina.⁴ The coefficients are fitted as a function of average salt concentration inside the tube, tube length and temperature. Figure 4 outlines the program flow.

- a) If the tube length is > 5.0 , a tube length correction factor of 1.0 is assigned. A shorter tube will necessitate the calculation of a length correction factor as a function of temperature.

$$CFN2 = \frac{1.0}{0.6736 + 0.001088(T)} .$$

- b) If the temperature is less than 100°F , its value is printed out and a new value of 100 is substituted.
- c) If the average salt concentration is less than or equal to 0.1008, an uncorrected overall heat transfer coefficient is calculated.

$$\begin{aligned} X = & A1 + A2(Y) + A3(Z) + A4(Z)(Y) + A5(Y^2) + A6(Z^2) \\ & + A7(Y)(Z^2) + A8(Y^2)(Z) + A9(Y^3) + A10(Y^2) + A11(Y)(Z^3) \\ & + A12(Y^3)(Z) + A13(Y^2)(Z^2) + A14(Y^2)(Z^3) + A15(Y^3)(Z^2) \\ & + A16(Y^3)(Z^3) \end{aligned}$$

where

X = uncorrected heat transfer coefficient, $\text{Btu/hr-ft}^2\text{-}^{\circ}\text{F}$

Y = temperature, $^{\circ}\text{F}$

Z = average salt concentration, weight fraction

⁴Final Report (1965). Operation and Maintenance of General Electric 37,000-GPD Thin-Film Distillation Pilot Plant (Contract 14-01-0001-248).

$$\begin{aligned}
A1 &= 0.94598989E3 \\
A2 &= 5.5243699 \\
A3 &= -0.11646098E5 \\
A4 &= -0.45611828E2 \\
A5 &= 0.79308461E-2 \\
A6 &= 0.20333492E6 \\
A7 &= 3.9411727 \\
A8 &= -0.25223411 \\
A9 &= -0.28923398E-4 \\
A10 &= -0.16531411E7 \\
A11 &= 0.41778945E4 \\
A12 &= 0.83445326E-3 \\
A13 &= 5.6979017 \\
A14 &= -0.43195339E2 \\
A15 &= -0.1424367E-1 \\
A16 &= 0.88897284E-1
\end{aligned}$$

Set:

$$URBC = X.$$

$$\begin{aligned}
d) \text{ CFN1} &= 1.0 \\
\text{AKFT} &= 125.0
\end{aligned}$$

Then:

$$CFN3 = \left(\frac{1.0}{URBC} \right) / \left(\left(\frac{1.0}{URBC} \right) - 0.000043 + \frac{[0.000043 \times 125.0]}{AKFT} \right)$$

e) The corrected heat transfer coefficient is then calculated.

$$ZUBAR = URBC \times CFN1 \times CFN2 \times CFN3.$$

f) Returning to (c), if the average salt concentration is greater than 0.1008, a counter IJK is set = 0 and a new value of 0.100 is substituted for CMT.

g) An uncorrected heat transfer coefficient is then calculated as shown previously.

If IJK = 0, set: URBC = X
 CMT = 0.10
 IJK = 1 .

Program flow is then returned to g).

If IJK $\neq$ 0, set: URBC2 = X
 DUDC = (URBC1 - URBC2)/0.0008
 URBC = URBC1 + (CMT - 0.1008)DUDC .

h) Program control is returned to c) and f'), resulting in a calculation of a corrected heat transfer coefficient.

13. CØSTVC

Most of the data required for cost calculations in CØSTVC are carried via a call list.

Since a BWR reactor has been assumed to be the steam source, the prime steam cost calculations are tailored to fit the specific reactor.^{5,8}

$$\begin{aligned} \text{FUEL} &= 8.81 + 26.7 (\text{RATEIN}) \\ \text{FIXC} &= 87.20(\text{SMAP})/[(\text{PRIMWT} \times 1.E-3)^{0.244}] \\ \text{XØPER} &= 4.35(\text{SMAP})^{0.231} [(\text{PRIMWT} \times 1.E-3)^{0.314}] \\ \text{PMSTMC} &= (\text{FUEL} + \text{FIXC} + \text{XØPER}) \times 1.E-2 . \end{aligned}$$

The compressor costs⁶ (\$) are then calculated.

$$\begin{aligned} \text{CC} &= \left[1.02E5 + 1392.0 \left(\frac{\text{HPVC}}{\text{AUNIT} \times 1.E3} \right)^{0.855} \left(\frac{\text{VSUC}^{0.746}}{(\text{PR})^{0.177}} \right) \right] \\ &\quad \times \text{AUNIT} \times \text{AJ} . \end{aligned}$$

⁵Moyers, J. C., Reactor and Turbine Plant Costs and Performance Information for Use in High-Product-Ratio Parametric Study, Letter to R. A. Ebel, April 17, 1967.

⁶Moyers, J. C., Nuclear Desalination Program Report on Activities of Interest to AEC, December 1966, (ORNL-CF-67-1-22).

The compressor foundation cost⁷ (\$) is:

$$C\phi F\phi UN = 0.12856 \times HPVC \times AJ$$

The turbine costs^{5,8} (\$) associated with the VC plant and the turbo-generator are then calculated.

$$AMWT = (TB\phi UT2 + P\phi T\phi T) \times \frac{0.746}{2.545E6}$$

$$TURBK = -0.85E-4(TS) + 0.3265$$

$$TURBN = 0.18E-4(TS) + 0.6614$$

$$TP\phi W = AMWT/AUNIT$$

$$TUR = [TURBK(TP\phi W^{TURBN}) - 14.444(TP\phi W \times 1.E-3)^{0.7882}] \times 1.E6 \times AUNIT \times AJ$$

$$TCSTP = TUR \left(\frac{WS3}{WS} \right)$$

$$TCSTC = TUR - TCSTP$$

The generator costs^{5,8} (\$) are then calculated.

$$P\phi GEN = P\phi T\phi T(0.746)/(AUNIT \times 2.545E6)$$

$$GEN = [14.444(P\phi GEN \times 1.E-3)^{0.7882}] \times 1.E6 \times AUNIT \times AJ$$

The effect areas and shell cost⁷ (\$) are then determined.

$$EVC = (AS + AD) \times A2 \times AJ$$

$$SHELL = 0.794 (AD + AS) \times AJ$$

Compressor ducting cost⁷ (\$) is:

$$DUCT = 0.051599 \times VS \times AJ$$

⁷Collins, C. W. and Senatore, S. J., ORNL Contribution to the AEC-OSW-BR-ORNL Large Desalting Plant Siting Study, October 11, 1966, (ORNL-CF-66-10-17).

⁸Unpublished notes from J. C. Moyers to R. A. Ebel, ORGDP, February 10, 1967.

The VTE brine pumps cost⁷ (\$) is:

$$\text{PUMP} = 3.693\text{E}6 \times \left(\frac{\text{WB}2}{386.6\text{E}6} \right)^{0.8} \times \text{AJ} .$$

The various valve and piping costs⁷ (\$) are individually calculated and totaled.

$$\begin{aligned} \text{PIPEF} &= 1.257\text{E}6 \times \text{WF}2 / 513.5\text{E}6 \times \text{AJ} \\ \text{PIPEB} &= 1.130\text{E}6 \times \text{WB}2 / 386.6\text{E}6 \times \text{AJ} \\ \text{PIPEP} &= 0.442\text{E}6 \times \text{WP}2 / 126.8\text{E}6 \times \text{AJ} \\ \text{PIPV} &= 1.60392\text{E}6 \times \text{VOLDI}3 / 15.283\text{E}6 \times \text{AJ} \\ \text{PIPTUR} &= 0.38356\text{E}6 \times \text{WSTEAM} / 0.102245\text{E}8 \times \text{AJ} \\ \text{PIPT} &= \text{PIPEF} + \text{PIPEB} + \text{PIPEP} + \text{PIPV} + \text{PIPTUR} . \end{aligned}$$

The site work cost (\$) is:

$$\text{SITEW} = \text{SITE} \times \text{GVTE} / \text{GMSF} \times \text{AJ} .$$

The electrical equipment cost (\$) is:

$$\begin{aligned} \text{PØVTE} &= 3.7677\text{E}-10 \times \text{WB}2 \times (\text{LENS} + \text{LEND} + 20.0) / \text{SMALLE} \\ \text{EECVTE} &= 0.0526\text{E}6 \times \text{PØVTE} \times \text{AJ} . \end{aligned}$$

The cranes + building, instrumentation, etc., cost⁷ (\$) is:

$$\text{CØSINS} = 0.317\text{E}6 \times (\text{WP}2 / 126.8\text{E}6)^{0.6} \times \text{AJ} .$$

The total capital cost (\$) is:

$$\begin{aligned} \text{CAPTØT} &= \text{CC} + \text{TUR} + \text{GEN} + \text{EVC} + \text{CØFØUN} + \text{SHELL} + \text{PUMP} + \text{PIPT} \\ &+ \text{SITEW} + \text{EECVTE} + \text{CØSINS} + \text{DUCT} . \end{aligned}$$

Costs for some of the components are then calculated on a \$/year basis:

$$\begin{aligned} \text{CCY} &= \text{CC} \times \text{SMAP} \\ \text{CØFØY} &= \text{CØFØUN} \times \text{SMAP} \\ \text{EVCST} &= (\text{AS} + \text{AD}) \times \text{SMAP} \times \text{A}2 \times \text{AJ} + (\text{AS} + \text{AD}) \times \text{SMAPP} \times \text{A}1 \\ \text{SHELLY} &= \text{SHELL} \times \text{SMAP} \\ \text{DUCTY} &= \text{DUCT} \times \text{SMAP} \\ \text{PUMPY} &= \text{PUMP} \times \text{SMAP} \\ \text{PIPEFY} &= \text{PIPEF} \times \text{SMAP} \end{aligned}$$

$$\begin{aligned}
\text{PIPEBY} &= \text{PIPEB} \times \text{SMAP} \\
\text{PIPEPY} &= \text{PIPEP} \times \text{SMAP} \\
\text{PIPV CY} &= \text{PIPV C} \times \text{SMAP} \\
\text{PIPTRY} &= \text{PIPTUR} \times \text{SMAP} \\
\text{PIPTY} &= \text{PIPEFY} + \text{PIPEBY} + \text{PIPEPY} + \text{PIPV CY} + \text{PIPTRY} \\
\text{SITEY} &= \text{SITEW} \times \text{SMAP} \\
\text{EECVTY} &= \text{EECVTE} \times \text{SMAP} \\
\text{C}\phi\text{SINY} &= \text{C}\phi\text{SINS} \times \text{SMAP} \\
\phi\text{PERY} &= 0.1104\text{E}6 [(\text{GVTE} + \text{GMSF}) \times 1.\text{E}-6]^{0.3238} + 7500.0 \\
\text{C}\phi\text{SMAY} &= 0.006(\text{CAPT}\phi\text{T} + \text{CAP11}).
\end{aligned}$$

Several of the component costs are calculated on a unit basis (\$/unit).

$$\begin{aligned}
\text{C}\phi\text{MUNT} &= \text{CC/AUNIT} \\
\text{TURUNT} &= \text{TUR/AUNIT} \\
\text{GENUNT} &= \text{GEN/AUNIT}
\end{aligned}$$

The cost of steam to the brine heater (\$/MBtu) is:

$$\begin{aligned}
\text{SMALLB} &= \text{PMSTMC} \left[1.0 - \frac{\text{EFFCYC}}{\text{ETP}} \right] \left[\frac{1.0}{1.0 - \text{EFFCYC}} \right] \\
&\quad - \left[\frac{0.101 \times \text{AJ} \times \text{SMAP} \times (1.0 - \text{ETP}) \times \text{EFFCYC}}{\text{ETP} \times \text{CAPF}} \right]
\end{aligned}$$

The cost of on-site power (\$/kw-hr) is:

$$\begin{aligned}
\text{ELSTM} &= \text{PMSTMC} \times \text{QIN} \times 1.\text{E}-6 \times \frac{\text{WS3}}{\text{WS}} \times \frac{\text{EFFCYC}}{\text{ETP}} \times 8760.0 \times \text{CAPF} \\
\text{C}\phi\text{NCST} &= 3.0217\text{E}3 \left[\text{P}\phi\text{T}\phi\text{T} \times \frac{0.746}{2.545\text{E}6} \right] \times \left[\frac{1.0 - \text{ETP}}{\text{ETP}} \right] \\
\text{ELCST} &= \text{ELSTM} + \text{C}\phi\text{NCST} + \text{GENCST} + \text{TCSTP} \times \text{SMAP} \\
\text{SMALLD} &= \frac{\text{ELCST}}{8.76\text{E}6 \times \text{CAPF} \times \text{P}\phi\text{T}\phi\text{T} \times \frac{0.746}{2.545\text{E}6}}
\end{aligned}$$

The heat cost (\$/year) is:

$$\text{HTCST2} = \text{PMSTMC} \times \text{QIN} \times 1.\text{E}-6$$

The annual costs are converted to \$/kgal costs by a factor.

$$\begin{aligned} \text{FACTØR} &= \frac{2.739726}{\text{CAPF}(\text{GVTE} + \text{GMSF})} \\ \text{HTCSKG} &= \text{HTCST2} \times \text{FACTØR} \\ \text{CCKG} &= \text{CCY} \times \text{FACTØR} \\ \text{TURKG} &= \text{TURCST} \times \text{FACTØR} \\ \text{EVCKG} &= \text{EVCST} \times \text{FACTØR} \\ \text{ELCKG} &= \text{ELCST} \times \text{FACTØR} \\ \text{GENKG} &= \text{GENCST} \times \text{FACTØR} \\ \text{DUCTKG} &= \text{DUCTY} \times \text{FACTØR} \\ \text{CØFØKG} &= \text{CØFØY} \times \text{FACTØR} \\ \text{SHELKG} &= \text{SHELLY} \times \text{FACTØR} \\ \text{PUMPKG} &= \text{PUMPY} \times \text{FACTØR} \\ \text{PIPKG} &= \text{PIPTY} \times \text{FACTØR} \\ \text{ØPERKG} &= \text{ØPERY} \times \text{FACTØR} \\ \text{CØSMKG} &= \text{CØSMAY} \times \text{FACTØR} \\ \text{SITEKG} &= \text{SITEY} \times \text{FACTØR} \\ \text{EECVTKG} &= \text{EECVTY} \times \text{FACTØR} \\ \text{CØSIKG} &= \text{CØSINY} \times \text{FACTØR} . \end{aligned}$$

The total vapor compression water costs in \$/year and \$/kgal are:

$$\begin{aligned} \text{VCTØT} &= \text{HTCST2} + \text{CCY} + \text{TURCST} + \text{EVCST} + \text{CIY} + \text{GENCST} \\ &\quad + \text{DUCTY} + \text{CØFØY} + \text{SHELLY} + \text{PUMPY} + \text{PIPTY} + \text{ØPERY} \\ &\quad + \text{CØSMAY} + \text{SITEY} + \text{EECVTY} + \text{CØSINY} \end{aligned}$$

and

$$\begin{aligned} \text{VCTØKG} &= \text{HTCSKG} + \text{CCKG} + \text{TURKG} + \text{EVCKG} + \text{CIYKG} + \text{GENKG} \\ &\quad + \text{DUCTKG} + \text{CØFØKG} + \text{SHELKG} + \text{PUMPKG} + \text{PIPKG} + \text{ØPERKG} \\ &\quad + \text{CØSMKG} + \text{SITEKG} + \text{EECVTKG} + \text{CØSIKG}, \end{aligned}$$

respectively.

The annual water cost of the plant complex is:

$$\text{TCST2} = \text{TC2} + \text{VCTØT}.$$

The unit cost of producing water in the plant complex (\$/kgal) is:

$$\text{TCST1} = \text{TC1} + \text{VCTØKG}.$$

The subroutine then prints all cost associated items, including a cost summary table

NOMENCLATURE

1. VAPCØM

AD	-	Area of discharge VTE effect, ft^2
ALPHAD	-	Boiling point elevation in discharge effect, °F
ALPHAS	-	Boiling point elevation in suction effect, °F
ARCØN	-	Total VTE effect area, ft^2
AS	-	Area of suction VTE effect, ft^2
AUNIT	-	Number of units
CAPF	-	Plant load factor
CAP11	-	MSF capital cost, \$
CB	-	Blowdown concentration, weight fraction
CMHP2	-	Vapor compressor power requirement, hp
CPMD	-	Pressure at vapor compressor discharge, psia
CPMØW2	-	Vapor compressor power requirement, Btu/hr
CMPS	-	Pressure at vapor compressor suction, psia
CMTD	-	Temperature of superheated vapor at compressor discharge, °F
CØ	-	Ocean salt concentration, weight fraction
CØNDIS	-	Salt concentration of discharge effect effluent, weight fraction
CØNSUC	-	Salt concentration between suction and discharge VTE effects, weight fraction
CR	-	Overall concentration ratio
CRVC	-	Vapor compression plant concentration ratio
DELTAD	-	Temperature drop across VTE tubes in discharge effect, °F
DELTS	-	Temperature drop across VTE tubes in suction effect, °F
DIAMCD	-	Diameter of vapor compressor at discharge end, ft
DIAMCS	-	Diameter of vapor compressor at suction end, ft
DISID	-	VTE tube I.D. in discharge effect, in.
EFFCØM	-	Vapor compressor efficiency, fraction
EFFCYC	-	Back-pressure cycle efficiency, Mwe/Mwt
ETP	-	Thermal efficiency of condensing turbine plant, $\frac{\text{gross output, MWe}}{\text{thermal input, Mwt}}$

GAM	- Ratio of specific heats for water vapor, CP/CV
GMSF	- Product made in MSF plant, gpd
GTØT	- Total product made in combined plant, gpd
GTØT1	- Calculated plant product rate, gpd
HBLØW	- Enthalpy of blowdown stream, Btu/lb
HCØN	- Enthalpy of blowdown stream from discharge effect, Btu/lb
HD	- Enthalpy of superheated vapor at compressor discharge following an isentropic path, Btu/lb
HDIS	- Enthalpy of superheated vapor at compressor discharge, Btu/lb
HLTF	- Enthalpy of brine feed stream, Btu/lb
HLTRBS	- Enthalpy of saturated liquid at TS, Btu/lb
HSUC	- Enthalpy of saturated vapor entering compressor suction, Btu/lb
HTDC	- Enthalpy of saturated liquid at compressor discharge, Btu/lb
HTSC	- Enthalpy of saturated liquid leaving suction effect at condensing temperature, Btu/lb
HTURBI	- Enthalpy of prime steam at turbine inlet, Btu/lb
HTURBØ	- Enthalpy of prime steam at turbine outlet, Btu/lb
HVSC	- Enthalpy of saturated vapor leaving flash tank at condensing temperature, Btu/lb
HVSUC	- Enthalpy of superheated vapor entering suction effect, Btu/lb
HVTDE	- Enthalpy of saturated vapor leaving discharge effect at evaporating temperature, Btu/lb
HVTRBS	- Enthalpy of saturated vapor at TS, Btu/lb
II	- Signal flag used to determine routing of DINTPL flow
IVC	- Counter used to control intermediate effect concentration calculation
KØUTPT	- Counter used to control stage-by-stage calculations
LEND	- Length of VTE tubes in discharge effect, ft
LENS	- Length of VTE tubes in suction effect, ft
ND	- Number of VTE tubes in discharge effect
NS	- Number of VTE tubes in suction effect
PDE	- Saturated vapor pressure at discharge effect exit, psia
PMSTMC	- Prime steam cost, \$/MBtu

PØ	- Estimated evaporator pumping power, Mwe
PØBTU	- Estimated evaporating pumping power, Btu/hr
PØBTU2	- Estimated evaporator pumping power, Btu/hr
PØES	- Estimated evaporator pumping, power, Mw
PØREA	- Reactor and turbine plant auxiliary power requirement, Mwe
PØTØT	- Gross electricity production, Btu/hr
PØWATR	- Calculated evaporator plant pumping power, Mw
PR	- Vapor compressor pressure ratio
PRIBTU	- Prime steam (power) required for entire plant complex, Btu/hr
PRIMWT	- Prime steam (power) required for entire plant complex, Mw
PSC	- Saturated vapor pressure at suction effect exit, psia
PTURBI	- Pressure of prime steam at turbine inlet, psia
Q	- Heat transferred across brine heater surface, Btu/hr
QBLØW	- Heat available in VTE blowdown stream, Btu/hr
QBR	- Total heat input at top of MSF plant, Btu/hr
QDIS	- Heat available in discharge effect product stream, Btu/hr
QFEED	- Heat available in VTE feed stream, Btu/hr
QIN	- Heat available in incoming prime steam, Btu/hr
QPRØD	- Heat available in VTE product stream, Btu/hr
QSUC	- Heat available in suction effect product stream, Btu/hr
QUAL	- Quality of steam at turbine outlet
RC	- Fraction of ocean flow rejected in MSF plant
REAPØ	- Reactor and turbine plant electricity requirement, Mwe/Mwt
RPØVAL	- Overall plant performance ratio, lb product/1000 Btu
RPVC	- Vapor compressor performance ratio, lb product/1000 Btu
SHAFHP	- Turbine output, hp
SIN	- Entropy of superheated vapor entering compressor, Btu/°F-lb
SITE	- Capital cost of MSF site work, \$
SMALLB	- Cost of steam to brine heater, \$/MBtu
SMALLD	- Electricity cost, \$/kw-hr
SPVØL	- Specific volume of vapor at compressor suction, ft ³ /lb
SPVØLD	- Specific volume of vapor at compressor discharge, ft ³ /lb
SUCID	- VTE tube I.D. in suction effect, in.
TBA	- Ambient temperature, °F

TBOUT2	- Turbine output, Btu/hr
TC1	- MSF water cost, \$/kgal
TC2	- MSF water cost, \$/year
TDC	- VC discharge effect condensing temperature, °F
TDE	- VC discharge effect evaporating temperature, °F
TDSC	- Mixed stream evaporator temperature entering suction effect, °F
TFEED	- VTE brine feed temperature, °F
THFA	- MSF brine feed temperature, °F
TS	- Steam temperature, °F
TSC	- VC suction effect condensing temperature, °F
TSE	- VC suction effect evaporating temperature, °F
TSEC	- Evaporating temperature in VTE suction effect tubes, °F
TTURBI	- Temperature of prime steam at turbine inlet, °F
VAPTSC	- Heat of vaporization of water at suction effect condensing temperature, Btu/lb
VCGPD2	- Product made in VC plant, gpd
VOLDIS	- Vapor compressor discharge flow, cfm
VS	- Vapor compressor suction flow, cfm
WA	- Available work per pound of prime steam, Btu/lb
WB2	- VTE blowdown flow, lb/hr
WCØM	- Combined vapor flow entering suction effect, lb/hr
WCØND	- Condensate flow, lb/hr
WD2	- Vapor flow from discharge VTE effect, lb/hr
WF2	- Feed flow to VTE effect, lb/hr
WP2	- Total product flow from VTE effects, lb/hr
WS	- Total prime steam flow, lb/hr
WSTEAM	- Turbine exhaust steam flow, lb/hr
WS1	- Steam required to operate VC plant, lb/hr
WS2	- Vapor flow from suction VTE effect, lb/hr; also, the condensate leaving discharge VTE effect
WS3	- Steam required to operate turbo-generator plant, lb/hr
WVF	- Vapor flow from flash tank, lb/hr

- ZUBARD - VTE heat transfer coefficient, discharge effect, $\text{Btu/hr-ft}^2\text{-}^\circ\text{F}$
 ZUBARS - VTE heat transfer coefficient, suction effect, $\text{Btu/hr-ft}^2\text{-}^\circ\text{F}$.

2. ϕRSEF^1

This program has been previously documented.

3. $\text{B}\phi\text{PR}$

- BPR - Boiling point elevation, $^\circ\text{F}$
 C - Salt concentration, weight fraction
 T - Temperature, $^\circ\text{F}$.

4. DINTPL

- C - Salt concentration, weight fraction
 ERR - Flag which may indicate trouble if greater than 0
 II - Signal flag used to determine routing of DINTPL flow.

5. WATH

- A0-A5 - Coefficients used to fit data
 H - Enthalpy of pure water, Btu/lb
 T - Temperature of pure water, $^\circ\text{F}$.

6. PSIA

- TF - Saturated water vapor temperature, $^\circ\text{F}$
 P - Saturated water vapor pressure, psia
 X,A,B,
 C,D,E - Coefficients used to fit data.

7. VAPTS

- P - Pressure of water vapor, psia
 S - Entropy of water vapor, $\text{Btu/}^\circ\text{F-lb}$
 T - Temperature of water vapor, $^\circ\text{F}$
 A0,A1,
 A2 - Coefficients used to fit data.

8. VAPTH

- P - Pressure of water vapor, psia
- H - Enthalpy of water vapor, Btu/lb
- T - Temperature of water vapor, °F
- A0, A1,
A2, B0,
B1, B2 - Coefficients used to fit data.

9. VAPV

- TS - Temperature of water vapor, °F
- PS - Pressure of water vapor, psia
- V - Specific volume of water vapor, ft³/lb
- B0, G1,
G2, G3,
PHE1,
PHE3,
PHE12 - Coefficients used to fit data.

10. VAPH

- TS - Temperature of water vapor, °F
- PS - Pressure of water vapor, psia
- H - Enthalpy of water vapor, Btu/lb
- F0, F1,
F2, F3,
FP - Coefficients used to fit data.

11. VAPS

- TS - Temperature of water vapor, °F
- PS - Pressure of water vapor, psia
- S - Entropy of water vapor, Btu/°F-lb
- M0, M1,
M3, M12 - Coefficients used to fit data.

12. UCALC

CFN2	- VTE tube length correction factor
CMT	- Average salt concentration in VTE tube, weight fraction
T	- Temperature, °F
TUBLEN	- VTE tube length, ft
URBC	- Uncorrected VTE overall heat transfer coefficient, Btu/hr-ft ² -°F
ZUBAR	- Corrected VTE overall heat transfer coefficient, Btu/hr-ft ² -°F

13. CØSTVC

AD	- Area of discharge VTE effect, ft ²
AJ	- Higher cost factor
AMWT	- Total turbine power requirement, Mwe
AS	- Area of suction VTE effect, ft ²
AUNIT	- Number of units
A1	- VTE tubing purchase price, \$/ft ²
A2	- VTE tubing installation price, \$/ft ²
CAPF	- Plant load factor
CAP11	- MSF capital cost, \$
CAPTØT	- Total VC capital cost, \$
CC	- VC compressor cost, \$
CCKG	- VC compressor cost, \$/kgal
CCY	- VC compressor cost, \$/year
CØFØKG	- VC compressor foundation cost, \$/kgal
CØFØUN	- VC compressor foundation cost, \$
CØFØY	- VC compressor foundation cost, \$/year
CØMUNT	- VC compressor cost, \$/unit
CØNCST	- Condenser + cooling water loop cost, \$/year
CØSIKG	- Cranes and building cost, \$/kgal
CØSINS	- Cranes and building cost, \$
CØSINY	- Cranes and building cost, \$/year
CØSMAY	- Maintenance and supplies cost, \$/year
CØSMKG	- Maintenance and supplies cost, \$/kgal

DUCT	- Compressor ducting cost, \$
DUCTKG	- Compressor ducting cost, \$/kgal
DUCTY	- Compressor ducting cost, \$/year
ECVTKG	- Electrical equipment cost, \$/kgal
EECVTE	- Electrical equipment cost, \$
EECVTY	- Electrical equipment cost, \$/year
EFFCYC	- Turbine cycle efficiency, 260°F exhaust temperature, fraction
ELCKG	- Cost of producing electricity, \$/kgal
ELCST	- Cost of producing electricity, \$/year
ELSTM	- Cost of producing steam, \$/year
ETP	- Turbine cycle efficiency, 92°F exhaust temperature, fraction
EVC	- Area cost of VC effects, \$
EVCKG	- Area cost of VC effects, \$/kgal
EVCST	- Area cost of VC effects, \$/year
FACTØR	- Factor used to convert \$/year to \$/kgal
FIXC	- Fixed charges for reactor, ¢/MBtu
FUEL	- Fuel cost for reactor, ¢/MBtu
GEN	- Generator cost, \$
GENCST	- Generator cost, \$/year
GENKG	- Generator cost, \$/kgal
GENUNT	- Generator cost, \$/unit
GMSF	- Product made in MSF plant, gpd
GTØT	- Total product made in combined plant, gpd
GVTE	- Product made in VC effects, gpd
HPVC	- Turbine output, hp (same as SHAFHP)
HTCSKG	- Heat cost, \$/kgal
HTCST2	- Heat cost, \$/year
LEND	- Length of VTE tubes in discharge effect, ft
LENS	- Length of VTE tubes in suction effect, ft
ØPERKG	- Plant operating cost, \$/kgal
ØPERY	- Plant operating cost, \$/year
PIPEB	- Blowdown piping costs, \$
PIPEBY	- Blowdown piping costs, \$/year
PIPEF	- Feed piping costs, \$

PIPEFY - Feed piping costs, \$/year
 PIPEP - Product piping costs, \$
 PIPEPY - Product piping costs, \$/year
 PIPKG - Total piping cost, \$/kgal
 PIPT - Total piping cost, \$
 PIPTUR - Turbine exhaust piping cost, \$
 PIPTRY - Turbine exhaust piping cost, \$/year
 PIPTY - Total piping cost, \$/year
 PIPVC - Vapor compressor discharge piping cost, \$
 PIPVCY - Vapor compressor discharge piping cost, \$/year
 PMSTMC - Prime steam cost, \$/MBtu
 PØGEN - Power generated/unit, Mwe
 PØTØT - Power available in turbo-generator steam, Btu/hr
 PØVTE - Power required to operate VTE pumps, Mwe
 PR - Vapor compressor pressure ratio
 PRIMWT - Prime steam required for plant complex, Mw
 PUMP - VTE brine pump cost, \$
 PUMPKG - VTE brine pump cost, \$/kgal
 PUMPY - VTE brine pump cost, \$/year
 QIN - Heat available in incoming prime steam, Btu/hr
 RATEIN - Nondepreciating fixed charge rate, fraction
 SHELKG - Shell cost, \$/kgal
 SHELL - Shell cost, \$
 SHELLY - Shell cost, \$/year
 SITEKG - Site cost, \$/kgal
 SITEW - Site cost, \$
 SITEY - Site cost, \$/year
 SMALLB - Cost of steam to brine heater, \$/MBtu
 SMALLD - Electricity cost, \$/kw-hr
 SMALLE - Pump efficiency, fraction
 SMAP - Depreciating fixed charge rate, fraction
 SMAPP - Retubing charge rate, fraction
 TBØUT2 - Turbine output, Btu/hr
 TCSTC - Turbine cost chargeable to VC plant, \$
 TCSTP - Turbine cost chargeable to turbo-generator, \$

TCST1	-	Average plant complex water cost, \$/kgal
TCST2	-	Average plant complex water cost, \$/year
TC1	-	MSF water cost, \$/kgal
TC2	-	MSF water cost, \$/year
TPØW	-	Power requirements per turbine, Mwe
TS	-	Steam temperature, °F
TSE	-	VC suction effect evaporating temperature, °F
TUR	-	Turbine cost, \$
TURBK	-	Turbine cost factor
TURBN	-	Turbine cost factor
TURCST	-	Turbine cost, \$/year
TURKG	-	Turbine cost, \$/kgal
TURUNT	-	Turbine cost, \$/unit
VCTØKG	-	VC water cost, \$/kgal
VCTØT	-	VC water cost, \$/year
VØLDIS	-	Total VC discharge volume, cfm
VS	-	Total VC suction volume, cfm
VSUC	-	Steam specific volume at compressor suction, ft ³ /lb
WB2	-	VTE blowdown flow, lb/hr
WF2	-	VTE feed flow, lb/hr
WP2	-	VTE product flow, lb/hr
WS	-	Total prime steam flow, lb/hr
WSTEAM	-	Turbine exhaust steam flow, lb/hr
WS1	-	Steam required to operate VC plant, lb/hr
WS3	-	Steam required to operate turbo-generator, lb/hr
XØPER	-	Reactor operating and maintenance cost, ¢/MBtu.

USAGE

Input

The data for a particular case are entered as follows: three data cards are read in "VAPCØM", one data card is read in "MAIN", and eleven data cards are read in "INPUT". Figure 3 presents the data cards required for one ØRVAC-TF case.

CARD 1

10	11	20	21	30	31	40	41	50	51	60	61	70	71	80
RC	LEND	LENS	TS	DISID	SUCID	CØ	CRVC							

CARD 2

TSE	DELTS	DELTAD	ETP	EFFCYC	GTØT	TBA	

CARD 3

PTURBI	TTURBI	REAPØ					

CARD 4

2 3							
NITER							

CARD 5

12	13	24	25	36	37	48	49	60	61	72	73	80
TITLE (UP TO 72 ALPHA-NUMERIC CHARACTERS)												

CARD 6

8	9	16	17	24	25	32	33	40	41	48	49	56	57	64	65	72	73	75	76	80
CASE	G	RP						CR									IC			

CARD 7

8	9	16	17	24	25	32	33	40	41	48	49	56	57	64	65	72	73	75	76	80
TS	THF	TB	TØ					TA	CØ	CP							IC			

CARD 8

AMØDU	ALEV	AUNIT	TØTALE	TØTALR	FREBD	TRAYDP	CL	SPL	IC	

Figure 3

CARD 9

8	9	16	17	24	25	32	33	40	41	48	49	56	57	64	65	72	73	75	76
SMALLE					SMALLP	RATEIN		WPL		CAPF							IC		

CARD 10

DØH	WALLH	DØE	WALLE	DØR	WALLR	A3	SMA1	SMA2	IC	

CARD 11

BIKTH	BIKTE	BIKTR	CSLTBH	CSLTBP	CSLTBR				IC	

CARD 12

RH	RE	RSR	SH	SE	SR	VH	VE	VR	IC	

CARD 13

HD	HH	HDL	HPR	GFHL	SSF1				IC	

CARD 14

	FACID	ACACID	DPLIM			XSØD	XNNN	XLLE	IC	

CARD 15

									IC	

Figure 3 (Continued)

Three data items are set in "VAPCØM", vapor compressor efficiency (EFFCØM), evaporator pumping factor (EIPE), and ratio of specific heats for water vapor (GAM).

Since the ØRVAC-TF program is essentially a combination of two unique operating programs, several data items appear twice, once in the "VAPCØM" data input and once in the "INPUT" data input. These are: steam temperature (TS), ocean salt concentration (CØ), total product rate (GTØT), and overall concentration ratio (CR). Ambient temperature appears in ØRVAC-TF as TBA and in "INPUT" as TA.

1. Description of Cards

a. Card 1 (Format 8E10.4)

- (1) Fraction of ocean intake flow rejected in MSF plant
- (2) Length of VTE tubes in discharge effect, ft
- (3) Length of VTE tubes in suction effect, ft
- (4) Steam temperature, °F
- (5) VTE tube I.D. in discharge effect, in.
- (6) VTE tube I.D. in suction effect, in.
- (7) Ocean salt concentration, fraction
- (8) Vapor compression plant concentration ratio

b. Card 2 (Format 8E10.4)

- (1) VC suction effect evaporating temperature, °F
- (2) Temperature drop across VTE tubes in suction effect, °F
- (3) Temperature drop across VTE tubes in discharge effect, °F
- (4) Thermal cycle efficiency, 92° exhaust temperature, fraction
- (5) Turbine cycle efficiency, 260°F exhaust temperature, fraction
- (6) Total product rate, gpd
- (7) Ambient temperature, °F
- (8) Overall plant concentration ratio

c. Card 3 (Format 5E10.6)

- (1) Pressure of prime steam at turbine inlet, psia
- (2) Temperature of prime steam at turbine inlet, °F
- (3) Fraction of plant power required for reactor operation.

d. Card 4 (Format I2)

- (1) Allowable number of MSF iterations.

e. Card 5

- (1) Title of case (72 alpha-numeric characters).

f. Card 6 (Format 9F8.0, I3)

- (1) Case number
- (2) Total product rate, gpd
- (3) Estimated MSF performance ratio, $\frac{\text{lb product}}{1000 \text{ Btu}}$
- (4) Blank
- (5) Blank
- (6) Overall plant concentration ratio
- (7) Blank
- (8) Blank
- (9) Blank
- (10) Card number - 1 (column No. 75).

g. Card 7 (Format 9F8.0, I3)

- (1) Steam temperature, °F
- (2) Maximum brine temperature, °F
- (3) Blowdown temperature, °F
- (4) Ocean temperature, °F
- (5) Blank
- (6) Ambient temperature, °F
- (7) Ocean salt concentration, weight fraction
- (8) Product salt concentration, weight fraction
- (9) Blank
- (10) Card number - 2 (column No. 75).

h. Card 8 (Format 9F8.0, I3)

- (1) Number of modules
- (2) Number of levels
- (3) Number of units
- (4) Total number of stages in heat recovery section
- (5) Total number of stages in heat reject section
- (6) Vertical height available for vapor escape from the trays, ft
- (7) Tray depth, ft
- (8) Loss coefficient of interstage orifice
- (9) Splash plate length, in.
- (10) Card number - 3 (column No. 75).

i. Card 9 (Format 9F8.0, I3)

- (1) Pump efficiency, fraction
- (2) Blank
- (3) Blank
- (4) Depreciating fixed charge rate, fraction
- (5) Nondepreciating fixed charge rate, fraction
- (6) Plant life, years
- (7) Plant load factor
- (8) Blank
- (9) Blank
- (10) Card number - 4 (column No. 75).

j. Card 10 (Format 9F8.0, I3)

- (1) Brine heater tube O.D., in.
- (2) Brine heater tube wall thickness, in.
- (3) Recovery tube O.D., in.
- (4) Recovery tube wall thickness, in.
- (5) Reject tube O.D., in.
- (6) Reject tube wall thickness, in.
- (7) Unit cost of heater tubing and tube sheets, $\$/\text{ft}^2$

- (8) Unit cost of recovery tubing and tube sheets, $\$/ft^2$
- (9) Unit cost of reject tubing and tube sheets, $\$/ft^2$
- (10) Card number - 5 (column No. 74).

k. Card 11 (Format 9F8.0, I3)

- (1) Tube metal conductivity in brine heater, $Btu/hr-ft^2-^{\circ}F/ft$
- (2) Tube metal conductivity in evaporator recovery,
 $Btu/hr-ft^2-^{\circ}F/ft$
- (3) Tube metal conductivity in evaporator reject,
 $Btu/hr-ft^2-^{\circ}F/ft$
- (4) Tube life in brine heater, years
- (5) Tube life in evaporator recovery, years
- (6) Tube life in evaporator reject, years
- (7) Blank
- (8) Blank
- (9) Blank
- (10) Card number - 6 (column 75).

l. Card 12 (Format 9F8.0, I3)

- (1) Fouling factor in brine heater, $Btu^{-1}-hr-ft^2-^{\circ}F$
- (2) Fouling factor in evaporator recovery, $Btu^{-1}-hr-ft^2-^{\circ}F$
- (3) Fouling factor in evaporator reject, $Btu^{-1}-hr-ft^2-^{\circ}F$
- (4) Flooding factor in brine heater
- (5) Flooding factor in evaporator recovery
- (6) Flooding factor in evaporator reject
- (7) Tube velocity in brine heater, ft/sec
- (8) Tube velocity in evaporator recovery, ft/sec
- (9) Tube velocity in evaporator reject, ft/sec
- (10) Card number - 7 (column No. 75).

m. Card 13 (Format 9F8.0, I3)

- (1) Pumping head from ocean to plant site, ft
- (2) Head loss in pumping between the plant and brine heater,
ft

- (3) Blowdown pump head, ft
- (4) Product pump head, ft
- (5) Fouling factor multiplying factor used to reflect technological improvement
- (6) Heat transfer coefficient multiplying factor used to reflect technological improvement
- (7) Blank
- (8) Blank
- (9) Blank
- (10) Card number - 8 (column No. 75).

n. Card 14 (Format 9F8.0, I3)

- (1) Blank
- (2) Temperature drop associated with submergence effects, °F
- (3) Slope of item (2) with temperature
- (4) Heater shell design pressure drop, psia
- (5) Blank
- (6) Blank
- (7) Condenser tube pitch/tube diameter ratio
- (8) Calculates condenser for every 1/XNNN stages. Remaining condensers are calculated by interpolation
- (9) Calculate tube rows in every 1/XLLL stages. Remaining tube rows are calculated by interpolation
- (10) Card number - 9 (column No. 75).

o. Card 15 (Format 9F8.0, I3)

- (1) - (9) are Blank
- (10) Card number - 10 (column Nos. 74 and 75).

Output

The output from the MSF plant appears first, with the case title being used to title each page. The input data from cards 1 - 4 and 6 - 14 are printed followed by any signals or iterations required in the MSF cost routines.

Two pages of MSF output summarize the costs and important overall flows, temperatures, and performance geometry.

The MSF stage-by-stage output follows in five separate groups.

The last two output pages contain vapor compressor information. The last page summarizes vapor-compression costs and presents an average overall plant water cost.

Operating Instructions

Since ØRVAC-TF is a very large program, it was necessary to redesign program flow using the overlay linkage system. Therefore, it is necessary to include all subroutines listed on the loading map within the designated link. Order within a given link is not important. An alternate input-output buffer system is used to allow approximately 20,000 extra octal storage locations to be made available for the program.

ØRVAC-TF consists of a main program (VAPCØM) and thirty-four subroutines arranged in five linkages. The program is loaded on the machine by stacking the main program and all 0 link subroutines (in any order). The remaining links should be loaded as shown on the loading map to decrease machine time. Each remaining link should begin with an overlay card. An end-of-file card and a set of data complete the deck. There are no programmed stops or pauses. The program takes its input from tape 5 and writes its output on tape 6. Card-to-tape and output translation is done off-line.

Example

To illustrate the use of ØRVAC-TF, a sample problem is included. The variables used as input data (in the order they are required) are as follows:

I. VAPCØM

RC	=	0.0	CØ	=	0.0336	EFFCYC	=	0.2137
LEND	=	10.0	CRVC	=	1.328	GTØT	=	0.750E9
LENS	=	10.0	TSE	=	237.0	TBA	=	90.0
TS	=	260.0	DELTS	=	8.0	PTURBI	=	965.0
DISID	=	3.0	DELTAD	=	8.0	TTURBI	=	540.0
SUCID	=	3.0	ETP	=	0.3425	REAPØ	=	0.01327

In the body of VAPCØM, the following variables are set:

EFFCØM	=	0.80	EIPE	=	0.20	GAM	=	1.32
--------	---	------	------	---	------	-----	---	------

II. MAIN

NITER = 10

III. INPUT

TITLE = 72 ALPHA-NUMERIC CHARACTERS

CASE	=	18.0	RP	=	10.0	Card No.	=	001
------	---	------	----	---	------	----------	---	-----

G	=	750.0E6	CR	=	1.8
---	---	---------	----	---	-----

TSTEAM	=	260.0	TØ	=	65.0	CP	=	0.000025
--------	---	-------	----	---	------	----	---	----------

THF	=	250.0	TA	=	80.0	Card No.	=	002
-----	---	-------	----	---	------	----------	---	-----

TB	=	92.6	CØ	=	0.0336
----	---	------	----	---	--------

AMØDU	=	8.0	TØTALR	=	4.0	CL	=	4.0
-------	---	-----	--------	---	-----	----	---	-----

ALFV	=	8.0	FREBD	=	1.6	SPL	=	12.0
------	---	-----	-------	---	-----	-----	---	------

AUNITS	=	5.0	TRAYDP	=	4.0	Card No.	=	003
--------	---	-----	--------	---	-----	----------	---	-----

TØTALE = 40.0

SMALLE	=	0.86	RATEIN	=	0.04	CAPF	=	0.9
--------	---	------	--------	---	------	------	---	-----

SMALLP	=	0.06	WPL	=	30.0	Card No.	=	004
--------	---	------	-----	---	------	----------	---	-----

DØH	=	0.750	DØR	=	0.750	SMA1	=	1.859
WALLH	=	0.042	WALLR	=	0.042	SMA2	=	1.859
DØE	=	0.750	A3	=	1.859	Card No.	=	005
WALLE	=	0.042						

BIKTH	=	26.0	CSLTBH	=	30.0	CSLTBR	=	30.0
BIKTE	=	26.0	CSLTBP	=	30.0	Card No.	=	006
BIKTR	=	26.0						

RH	=	0.0003	SE	=	16.0	VE	=	7.0
RE	=	0.0003	SR	=	16.0	VR	=	7.0
RSR	=	0.0005	VH	=	7.0	Card No.	=	007
SH	=	16.0						

HD	=	35.0	HPR	=	92.0	SSFL	=	0.0
HH	=	25.0	FFHL	=	0.0	Card No.	=	008
HBL	=	0.0						

CPSTB	=	2.0	A6	=	3.9532	XNNN	=	4.0
FACID	=	0.5	A7	=	3.6412	XLIL	=	4.0
ACACID	=	0.0	XSD	=	1.30	Card No.	=	009
DPLIM	=	14.696						

Card No. = 010

The output for this case is given in Figure 5.

Coding Information

1. Time Requirements. Approximately 2-1/2 minutes is required to run a single case with 45 MSF stages. This assumes no compilation of source decks is required.
2. Flow Charts and Source Program. Figure 4 is a flow diagram of the subroutine UCALC. Figure 6 presents a complete listing of all the Fortran IV source programs used in ØRVAC-TF.

Figure 4
SUBROUTINE UCALC

VAPCOM DATA INPUT

CARD 01
 0. 0.100000E 02 0.100000E 02 0.260000E 03 0.300000E 01 0.300000E 01 0.336000E-01 0.132800E 01
 CARD 02
 0.237000E 03 0.800000E 01 0.800000E 01 0.342500E 00 0.213700E 00 0.750000E 09 0.900000E 02
 CARD 03
 0.965000E 03 0.540000E 03 0.132700E-01

UNDRFLOW AT 60413 IN MQ

UNDRFLOW AT 64005 IN MQ

UNDRFLOW AT 60413 IN MQ

UNDRFLOW AT 64037 IN MQ

UNDRFLOW AT 60413 IN MQ

MAIN DATA INPUT

CARD 04
 10

INPUT DATA INPUT

CARD 06
 0.180000E 02 0.750000E 09 0.100000E 02 -0.000000E-19 -0.000000E-19 0.180000E 01 -0. -0.
 CARD 07
 0.260000E 03 0.250000E 03 0.926000E 02 0.650000E 02 -0. 0.800000E 02 0.336000E-01 0.250000E-04
 CARD 08
 8.00 8.00 5.00 40.00 4.00 1.60 4.00 4.00 12.00
 CARD 09
 0.860000 -0. -0. 0.860000 0.040000 30.000000 0.900000 0.333300 -0.
 CARD 10
 0.750000 0.042000 0.750000 0.042000 0.750000 0.042000 1.859000 1.859000 1.859000
 CARD 11
 26.0000 26.0000 26.0000 30.0000 30.0000 30.0000
 CARD 12
 0.00030 0.00030 0.00050 16.00000 16.00000 16.00000 7.00000 7.00000 7.00000
 CARD 13
 35.00 25.00 0. 92.00 0. 0.
 CARD 14
 2.000000 0.500000 0. 14.696000 3.953200 3.641200 1.300000 4 4

OPEN CHANNEL USED ANNUAL COSTS ARE 0.49975626E 06 VS 0.73213737E 06

OPEN CHANNEL USED ANNUAL COSTS ARE 0.49758266E 06 VS 0.72839083E 06

FIGURE 5

SPECIAL CASE FOR LIBRARY CODE

PRODUCT ABOVE-GPD	0.416488E 09	PRODUCT FROM SEMS	0.33339124F 09	TOTAL PRODUCT RATE-GPD	0.74987931E 09
TOTAL STAGES	44.	EVAP HEAT LOSS (PCT)	0.	POWER (\$/KW HR)	-0.
STEAM TEMP	260.00	PLANT LOAD FACTOR	0.9000	HEAT (\$/MBTU)	-0.
MAX BRINE TEMP	251.64	PUMP EFF	0.8600	ANNUAL CAP 1/YEAR	0.0600
OCEAN TEMP	65.00	DELIVERY HEAD	35.00	EVAP AND REJ RETUBING CHARGE	0.
AMBIENT TEMP	80.00	REJECT HEAD	50.20	HEATER RETUBING CHARGE	0.
SEA WATER SALT CONC	0.03360	EVAP HEAD	50.20	REJECT AREA (\$/SQFT)	2.8697
PRODUCT SALT CONC	0.00002	HEATER HEAD	25.00	EVAP AREA (\$/SQFT)	2.7147
CONC RATIO C(8)/C(10)	1.80000	BLOWDOWN HEAD	0.	BRINE HEATER (\$/SQFT)	1.8590
RECOVER RATIO P	0.11902	PRODUCT HEAD	106.63	BRINE HEATER SHELL \$/SQFT	1.1670
PERFORMANCE RATIO	7.032	HIGHER COST	1.2138	INTEREST RATE	0.0400
REJECT/EVAP TUBE FLOW Q.	0.6022	HEATER HEAT LOSS (PCT)	0.	PRODUCT TEMP	91.163
PLANT LIFE	30.0	TUBE LIFE, HEATER	30.00	TUBE LIFE, EVAP.	30.00
	BRINE HEATER	EVAPORATOR	REJECT		
FLOODING FACTOR	16.00	16.00	16.00		
TUBE CONDUCTIVITY	26.00	26.00	26.00		
TUBE VELOCITY	7.00	7.00	7.00		
TUBE OD	0.75000	0.75000	0.75000		
TUBE ID	0.66600	0.66600	0.66600		
FOULING FACTOR	0.000300	0.000300	0.000500		
TEMP DROP/STAGE RHO		3.5184994	4.3226099		
TUBE FLOW LB/HR	0.96443494E 09	0.96443494E 09	0.58080506E 09		
NO OF STAGES		40	4		
HEAT TRANSFER COEF	0.80118335E 03	0.71194028E 03	0.51536003E 03		
CONDENSER AREA	0.13210735E 07	0.14279565E 08	0.17943647E 07		
TUBE LENGTH	0.25604076E 02	0.27888517E 03	0.60879859E 02		
NO OF TUBES	0.26277761E 06	0.26077144E 06	0.15010929E 06		
TUBE HEAD LOSS	0.12125127E 02	0.77697362E 02	0.15163830E 02		
COST	\$/YEAR	\$/KGAL			
HEAT	-0.	-0.	RECOVERY RATIO (CALC)	0.11902	
CHEMICAL	0.26670303E 07	0.10825085E-01	PERFORMANCE RATIO (CALC)	7.032	
POWER	-0.	-0.	AVE BOILING POINT RISE	2.165	
PUMPS AND MOTORS	0.10952659E 07	0.44455238E-02	AVE THERMAL FORCE/STAGE	13.322	
CAP. CHEM	0.26362449E 06	0.10700132E-02			
SITE WORK	0.21520277E 05	0.87347653E-04	BLOWDOWN TEMP	93.607	
SEA-INTAKE	0.42258266E 06	0.17152011E-02	BRINE TEMP INTO HEATER	234.377	
EVAPORATOR SHELL	0.15621382E 07	0.63404898E-02			
EVAPORATOR AREA	0.31565377E 07	0.12811924E-01			
BRINE HEATER	0.37242592E 06	0.15116222E-02			
VALVES AND PIPING	0.52463132E 06	0.21294037E-02	U-PAR AVERAGE	692.09	
ELEC EQUIPMENT	0.30209219E 06	0.12261479E-02	POWER (MEGA-WATTS)	151.061	
OPERATING COST	0.	0.	PRODUCT RATE (LB/HR)	0.11483064E 09	
MAINTENANCE AND SUPPLIES	0.	0.	RECYCLE FLOW (LB/HR)	0.38362988E 09	
CRANES, INSTRU, BUILDINGS, CONCRETE	0.16200745E 06	0.65756449E-03	SEA WATER RETURN (LB/HR)	0.	
DEAERATOR	0.36106070E 06	0.14654925E-02			
TOTAL COST	0.10910917E 08	0.44285814E-01	BLOWDOWN FLOW (LB/HR)	0.32256273E 09	
			STEAM FLOW (LB/HR)	0.17389050E 08	

	\$	\$/GPD	\$/KGAL
CAPITAL INVESTMENT	0.13739811E 09	0.18319748E 00	0.33460727E-01

FIGURE 5 (Continued)

DEAERATOR POWER, MW	0.13266205E 02	STAGE 1 PRESS HEAD	0.68789522E 02	VALVES AND PIPING	0.72039661E 07
PUMPS AND MOTORS	0.15039611E 08	ELFC EQUIPMENT	0.41481698E 07	SHELL, DMSTR, WEIR	0.21450453E 08
SITE WORK	0.29550505E 06	WATER INTAKE	0.58026812E 07	BRINE HEATER	0.51139554E 07
EVAPORATOR AREA	0.43343903E 08	CRANES INSTRU, BLDG, CONCRETE	0.22240004E 07	INSTRUMENTATION	0.14375296E 07
DEMISTER	0.37288603E 07	CHEM SYS CAP COST	0.36195517E 07	BUILDINGS	0.24297595E 06
WEIRS	0.23507589E 07	CRANE	0.54405477E 06	PUMP COST	0.94226676E 07
DEAERATOR	0.49578942E 07	MOTOR COST	0.56165434E 07		
RETUR CHARGE(\$/YR)	0.	RETUR CHARGE(\$/K GAL)	0.		
NO. OF MODULES	0.80000000E 01	NO OF TRAY LEVELS	0.80000000E 01	TUBE SHEET THICKNESS IN	0.7500
FREE BOARD, FT	0.16000000E 01	TRAY WIDTH FACTOR	0.90000000E 00	SPLASH PLATE LENGTH, IN	12.00
BRINE DEPTH, FT	0.10000000E 01	LEVEL HEIGHT	0.56000000E 01	MAX TRAY FLOW	500000.000
COEF A	1.000				
		FOR 1 MODULE			
EVAP SHELL VOLUME	0.45797861E 06	REJECT SHELL VOLUME	0.8536E962E 05		
EVAP TUBE BUND WID (FT)	5.5000	REJ TUBE BUND WID (FT)	4.4437		
WTME	0.25655722E 02	WTMR	0.22412790E 02		
HSTE	0.56000000E 01	HSTR	0.56000000E 01		
EVAP FLASHING AREA	0.373255E 06	REJECT FLASHING AREA	0.84187136E 05		
MAX AREA OF ORIFICE-EVAP	19.24179	MAX AREA OF ORIFICE-REJECT	0.16305592E 02		
ORIFICE LOSS COEFF	4.0000				

FIGURE 5 (Continued)

SPECIAL CASE FOR LIBRARY CODE

STAGE	TTD	CT	C1	C2	QN	UBAR	HI	HO	OM	AS	LS	W-W	SF
1	11.5899	0.03360	0.03360	0.05221	0.26488289E	10	806.56	2801.80	2530.77	12.95	0.253612E	06	4.953 C.127410E 01
2	10.8857	0.03360	0.05221	0.05240	0.33015301E	10	805.75	2777.88	2545.02	12.56	0.326112E	06	6.369 C.169920E 01
3	10.9141	0.03360	0.05240	0.05258	0.32945149E	10	802.16	2751.25	2534.57	12.59	0.326195E	06	6.371 C.167610E 01
4	10.9370	0.03360	0.05258	0.05277	0.32922112E	10	798.50	2724.28	2523.92	12.61	0.326864E	06	6.384 C.165670E 01
5	10.9595	0.03360	0.05277	0.05295	0.32899256E	10	794.74	2696.94	2512.91	12.64	0.327592E	06	6.398 C.163777E 01
6	10.9807	0.03360	0.05295	0.05314	0.32878241E	10	790.89	2669.26	2501.61	12.66	0.328420E	06	6.414 C.161953E 01
7	11.0018	0.03360	0.05314	0.05332	0.32855675E	10	786.94	2641.23	2489.95	12.68	0.329291E	06	6.431 C.160162E 01
8	11.0225	0.03360	0.05332	0.05351	0.32833339E	10	782.89	2612.87	2477.94	12.70	0.330225E	06	6.449 C.158416E 01
9	11.0429	0.03360	0.05351	0.05370	0.32811118E	10	778.74	2584.18	2465.58	12.72	0.331223E	06	6.469 C.156712E 01
10	11.0625	0.03360	0.05370	0.05388	0.32790087E	10	774.49	2555.18	2452.90	12.74	0.332308E	06	6.490 C.155062E 01
11	11.0819	0.03360	0.05388	0.05407	0.32768266E	10	770.14	2525.87	2439.88	12.76	0.333449E	06	6.512 C.153448E 01
12	11.1010	0.03360	0.05407	0.05425	0.32746759E	10	765.69	2496.27	2426.52	12.78	0.334662E	06	6.536 C.151875E 01
13	11.1196	0.03360	0.05425	0.05444	0.32725619E	10	761.14	2466.38	2412.83	12.80	0.335948E	06	6.561 C.150345E 01
14	11.1262	0.03360	0.05444	0.05463	0.32705871E	10	756.50	2436.21	2398.84	12.82	0.337337E	06	6.588 C.148868E 01
15	11.1441	0.03360	0.05463	0.05481	0.32685291E	10	751.75	2405.78	2384.52	12.83	0.338790E	06	6.617 C.147424E 01
16	11.1616	0.03360	0.05481	0.05500	0.32664829E	10	746.90	2375.08	2369.88	12.85	0.340321E	06	6.647 C.146019E 01
17	11.1788	0.03360	0.05500	0.05518	0.32644833E	10	741.94	2344.14	2354.92	12.87	0.341936E	06	6.678 C.144654E 01
18	11.1956	0.03360	0.05518	0.05537	0.32627499E	10	736.89	2312.96	2339.70	12.88	0.343689E	06	6.712 C.143352E 01
19	11.2111	0.03360	0.05537	0.05556	0.32602626E	10	731.73	2281.56	2324.03	12.90	0.345382E	06	6.745 C.142019E 01
20	11.2283	0.03360	0.05556	0.05574	0.32583701E	10	726.46	2249.95	2308.09	12.92	0.347236E	06	6.782 C.140757E 01
21	11.2450	0.03360	0.05574	0.05593	0.32564313E	10	721.09	2218.13	2291.83	12.93	0.349169E	06	6.819 C.139526E 01
22	11.2615	0.03360	0.05593	0.05612	0.32546277E	10	715.62	2186.12	2275.35	12.95	0.351289E	06	6.861 C.138372E 01
23	11.2761	0.03360	0.05612	0.05631	0.32530698E	10	710.05	2153.93	2258.56	12.96	0.353446E	06	6.903 C.137226E 01
24	11.2907	0.03360	0.05631	0.05649	0.32512368E	10	704.37	2121.57	2241.46	12.98	0.355704E	06	6.947 C.136116E 01
25	11.3050	0.03360	0.05649	0.05668	0.32494054E	10	698.59	2089.05	2224.06	12.99	0.358058E	06	6.993 C.135036E 01
26	11.3192	0.03360	0.05668	0.05687	0.32484925E	10	692.72	2056.38	2206.53	13.00	0.360706E	06	7.045 C.134068E 01
27	11.3302	0.03360	0.05687	0.05705	0.32467474E	10	686.73	2023.57	2188.68	13.01	0.363353E	06	7.096 C.133086E 01
28	11.3411	0.03360	0.05705	0.05724	0.32450637E	10	680.65	1990.64	2170.55	13.02	0.366117E	06	7.150 C.132136E 01
29	11.3518	0.03360	0.05724	0.05743	0.32434284E	10	674.45	1957.61	2152.13	13.03	0.369000E	06	7.207 C.131219E 01
30	11.3644	0.03360	0.05743	0.05762	0.32418137E	10	668.18	1924.46	2133.71	13.04	0.372353E	06	7.272 C.130466E 01
31	11.3554	0.03360	0.05762	0.05780	0.32418813E	10	661.80	1891.22	2114.96	13.04	0.375638E	06	7.336 C.129667E 01
32	11.3593	0.03360	0.05780	0.05799	0.32403963E	10	655.31	1857.92	2095.94	13.05	0.379057E	06	7.403 C.128897E 01
33	11.3629	0.03360	0.05799	0.05818	0.32389921E	10	648.71	1824.55	2076.66	13.05	0.382626E	06	7.473 C.128161E 01
34	11.3531	0.03360	0.05818	0.05837	0.32406604E	10	642.05	1791.11	2057.58	13.04	0.387025E	06	7.559 C.127698E 01
35	11.3465	0.03360	0.05837	0.05856	0.32393710E	10	635.28	1757.63	2038.15	13.04	0.391180E	06	7.640 C.127117E 01
36	11.3395	0.03360	0.05856	0.05875	0.32381959E	10	628.40	1724.13	2018.47	13.03	0.395515E	06	7.725 C.126571E 01
37	11.3322	0.03360	0.05875	0.05893	0.32370806E	10	621.41	1690.62	1998.53	13.02	0.400033E	06	7.813 C.126056E 01
38	11.3043	0.03360	0.05893	0.05912	0.32408712E	10	614.38	1657.07	1979.03	13.00	0.405860E	06	7.927 C.125942E 01
39	11.2816	0.03360	0.05912	0.05931	0.32399047E	10	607.23	1623.52	1959.13	12.98	0.411218E	06	8.031 C.125630E 01
40	11.2583	0.03360	0.05931	0.05950	0.32391380E	10	599.97	1590.01	1938.99	12.95	0.416824E	06	8.141 C.125357E 01
41	10.6642	0.03360	0.05950	0.05973	0.39168479E	10	535.89	1595.95	1931.68	13.90	0.525989E	06	17.846 C.247654E 01
42	13.3245	0.03360	0.05973	0.05996	0.39783278E	10	517.28	1529.19	1804.99	16.66	0.461686E	06	15.664 C.212236E 01
43	16.0556	0.03360	0.05996	0.06020	0.39895212E	10	499.71	1462.22	1700.01	19.44	0.410688E	06	13.934 C.184385E 01
44	19.0517	0.03360	0.06020	0.06043	0.20640251E	10	487.96	1411.56	1642.65	20.81	0.191840E	06	6.509 C.159126E 01
45		0.03360	0.03363		0.18638790E	10	397.87	1380.16	1580.58	23.58	0.198635E	06	6.739

FIGURE 5 (Continued)

SPECIAL CASE FOR LIBRARY CODE

STAGE	WV	WS2	WP2	TV2	TS1	TS2	T1	T2	BRINE CFM	PROD CFM
1	0.29408018E 07	0.81804228E 09	0.14639266E 09	245.96	251.64	248.12	231.54	234.38	0.697001E 06	C.
2	0.29205832E 07	0.81512170E 09	0.14931324E 09	242.42	248.12	244.60	228.01	231.54	0.734253E 06	0.986147E 05
3	0.29005574E 07	0.81222114E 09	0.15221379E 09	238.91	244.60	241.08	224.47	228.01	0.774032E 06	0.106204E 06
4	0.28807590E 07	0.80934038E 09	0.15509455E 09	235.40	241.08	237.56	220.94	224.47	0.816547E 06	0.115429E 06
5	0.28611765E 07	0.80647919E 09	0.15795573E 09	231.90	237.56	234.05	217.41	220.94	0.862011E 06	0.125485E 06
6	0.28418121E 07	0.80363738E 09	0.16079754E 09	228.39	234.05	230.53	213.88	217.41	0.910666E 06	0.136496E 06
7	0.28226532E 07	0.80081472E 09	0.16362019E 09	224.88	230.53	227.01	210.35	213.88	0.962765E 06	0.148470E 06
8	0.28037074E 07	0.79801101E 09	0.16642390E 09	221.37	227.01	223.49	206.82	210.35	0.101860E 07	0.161544E 06
9	0.27849680E 07	0.79522603E 09	0.16920886E 09	217.86	223.49	219.97	203.29	206.82	0.107846E 07	0.175826E 06
10	0.27664321E 07	0.79245959E 09	0.17197530E 09	214.35	219.97	216.45	199.76	203.29	0.114271E 07	0.191473E 06
11	0.27480867E 07	0.78971150E 09	0.17472338E 09	210.83	216.45	212.93	196.23	199.76	0.121170E 07	0.208561E 06
12	0.27299425E 07	0.78698156E 09	0.17745332E 09	207.32	212.93	209.42	192.70	196.23	0.128584E 07	0.227269E 06
13	0.27119901E 07	0.78426957E 09	0.18016532E 09	203.81	209.42	205.90	189.16	192.70	0.136557E 07	0.247769E 06
14	0.26942196E 07	0.78157534E 09	0.18285954E 09	200.30	205.90	202.38	185.63	189.16	0.145139E 07	0.270298E 06
15	0.26766440E 07	0.77889870E 09	0.18553618E 09	196.78	202.38	198.86	182.10	185.63	0.154383E 07	0.294965E 06
16	0.26592420E 07	0.77623945E 09	0.18819542E 09	193.27	198.86	195.34	178.57	182.10	0.164347E 07	0.322044E 06
17	0.26420289E 07	0.77359742E 09	0.19083745E 09	189.75	195.34	191.82	175.04	178.57	0.175099E 07	0.351804E 06
18	0.26249838E 07	0.77097243E 09	0.19346243E 09	186.24	191.82	188.30	171.51	175.04	0.186707E 07	0.384680E 06
19	0.26081145E 07	0.76836431E 09	0.19607054E 09	182.72	188.30	184.79	167.98	171.51	0.199252E 07	0.420364E 06
20	0.25914168E 07	0.76577289E 09	0.19866196E 09	179.21	184.79	181.27	164.44	167.98	0.212823E 07	0.460024E 06
21	0.25748878E 07	0.76319800E 09	0.20123684E 09	175.69	181.27	177.75	160.91	164.44	0.227514E 07	0.503689E 06
22	0.25585225E 07	0.76063947E 09	0.20379537E 09	172.17	177.75	174.23	157.38	160.91	0.243434E 07	0.552225E 06
23	0.25423190E 07	0.75809715E 09	0.20633769E 09	168.65	174.23	170.71	153.84	157.38	0.260703E 07	0.605460E 06
24	0.25262822E 07	0.75557086E 09	0.20886377E 09	165.13	170.71	167.19	150.31	153.84	0.279452E 07	0.664318E 06
25	0.25103921E 07	0.75306046E 09	0.21137436E 09	161.61	167.19	163.68	146.78	150.31	0.299827E 07	0.729412E 06
26	0.24946747E 07	0.75056578E 09	0.21386903E 09	158.09	163.68	160.16	143.24	146.78	0.321997E 07	0.802504E 06
27	0.24790966E 07	0.74808668E 09	0.21634813E 09	154.56	160.16	156.64	139.71	143.24	0.346140E 07	0.882597E 06
28	0.24636752E 07	0.74562300E 09	0.21881181E 09	151.04	156.64	153.12	136.17	139.71	0.372464E 07	0.971514E 06
29	0.24484015E 07	0.74317459E 09	0.22126020E 09	147.51	153.12	149.60	132.63	136.17	0.401197E 07	0.107033E 07
30	0.24332757E 07	0.74074131E 09	0.22369348E 09	143.98	149.60	146.08	129.09	132.63	0.432597E 07	0.118282E 07
31	0.24183014E 07	0.73832301E 09	0.22611178E 09	140.44	146.08	142.56	125.55	129.09	0.466955E 07	0.130575E 07
32	0.24034610E 07	0.73591954E 09	0.22851524E 09	136.91	142.56	139.05	122.01	125.55	0.504593E 07	0.144287E 07
33	0.23887650E 07	0.73353078E 09	0.23090400E 09	133.37	139.05	135.53	118.47	122.01	0.545881E 07	0.159608E 07
34	0.23742104E 07	0.73115656E 09	0.23327821E 09	129.82	135.53	132.01	114.92	118.47	0.591234E 07	0.177456E 07
35	0.23597984E 07	0.72879676E 09	0.23563801E 09	126.27	132.01	128.49	111.38	114.92	0.641124E 07	0.196786E 07
36	0.23455160E 07	0.72645124E 09	0.23798353E 09	122.71	128.49	124.97	107.83	111.38	0.696083E 07	0.218498E 07
37	0.23313665E 07	0.72411987E 09	0.24031489E 09	119.16	124.97	121.45	104.28	107.83	0.756721E 07	0.242907E 07
38	0.23173625E 07	0.72180250E 09	0.24263225E 09	115.58	121.45	117.93	100.72	104.28	0.823738E 07	0.272065E 07
39	0.23034858E 07	0.71949902E 09	0.24493574E 09	112.00	117.93	114.42	97.17	100.72	0.897925E 07	0.303414E 07
40	0.22897346E 07	0.71720928E 09	0.24722548E 09	108.42	114.42	110.90	93.61	97.17	0.980195E 07	0.338922E 07
41	0.227945734E 07	0.71441470E 09	0.25002005E 09	104.26	110.90	106.58	86.53	93.61	0.134490E 08	0.447036E 07
42	0.22742328E 07	0.71164046E 09	0.25279428E 09	99.85	106.58	102.25	79.34	86.53	0.150448E 08	0.545852E 07
43	0.227541689E 07	0.70888629E 09	0.25554844E 09	95.39	102.25	97.93	72.12	79.34	0.168727E 08	0.637542E 07
44	0.94657046E 06	0.70615223E 09	0.25649571E 09	91.16	97.93	93.61	68.48	72.12	0.656827E 07	0.694552E 07
45	0.17874832E 07		0.25828249E 09	90.37			65.00	68.48		

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FIGURE 5 (Continued)

SPECIAL CASE FOR LIBRARY CODE

ONE LEVEL OF ONE MODULE												
STAGE	VAPOR VEL FT/SEC	TRAY FLOW LB/HR FT	TRAY WIDTH FT	RES TIME SEC	PV	DELP AVAILABLE	DELP REQUIRED	A	ALPHA	DTPD		
1	12.561253	0.500000E 06	25.655721	1.957303	0.27782E 02	0.16977E 01	0.24591E 00	0.36319E 01	2.159	0.51		
2	10.073804	0.500000E 06	25.563821	2.611085	0.26084E 02	0.15983E 01	0.24040E 00	0.37266E 01	2.180	0.54		
3	10.616662	0.500000E 06	25.472553	2.616240	0.24486E 02	0.15175E 01	0.23828E 00	0.38077E 01	2.169	0.54		
4	11.175201	0.500000E 06	25.381910	2.626403	0.22968E 02	0.14398E 01	0.23619E 00	0.38920E 01	2.159	0.55		
5	11.769291	0.500000E 06	25.291887	2.637054	0.21529E 02	0.13654E 01	0.23413E 00	0.39791E 01	2.149	0.55		
6	12.399926	0.500000E 06	25.202475	2.648549	0.20163E 02	0.12936E 01	0.23210E 00	0.40703E 01	2.140	0.55		
7	13.072132	0.500000E 06	25.113668	2.660390	0.18870E 02	0.12246E 01	0.23009E 00	0.41653E 01	2.132	0.55		
8	13.788187	0.500000E 06	25.025460	2.672765	0.17645E 02	0.11584E 01	0.22812E 00	0.42643E 01	2.123	0.56		
9	14.551451	0.500000E 06	24.937844	2.685666	0.16487E 02	0.10951E 01	0.22616E 00	0.43671E 01	2.115	0.56		
10	15.364305	0.500000E 06	24.850813	2.699314	0.15391E 02	0.10343E 01	0.22424E 00	0.44745E 01	2.108	0.57		
11	16.232084	0.500000E 06	24.764362	2.713437	0.14357E 02	0.97603E 00	0.22234E 00	0.45865E 01	2.101	0.57		
12	17.158417	0.500000E 06	24.678484	2.728162	0.13381E 02	0.92036E 00	0.22046E 00	0.47033E 01	2.094	0.58		
13	18.147632	0.500000E 06	24.593174	2.743527	0.12461E 02	0.86730E 00	0.21861E 00	0.48247E 01	2.088	0.58		
14	19.203030	0.500000E 06	24.508424	2.759769	0.11594E 02	0.81647E 00	0.21679E 00	0.49519E 01	2.083	0.59		
15	20.332267	0.500000E 06	24.424229	2.776570	0.10777E 02	0.76795E 00	0.21498E 00	0.50846E 01	2.078	0.60		
16	21.540398	0.500000E 06	24.340584	2.794041	0.10009E 02	0.72172E 00	0.21320E 00	0.52233E 01	2.074	0.61		
17	22.833514	0.500000E 06	24.257483	2.812248	0.92874E 01	0.67792E 00	0.21145E 00	0.53672E 01	2.070	0.62		
18	24.214398	0.500000E 06	24.174919	2.831670	0.86095E 01	0.63550E 00	0.20972E 00	0.55207E 01	2.068	0.63		
19	25.705999	0.500000E 06	24.092888	2.850553	0.79740E 01	0.59572E 00	0.20801E 00	0.56788E 01	2.064	0.63		
20	27.300035	0.500000E 06	24.011385	2.870849	0.73782E 01	0.55788E 00	0.20632E 00	0.58445E 01	2.061	0.64		
21	29.011981	0.500000E 06	23.930403	2.891845	0.68204E 01	0.52229E 00	0.20465E 00	0.60159E 01	2.058	0.65		
22	30.841986	0.500000E 06	23.849937	2.914497	0.62981E 01	0.48820E 00	0.20301E 00	0.61974E 01	2.058	0.66		
23	32.814540	0.500000E 06	23.769983	2.937481	0.58099E 01	0.45595E 00	0.20138E 00	0.63872E 01	2.059	0.68		
24	34.936181	0.500000E 06	23.690536	2.961364	0.53539E 01	0.42542E 00	0.19978E 00	0.65860E 01	2.060	0.69		
25	37.220670	0.500000E 06	23.611589	2.986098	0.49285E 01	0.39703E 00	0.19819E 00	0.67905E 01	2.061	0.70		
26	39.659905	0.500000E 06	23.533139	3.013462	0.45315E 01	0.36974E 00	0.19663E 00	0.70089E 01	2.067	0.72		
27	42.302560	0.500000E 06	23.455181	3.040827	0.41617E 01	0.34401E 00	0.19509E 00	0.72377E 01	2.074	0.74		
28	45.153701	0.500000E 06	23.377709	3.069238	0.38177E 01	0.31978E 00	0.19356E 00	0.74776E 01	2.081	0.76		
29	48.232425	0.500000E 06	23.300719	3.098731	0.34979E 01	0.29753E 00	0.19206E 00	0.77220E 01	2.089	0.78		
30	51.509106	0.500000E 06	23.224206	3.132441	0.32004E 01	0.27598E 00	0.19057E 00	0.79868E 01	2.105	0.81		
31	55.083024	0.500000E 06	23.148166	3.165561	0.29244E 01	0.25572E 00	0.18910E 00	0.82652E 01	2.122	0.84		
32	58.952164	0.500000E 06	23.072594	3.199907	0.26687E 01	0.23670E 00	0.18765E 00	0.85579E 01	2.139	0.87		
33	63.144090	0.500000E 06	22.997486	3.235609	0.24320E 01	0.21961E 00	0.18622E 00	0.88508E 01	2.158	0.90		
34	67.565196	0.500000E 06	22.922837	3.278799	0.22124E 01	0.20271E 00	0.18481E 00	0.91774E 01	2.191	0.94		
35	72.441077	0.500000E 06	22.848642	3.319830	0.20097E 01	0.18685E 00	0.18341E 00	0.95227E 01	2.225	0.99		
36	77.736994	0.500000E 06	22.774899	3.362518	0.18228E 01	0.17197E 00	0.18203E 00	0.98891E 01	2.261	1.03		
37	83.497999	0.500000E 06	22.701601	3.406875	0.16509E 01	0.15883E 00	0.18067E 00	0.10251E 02	2.298	1.08		
38	89.511444	0.500000E 06	22.628746	3.463098	0.14920E 01	0.14551E 00	0.17932E 00	0.10670E 02	2.356	1.15		
39	96.228339	0.500000E 06	22.556328	3.515132	0.13465E 01	0.13298E 00	0.17799E 00	0.11120E 02	2.416	1.22		
40	103.552001	0.500000E 06	22.484344	3.569453	0.12135E 01	0.13945E 00	0.17667E 00	0.10819E 02	2.478	1.30		
41	62.870829	0.500000E 06	22.412790	8.074664	0.10741E 01	0.13163E 00	0.22980E 00	0.11094E 02	2.310	1.14		
42	80.407697	0.500000E 06	22.325459	7.071265	0.94245E 00	0.11697E 00	0.22773E 00	0.11716E 02	2.399	1.25		
43	101.738003	0.500000E 06	22.238764	6.275156	0.82549E 00	0.96645E-01	0.22570E 00	0.12831E 02	2.538	1.40		
44	88.041487	0.500000E 06	22.152696	2.926117	0.72884E 00	0.	0.22370E 00	0.	2.443	1.32		
45	0.	0.	0.	0.	0.70559E 00	0.	0.	0.	0.	1.60		

FIGURE 5 (Continued)

SPECIAL CASE FOR LIBRARY CODE

STAGE	AREA DM	DPTDM	CTDM	CPRCD	WIDDM
1	0.	0.	0.	0.67178436E-03	0.42984974E 01
2	0.20090220E 02	0.16277239E-01	0.33645630E-01	0.34194019E-03	0.33876837E 01
3	0.20425335E 02	0.16449417E-01	0.35812378E-01	0.23069531E-03	0.34432347E 01
4	0.20777106E 02	0.16620903E-01	0.38116455E-01	0.17475428E-03	0.34948472E 01
5	0.21143865E 02	0.16794535E-01	0.40603638E-01	0.14104658E-03	0.35480754E 01
6	0.21526658E 02	0.16970163E-01	0.43281555E-01	0.11849034E-03	0.36025221E 01
7	0.21925865E 02	0.17148172E-01	0.46173096E-01	0.10232162E-03	0.36588974E 01
8	0.22342515E 02	0.17328555E-01	0.49301147E-01	0.90153359E-04	0.37171146E 01
9	0.22777435E 02	0.17511372E-01	0.52627563E-01	0.80657314E-04	0.37772086E 01
10	0.23231685E 02	0.17696612E-01	0.56282043E-01	0.73035469E-04	0.38390598E 01
11	0.23706051E 02	0.17884498E-01	0.60211182E-01	0.66779395E-04	0.39030556E 01
12	0.24201762E 02	0.18075061E-01	0.64445496E-01	0.61549734E-04	0.39691661E 01
13	0.24719905E 02	0.18268406E-01	0.69091797E-01	0.57111284E-04	0.40375272E 01
14	0.25261774E 02	0.18464452E-01	0.74111938E-01	0.53295869E-04	0.41078374E 01
15	0.25828612E 02	0.18663501E-01	0.79551697E-01	0.49979985E-04	0.41806750E 01
16	0.26421763E 02	0.18865622E-01	0.85449217E-01	0.47070899E-04	0.42560882E 01
17	0.27042743E 02	0.19070871E-01	0.91896057E-01	0.44497603E-04	0.43340966E 01
18	0.27693214E 02	0.19279226E-01	0.98915100E-01	0.42204795E-04	0.44145137E 01
19	0.28844313E 02	0.19881217E-01	0.10377502E 00	0.40155719E-04	0.45733733E 01
20	0.29979437E 02	0.18769867E-01	0.10941315E 00	0.38312704E-04	0.47263582E 01
21	0.31182426E 02	0.18556317E-01	0.11550140E 00	0.36646398E-04	0.48869313E 01
22	0.32455120E 02	0.18343290E-01	0.12197402E 00	0.35132744E-04	0.50535317E 01
23	0.33807835E 02	0.18126209E-01	0.12889862E 00	0.33751924E-04	0.52297808E 01
24	0.35244690E 02	0.17906607E-01	0.13633728E 00	0.32487409E-04	0.54151015E 01
25	0.36772054E 02	0.17684392E-01	0.14424133E 00	0.31325319E-04	0.56100830E 01
26	0.38389779E 02	0.17464794E-01	0.15280914E 00	0.30253830E-04	0.58109152E 01
27	0.40116288E 02	0.17239457E-01	0.16193390E 00	0.29262985E-04	0.60249713E 01
28	0.41956050E 02	0.17011402E-01	0.17171478E 00	0.28344213E-04	0.62504815E 01
29	0.43918165E 02	0.16780482E-01	0.18225861E 00	0.27490132E-04	0.64883097E 01
30	0.45995208E 02	0.16556564E-01	0.19369507E 00	0.26694202E-04	0.67295767E 01
31	0.48224069E 02	0.16324140E-01	0.20590210E 00	0.25950941E-04	0.69897956E 01
32	0.50607056E 02	0.16088881E-01	0.21902466E 00	0.25255480E-04	0.72645402E 01
33	0.53157029E 02	0.15850820E-01	0.23322296E 00	0.24603548E-04	0.75547752E 01
34	0.55845718E 02	0.15628840E-01	0.24881744E 00	0.23991098E-04	0.78397467E 01
35	0.58753499E 02	0.15392800E-01	0.26543427E 00	0.23414965E-04	0.81541685E 01
36	0.61872498E 02	0.15154221E-01	0.28342439E 00	0.22872189E-04	0.84864516E 01
37	0.65222116E 02	0.14912996E-01	0.30287933E 00	0.22360418E-04	0.88380419E 01
38	0.68733029E 02	0.14699625E-01	0.32463837E 00	0.21880050E-04	0.91684948E 01
39	0.72564158E 02	0.14465266E-01	0.34778595E 00	0.21429483E-04	0.95437791E 01
40	0.76687767E 02	0.14228747E-01	0.37297821E 00	0.21007181E-04	0.99406497E 01
41	0.86410601E 02	0.17143321E-01	0.49618530E 00	0.20470977E-04	0.49692532E 01
42	0.96665480E 02	0.15727873E-01	0.50799561E 00	0.19976101E-04	0.63372973E 01
43	0.10838200E 03	0.14443908E-01	0.52173615E 00	0.19525343E-04	0.80184499E 01
44	0.12178733E 03	0.13298213E-01	0.53842926E 00	0.19385204E-04	0.10229148E 02
45	0.89184104E 02	0.12149550E-01	0.52835846E 00	0.19131626E-04	0.14137134E 02

FIGURE 5 (Continued)

SPECIAL CASE FOR LIBRARY CODE

TUBE BUNDLE IN EVAPORATOR SECTION

TUBE OD, INCHES	0.750000E 00	NO OF TUBES/BNCLE	0.203728E 04		
VERT ROWS	0.670000E 02	HORIZ ROWS	0.310000E 02	S/D RATIO	0.130000E 01
BUNDLE HT, FT	0.470642E 01	BUNDLE WIDTH, FT	0.250000E 01	BUNDLE WIDTH + 3	0.550000E 01

TUBE BUNDLE IN REJECT SECTION

	TUBE OD, INCHES	0.750000E 00	NO OF TUBES/BNCLE	0.117273E 04		
	VERT ROWS	0.670000E 02	HORIZ ROWS	0.180000E 02	S/D RATIO	0.130000E 01
	BUNDLE HT, FT	0.470642E 01	BUNDLE WIDTH, FT	0.144375E 01	BUNDLE WIDTH + 3	0.444375E 01
I	DPINIT	DTINIT	DPCLR	DTCLR	DTCNC	
1	0.27790889E-02	0.54244995E-02	0.12567043E-02	0.24490356E-02	0.78735352E-02	
2	0.25652562E-02	0.52261353E-02	0.11791587E-02	0.24147034E-02	0.76408386E-02	
3	0.23514235E-02	0.50277710E-02	0.11016130E-02	0.23803711E-02	0.74081421E-02	
4	0.21375908E-02	0.48294067E-02	0.10240674E-02	0.23460388E-02	0.71754456E-02	
5	0.19237581E-02	0.46310425E-02	0.94652176E-03	0.23117065E-02	0.69427490E-02	
6	0.20130301E-02	0.51860809E-02	0.99200010E-03	0.25844574E-02	0.77705383E-02	
7	0.21023022E-02	0.57411194E-02	0.10374784E-02	0.28572083E-02	0.85983276E-02	
8	0.21915742E-02	0.62961578E-02	0.10829568E-02	0.31299591E-02	0.94261169E-02	
9	0.22808463E-02	0.68511963E-02	0.11284351E-02	0.34027100E-02	0.10253906E-01	
10	0.23907265E-02	0.77152252E-02	0.11848509E-02	0.38280487E-02	0.11543274E-01	
11	0.25006068E-02	0.85792542E-02	0.12412667E-02	0.42533875E-02	0.12832642E-01	
12	0.26104870E-02	0.94432831E-02	0.12976925E-02	0.46787262E-02	0.14122009E-01	
13	0.27203673E-02	0.10307312E-01	0.13540983E-02	0.51040649E-02	0.15411377E-01	
14	0.28563756E-02	0.11665344E-01	0.14246404E-02	0.58097839E-02	0.17475128E-01	
15	0.29923841E-02	0.13023376E-01	0.14951825E-02	0.65155029E-02	0.19538879E-01	
16	0.31283925E-02	0.14381409E-01	0.15657246E-02	0.72212219E-02	0.21602631E-01	
17	0.32644009E-02	0.15739441E-01	0.16362667E-02	0.79269409E-02	0.23666382E-01	
18	0.34350154E-02	0.17957687E-01	0.17255247E-02	0.90560913E-02	0.27013779E-01	
19	0.36056298E-02	0.20175934E-01	0.18147826E-02	0.10185242E-01	0.30361176E-01	
20	0.37762442E-02	0.22394180E-01	0.19040406E-02	0.11314392E-01	0.33708572E-01	
21	0.39468587E-02	0.24612427E-01	0.19932985E-02	0.12443542E-01	0.37055969E-01	
22	0.41611064E-02	0.28276443E-01	0.21067262E-02	0.14341354E-01	0.42617798E-01	
23	0.43753540E-02	0.31940460E-01	0.22201538E-02	0.16239166E-01	0.48179626E-01	
24	0.45896017E-02	0.35604477E-01	0.23335814E-02	0.18136978E-01	0.53741455E-01	
25	0.48038494E-02	0.39268494E-01	0.24470091E-02	0.20034790E-01	0.59303284E-01	
26	0.50741398E-02	0.45484543E-01	0.25920272E-02	0.23283005E-01	0.68767548E-01	
27	0.53444302E-02	0.51700592E-01	0.27370453E-02	0.26531219E-01	0.78231812E-01	
28	0.56147206E-02	0.57916641E-01	0.28820634E-02	0.29779434E-01	0.87696075E-01	
29	0.58850111E-02	0.64132690E-01	0.30270815E-02	0.33027649E-01	0.97160339E-01	
30	0.62259235E-02	0.74884415E-01	0.32131299E-02	0.38732529E-01	0.11361694E 00	
31	0.65668360E-02	0.85636139E-01	0.33991784E-02	0.44437408E-01	0.13007355E 00	
32	0.69077485E-02	0.96387863E-01	0.35852268E-02	0.50142288E-01	0.14653015E 00	
33	0.72486610E-02	0.10713959E 00	0.37712753E-02	0.55847168E-01	0.16298676E 00	
34	0.76744920E-02	0.12610435E 00	0.40092021E-02	0.66106796E-01	0.19221115E 00	
35	0.81003230E-02	0.14506912E 00	0.42471290E-02	0.76366425E-01	0.22143555E 00	
36	0.85261540E-02	0.16403389E 00	0.44850558E-02	0.86626053E-01	0.25065994E 00	
37	0.89519850E-02	0.18299866E 00	0.47229826E-02	0.96885681E-01	0.27988434E 00	
38	0.94552011E-02	0.21422577E 00	0.50129890E-02	0.11415354E 00	0.32837931E 00	
39	0.99584172E-02	0.24545288E 00	0.53029954E-02	0.13142140E 00	0.37687428E 00	
40	0.10461633E-01	0.27667999E 00	0.5593018E-02	0.14868927E 00	0.42536926E 00	
41	0.35302149E-02	0.10302734E 00	0.15611500E-02	0.45654297E-01	0.14868164E 00	
42	0.50992720E-02	0.16627502E 00	0.22435784E-02	0.73371887E-01	0.23964691E 00	
43	0.72353145E-02	0.26426697E 00	0.31290203E-02	0.11487579E 00	0.37914276E 00	
44	0.47653106E-02	0.19499969E 00	0.21146536E-02	0.86845398E-01	0.28184509E 00	
45	0.17127268E-01	0.75850677E 00	0.69300681E-02	0.31141663E 00	0.10699234E 01	

FIGURE 5 (Continued)

INPUT DATA

RC#	0.	LEND#	0.10000E 02	LENS#	0.10000E 02	TS#	0.26000E 03	DISID#	0.30000E 01	SUCID#	0.30000E 01
CO#	0.33600E-01	CRVC#	0.13280E 01	TSE#	0.23700E 03	DELTS#	0.80000E 01	DELTAD#	0.80000E 01	ETP#	0.34250E 00
EFFCYC#	0.21370E 00	GTOT#	0.75000E 09	TBA#	0.90000E 02	PTURBT#	0.96500E 03	TTURBT#	0.54000E 03	REAPC#	0.13270E-01

VARIABLES SET IN PROGRAM

EFFCOM#	0.80000E 00	EIPE#	0.20000E 00	GAM#	0.13200E 01
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CALCULATED VARIABLES

VS#	0.22318E 08	SPVOL#	0.17946E 02	CMPS#	0.22652E 02	CMTD#	0.31415E 03	AS#	0.49664E 07	AD#	0.51674E 07
VOLDIS#	0.17256E 08	SPVOLD#	0.13876E 02	CMPS#	0.32629E 02	DIAM-S#	0.30776E 02	NS#	0.52695E 05	ND#	0.54828E 05
SHAFHP#	0.10505E 07	CMHP2#	0.84040E 06	PR#	0.14404E 01	DIAM-C#	0.27062E 02	ALPHAS#	0.23437E 01	ALPHAD#	0.21759E 01
TBOUT2#	0.26752E 10	CONDIS#	0.38118E-01	CONSUC#	0.44621E-01						
TSC#	0.24500E 03	TDC#	0.25518E 03	TDE#	0.24718E 03	TDSC#	0.24715E 03	VAPTSC#	0.94886E 03	RPVC#	0.53623E 02
WB2#	0.43735E 09	WD2#	0.68838E 08	WP2#	0.14345E 09	WS2#	0.74614E 08	WF2#	0.58081E 09	WMIX#	0.58081E 09
HBLOW#	0.19746E 03	HOIS#	0.11957E 04	HTDC#	0.22373E 03	HSUC#	0.11598E 04	HLTF#	0.19679E 03	HMIX#	0.20140E 03
QBLOW#	0.86358E 11	QDIS#	0.89215E 11	QPRGD#	0.30613E 11	GSUC#	0.86540E 11	QFEED#	0.11430E 12	QMIX#	0.11697E 12
WVF#	0.81226E 06	WCOM#	0.69650E 08	HTSC#	0.21340E 03			TFEED#	0.23438E 03	TMIX#	0.23816E 03
POBTU	0.51193E 09	POREA	0.61829E 02	POWATR	0.15000E 03	PO	0.15106E 03	POTOT	0.72294E 09	ZURARS	0.16653E 04
AUNIT	0.50000E 01	QIN	0.15901E 11	WA	0.20604E 03	WS1	0.12984E 08	WS3	0.35088E 07	ZUBARD	0.17543E 04
RPOVAL	0.16245E 02	WS	0.16493E 08	WSTEAM	0.13320E 08						

COST ITEMS CALCULATED IN CSTVP

GVTE	0.41649E 09	GMSF	0.33351E 09	CAPF	0.90000E 00	SMAP	0.60000E-01	SMALLB	0.69162E-01	SMALLO	0.21071E-02
SMALLE	0.86000E 00	AJ	0.12138E 01	VSUC	0.17946E 02	HPVC	0.10505E 07	PMSTMC	0.15162E 00	AMWT	0.99569E 03
TURBN	0.66608E 00	TURBK	0.30440E 00	POVTE	0.76643E 01	ELSTM	0.25232E 07	ELCST	0.35204E 07	TCSTC	0.30098E 08
TCSTP	0.81338E 07	COMUNT	0.14447E 07	TURUNT	0.76464E 07	GENUNT	0.14513E 07	CONCST	0.73755E 05	HTCST2	0.19008E 08
COFOUN	0.16392E 06	SHELL	0.97662E 07	SITEW	0.44791E 06	PUMP	0.49473E 07	PIPEF	0.17257E 07	PIPEB	0.15516E 07
PIPEP	0.66693E 06	PIPVC	0.21981E 07	PIPTUR	0.60649E 06	EECVTE	0.30326E 06	COSINS	0.41433E 06	DUCT	0.13977E 07
CAPTOT	0.11436E 09										

FIGURE 5 (Continued)

COSTS				
	\$,DIR+IND	\$/YEAR	\$/KG	\$/MMBTU
	-----	-----	-----	-----
POWER COST		0.35203558E 07	0.14288608E-01	
PRIME STEAM COST				0.15162031E 00
STEAM TO BRINE HTR				0.69161669E-01
HEAT COST		0.19008223E 08	0.77151588E-01	
COMPRESSOR COST	0.72233951E 07	0.43340371E 06	0.17591221E-02	
COMP FOUND COST	0.16392063E 06	0.98352379E 04	0.39919788E-04	
COMP DUCT COST	0.13977194E 07	0.83863163E 05	0.34038828E-03	
TURBINE COST	0.38232249E 08	0.22939349E 07	0.93107456E-02	
GENERATOR COST	0.72566545E 07	0.43539928E 06	0.17672218E-02	
EVAPORATOR COST	0.37514963E 08	0.30220881E 07	0.12266212E-01	
SHELL COST	0.97661901E 07	0.58597141E 06	0.23783720E-02	
VTE BRINE PUMPS	0.49472902E 07	0.29683742E 06	0.12048195E-02	
VALVES AND PIPING	0.66887789E 07	0.40132673E 06	0.16289263E-02	
ELECTRIC EQUIPMENT	0.30326304E 06	0.18195782E 05	0.73854011E-04	
CRANES AND BLDG	0.41432690E 06	0.24859613E 05	0.10090153E-03	
SITE WORK	0.44790698E 06	0.26874419E 05	0.10907932E-03	
-----	-----			
TOTAL VC CAPITAL	0.11435665E 09			
OPERATING (VC+SEMS)		0.94920288E 06	0.38526753E-02	
MAINT+SUPPL (VC+SEMS)		0.15105286E 07	0.61310140E-02	
VC WATER COST		0.29100542E 08	0.11811483E 00	
TOTAL WATER COST (VC+SEMS)		0.40011459E 08	0.16240065E 00	

FIGURE 5 (Concluded)

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VAPCOM - EFN SOURCE STATEMENT - IFN(S) -

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C      TWO EFFECT BACK PRESS.TURBINE DRIVEN VAPOR COMPRESSION SYSTEM CN VAPCC020
C      TOP OF SEMS VAPCC025
C      DATE 2/1/67 VAPCC030
C      OLIN FLUTED TUBES IN VTE EFFECTS VAPCC035
C      KOUTPT IS A COUNTER USED TO CONTROL STAGE BY STAGE CALCULATIONS VAPCC040
C      AND OUTPUT VAPCC045
C      KOUTPT#0 GIVES NO OUTPUT OR STAGE BY STAGE CALCULATIONS VAPCC050
C      KOUTPT#1 GIVES FORMAL OUTPUT AND STAGE BY STAGES CALCULATIONS VAPCC055
C      KOUTPT#2 GIVES ONLH PO FOR CONVERGENCE LOOP VAPCC060
C VAPCC065
C      COMMON/MAR22/GTOT VAPCC070
C      COMMON/GEOME/AMODU,ALEV,AUNIT,TGTAL,TOTALR,FREBC,TRAYDP,HST,CL, VAPCC075
C      ISPL VAPCC080
C      COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM, VAPCC085
C      IPMSTMC VAPCC090
C      COMMON /OP1/ SMAPPP, HR, SMAPPH, HF, IINARAR, IINARAE, AH, AJ, WCO, VAPCC095
C      1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHVAPCC100
C      2T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPEAR, PMC2, PMC1, CCCAP2, VAPCC105
C      3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1, VAPCC110
C      4 BHC2, BHC1, VPC2, VPC1, UBPH, EEC2, EEC1, PO, CC2, OC1, VAPCC115
C      5 SCM2, SCM1, CIBC2, CIBC1, DEA2, DEA1, TC2, TC1, CAPI1, VAPCC120
C      6 CAPI2, CAPI3, PO3, H31, PMC, EEC, VPC, SITE, WAIT, VAPCC125
C      7 ES, EA, CIBC, BHC, CCCAP, COSTIN, WEIRC, CRANE, BLDG, VAPCC130
C      8 DEACST, PMCP0, PMCFLO, RETUR2, RETUR1, DPREQ(100), AMSC2, VAPCC135
C      9 AMSC1 VAPCC140
C      COMMON/PHYS/II VAPCC145
C      REALMWH,LF,MFGPDI,NS,ND,NPH,LENS,LEND,LENPH,LENAUX,N,M,MSC, VAPCC150
C      INAUX, ID, MFFR,MFGPD2,LAMDA,LAMEX,K,KC1,KC3,KC4,KS2,K1,K2,LF2 VAPCC155
C      100 READ(5, 8000)RC,LEND,LENS,TS,DISID,SUCID, VAPCC160
C      1 CO,CRVC,TSE,DELTS,DELTAD,ETP ,EFFCYC,GTOT, TBA VAPCC165
C      8000 FORMAT(8E10.4) VAPCC170
C      READ(5,8005 ) PTURBI,TTURBI,REAPC VAPCC175
C      8005 FORMAT(5E10.6) VAPCC180
C      WRITE(6,8010) RC,LEND,LENS,TS,DISID,SUCID, VAPCC185
C      1 CO,CRVC,TSE,DELTS,DELTAD,ETP,EFFCYC,GTOT,TBA, VAPCC190
C      2 PTURBI,TTURBI,REAPC VAPCC195
C      8010 FORMAT(1H1,5X,17HVAPCOM DATA INPUT/ VAPCC200
C      1 1H 7HCARD 01/1H 8E15.6/1H 7HCARD 02/1H 7E15.6/1H 7HCARD 03/ VAPCC205
C      1 1H 3E15.6) VAPCC210
C      EFFCOM#.80 VAPCC215
C      GAM#.32 VAPCC220
C      CALL VAPH(TTURBI,PTURBI,HTURBI) VAPCC225
C VAPCC230
C      X-ID BOILING POINT ELEVATION 2/1/65 VAPCC235
C VAPCC240
C      CONSUC#CJ*CRVC VAPCC245
C      IVC#0 VAPCC250
C      KOUTPT#0 VAPCC255
C      TBOU2#2.5*GTOT VAPCC260
C      105 CONTINUE VAPCC265
C      C#CONSUC VAPCC270
C      CALL ROPR(TSE,CONSUC,ALPHA) VAPCC275
C      ALPHAS#ALPHA+1.0 VAPCC280
C      T#TSE-ALPHAS VAPCC285
C      CALL PSIA(T,CMPS) VAPCC290

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FIGURE 6

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VAPCOM - EFN SOURCE STATEMENT - IFN(S) -

	TSC#TSE+DELTS	VAPCC295	
	CALL VAPH(TSE,CMPS,HSUC)	VAPCC300	13
	CALL VAPS(TSE,CMPS,SIN)	VAPCC305	15
	CALL WATH(TSC,HTSC)	VAPCC310	17
	CALL PSIA(TSC,PSC)	VAPCC315	19
	CALL VAPH(TSC,PSC,HVSC)	VAPCC320	21
	VAPTSC#HVSC-HTSC	VAPCC325	
C		VAPCC330	
C	ASSUMPTION OF COND IS ASSUME WS2#WD2	VAPCC335	
C		VAPCC340	
	CRF#(1.-1./CRVC)	VAPCC345	
	COND IS#C0/(1.-CRF/2.)	VAPCC350	
	ALPHAD#ALPHA-.4	VAPCC355	
	TDE#TSC+ALPHAD	VAPCC360	
C		VAPCC365	
C	X-ID BOILING POINT ELEVATION 2/1/65	VAPCC370	
C		VAPCC375	
	110 C#COND IS	VAPCC380	
	CALL BOPR(TDE,C,ALPHA)	VAPCC385	24
	ALPHAD#ALPHA+1.0	VAPCC390	
	TDE#TSC+ALPHAD	VAPCC395	
	IVC#IVC+1	VAPCC400	
	TDC#TDE+DELTA D	VAPCC405	
	CALL PSIA(TDC,CMPT)	VAPCC410	27
	PR#CMPT/CMPS	VAPCC415	
	CALL VAPV(TSE,CMPS,SPVOL)	VAPCC420	29
	CMPTW2#TBOUT2*EFFCOM	VAPCC425	
	CMHP2#CMPTW2/2546.6	VAPCC430	
	SHAFHP#TBOUT2/2546.6	VAPCC435	
	GAMF#(GAM-1.)/GAM	VAPCC440	
	PRF#(PR**GAMF)-1.	VAPCC445	31
	CALL VAPTS(CMPT,SIN,TOUT)	VAPCC450	32
	CALL VAPH(TOLT,CMPT,HD1)	VAPCC455	34
	HD#(HD1-HSUC)/EFFCOM+HSUC	VAPCC460	
	CALL VAPTH(CMPT,HD,CMTD)	VAPCC465	36
	CALL VAPH(CMTD,CMPT,HD1S)	VAPCC470	38
	WS2#TBOUT2/(HD1S-HSUC)	VAPCC475	
	CALL WATH(TDC,HTDC)	VAPCC480	40
	WVF#WS2*(HTDC-HTSC)/(VAPTSC)	VAPCC485	
C		VAPCC490	
C	APPROXIMATE SOLUTION OF TDSC	VAPCC495	
C		VAPCC500	
	TDSC#(WS2*TDE+WVF*TSC)/(WS2+WVF)	VAPCC505	
	CB#C0*CRVC	VAPCC510	
	WB2#COND IS*WS2/(CB-COND IS)	VAPCC515	
	TI#2	VAPCC520	
	CALL DINTPL(TSE,CB,HBLW)	VAPCC525	43
	CALL DINTPL(TDE,COND IS,HCON)	VAPCC530	45
	CALL PSIA(TDE,PDE)	VAPCC535	47
	CALL VAPH(TDE,PDE,HVTDE)	VAPCC540	49
	WD2#(WB2*(HCON-HBLW)+WS2*(HCON-HSUC)+WVF*(HVSC-HTSC))/	VAPCC545	
	1 (HTSC-HVTDE)	VAPCC550	
	WF2#WS2+WD2+WB2	VAPCC555	
	CASSI#COND IS	VAPCC560	
	COND I1#C0*WF2/(WB2+WS2)	VAPCC565	
	IF(ABS(CONDI1-CASSI)-.00001)130,130,115	VAPCC570	

FIGURE 6 (Continued)

VAPCOM - EFN SOURCE STATEMENT - IFN(S) -

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115	CASS2#(CASS1+CONDI1)/2.	VAPC0575	
120	CONTINUE	VAPC0580	
	CONDIS#CASS2	VAPC0585	
	WB2#CONDIS*WS2/(CB-CONDIS)	VAPC0590	
	CALL DINTPL(TDE,CONDIS,HCON)	VAPC0595	54
	WD2#(WB2*(HCON-HBLOW)+WS2*(HCON-HSUC)+WVF*(HVSC-HTSC))/	VAPC0600	
	I(HTSC-HVTDE)	VAPC0605	
	WF2#WS2+WD2+WB2	VAPC0610	
	CONDI2#CJ*WF2/(WB2+WS2)	VAPC0615	
	IF(ABS(CONDI2-CASS2)-.00001)135,135,125	VAPC0620	
125	SLOPE#(CONDI2-CONDI1)/(CASS2-CASS1)	VAPC0625	
	B#CONDI2-SLOPE*CASS2	VAPC0630	
	CASS3#H/(1.-SLOPE)	VAPC0635	
	CASS2#CASS3	VAPC0640	
	GO TO 120	VAPC0645	
130	CONDIS#CONDI1	VAPC0650	
	GO TO 140	VAPC0655	
135	CONDIS#CONDI2	VAPC0660	
140	CONTINUE	VAPC0665	
	IF(IVC.LE.1)GO TO 110	VAPC0670	
	CALL DINTPL(TDE,CONDIS,HCON)	VAPC0675	66
	CB#CJ*CRVC	VAPC0680	
	CALL DINTPL(TSE,CB,HBLOW)	VAPC0685	60
	QDIS#WS2*HDIS	VAPC0690	
	WP2#WS2+WD2	VAPC0695	
	QPROD#WP2*HTSC	VAPC0700	
	QBLQW#WB2*HBLOW	VAPC0705	
	QFEED#QPROD+QBLQW-TBOUT2	VAPC0710	
	HLTF#QFEED/WF2	VAPC0715	
	CALL DINTPL(TDE,CO,H1)	VAPC0720	70
	CALL DINTPL(TDC,CO,H2)	VAPC0725	72
	CP#(H1-H2)/(TDE-TDC)	VAPC0730	
	BS#H1-(CP*TDE)	VAPC0735	
	TFEED#(HLTF-BE)/CP	VAPC0740	
	IF((TS-ID.).LT.TFEED)GOTO 145	VAPC0745	
	GO TO 150	VAPC0750	
145	WRITE(6,8015)	VAPC0755	78
8015	FORMAT(1H,50HTCF TOO HIGH, TSE TOO LOW OR EVAP CELA-T TOO HIGH))	VAPC0760	
150	CONTINUE	VAPC0765	
	QSUC#WS2*HSUC	VAPC0770	
	VS#WS2*SPVOL/60.	VAPC0775	
	VCGPD2#2.90333*(WS2+WD2)	VAPC0780	
	WMIX#WB2+WP2	VAPC0785	
	CMIX#(CONDIS*WB2)/WMIX	VAPC0790	
	QMIX#QBLQW+QPROD	VAPC0795	
	HMIX#QMIX/WMIX	VAPC0800	
	CALL DINTPL(TSE,CMIX,H1)	VAPC0805	80
	CALL DINTPL(TDC,CMIX,H2)	VAPC0810	82
	CP#(H1-H2)/(TSE-TDC)	VAPC0815	
	BS#H1-(CP*TSE)	VAPC0820	
	TMIX#(HMIX-BE)/CP	VAPC0825	
	CALL VAPV(CMTD,CMPD,SPVOLD)	VAPC0830	84
	DIAMCS#(VS*4./((3.1416*500.*60.))**.5	VAPC0835	86
	VOLDIS#WS2*SPVOLD/60.	VAPC0840	
	DIAMCD#(VOLDIS*4./((3.1416*500.*60.))**.5	VAPC0845	
		VAPC0850	

FIGURE 6 (Continued)

VAPCOM - EFN SOURCE STATEMENT - IFN(S) -		09/26/67
C	OLIV ALLOY FLUTED TUBES	VAPC0855
C	TSEC#TSE-ALPHAS	VAPC086C 87
	UDEL T#TSC-TSEC	VAPC0865
	CALL UCALC(UDEL T,LENS,TSEC,CONSUC,ZUBARS)	VAPC087C
	UDEL T#TDC-TSC	VAPC0875 88
	CALL UCALC(UDEL T,LEND,TSC,CONDIS,ZUBARD)	VAPC088C
	WCOM#WD2+WVF	VAPC0885 90
	AD#WS2*(HDIS-HTDC)/(ZUBARD*DEL TAD)	VAPC089C
	CALL VAPH(TDSC,PSC,HVSUC)	VAPC0895
	AS#(WD2*(HVSUC-HTSC)+WVF*(HVSUC-HTSC))/(ZUBARS*DEL T)	VAPC090C 92
	ARCON#AD+AS	VAPC0905
	ND#AD/(LEND*3.1416*DISID)	VAPC091C
	NS#AS/(LENS*3.1416*SUCID)	VAPC0915
	RPVC#WP2*1000./TBOUT2	VAPC092C
	CALL PSIA(TS,PC)	VAPC0925 94
	CALL VAPH(TS,PC,HVTRBS)	VAPC093C
C	ESTIMATE OF EVAPORATOR PUMPING	VAPC0935
C	EIPE#D.2	VAPC094C
	POES#GTOT*FIPE/1.E6	VAPC0945 96
C	CALL WATH(TS,HLTRBS)	VAPC095C
	WA#EFFCYC*(HTURBI-HLTRBS)	VAPC0955
	HTURBO#HTURBI-WA	VAPC096C
	WSI#TBOUT2/WA	VAPC0965 98
	AAA#(HTURBI-HLTRBS)	VAPC097C
	POBTU2#POES*2.546E6/.746	VAPC0975
	WS3#(POBTU2+REAPO*WSI*AAA)/(WA-REAPO*AAA)	VAPC098C
	WS#WS1+WS3	VAPC0985
	QUAL#(HTURBO-HLTRBS)/(HVTRBS-HLTRBS)	VAPC099C
	WSTEAM#WS*QUAL	VAPC0995
	WCOND#WS-WSTEAM	VAPC100C
	QBR#TBOUT2+WSTEAM*(HVTRBS-HLTRBS)	VAPC1005
	POTCT#WS3*WA	VAPC101C
	POREA#REAPO*WS *AAA*.746/2.546E6	VAPC1015
	Q#QBR-TBOUT2	VAPC102C
	AA#108C.*(WF2*(CR-1.)/CR-WP2)	VAPC1025
	BB#WB2*(TFEED-TSE)-Q	VAPC103C
	THFA#(AA*TFEED+BB*TBA)/(AA+BB)	VAPC1035
	IF(<OUTPT.EQ.1)GOTO155	VAPC104C
	CALL MAIN(WP2,WB2,RC,QBR,TSC,TFEED,THFA,KOUTPT,GTOT1,PC)	VAPC1045
	IF(<OUTPT.EQ.3)GOTO16C	VAPC105C
	KOUTPT#1	VAPC1055 103
C		VAPC106C
C	ESTIMATE PROPER TBOUT2	VAPC107C
C	TBOUT2#TBOUT2*GTOT/GTOT1	VAPC1075
C	END TBOUT2 SCALING	VAPC108C
C		VAPC1085
C		VAPC109C
C		VAPC1095
	GO TO 105	VAPC110C
155	CALL MAIN(WP2,WB2,RC,QBR,TSC,TFEED,THFA,KOUTPT,GTCT1,PO)	VAPC1105
	POBTU#POBTU2	VAPC111C
	POWATR#POBTU*.746/(2.546E6)	VAPC1115 111
	QIN#WS*(HTURBI-HLTRBS)	VAPC112C
		VAPC1125
		VAPC113C

FIGURE 6 (Continued)

VAPCOM - EFN SOURCE STATEMENT - IFN(S) -

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RPOVAL#(GTOT/2.90333)*1000./QIN
160 CONTINUE
  WRITE(6,8020) RC,LEND,LENS,TS,DISTD,SUCID,CO,CRVC,
  1 TSE,DELTS,DELTAD,ETP,EFFCYC,GTOT,TBA,PTURBI,
  2 TTURPI,REAPO,EFFCOM,EIPE,GAM
8020 FORMAT(1H1,55X,10HINPUT DATA/1H 55X,10H----- /
  1 1H0,3HRC#,E17.5,1X,5HLEND#,E15.5,1X,5HLENS#,E15.5,1X,
  2 3HTS#,E17.5,1X,6HDISID#,E14.5,1X,6HSUCID#,E14.5/1H 3HCC#,
  3 E17.5,1X,5HCRVC#,E15.5,1X,4HTSE#,E16.5,1X,6HDELTS#,E14.5,
  4 1X,7HDELTA#,E13.5,1X,4HETP#,E16.5/1H 7HEFFCYC#,E13.5,1X,
  5 5HGTOT#,E15.5,1X,4HTBA#,E16.5,1X,7HTURBI#,E13.5,
  6 1X,7HTTURBI#,E13.5,1X,6HREAPO#,E14.5/1H0,4RX,
  7 24H VARIABLES SET IN PROGRAM/1H 48X,24H----- /
  8 1H0,7HEFFCOM#,E13.5,1X,5HEIPE#,E15.5,1X,4HGAM#,E16.5)
  WRITE(6,8025) VS,SPVOL,CMPS,CMTD,AS,AD,VOLDIS,
  1 SPVOLD,CMPO,DIAMCS,NS,ND,SHAFHP,CMHP2,PR,
  2 DIAMCD,ALPHAS,ALPHA0,TBOU2,CNDIS,CONSUC
8025 FORMAT(1H0,50X,20H CALCULATED VARIABLES/1H 50X,
  1 20H----- /
  1 1H0,3HVS#,E17.5,1X,6HSPVOL#,E14.5,1X,
  1 5HCMPS#,E15.5,1X,5H CMTD#,E15.5,1X,3HAS#,E17.5,1X,
  2 3HAD#,E17.5/1H 7HVOLDIS#,E13.5,1X,7HSPVOLD#,E13.5,1X,
  3 5HCMPO#,E15.5,1X,7HDIAM-S#,E13.5,1X,3HNS#,E17.5,1X,3HND#,
  4 E17.5/1H 7HSHAFHP#,E13.5,1X,6H CMHP2#,E14.5,1X,3HPR#,
  5 E17.5,1X,7HDIAM-O#,E13.5,1X,7HALPHAS#,E13.5,1X,
  6 7HALPHAD#,E13.5/ 1H 7HTBOU2#,E13.5,1X,
  6 7HCNDIS#,E13.5,1X,7HCONSUC#,E13.5)
  WRITE(6,8030) TSC,TDC,TDE,TDSC,VAPTSC,RPVC,
  2 WB2,WD2,WP2,WS2,WF2,WMI X,
  3 HBLOW,HDIS,HTDC,HSUC,HLTF,HMI X,
  4 QBLOW,QDIS,QPROD,QSUC,QFEED,QMI X,
  5 WVF,WCOM,HTSC,TFEED,TMIX
8030 FORMAT(1H0,4HTSC#,E16.5,1X,4HTDC#,E16.5,1X,4HTDE#,E16.5,1X,
  3 5HTDSC#,E15.5,1X,7HVAPTSC#,E13.5,1X,
  4 5H RPVC#,E15.5/1H 4H WB2#,E16.5,1X,4H WD2#,E16.5,1X,
  5 4H WP2#,E16.5,1X,4H WS2#,E16.5,1X,4H WF2#,E16.5,1X,
  6 5H WMI X#,E15.5/1H 6H HBLOW#,E14.5,1X,5H HDIS#,E15.5,1X,
  7 5H HTDC#,E15.5,1X,5H HSUC#,E15.5,1X,5H HLTF#,E15.5,1X,
  8 5H HMI X#,E15.5/1H 6H QBLOW#,E14.5,1X,5H QDIS#,E15.5,1X,
  9 6H QPROD#,E14.5,1X,5H QSUC#,E15.5,1X,6H QFEED#,E14.5,1X,
  1 5H QMI X#,E15.5/1H 4H WVF#,E16.5,1X,5H WCOM#,E15.5,1X,
  2 5H HTSC#,E15.5,22X,6H TFEED#,E14.5,1X,5H TMIX#,E15.5)
  WRITE(6,8035) POBTU,PORCA,POWATR,PC,POTOT,ZUBARS,AUNIT,QIN,
  1 WA,WS1,WS3,ZUBARD,RPOVAL,WS,WSTEAM
8035 FORMAT(1H0,5HPOTU,E15.5,1X,5HPORCA,E15.5,1X,6HPCWATR,
  1 E14.5,1X,2HPO,E18.5,1X,5HPOTOT,E15.5,1X,7HZUBARS ,E13.5/
  2 1H SHAUNIT,E15.5,1X,
  2 3HQIN,E17.5,1X,2HWA,E18.5,1X,3HWS1,E17.5,1X,3HWS3,
  3 E17.5,1X,7HZUBARD ,E13.5/1H ,6H RPOVAL,E14.5,1X,
  3 2HWS,E18.5,1X,6H WSTEAM,E14.5)
  GMSF#GTOT-VCGPD2
  PRIBTU#WSTEAM *(HTURBI-HLTRBS)
  PRIMWT#PRIBTU/.34115E7
  CALL COSTVC(SMALLD,SMALLB,PR,VS,AUNIT,TSE,SMALLP,QIN,TS,
  1 WS,WS3,POTOT,AS,AD,PMSTMC,CAPF,WS1,VCGPD2,SPVCL,SHAFHP,
  2 TBOU2,WB2,WF2,WP2, GMSF ,LENS,LEND,SMALLE,SITE,CAP11,
  3 WSTEAM,VOLDIS,TC2,TC1,PRIMWT,REAPC,ETP,EFFCYC)
  GO TO 100
END

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FIGURE 6 (Continued)

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\$IBFTC MNIA DECK

MNIACCOO

FIGURE 6 (Continued)

MNIA - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE MAIN(BILL1,BILL2,BILL3,BILL4,BILL5,BILL6,BILL7,      MNIA0005
1 IBILL,BILL8,BILL9)      MNIA0010
COMMON/GEN/CASE,G,RP, XRP,O,XO,U,XU,CR,XCR, RCE,ROER      MNIA0015
COMMON/TEMPC/TSTEAM,TS(100), THF,TB,XTB, TC,TP,TA,CC,CP      MNIA0020
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREEC,TRAYDP,HST,CL,      MNIA0025
1 SPL      MNIA0030
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,      MNIA0035
1 PMSTMC      MNIA0040
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,      MNIA0045
1 BIKTR,CSLTBH,CSLTBP,CSLTBR      MNIA0050
COMMON/FJULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR      MNIA0055
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1      MNIA0060
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL      MNIA0065
COMMON/DATA1/BDEPH,DTPD,SSF2,TCTAL,UMAX,UALP,PI,TWFA,TSTH,CQEFA,      MNIA0070
1 ORITE,ITER      MNIA0075
COMMON/AZ1/DTPDP(100),TITLE(15)      MNIA0080
COMMON/TCVLI/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,      MNIA0085
1 WF,WJ,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,      MNIA0090
2 TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK      MNIA0095
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),      MNIA0100
1 C(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)      MNIA0105
COMMON/PHYS/II      MNIA0110
COMMON /DPI/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO,      MNIA0115
1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHM      MNIA0120
2 T, HC2, HCl, CC2, CCl, POCST2, POCST1, ALPBAR, PMC2, PMC1, CCCAP2,      MNIA0125
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1,      MNIA0130
4 BHC2, BHC1, VPC2, VPC1, URPH, EEC2, EEC1, PO, CC2, OCI,      MNIA0135
5 SCM2, SCMI, CIBC2, CIBC1, DEA2, DEAI, TC2, TCI, CAPI1,      MNIA0140
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,      MNIA0145
7 ES, EA, CIBC, BHC, CCCAP, COSTIN, WEIRC, CRANE, BLDG,      MNIA0150
8 DEACST, PMCPD, PMCFLO, RETUR2, RETUB1, CPREQ(100), AMSC2,      MNIA0155
9 AMSC1      MNIA0160
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), CM(100),      MNIA0165
1 HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWD(100),      MNIA0170
2 RESIOT(100), PV(100),DELP(100), DTPDPS(100)      MNIA0175
DIMENSION Q(10),P(10),PLIM(10),QLIM(10) ,TC(10)      MNIA0180
DIMENSION QMAX(10) ,QRPL(10)      MNIA0185
COMMON /MAIN1/ SSF, HFG      MNIA0190
COMMON /STG1/ ATR, BTR, CTR, CTA      MNIA0195
COMMON/JAN18/WPI      MNIA0200
COMMON/JAN23/CFR,TFR,WBI,TPI,WPRGSC,WPEGSC,WPTGSC      MNIA0205
COMMON/JAN27/WI, SUMALP,SUMGH,WPNK,CPSN,CPSNK      MNIA0210
COMMON/JAN31/KOUTPT      MNIA0215
COMMON/FEB4/GTOT1,THFA,RC,QBR      MNIA0220
COMMON/FEB8/SSFUBR      MNIA0225
WPI#BILL1      MNIA0230
WBI#BILL2      MNIA0235
RC#BILL3      MNIA0240
QBR#BILL4      MNIA0245
TPI#BILL5      MNIA0250
TCF#BILL6      MNIA0255
THFA#BILL7      MNIA0260
KOUTPT#IBILL      MNIA0265
GTOT1#BILL8      MNIA0270
PO#BILL9      MNIA0275

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FIGURE 6 (Continued)

MNIA - EFN SOURCE STATEMENT - IFN(S) -		09/26/67
IF(<OUTPT.NE.0)GO TO 100		MNIA0280
TPCT#0.005		MNIA0285
READ (5, 8000)NITER		MNIA0290
8000 FORMAT(12)		MNIA0295
WRITE(6,8005) NITER		MNIA0300
8005 FORMAT(1H0,5X,15HMAIN DATA INPUT/1H 7HCARD 04/14)		MNIA0305
IREAD#0		MNIA0310
Q(1)#1.0		MNIA0315
C READ INPUT DATA		MNIA0320
CALL INPUT (IREAD)		MNIA0325
100 CONTINUE		MNIA0330
IREAD#1		MNIA0335
TS(1)#TSTEAM		MNIA0340
WINSB#0.0		MNIA0345
XTC#0.0		MNIA0350
NTOTAL#TOTAL+0.1		MNIA0355
TC(3)#0.0		MNIA0360
SSF#1.0		MNIA0365
SSFUBR#1.0		MNIA0370
C COMPUTE EVAPORATOR AND REJECT ELEVATION IF NOT SPECIFIED		MNIA0375
C SAVE INPUT VALUES OF KEY DATA		MNIA0380
Q(1)#U		MNIA0385
P(1)#0		MNIA0390
ERR#0.0		MNIA0395
CALL TCVAL(P(1),Q(1),TC(1))		MNIA0400
BILL7#THFA		MNIA0405
IRILL#KOUTPT		MNIA0410
HILL8#GTOTI		MNIA0415
HILL9#PO		MNIA0420
IF(ERR.GT.0.0)GO TO 105		MNIA0425
IF(<OUTPT.NE.1)RETURN		MNIA0430
CALL OUTPUT		MNIA0435
RETURN		MNIA0440
105 KOUTPT#3		MNIA0445
IBILL#KOUTPT		MNIA0450
RETURN		MNIA0455
END		MNIA0460

FIGURE 6 (Continued)

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*
\$1BFTC 8PRI DECK

8PRIG000

FIGURE 6 (Continued)

09/26/67

BPRI - EFN SOURCE STATEMENT - IFN(S) -

FUNCTION BPE (C,T)	BPRI0005	
I#0	BPRI0010	
CALL BOPR(T,C,BP)	BPRI0015	3
100 TV#T-BP	BPRI0020	
CALL BOPR(TV,C,BPE)	BPRI0025	5
IF(I.EQ.5)GOTO105	BPRI0030	
IF(ABS(BPE-BP)/BPE .LT..0001)I#5	BPRI0035	
BP#BPE	BPRI0040	
GOTO100	BPRI0045	
105 RETURN	BPRI0050	
END	BPRI0055	

FIGURE 6 (Continued)

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*
\$IBFTC TCVA DECK

TCVAC000

FIGURE 6 (Continued)

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TCVA - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE TCVAL(PVAL,QVAL,TCVA)
COMMON/GEN/CASE,G,RP,XRP,P,XO,G,XU,CR,XCR,ROE,ROEK
COMMON/TEMPC/TSTEAM,TS(100),THF,TB,XTB,TC,TP,TA,CG,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDP,HST,CL,
1 SPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL,CAPF,THERM,
1 PMSTMC
COMMON/TUBING/DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTE,BIKTE,
1 BIKTR,CSLTDBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BUPEH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
1 ORITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ACPSN,ACPSNK,ACPTNK,CPBT,CPTK,CPTNK,AMBN,TCF,WX,
1 WF,WJ,CB,WC,WB,WR,RHONK,RHCK,ERR,CCF,NITER,NK,NTOTAL,PN,SPN,
2 TC,ALPHA1,WPN,DELCT,DELST,IGSC,SMAQ,SUMA,TK
COMMON/TCVL2/TD(100),SMT(100),CT(100),WS(100),
1 C(100),TV(100),WV(100),CH(100),WP(100),AS(100),SLS(100)
COMMON/TCVWSC/CTDCS
COMMON/PHYS/II
COMMON/MAIN1/SSF,HFG
COMMON/JAN18/WPI
COMMON/JAN23/CFR,TFR,WBI,TPI,WPRGSC,WPEGSC,WPTGSC
COMMON/JAN27/WM,SUMALP,SUMGH,WPNK,CPSN,CPSNK
COMMON/JAN31/KOUTPT
COMMON/FEB4/GTOT1,THFA,RC,QBR
COMMON/JOPI/SMAPPP,HR,SMAPPH,HE,UNARAR,UNARAE,A4,AJ,WCO,
1 UPARE,UBARR,UTHE,AE,AR,ATHE,THEL,ENE,THEN,HFE,HFR,THEHTCVAQ150
2 T,HC2,HC1,CC2,CCI,POCST2,POCST1,ALPEAR,PMC2,PMC1,CCCAP2,TCVAQ155
3 CCCAP1,SITE2,SITE1,WAIT2,WAIT1,ES2,ES1,EA2,EAI,TCVAQ160
4 BHC2,BHC1,VPC2,VPC1,URPH,EEC2,EEC1,PO,CC2,CCI,TCVAQ165
5 SCM2,SCM1,CIBC2,CIBC1,DEA2,DEAI,TC2,TC1,CAP11,TCVAQ170
6 CAPI2,CAPI3,PO3,HSI,PMC,EEC,VPC,SITE,WAIT,TCVAQ175
7 ES,FA,CIBC,BHC,CCCAP,COSTIN,WEIRC,CRAVE,BLDG,TCVAQ180
8 DEACST,PMCP0,PMCFLO,RETUB2,RETUB1,DPREQ(100),AMSC2,TCVAQ185
9 AMSC1TCVAQ190
10 IF(IRR)385,100,385TCVAQ195
C ASSIGN INITIAL VALUES TO FLAGS AND COUNTERS
C ITER#COUNTER ON NUMBER ITERATIONS THROUGH SUBR-GSC
C NITER#MAXIMUM NUMBER ITERATIONS BEFORE SKIPPING CASE
C ERR#FLAG WHICH INDICATES TROUBLE,(0#OK,+SKIP CASE)
C II#FLAG WHICH PHYSICAL PROPERTY DESIRED
C FLAG,(0#GST NOT CONVERGED,+GST CONVERGED,CONTINUE)
C A9#AN OBSOLETE ERROR RETURN SIGNAL
100 TJEAV#1.0/(1.0+SSF1)
TER5#1.0+SSF1
P#PVAL
TS(1)#TSTEAM
Q#QVAL
FLAG#0.0
ITER#0
IGSC#0
ILOSE#0
TCVAQ200
TCVAQ205
TCVAQ210
TCVAQ215
TCVAQ220
TCVAQ225
TCVAQ230
TCVAQ235
TCVAQ240
TCVAQ245
TCVAQ250
TCVAQ255
TCVAQ260
TCVAQ265
TCVAQ270
TCVAQ275

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FIGURE 6 (Continued)

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TCVA - EFN SOURCE STATEMENT - IFN(S) -

I#1	TCVA028C	
NTOTAL#TOTAL+0.1	TCVA0285	
DELCT#TS(1)-TO	TCVA029C	
DELST#TS(1)-THF	TCVA0295	
C ASSIGN STARTING VALUES TO VARIABLES	TCVA030C	
ALPHA1#2.0	TCVA0305	
ACPSN#1050.0	TCVA031C	
ACPSNK#1050.0	TCVA0315	
ACPTNK#1050.0	TCVA032C	
CPBT#0.92	TCVA0325	
CPTK#0.96	TCVA033C	
CCF#CO	TCVA0335	
CPTNK#0.90	TCVA034C	
AMBN#1000.0	TCVA0345	
ANWP#344.432*G	TCVA035C	
C BLOWDOWN TEMP. AND PERFORMANCE RATIO GIVEN	TCVA0355	
BOBPCW#0.0005	TCVA036C	
BOBPCW#0.001	TCVA0365	
BOBPCT#0.001	TCVA037C	
BOBPCT#.01	TCVA0375	
BOBPCW#.01	TCVA038C	
AMBE # 990.0	TCVA0385	
AMBR # 1010.0	TCVA039C	
DTPDE # .5	TCVA0395	
DTPDR # .5	TCVA040C	
THF #THFA	TCVA0405	
WM#WPI + WBI	TCVA041C	
WC#WM*RC	TCVA0415	
WO#WC + WM	TCVA042C	
CB#CR*CO	TCVA0425	
WPT#WO*(CB-CO)/(CB-CP) -WC *(CB-CG)/(CB-CP)	TCVA043C	
WB#WO -WPT-WC	TCVA0435	
105 CFI#(WM*CO -WPI*CP)/WRI	TCVA044C	
IHR#0	TCVA0445	
FLAG3#U.U	TCVA045C	
110 II#2	TCVA0455	
CALL DINTPL(TCF,CO,HMCF)	TCVA046C	13
CALL UNIPPL(IP1,CP,HCPTP)	TCVA0465	15
CALL DINTPL(THF, CB, HRHF)	TCVA047C	17
CALL DINTPL(THF, CFI, HBI)	TCVA0475	19
CALL DINTPL(TCF, CB, HRCF)	TCVA048C	21
WR#(WM*HMCF + QBR -WPI*HCPTP -WBI *HBI) / (HRHF -HRCF)	TCVA0485	
WF#WM+WR	TCVA049C	
CFR#(WR * CB +WBI*CFI) / (WR + WBI)	TCVA0495	
HFR# (WBI*HBI +WR*HRHF)/(WBI +WR)	TCVA050C	
TFR#TTT(CFR,HFR)	TCVA0505	23
TB#TO+ (QBR +WPT*(2.0 +DTPDR))/(WC + WPT +WB)	TCVA051C	
FLAG4#0.0	TCVA0515	
115 TP # TB - BPE(CB,TB) - DTPDR	TCVA052C	25
II#2	TCVA0525	
CALL DINTPL(TP, CP, HCPTP)	TCVA053C	27
CALL DINTPL(TB,CB,HCPTB)	TCVA0535	29
CALL DINTPL(TB, CO, HMB)	TCVA054C	31
CALL DINTPL(TO, CO,HO)	TCVA0545	33
ALP#HCPTP - HCPTB	TCVA055C	
HB#(QBR+WO*HO -WC*HMB-WPT*ALP)/(WPT+WB)	TCVA0555	

FIGURE 6 (Continued)

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TCVA		- EFN	SOURCE STATEMENT	- IFN(S)	-
	TBC #TTT(CB,HB)			TCVAC560	35
	HZ#H0			TCVAC565	
	IF(ABS(TBC-TB)/TBC - .00001) 125,120,120			TCVAC570	
120	TB#TBC			TCVAC575	
	GOTO 115			TCVAC580	
125	IF(FLAG4) 135,130,135			TCVAC585	
130	FLAG4# 4.0			TCVAC590	
	TB#TBC			TCVAC595	
	GO TO 115			TCVAC600	
135	TBE#TB+TFR -TCF			TCVAC605	
	TBEC#TBE			TCVAC610	
	CBE#CB			TCVAC615	
	CBEC#CBE			TCVAC620	
	TPE#TBE-2.0-DTPDE			TCVAC625	
	FLAG21#0.0			TCVAC630	
140	FLAG19#0.0			TCVAC635	
145	II#2			TCVAC640	
	CALL DINTPL (TBE,CBE,HCBE)			TCVAC645	47
	CALL DINTPL (TB ,CB ,HC8TB)			TCVAC650	49
	CBE#CP + (CB-CP) *(1.0 - (HCBE-HC8TB)/AMBR)			TCVAC655	
	IF(ABS(CBE-CBEC)/CBE - 0.00001) 155,150,150			TCVAC660	
150	CBEC#CBE			TCVAC665	
	GO TO 145			TCVAC670	
155	WBE#(WB+WR)/(1.0 -(HCBE-HC8TB)/AMBR)			TCVAC675	
	IF(FLAG19)165,160,165			TCVAC680	
160	FLAG19#19.0			TCVAC685	
	CBEC#CBE			TCVAC690	
	GO TO 145			TCVAC695	
165	CONTINUE			TCVAC700	
	II#2			TCVAC705	
	CALL DINTPL(TPE,CP,HCPTPE)			TCVAC710	60
	HTPE#(WO*(HMB-HO) +WPT*HCPTP+(WB+WR)*HC8TB-WBE*(HCBE-HCPTPE))/			TCVAC715	
	I(WPI+WR+WB1)			TCVAC720	
	TPE#TTT(CP,HTPE)			TCVAC725	62
	TPX#TPE+DTPDE			TCVAC730	
	CALL BOPR(TPX,CBE,BPR)			TCVAC735	63
	TBE#TPE + BPR + DTPDE			TCVAC740	
	IF(ABS(TBE -TBEC)/TBE -0.0001)175,170,170			TCVAC745	
170	TBEC#TBE			TCVAC750	
	GO TO 145			TCVAC755	
175	WPE#WR + WB1 -WBE			TCVAC760	
	IF(FLAG21)185,180,185			TCVAC765	
180	FLAG21#21.0			TCVAC770	
	TBEC#TBE			TCVAC775	
	GO TO 140			TCVAC780	
185	CONTINUE			TCVAC785	
	WPR#WBE -WB -WR			TCVAC790	
	WPR1#WPT-WP1-WPE			TCVAC795	
	CBE1#(WB*CB +WR*CB +WPR*CP)/WBE			TCVAC800	
	HFR#WPE*AMBE/(WR +WB1) +HCBE			TCVAC805	
	IF(ABS(HFR -HFR)/HFR -0.0005)220,190,190			TCVAC810	
190	IHFR#IHFR+1			TCVAC815	
	IF(IHFR-1)195,195,200			TCVAC820	
195	HC1#HFR			TCVAC825	
	HAI#HFR			TCVAC830	
	THF#0.99*THF			TCVAC835	

FIGURE 6 (Continued)

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TCVA - EFN SOURCE STATEMENT - IFN(S) -

	GO TO 110	TCVA0840	
200	HC2#HFR	TCVA0845	
	HA2#HFR	TCVA0850	
	HA#(HC2*HA1 -HA2*HC1) / (HC2 -HC1 -HA2 +HA1)	TCVA0855	
	TFR#TTT(CFR,HA)	TCVA0860	80
	THF2#THF*TFR/TFR	TCVA0865	
	THFDIF#THF2-THF	TCVA0870	
205	THFC#THF +THFDIF	TCVA0875	
	IF(THFC-TCF) 210,210,215	TCVA0880	
210	THFDIF#0.5*THFDIF	TCVA0885	
	GO TO 205	TCVA0890	
215	THF#THFC	TCVA0895	
	HC1#HC2	TCVA0900	
	HA1#HA2	TCVA0905	
	GO TO 110	TCVA0910	
220	TK#TBE	TCVA0915	
	IF(FLAG3)230,225,230	TCVA0920	
225	FLAG3#3.0	TCVA0925	
	GO TO 110	TCVA0930	
230	CONTINUE	TCVA0935	
	IF((TSTEAM -2.5).LT.THFI)GOTO 235	TCVA0940	
	GO TO 240	TCVA0945	
235	WRITE(6, 8000)THF,CR,TSE,TSTEAM	TCVA0950	96
8000	FORMAT(1H ,43THF IS TOO HIGH (CR TOO LOW OR TSE TOO LOW),4E13.6)	TCVA0955	
	ERR#15.	TCVA0960	
	RETURN	TCVA0965	
240	CONTINUE	TCVA0970	
C	FLAG#0 MEANS NO CONVERGENCE SO CONTINUE	TCVA0975	
C	FLAG#1 MEANS CONVERGENCE-CALL STAGE GEO. AND COSTS	TCVA0980	
	IF(FLAG)355,245,355	TCVA0985	
245	IF(ROE)250,275,250	TCVA0990	
250	THFTK#TFR-TBE	TCVA0995	
	IF(ITER-4)260,255,255	TCVA1000	
255	ZNVK#NK	TCVA1005	
	RHOVK#THFTK/ZNVK	TCVA1010	
	ZVK#NVK	TCVA1015	
	RHO<#(TK-TB)/7NK	TCVA1020	
	GO TO 290	TCVA1025	
260	VK#THFTK/ROE+0.5	TCVA1030	
	ZNVK# NK	TCVA1035	
	RHOVK#THFTK/ZNVK	TCVA1040	
	NNK#(TK-TB)/ROE +0.5	TCVA1045	
	IF(VNK-1)265,265,270	TCVA1050	
265	NNK#2	TCVA1055	
270	ZVK#NVK	TCVA1060	
	RHO<#(TK-TB)/ZVK	TCVA1065	
	NTOTAL#NVK+NK	TCVA1070	
	TOTAL#NTOTAL	TCVA1075	
	GO TO 290	TCVA1080	
275	TAU#(TFR-TK)*TOTAL/(TFR-TB)	TCVA1085	
	IF(TOTALR)285,285,280	TCVA1090	
280	ZNK#TOTAL-TOTALR	TCVA1095	
	NK#ZVK	TCVA1100	
	RHOVK#(TFR-TK)/ZNK	TCVA1105	
	RHO<#(TK-TB)/TOTALR	TCVA1110	
	NNK#TOTALR	TCVA1115	

FIGURE 6 (Continued)

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TCVA - EFN SOURCE STATEMENT - IFN(S) -		
	GO TO 290	TCVA1120
285	NK#TAU	TCVA1125
	ZNK#NK	TCVA1130
	RHONK#(TFR-TK)/ZNK	TCVA1135
	DEVV#NTOTAL-NK	TCVA1140
	RHOK#(TK-TB)/DENN	TCVA1145
290	ITER#ITER+1	TCVA1150
	TTD(I)#TFR-TCF-(RHONK+ALPHA1)	TCVA1155
	IF(ITER-NTOTAL)295,390,390	TCVA1160
295	SMAQ#WF*CPBT*(TFR-TCF)*FFHL	TCVA1165
	SUMVK#0.0	TCVA1170
	SUMVVK#0.0	TCVA1175
	NK1#VK-1	TCVA1180
	DO 300J#1,NK1	TCVA1185
300	SUMVK#SUMVK+FLOAT(J)	TCVA1190
	J#NTOTAL-NK-1	TCVA1195
	DO 305K#1,J	TCVA1200
305	SUMVVK#SUMNNK+FLOAT(K)	TCVA1205
	SUMA#TOTAL*(TFR-TA)-RHONK	TCVA1210
	I*SUMVK-RHONK*SUMNNK - (TOTAL-ZNK)*ZNK*RHONK	TCVA1215
	P#WX/WF	TCVA1220
	PN#P	TCVA1225
	WX#WPE + WPR	TCVA1230
	RP#P*1.0E3/(CPBT*(THF-TCF))	TCVA1235
	RPN#RP	TCVA1240
	Q#WQ/WF	TCVA1245
	G#WX/0.344432	TCVA1250
	GTOTI#G+WP1*2.90333	TCVA1255
310	CAL_GSC	TCVA1260
	IF(ERR)385,315,385	TCVA1265
315	LGSC#1	TCVA1270
	IZ#NTOTAL+1	TCVA1275
	II#2	TCVA1280
	CALL DINTPL(TFR,CFR,HCFR)	TCVA1285
	CALL DINTPL(TS(NK+1),C(NK+1),HC2NK)	TCVA1290
	CALL DINTPL(TS(NTOTAL+1),C(NTOTAL+1),HC2N)	TCVA1295
	AMBR#WS(NK+1)/WPRGSC*(HC2NK-HC2N)	TCVA1300
	AMBE#(WR+WB1)/WPEGSC*(HCFR-HC2NK)	TCVA1305
C	CONVERGENCE CRITERIA IF TB GIVEN	TCVA1310
	RPN#PN*1.0E3/(CPBT*(THF-TCF))*TJEAN	TCVA1315
	IF(ABS(TS(NK+1)-TBE)/TBE -BOBPCT)320,105,105	TCVA1320
320	IF(ABS(WPEGSC-WPE)/WPE -BOBPCT)325,105,105	TCVA1325
325	IF(ABS(WPRGSC-WPR)/WPR -BOBPCT)330,105,105	TCVA1330
330	IF(ABS(WPTGSC-WPT)/WPT -BOBPCT)335,105,105	TCVA1335
335	IF(ABS(TS(NTOTAL+1)-TB)/TB -BOBPCT)340,105,105	TCVA1340
340	IF(ABS(SMT(NTOTAL)-TO)/TO -BOBPCT)345,105,105	TCVA1345
345	IF(ABS(SMT(NK)-TB)/TB -BOBPCT)350,105,105	TCVA1350
350	CONTINUE	TCVA1355
	FLAG#1.0	TCVA1360
	GO TO 105	TCVA1365
C	CALCULATE STAGE GEOMETRY AND COSTS	TCVA1370
355	CALL STAGE	TCVA1375
	BOBPCT#0.0001	TCVA1380
	DTPDE#DTPDP(NK)	TCVA1385
	DTPDR#DTPDP(NTOTAL)	TCVA1390
	IF(ERR)385,360,385	TCVA1395

FIGURE 6 (Continued)

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TCVA	- EFN	SOURCE STATEMENT	- IFN(S)	-
360	FLAG#0.0		TCVA1400	
	IF(IGSC-2) 365,380,380		TCVA1405	
365	IGSC#1 +IGSC		TCVA1410	
	IF(JMAX)370,380,370		TCVA1415	
370	IF(JALP)375,380,375		TCVA1420	
375	GO TO 310		TCVA1425	
380	CALL COST (JJ)		TCVA1430	192
	THF#JFR		TCVA1435	
	WX#WP(NTOTAL+1)		TCVA1440	
	WPMWPI#WP(NTOTAL+1)-WPI		TCVA1445	
	TCVA#TC		TCVA1450	
	BITER#NITER		TCVA1455	
385	CONTINUE		TCVA1460	
	RETURN		TCVA1465	
390	WRITE (6,8005)NITER		TCVA1470	197
8005	FORMAT(35H THIS CASE WILL NOT CONVERGE AFTER 15, 11H ITERATIONS		TCVA1475	
1	17H*****)		TCVA1480	
	CALL STAGEG		TCVA1485	198
	CALL COST(JJ)		TCVA1490	200
	CALL OUTPUT		TCVA1495	202
	ERR#10.0		TCVA1500	
	RETURN		TCVA1505	
	END		TCVA1510	

FIGURE 6 (Continued)

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*
\$IBFTC GSCI DECK

GSCI0000

FIGURE 6 (Continued)

GSCI - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

```

SUBROUTINE GSC
C**** SUBROUTINE GSC FOR HMN -- INCLUDES DEMISTER 9/14/65
COMMON/GEN/CASE,G,RP, XRP,P,XO,Q,XU,CR,XCR, ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TR,XTB, TO,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TOTALE,TOTALR,FREBD,TRAYDP,HST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
IPMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FJULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
IDRITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
IWF,WJ,CB,WC,WB, WR,KHONK, KHUK, ENK,UCF, NITER, NK,NTOTAL, PN,RPN,
2TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
IC(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)
COMMON /TCVGSC / CTDCS
COMMON/PHYS/II
COMMON /MAIN1/ SSF, HFG
COMMON/JAN18/WPI
COMMON/JAN23/CFR,TFR,WB1,TPI,WPRGSC,WPEGSC,WPTGSC
COMMON/JAN27/WM, SUMALP,SUMQH,WPNK,CPSN,CPSNK
COMMON /JPI/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO,
1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHG
2T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPRAR, PMC2, PMCI, CCCAP2,
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1,
4 BHC2, BHC1, VPC2, VPC1, URPH, EEC2, EEC1, PO, CC2, OC1,
5 SCM2, SCM1, CIBC2, CIBC1, DEA2, DEA1, TC2, TCI, CAPI1,
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7 ES, EA, CIBC, BHC, CCCAP, COSTIN, WEIRC, CRANF, BLDG,
8 DEACST, PMCPQ, PMCFLO, RETUR2, RETUR1, GPREQ(100), AMSC2,
9 AMSCI
DIMENSIONHP(100),RHOTAP(100)
C INITIALIZATION OF VARIABLES AND PARAMETERS
XPCT#0.0001
WPRGSC#0.0
NK#NK
NTOTAL#NTOTAL
NNK#NTOTAL-NK
SUMALP#0.0
SUM23#0.0
SUM25#0.0
SUMQH#0.0
SUM21#0.0
SUM22#0.0
SUM24#0.0
SUM26#0.0
C ASSIGN VALUE OF I (#STAGE NO BEING TREATED)
DO215 I#1,NTOTAL
IF(I-1)125,125,100

```

FIGURE 6 (Continued)

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```

GSCI      -   EFN   SOURCE STATEMENT   -   IFN(S)   -

C ASSIGN VALUES TO MATRIX FOR CALCULATING STAGES 2 THRU N
100 II#1
    SMT(I+1)#SMT1
    SMT2(I )#SMT1
    IF(ERR)220,105,220
105 IF(I -VK)110,110,115
C   HEAT RECOVERY STAGES
110 WT#WF
    CT(I)#CCF
    RHO#RHONK
    GO TO 120
C   HEAT REJECT STAGES
115 WT#WO
    CT(I)#CO
    RHO#RHOK
120 TTD(I)#TS(I)-SMT1-RHO-(TS(I)-TV(I))
    TS(I+1)#TS(I)-RHO
    GO TO 130
C ASSIGN STARTING VALUES FOR CALCULATION OF STAGE 1
125 WS(I)# WBI +WR
    TS(I)#TFR
    C(I)#CFR
    WP(I)#WPI
    TV(I)#TPI
    HP(I)#0.0
    WT#WF
    SMT(I+1)#TCF
    SMT2(I )#TCF
    RHO#RHONK
    CT(I)#CCF
    TTD(I)#THF-TCF-RHO -ALPHA1
    TS(I+1)#TS(I)-RHO
C INDIVIDUAL STAGE CALCULATIONS BEGIN
130 C(I+1)#C(I)
135 TV(I+1)#SMT(I+1)+TTD(I)
    RHOTAP(I)#RHO
    TAB#TV(I+1)+DTDPD(I)
    CALL BOPR (TAB,C(I+1),DTBPR)
    TS2C#TV(I+1)+DTBPR+DTDPD(I)
    IF(ABS(TS2C-TS(I+1))/TTD(I)-0.001) 145,140,140
140 TTD(I)#TS(I+1)-DTBPR-DTDPD(I)-SMT2(I)
    GO TO 135
145 II#2
    TV (I+1) # TS (I+1) - DTBPR - DTDPD (I)
    CALLDINTPL(TV(I+1),CP,HF)
    HFG#1093.88-.5703*TV(I+1)+1.2819E-4*TV(I+1)**2-.8824E-6*TV(I+1)**3
    CALLDINTPL(TS(I),C(I),HS1)
    CALLDINTPL(TS(I+1),C(I+1),HS2)
    WV(I)#WS(I)*(HS1-HS2)/(HF+HFG-HS2)
    C2C#(WS(I)*C(I)-WV(I)*CP)/(WS(I)-WV(I))
    IF(ABS(C2C-C(I+1))/C2C-XPCT) 155,150,150
150 C(I+1)#C2C
    GO TO 135
155 WP(I+1)#WP(I)+WV(I)
    CALLDINTPL(TV(I),CP,HP1)
    CALLDINTPL(TV(I+1),CP,HP2)

```

```

GSCI0280
GSCI0285
GSCI0290
GSCI0295
GSCI0300
GSCI0305
GSCI0310
GSCI0315
GSCI0320
GSCI0325
GSCI0330
GSCI0335
GSCI0340
GSCI0345
GSCI0350
GSCI0355
GSCI0360
GSCI0365
GSCI0370
GSCI0375
GSCI0380
GSCI0385
GSCI0390
GSCI0395
GSCI0400
GSCI0405
GSCI0410
GSCI0415
GSCI0420
GSCI0425
GSCI0430
GSCI0435
GSCI0440
GSCI0445
GSCI0450
GSCI0455
GSCI0460
GSCI0465
GSCI0470
GSCI0475
GSCI0480
GSCI0485
GSCI0490
GSCI0495
GSCI0500
GSCI0505
GSCI0510
GSCI0515
GSCI0520
GSCI0525
GSCI0530
GSCI0535
GSCI0540
GSCI0545
GSCI0550
GSCI0555

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53

72

80

84

103

106

FIGURE 6 (Continued)

GSCI - EFN SOURCE STATEMENT - IFN(S) -

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WS(I+1)#WS(I)-WV(I)	GSCI0560	
QLN#(SMAQ*(TS(I)-TA))/SUMA	GSCI0565	
QH(I)#WS(I)*HSI-WS(I+1)*HS2+WP(I)*HPI-WP(I+1)*HP2-QLN	GSCI0570	
II#1	GSCI0575	
ARG#SMT(I+1)-(TS(I)-TS(I+1))*0.5	GSCI0580	
IF(I-NK) 160,160,180	GSCI0585	
160 SMT(I+1)#SMT2(I)- RHO	GSCI0590	
165 II#2	GSCI0595	
CALL DINTPL(SMT2(I),CO,HCOT2)	GSCI0600	128
CALL DINTPL(SMT(I+1),CO,HCOT1)	GSCI0605	131
CALL DINTPL(SMT(I+1),CB,HCRT1)	GSCI0610	134
CALL DINTPL(SMT2(I),CB,HCRT2)	GSCI0615	137
CPM#(HCOT2 -HCOT1)/(SMT2(I) -SMT(I+1))	GSCI0620	
CPR#(HCRT2 -HCRT1)/(SMT2(I) -SMT(I+1))	GSCI0625	
SMTC#SMT2(I) -QH(I)/(WM*CPM +WR*CPR)	GSCI0630	
IF(ABS(SMTC -SMT(I+1))/SMT(I+1) -.000005)175,170,170	GSCI0635	
170 SMT(I+1)#SMTC	GSCI0640	
GO TO 165	GSCI0645	
175 SMT(I) #SMTC	GSCI0650	
GO TO 185	GSCI0655	
180 II#2	GSCI0660	
CALL DINTPL(SMT(I+1),CT(I),HSMT)	GSCI0665	158
HSM#HSMT -QH(I)/WT	GSCI0670	
SMT(I)#TTTT(CT(I),HSM)	GSCI0675	162
185 SMTI#SMT(I)	GSCI0680	
C INDIVIDUAL STAGE CALCULATIONS COMPLETE	GSCI0685	
C CALCULATE NECESSARY CUMULATIVE STAGE PROPERTIES	GSCI0690	
DEL#TS(I)-TS(I+1)	GSCI0695	
AMBDA#QH(I)/WV(I)	GSCI0700	
CPS#WV(I)*AMBDA/(WS(I)*DEL)	GSCI0705	
IF(I-NK)190,190,210	GSCI0710	
190 SUM21#WV(I)+SUM21	GSCI0715	
WPEGSC#SUM21	GSCI0720	
SUM24#SUM24 +QH(I)	GSCI0725	
SUM26#SUM26+WV(I) *AMBDA	GSCI0730	
SUMQH#SUMQH+QH(I)*WV(I)	GSCI0735	
SUMALP#SUMALP+TS(I+1)-TV(I+1)	GSCI0740	
IF((THF-TB)/TOTAL+.5 - (THF -TCF -DTPDP(I) - DTBPR))200,195,195	GSCI0745	
195 WRITE (6, 8000)THF, TB, TOTAL, TCF, DTPDP(I),DTBPR	GSCI0750	183
8000 FORMAT(18H NOT ENOUGH STAGES /7E16.8)	GSCI0755	
ERR #1.0	GSCI0760	
GO TO 220	GSCI0765	
200 IF(I-NK)215,205,215	GSCI0770	
205 WPNK#SUM21	GSCI0775	
SUM24#SUM24/WF	GSCI0780	
CPTNK#SUM24/(TCF-SMT(NK))	GSCI0785	
AMBNK#(SUM26)/WPNK	GSCI0790	
CPSNK#AMBNK*WPNK/(WF*(THF-TS(NK+1)))	GSCI0795	
ACPSNK#AMBNK/CPSNK	GSCI0800	
ACPTNK#AMBNK/CPTNK	GSCI0805	
GO TO 215	GSCI0810	
210 SUM21#SUM21+WV(I)	GSCI0815	
WPRGSC#WPRGSC + WV(I)	GSCI0820	
SUM25#SUM25 + QH(I)	GSCI0825	
SUM26#SUM26+WV(I) *AMBDA	GSCI0830	
SUMQH#QH(I)*WV(I)+SUMQH	GSCI0835	

FIGURE 6 (Continued)

GSCI - EFN SOURCE STATEMENT - IFN(S) -		09/26/67
SUMALP#SUMALP+TS(I+1)-TV(I+1)		GSCI0840
215 CONTINUE		GSCI0845
C CALCULATE OVERALL PLANT PROPERTIES		GSCI0850
WPN#SUM21		GSCI0855
SUM25#SUM25/WO		GSCI0860
CPT<#SUM25/(SMT2(NK+1)-SMT(NTOTAL))		GSCI0865
AMBN#SUM26/WPN		GSCI0870
CPSV#AMBN*WPN/(WF*(THF- TS(NTOTAL+1)))		GSCI0875
ACPSV#AMBN/CPSN		GSCI0880
ALPHA1#TS(2)-TV(2)		GSCI0885
SUMQH#SUMQH/WPN		GSCI0890
ALPBAR#SUMALP/TOTAL		GSCI0895
II#2		GSCI0900
CALL DINTPL (TCF,CCF,HCF1)		GSCI0905
CALL DINTPL (THF,CCF,HHF1)		GSCI0910
CPBT#(HHF1-HCF1)/(THF-TCF)		GSCI0915
WPTGSC#WP(NTOTAL+1)		GSCI0920
220 RETJRN		GSCI0925
END		GSCI0930
		208
		210

FIGURE 6 (Continued)

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*
\$18FTC TT100 DECK

TT100000

FIGURE 6 (Continued)

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TT100 - EFN SOURCE STATEMENT - IFN(S) -

```

FUNCTION TTT( CB,HB)
COMMON/PHYS/II
II #1
CALL DINTPL(40.0, CB, CP)
FLAG #0.0
II #2
CALL DINTPL (40.0,CB, H40)
100 TB # (HB - H40) /CP + 40.0
CALL DINTPL(TB, CB, HBC)
IF(ABS(HBC-HB) /HBC - C.0001) 110,105,105
105 CP # (HBC-H40) / (TB-40.0)
GOTO 100
110 IF(FLAG) 120,115,120
115 FLAG #1.0
GOTO 100
120 TTT#TB
RETURN
END

```

```

TT100005
TT100010
TT100015
TT100020 3
TT100025
TT100030
TT100035 6
TT100040
TT100045 8
TT100050
TT100055
TT100060
TT100065
TT100070
TT100075
TT100080
TT100085
TT100090

```

FIGURE 6 (Continued)

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*
\$IBFTC CNDV DECK

CNDN0000

FIGURE 6 (Continued)

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CNDV - EFN SOURCE STATEMENT - IFN(S) -

```

SUBROUTINE CNDNSR (XTITLE, NERR)
C**** CONDENSER SUBROUTINE FOR STAGE BY STAGE CALCULATION
C**** SIMPLIFIED CONDENSER CALCULATION - MOD HORIZONTAL FLOW 8/6/65
C**** THIS SUBROUTINE REQUIRES INTPL, APPRCX, AMATQ2, EVAL SUBROUTINES
COMMON/MAY15/AJ
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDX,HST,CL,
1 SPL
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
1ORITE,ITER
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
1WF,W0,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
1C(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), CM(100),
1HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWD(100),
2RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100),
1DTCVD(100)
COMMON /STG1/ ATR, BTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), DO, DI, R, S,
1 V, TVIT(100),ZZ(100), HV, HS(100), WBS(100)
COMMON /CND1/ NERR, COCR(3), K
COMMON /DEM1/ SLKP2, SUMDMA, TOMP(100), APTSE, VCLM, APTSR
COMMON /DEM3/ VNO(1), DTUBE, TUBENO, HNO(1),VBL(1),HBLG, TRAYCP,
1TRAYHT(
15), HBL1, TRAYW2, ZZZZ
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,H0H,HBLE,HBLR,
1HLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TBNOE,TBNCR,
2UBARH, VBLE,VBLR,VNOE, VNOR, WIME, WIMR, WY
DIMENSION
2DPFG(100), DPFTP(100), DPM(100),FFX(100), DPT(100)
COMMON/CVDLNK/WG(100),IDNO,WCNDT,WL,SPATRA,DTUBE,TSAT(100),PSAT(100)
1C),VSAT(100),VEL(1),SOD(1),HBL(1),AREAB(1),AREAT(1)
YPSAT(Q000FL) #EXP(CTR + BTR/Q000FL+ ATR/ (Q000FL*Q000FL))
YVSAT(Q001FL,Q002FL)#EXP(-0.72240 + 1.10267 * ALOG(Q001FL/Q002FL)
1 -0.0177861 * (ALOG(Q001FL/Q002FL)) **2
2 + 0.00103758 * (ALOG(Q001FL/Q002FL))**3)
YVISG(Q003FL) #((-0.7693E-10*Q003FL+.2892E-6)* Q003FL+ .1001E-2)*
1Q003FL+ .1220) * 1.E-5
VLIQ(Q004FL) #.16153716E-1 + (.48841151E-4 + (-.82269193E-6 +
1.57044577E-8 * Q004FL) *Q004FL) * Q004FL
YTPG1(Q005FL)#EXP(-.93620189 +(-0.7500582 +(-0.11991543
1+.12224994E-01*Q005FL)*Q005FL)*Q005FL)
YTPG2(Q006FL)#EXP(-0.94283631 +(-0.80225485 +(-.79487734E-01+.9212
16780E-2*Q006FL)*Q006FL) *Q006FL)
TRSAT(Q007FL) #-2.0 * ATR/ (BTR+ SQRT(BTR*BTR-4.0 *
1TR* (CTR- ALOG(Q007FL) )))
ATR # -837533.21
PTR # -6452.5621
CTR # 14.150119
CLTURN # 0.3
100 NERR#0

```

FIGURE 6 (Continued)

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CNDN - EFN SOURCE STATEMENT - IFN(S) -

```

PCT#0.001
LLL#XLLL+0.1
LLI#LLL-1
LEFTL# KK-JJ +1
DO 305 LLLL # JJ, KK, LLL
ISTAGE# LLLL
LEFTL# LEFTL-LLL
105 TSATI#TOMP(ISTAGE)-459.69
TUBENO#ZZ(ISTAGE)
1/(2.0*ALEV*AMODU)
C*****REVISIONS MADE 11-23-65
IF(WVST(ISTAGE)) 110,111,115
110 DPINIT(ISTAGE)#0.0
DTINIT(ISTAGE)#0.0
DPCLR(ISTAGE)#0.0
DTCLR(ISTAGE)#0.0
GO TO 305
115 W#WVST(ISTAGE)/2.0
TRAYL#SLS(ISTAGE) -0.5+TSTH/12.0
SODMIN # 1.3
XTR # TSATI + 459.69
120 PSATI #YPSAT(XTR)
PMIN #.001
125 ICASE # 1
SOD(ICASE)#XSOD
DELP('1)# 0.01
130 DTUBE # DTUBE/12.0
135 WGT # W/3600.0
ITER # 1
XTR # TSATI + 459.69
XPI # PSATI
140 VGI# YVSAT(XTR,XPI)
VGS # VGI
145 DPACC # WGT * WGT * VGI / (9266.112 * (TRAYL * TRAYHT(ICASE))**2.0
1)
VEL (ICASE) # WGT * VGI / (TRAYL * TRAYHT (ICASE))
UPIURN # VEL(ICASE) **2 / (9266.112 * VGI * CLTURN *
1 (1.0 + (TRAYHT (ICASE) / (TRAYHT (ICASE) + 3.0 )) **2)
DPEDGE # (0.4 * (1.25 - TRAYHT(ICASE) / (HST - 1.5)) +
1 (1.0 - (TRAYHT (ICASE) / ( TRAYHT (ICASE) + 3.0 ))**2 )
2 * VEL (ICASE) **2 / (9266.112 * VGI)
IMIN # 0
IMAX # 0
FREBD # TRAYHT (ICASE)
VBL1 # HST - 0.6 * FREBD
150 IVNO # VBL1 / (0.866 *SOD(ICASE)* DTUBE) + 1.0
I#1
155 VNO(ICASE) #FLOAT(IVNO)
IHNO # TUBENO/ VNO(ICASE) + 0.9
IHNO2 # TUBENO / VNO (ICASE) * 0.5 + 0.9
160 HNO(ICASE) #FLOAT(IHNO)
165 VBL2 # HST - (VNO(ICASE) + HNO(ICASE))/ (2.0* VNO(ICASE) +
1 HNO(ICASE)) * FREBD
IVNO # VBL2 / (0.866 *SOD(ICASE)* DTUBE) + 1.0
VNO(ICASE) #FLOAT(IVNO)
IHNO # TUBENO/ VNO(ICASE) + 0.9

```

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FIGURE 6 (Continued)

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CNDV      - EFN      SOURCE STATEMENT - IFN(S) -

      IHN02 # TUBENO / VNO (ICASE) * 0.5 + 0.9      CNDNC560
      HNO(ICASE) #FLOAT(IHNO)      CNDNC565
      IF (ABS(VBL1/VBL2 - 1.0) - .01) 175, 175, 170      CNDNC570
170 VBL1 # VBL2      CNDNC575
      GO TO 165      CNDNC580
175 IF (IHNO2 /NNN -99)185,185,180      CNDNC585
180 WRITE (6,8000)IHNO2, VNO, HNO, TUBENO      CNDNC590
8000 FORMAT (1H0 22HT00 MANY ROWS, IHNO2 # 14 /      CNDNC595
      1 1H 2X 5HVNO # E13.6, 2X 5HHNC # E13.6, 2X 9HTUBENO # E13.6)      CNDNC600
      GO TO 305      CNDNC605
185 WG (1) # WGT / ((VNO (ICASE) - 1.0) * 2.0 + (HNO (ICASE) - 1.0) )      CNDNC610
      IDNO # IHNO2      CNDNC615
190 SPAS # (SOD(ICASE) -1.0)* DTUBE      CNDNC620
195 WCNDT # WGT /TUBENO      CNDNC625
200 WL # WCNDT* VNO(1)/8.0      CNDNC630
      AXBND # SPAS * TRAYL *(2.0 * (VNO (ICASE) - 1.0)      CNDNC635
      1 + HNO (ICASE) - 1.0)      CNDNC640
      ARATIO # AXBND / (TRAYL *(TRAYHT (ICASE) + 3.0) )      CNDNC645
      IF (ARATIO - 1.0) 220, 220, 205      CNDNC650
205 ARATOX # 1.0 / ARATIO      CNDNC655
210 DPEXP # ((1.0 - ARATOX)      * WGT/(TRAYL *(TRAYHT (ICASE) + 3.0)))      CNDNC660
      1 **2 * VGI / 9266.112      CNDNC665
215 DPCNTR # DPEXP      CNDNC670
      GO TO 240      CNDNC675
220 IF (ARATIO - 0.715) 225, 225, 230      CNDNC680
225 CONTC # 0.4 * (1.25 - ARATIO)      CNDNC685
      GO TO 235      CNDNC690
230 CONTC # 0.75 * (1.0 - ARATIO)      CNDNC695
235 DPCNTR # CONTC * (WGT / AXBND ) **2 * VGI / 9266.112      CNDNC700
240 DPACC2 # WGT * WGT * VGI*(1.0 / AXBND**2 -      CNDNC705
      1 1.0/ (TRAYL *(TRAYHT (ICASE) + 3.0)) **2 ) / 9266.112      CNDNC710
245 COOR (2) # 0.50 * SOD (ICASE)      CNDNC715
      COOR (3) # SOD ( ICASE)      CNDNC720
250 IF (COOR (3) - 3.5) 260, 260, 255      CNDNC725
255 COOR (3) # 3.5      CNDNC730
      GO TO 270      CNDNC735
260 IF (COOR(3) -1.15) 265, 270, 270      CNDNC740
265 COOR (3) # 1.15      CNDNC745
270 PSAT(1) # PSAT1 - DPACC - DPCNTR - DPACC2      CNDNC750
      1 - DPTURN - DPEDGE      CNDNC755
      IF (PSAT(1) - PMIN) 280, 280, 275      CNDNC760
275 XPI # PSAT(1)      CNDNC765
      TSAT(1) # TRSAT(XPI) - 459.69      CNDNC770
      COOR(2)#COOR(3)      CNDNC775
      SPATRA#SPAS*TRAYL      CNDNC780
      CALL CNDVS(LLLL,COOR(1))      CNDNC785
      IDNO1 # K      CNDNC790
      DP2 # PSAT1 - PSAT (IDNO1)      CNDNC795
      SOD2 # SOD (ICASE)      CNDNC800
      GO TO 285      CNDNC805
280 WRITE (6,8005)PSAT(1)      CNDNC810
8005 FORMAT(1H0 4X 18HPSAT(1) TOO LOW #      E16.8)      CNDNC815
      NERR#1      CNDNC820
      GO TO 305      CNDNC825
285 VBL(ICASE)#(VNO(ICASE)-1.0)*0.866*SOD(ICASE)*DTUBE+DTUBE      CNDNC830
      HBLG      #(HNO(ICASE)-1.0)*      SOD(ICASE)*DTUBE+DTUBE      CNDNC835

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FIGURE 6 (Continued)

CNDN - EFN SOURCE STATEMENT - IFN(S) -

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HBLX # HBL G	+ 3.0	CNDN0840
HST # TRAYDP + TRAYHT (ICASE)		CNDN0845
AREAB (ICASE) # HBL G	* VBL (ICASE)	CNDN0850
AREAT (ICASE) # (HBLX + TRAY*2) * (TRAYDP + TRAYHT (ICASE))		CNDN0855
DPINIT(ISTAGE) # DPACC + DPCNTR + DPACC2 + DPTURN + DPEDGE		CNDN0860
DTINIT(ISTAGE) # TSAT1 - TSAT(1)		CNDN0865
DPCLR(ISTAGE) # PSAT(1) - PSAT(IDNO1)		CNDN0870
DTCLR(ISTAGE) # TSAT(1) - TSAT(IDNO1)		CNDN0875
8010 FORMAT(IH 15, 7E16.8)		CNDN0880
L#ISTAGE		CNDN0885
IF(LEFTL)290,290,305		CNDN0890
290 IF(LLLL-KK)295,305,305		CNDN0895
295 IF(ISTAGE-KK)300,305,305		CNDN0900
300 ISTAGE#KK		CNDN0905
LLL#KK		CNDN0910
GO TO 105		CNDN0915
305 CONTINUE		CNDN0920
310 HBL#HBLX		CNDN0925
SAVEXL#XLLL		CNDN0930
DO 345 I#JJ, KK, LLL		CNDN0935
K#I+LLL		CNDN0940
IF(LL1)315,350,315		CNDN0945
315 IF(K-NK)330,330,320		CNDN0950
320 IF(I-NK-I)325,345,345		CNDN0955
325 K#NK		CNDN0960
XLLL#NK-I		CNDN0965
LL1#XLLL-1.0		CNDN0970
IF(XLLL)350,350,330		CNDN0975
330 DELTA1 # (DPINIT(K) - DPINIT(I))/XLLL		CNDN0980
DELTA2 # (DTINIT(K) - DTINIT(I))/XLLL		CNDN0985
DELTA3 # (DPCLR(K) - DPCLR(I))/XLLL		CNDN0990
DELTA4 # (DTCLR(K) - DTCLR(I))/XLLL		CNDN0995
IF(LL1)345,345,335		CNDN1000
335 DO 340 JL#1, LL1		CNDN1005
IL#I+JL		CNDN1010
XILI # FLOAT(IL-I)		CNDN1015
DPINIT(IL)# DPINIT(I) + DELTA1 * XILI		CNDN1020
DTINIT(IL)#DTINIT(I) + DELTA2 * XILI		CNDN1025
DTCLR(IL)#DTCLR(I) + DELTA4 * XILI		CNDN1030
DPCLR(IL)#DPCLR(I) + DELTA3 * XILI		CNDN1035
340 CONTINUE		CNDN1040
345 CONTINUE		CNDN1045
350 XLLL#SAVEXL		CNDN1050
RETURN		CNDN1055
END		CNDN1060

FIGURE 6 (Continued)

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\$IBFTC STAGE DECK

STAG0000

FIGURE 6 (Continued)

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STAGE - EFN SOURCE STATEMENT - IFN(S) -

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C**** SUBROUTINE STAGEG
STAGEGEOM FOR NORITAKE DEAERATOR AND 421 DEMISTER 10/12/65
COMMON/GEN/CASE,G,RP, XRP,P,XO,G,XU,CR,XCR, RCE,ROER
COMMON/TEMPG/TSTEAM,TS(100), THF,TB,XTB, TO,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDP,HST,CL,
I SPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
I PMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,
I BIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FJULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,OTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
I QRITE,ITFR
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMEN,TCF,WX,
I WF,W0,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2 TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
I C(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), CM(100),
I HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWD(100),
2 RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,FBLE,HBLR,
I HLB, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TBNOE,TBNOR,
2 UBARH, VBLE,VBLR,VNOE, VNOR, WTME, WTMR, WY
COMMON/PHYS/ II
COMMON /MAIN/ SSF, HFG
COMMON /STG1/ ATR, PTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), DO, DI, R, S,
I V, TVTT(100), Z(100), HV, HS(100), WBS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON /CNDR1/ NERR, COOR(3), K
COMMON /DEMI/ SLKP2, SUMDMA, TDMP(100), APTSE, VCLM, APTSR
COMMON/STG21/TRAYLN,SLDEA,GR,WVKEEP,TTRAY,WVDEA1
COMMON/STGCST/TRAWDP,PTRAWD
COMMON/FEB8/SSFUBR
YPSAT(Q000FL) #EXP(CTR + BTR/Q000FL+ ATR/ (Q000FL*Q000FL))
FTIH(Q001FL) #2.1786818-.70443622E-01*Q001FL+.93941286E-03*Q001FL**
I 2-.53958083E-05*Q001FL**3+.18139197E-07*Q001FL**4
HFGH(Q002FL) #1093.88-0.5703*Q002FL+1.2819E-4*Q002FL**2-0.8824E-6*Q
I 002FL**3
ATR # -837533.21
BTR # -6452.5621
CTR # 14.150119
PI # 3.14159
CTA#6.65
SUMLS#0.0
NTOTAL#NTOTAL
NK#VK
ZBAR#0.0
SUMDM#0.0
TER5#1.0+SSF1
II#5

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2

FIGURE 6 (Continued)

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STAGE	- EFN	SOURCE STATEMENT	- IFN(S)	
		CALL DINTPL(TCF,CT(I),RHOE1)	STAG0280	12
		GE#3600.0*RHOE1*VE	STAG0285	
		CALL DINTPL(TB,CO,RHOR1)	STAG0290	14
		GR#3600.0*RHOR1*VR	STAG0295	
		CO270 I#1,NTOTAL	STAG0300	
		WVST(I)#WV(I)/(AMODU*ALEV)	STAG0305	
		IF(I-NK)100,100,115	STAG0310	
100		DO#DOE	STAG0315	
		RHJ#RHONK	STAG0320	
		DI#DIE	STAG0325	
		BIKT#BIKTE	STAG0330	
105		R#RE	STAG0335	
110		S#SE	STAG0340	
		V#VE	STAG0345	
		GF#GE	STAG0350	
		GOTJ120	STAG0355	
115		DO#DOR	STAG0360	
		DI#DIR	STAG0365	
		RHJ#RHOK	STAG0370	
		BIKT#BIKTR	STAG0375	
		S#SR	STAG0380	
		R#RSR	STAG0385	
		V#VR	STAG0390	
		GF#GR	STAG0395	
120		ARG#(SMT2(I)+SMT(I))*0.5	STAG0400	
		UBAR(I)#0.0	STAG0405	
		TVTT(I)#0.35*(TV(I+1)-ARG)	STAG0410	
		TW#0.65*(TV(I+1)-ARG)+ARG	STAG0415	
		HANK# (TV(I+1)-SMT(I))/(TV(I+1)-SMT2(I))	STAG0420	
		IF(HANK)125,125,130	STAG0425	
125		WRITE(6,8000)I,SMT(I),SMT2(I),TV(I+1),CTPDP(I)	STAG0430	39
0000		FORMAT(60HGTROUBLE IN U-BAR CALC. NEG LCG SKIPPING TO NEXT C	STAG0435	
		IASE / 15, 5E16.8)	STAG0440	
		ERR#1.0	STAG0445	
		RETURN	STAG0450	
130		OM(I)#(SMT2(I)-SMT(I))/ALOG(HANK)	STAG0455	47
		PCT#CP	STAG0460	
		II#6	STAG0465	
		CALL DINTPL(ARG,CT(I),AK)	STAG0470	51
		II#7	STAG0475	
		CALL DINTPL(ARG,CT(I),U)	STAG0480	55
		II#1	STAG0485	
		CALL DINTPL(ARG,CT(I),CZ)	STAG0490	59
		BIG1#(0.027*CZ*U**0.14*GF)/((GF*DI/(12.0*U))*0.2*	STAG0495	
		I(U*CZ/AK)**0.66666667)	STAG0500	61 62 63
135		II#7	STAG0505	
		CALL DINTPL(TW,CT(I),UW)	STAG0510	67
		HI(I)# BIG1/UW**0.14	STAG0515	69
		USAVE#UBAR(I)	STAG0520	
		DODI#DO/DI	STAG0525	
		BIK24#24.0*BIKT	STAG0530	
		REST#DO/BIK24*ALOG(DODI)+ R	STAG0535	72
		II#5	STAG0540	
140		CALL DINTPL(TV(I+1),PCT,RHO)	STAG0545	75
		II#6	STAG0550	
		CALL DINTPL(TV(I+1),PCT,SMK)	STAG0555	79

FIGURE 6 (Continued)

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STAGE	EFN	SOURCE STATEMENT	IFN(S)
		II#7	STAG0560
		CALL DINTPL(TV(I+1),PCT,U)	STAG0565
		HFG#1093.88-0.5703*TV(I+1)+1.2819E-4*TV(I+1)**2-0.8824E-6	83
		I*TV(I+1)**3	STAG0570
		IF (S-1.0) 145, 145, 150	STAG0575
145		BIG<#0.728*((50.04E+8*RHO**2*SMK**3*(HFG+0.375*TVTT(I)))/	STAG0580
		I(U*S))**0.25* 1.310	STAG0585
		GO TO 155	STAG0590
150		BIG<#0.728*((50.04E+8*RHO**2*SMK**3*(HFG+0.375*TVTT(I)))/	STAG0595
		I(U*S))**0.25*(1.2379476 + .35360826E-1*S - .15703466E-2*S**2)	STAG0600
155		HO(I)#BIG/(DO **0.25*TVTT(I)**0.25)	STAG0605
		UBAR1#CODI/HI(I)+REST+1.0/HO(I)	96
		UBAR(I)#1.0/UBAR1	99
		TVTTN#TVTT(I)	100
		TVTT(I)#UBAR(I)*OM(I)/HO(I)	STAG0610
		IF(ABS(TVTT(I)-TVTTN)/TVTTN-0.01) 165,167,160	STAG0615
160		TW#ARG+UBAR(I)*OM(I)*DO/(HI(I)*DI)	STAG0620
		GO TO 135	STAG0625
165		IF(ABS(UBAR(I)-USAVE)/UBAR(I)-0.0005) 170,160,160	STAG0630
170		IF(I -VK) 175,175,180	STAG0635
175		W#WF	STAG0640
		C(I)#CCF	STAG0645
		GO TO 185	STAG0650
180		W#WJ	STAG0655
		C(I)#CJ	STAG0660
185		ARG#(SMT2(I) +SMT(I))*0.5	STAG0665
		II#5	STAG0670
		CALL DINTPL(ARG,C(I),RHO)	STAG0675
		UBAR(I)#SSFUBR*UBAR(I)	STAG0680
		AS(I)#QH(I)/(UBAR(I)*OM(I))	STAG0685
		SLS(I)#12.0*AS(I)*DI**2*GF/(576.0*DO*W)	STAG0690
		IF(I-NTOTAL) 195,190,195	STAG0695
C***		CALCULATION FOR DEAREATOR	STAG0700
190		CONTINUE	STAG0705
		CAL DEARI	STAG0710
C***		END OF CALCULATION FOR DEAREATOR	STAG0715
		GO TO 200	STAG0720
195		Z(I)#12.0*AS(I)/(DO *PI*SLS(I))	STAG0725
C		CFM IS REALLY CFMWV	STAG0730
200		CFMWV(I)#WV(I)/(60.0*TS(I+1))*EXP(12.4636-0.021987*TS(I+1)+	STAG0735
		1.18849E-4*TS(I+1)**2)	142
		HV#1.00125*TV(I+1)-32.125+1093.88-0.5703*TV(I+1)+1.2819E-4*TV(I+1)	STAG0740
		2-0.8824E-6*TV(I+1)3	STAG0745
		HP1#1.00125*TV(I)-32.125	STAG0750
		HP2#1.00125*TV(I+1)-32.125	STAG0755
		CFMWZ(I)#WP(I)*(HP1-HP2)/(60.0*(HV+HP2)*TV(I+1))*EXP(12.4632-	STAG0760
		1.021987*TV(I+1)+1.8849E-5*TV(I+1)**2)	STAG0765
		HS(I)#(.0056+.02436/(DI*V)** 0.32)*SLS(I)*12.0*V**2/(DI*64.348)	STAG0770
		I*SSF	STAG0775
		IF(CFMWZ(I)) 205,210,210	STAG0780
205		CFMWZ(I)#0.0	STAG0785
210		SUMOM#SUMOM+OM(I)	STAG0790
		SUMLS#SUMLS+SLS(I)	167
215		ZBAR#ZBAR+Z(I)	STAG0795
		SLSP#SLS(I)-0.5+TSTH/12.0	STAG0800
		VVEV(I)#CFMWV(I)/(120.0*SLSP *FRERD*	170
			STAG0805
			STAG0810
			STAG0815
			STAG0820
			STAG0825
			STAG0830
			STAG0835

FIGURE 6 (Continued)

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STAGE	-	EFN	SOURCE STATEMENT	-	IFN(S)	-
			1AMODU*ALEV)			STAG0840
			IF(I- NTOTAL) 225,220,225			STAG0845
220			TRAYFL(I)#((12.0*TWFA*TRAYLN -3.6-.63*SPL)			STAG0850
			1*.DE+4/((610.0/(TS(I)+459.69))**3.12*			STAG0855
			2(RHJ /3.0)**0.6)+85000.0)			STAG0860
			GO TO 230			STAG0865
225			TRAYFL(I)#((12.0*TWFA*SLSP -3.6-.63*SPL)			STAG0870
			1*.DE+4/((610.0/(TS(I)+459.69))**3.12*			STAG0875
			2(RHJ /3.0)**0.6)+85000.0)			STAG0880
230			WBS(I)#WBS(I)/(AMODU*ALEV)			STAG0885
			IF(TRAYFL(I)-100000.0)235,240,240			STAG0890
235			TRAYFL(I)#100000.0			STAG0895
			WRITE (6,8005)I			STAG0900
8005			FORMAT(27H0TRAYFLOW SET # 100000.0	15)		STAG0905
240			IF(TRAYFL(I) -SSF2)245,250,250			STAG0910
245			TRAYWD(I)#WBS(I)/TRAYFL(I)			STAG0915
			WWFS (I) # 1.0			STAG0920
			GO TO 255			STAG0925
250			TRAYWD(I)#WBS(I)/ SSF2			STAG0930
			WWFS (I) # TRAYFL (I) /SSF2			STAG0935
			TRAYFL (I) # SSF2			STAG0940
255			II#5			STAG0945
			CALL DINTPL(TS(I),C(I),RHORES)			STAG0950
			IF(I-1)265,265,260			STAG0955
260			DENBR(I-1)#RHORES			STAG0960
265			RESIDT(I)#(TRAYWD(I)*SLSP *BDEPH*			STAG0965
			IRHORES*3600.0)/WBS(I)			STAG0970
			PV(I)#2.1786818-.70443622E-01*TV(I+1)+.23941286E-03*TV(I+1)**2			STAG0975
			1-.53958083E-05*TV(I+1)**3 +.18139197E-07*TV(I+1)**4			STAG0980
270			CONTINUE			STAG0985
			I#NTOTAL+1			STAG0990
			PTRAFL #((12.0*TWFA*TRAYLN -3.6-.63*SPL)			STAG0995
			1*.DE+4/((610.0/(TV(I)+459.69))**3.12*			STAG1000
			2(RHJ /3.0)**0.6)+85000.0)			STAG1005
			I#NK			STAG1010
			TRAYNK#SLS(NK)-0.5+TSTH /12.0			STAG1015
			PTRAFK #((12.0*TWFA*TRAYNK -3.6-.63*SPL)			STAG1020
			1*.DE+4/((610.0/(TV(NK)+459.69))**3.12*			STAG1025
			2(RHJ /3.0)**0.6)+85000.0)			STAG1030
			WPZ#WP(NTOTAL+1)/(AMODU*2.0)			STAG1035
			IF(PTRAFL -SSF2)280,275,275			STAG1040
275			PTRAFL # SSF2			STAG1045
280			PTRAW1 # WPZ / PTRAFL			STAG1050
			WID1 # 2.0 *PTRAW1 + TRAYWD (NTOTAL)			STAG1055
			WPNK1# WP(NK) / (AMODU * 2.0)			STAG1060
			IF(PTRAFK -SSF2) 290, 290, 285			STAG1065
285			PTRAFK # SSF2			STAG1070
290			PTRAW2 # WPNK1/ PTRAFK			STAG1075
			WID2 # 2.0 * PTRAW2 + TRAYWD (NK)			STAG1080
			IF(WID1 -WID2) 300,300,295			STAG1085
295			PTRAWD # PTRAW1			STAG1090
			TRAWDP#TRAYWD(NTOTAL)			STAG1095
			GO TO 305			STAG1100
300			PTRAWD # PTRAW2			STAG1105
			TRAWDP # TRAYWD (NK)			STAG1110
305			CONTINUE			STAG1115

FIGURE 6 (Continued)

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STAGE	-	EFN	SOURCE STATEMENT	-	IFN(S)	-
8010			FORMAT(6E16.8)			STAG1120
			ASIEV#5.31E-5*(WB*WX)			STAG1125
			NPLAT#ASIEV/(AMODU*TRAYWD(NTOTAL)*SLDEA)			STAG1130
			ANPLAT#FLOAT(NPLAT)+1.0			STAG1135
			SLPLAT#ASIEV/(ANPLAT*AMODU*TRAYWD(NTOTAL))			STAG1140
			APLAT#SLPLAT*TRAYWD(NTOTAL)			STAG1145
			N#NTOTAL			STAG1150
			NLI#N-1			STAG1155
			DELP(N)#0.0			STAG1160
			A(N)#0.0			STAG1165
			COFA1#COEFA*3600.0			STAG1170
			DO 310 I#1,NLI			STAG1175
			DELP(I)#PV(I)-PV(I+1)			STAG1180
			A(I)#(TRAYFL(I)*TRAYWD(I))/(COFA1*SQRT(DENBR(I)*DELP(I)*9273.6))			STAG1185
310			CONTINUE			STAG1190
			II#2			STAG1195
			CALL DINTPL(TCF,CCF,HCF)			STAG1200
			CALL DINTPL(THF,CCF,HHF)			STAG1205
			TSTEM#TSTEM			STAG1210
			AMBDAS#1093.88-0.5703*TSTEM+1.2819E-4*TSTEM**2-0.8824E-6*TSTEM**3			STAG1215
			WY #WF*(THF-TCF)/AMBDAS			STAG1220
			PR#WPN*1.0E+3/(AMBDAS*WY)			STAG1225
C			BRINEHEATER			STAG1230
			II#5			STAG1235
			CALL DINTPL(THF,CCF,RHO)			STAG1240
			GH#3600.0*VH*RHO			STAG1245
			ARG#(TCF+THF)*0.5			STAG1250
			TT#0.35*(TSTEM-ARG)			STAG1255
			TW#0.65*(TSTEM-ARG)+ARG			STAG1260
			THM#(THF-TCF)/ALOG((TSTEM-TCF)/(TSTEM-THF))			STAG1265
			II#6			STAG1270
			CALL DINTPL(ARG,CCF,AK)			STAG1275
			II#5			STAG1280
			CALL DINTPL(ARG,CCF,RHO)			STAG1285
			II#7			STAG1290
			CALL DINTPL(ARG,CCF,U)			STAG1295
			II#1			STAG1300
			CALL DINTPL(ARG,CCF,CZ)			STAG1305
			BIGK3#(0.027*CZ*U**0.14*GH)/((GH*DIH/(12.0*U))**0.2*			STAG1310
			I(U*CZ/AK)**0.66666667)			STAG1315
315			II#7			STAG1320
			CALL DINTPL(TW,CCF,UW)			STAG1325
			HIH#BIGK3/UW**0.14			STAG1330
			USAVE#UBARH			STAG1335
			PCT#0.0			STAG1340
			HFG#1093.88-0.5703*TSTEM +1.2819E-4*TSTEM **2-0.8824E-6*TSTEM**3			STAG1345
			II#5			STAG1350
			CALL DINTPL(TSTEM,PCT,RHO)			STAG1355
			II#6			STAG1360
			CALL DINTPL(TSTEM,PCT,AK)			STAG1365
			II#7			STAG1370
			CALL DINTPL(TSTEM,PCT,II)			STAG1375
			DOHDIH#DOH/DIH			STAG1380
			BIK24#24.0*BIKTH			STAG1385
			PARTU#DOH/BIK24*ALOG(DOHDIH)+	RH		STAG1390
			IF (SH - 1.0) 320, 320, 325			STAG1395

FIGURE 6 (Continued)

STAGE	-	EFN	SOURCE STATEMENT	-	IFN(S)	-	09/26/67
320			CAP<#0.728*((50.04E+8*RHO**2*AK**3*(HFG+0.375*TT))/(SH*U))**0.25				STAG1400
			I * 1.310				STAG1405 331
			GO TO 330				STAG1410
325			CAP<#0.728*((50.04E+8*RHO**2*AK**3*(HFG+0.375*TT))/(SH*U))**0.25				STAG1415
			I * (1.2379476 + .35360826E-1*SH - .15703466E-2*SH**2)				STAG1420 334
330			HOH#CAPK/(DOH**0.25*TT**0.25)				STAG1425 336 337
			UBAR1#DOHDIH/HIH*PARTU+1.0/HCH				STAG1430
			TTN#TT				STAG1435
			UBARH#1.0/UBAR1				STAG1440
			TT#UBARH*THM/HOH				STAG1445
			IF(ABS((TT-TTN)/TT)-0.01)340,335,335				STAG1450
335			TH#ARG+UBARH*THM*DOH/HIH				STAG1455
			GO TO 315				STAG1460
340			IF(ABS(UBARH-USAVE)/UBARH-0.0005)345,335,335				STAG1465
345			II#2				STAG1470
			CALL DINTPL (THF,CCF,HMF)				STAG1475 345
			CALL DINTPL (TCF,CCF,HCF)				STAG1480 347
			UBARH#SSFUBR*UBARH				STAG1485
			AH#(HMF-HCF)*WF/(UBARH*THM)				STAG1490
			ARG#(TCF+THF)*0.5				STAG1495
			II#5				STAG1500
			CALL DINTPL (ARG,CCF,RH02)				STAG1505 350
			HLH#12.0*AH*DIH**2*GH/(576.0*DCH*WF)				STAG1510
			HN#12.0*AH/(PI*DOH*HLH)				STAG1515
			HBH # (0.021+0.0258/(DIH*VH))**0.42) *SSF				STAG1520
			I*HLH *12.0/DIH*VH**2/64.348				STAG1525 352
			BAROM#SUMOM/TOTAL				STAG1530
			NTOT1 #NTOTAL+1				STAG1535
			DO 350 I#1,NTOT1				STAG1540
350			DTPDPS(I)#DTPDP(I)				STAG1545
			IF(IGSC - 2) 355, 360, 360				STAG1550
355			V#VH				STAG1555
			CALL DEMIST				STAG1560 364
360			RETURN				STAG1565
			END				STAG1570

FIGURE 6 (Continued)

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*
\$18FTC UBARI DECK

UBARCOCC

FIGURE 6 (Continued)

09/26/67

UBAR1 - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE UBARHM(J,UB)
C**** STAGEGEOM FOR NORITAKE WITH DEMISTER AND CONDENSER 9/10/65
COMMON/GEN/CASE,G,RP,XRP,P,XC,C,XU,CR,XCR,ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100),THF,TB,XTB,TC,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TOTALE,TOTALR,FREBD,TRAYDP,HST,CL,
I SPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL,CAPF,THERM,
IPMSTMC
COMMON/TUBING/DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTF,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FJULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
I ORITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ACPSN,ACPSNK,ACPTNK,CPBT,CPTK,CPTNK,AMBN,TCF,WX,
IWF,WJ,CB,WC,WB,WR,RHONK,RHCK,ERR,CCF,NITER,NK,NTOTAL,PN,RPN,
2TC,ALPHA1,WPN,DELCT,DELST,IGSC,SMAO,SUMA,TK
COMMON/TCVL2/TTD(100),SMT(100),SMT2(100),CT(100),WS(100),
IC(100),TV(100),WV(100),QH(100),WP(100),AS(100),SLS(100),
COMMON/STAGE1/A(100),CFMWV(100),CFMWZ(100),UPAR(100),OM(100),
IH(100),HI(100),WWFS(100),VVEV(100),TRAYFL(100),TRAYWD(100),
2RESIDT(100),PV(100),DELP(100),DTPDPS(100)
COMMON/PHYS/II
COMMON/MAIN1/SSF,HFG
COMMON/STG1/ATR,BTR,CTR,CTA
COMMON/STG2/HOH,PR,DENBR(100),SUMLS,WVST(100),CO,DI,R,S,
I V,TVTT(100),Z(100),HV,HS(100),WBS(100)
COMMON/FEB8/SSFUBR
I#J
II#5
CALL DINTPL(TB,CO,RHOR1)
GR#3600.0*RHOR1*VR
100 DO#DJR
DI#DIR
RHJ#RHOK
BIKT#BIKTR
S#SR
R#RSR
V#VR
GF#GR
105 ARG#(SMT2(I)+SMT(I))*0.5
UBAR(I)#0.0
TVTT(I)#0.35*(TV(I+1)-ARG)
TW#0.65*(TV(I+1)-ARG)+ARG
HANK#(TV(I+1)-SMT(I))/(TV(I+1)-SMT2(I))
IF(HANK)110,110,115
110 WRITE(6,8000)I,SMT(I),SMT2(I),TV(I),DTPCP(I)
8000 FORMAT(60HCTROUBLE IN U-BAR CALC. NEG LOG SKIPPING TO NEXT
IASE/15,5H16.8)
ERR#1.5
RETURN
115 OM(I)#(SMT2(I)-SMT(I))/ALOG(HANK)
PCT#CP

```

FIGURE 6 (Continued)

09/26/67

UBAR I - EFN SOURCE STATEMENT - IFN(S) -

II#6	CALL DINTPL(ARG,CT(I),AK)	UBARQ280		
II#7	CALL DINTPL(ARG,CT(I),U)	UBARQ285	31	
II#1	CALL DINTPL(ARG,CT(I),CZ)	UBARQ290		
BIG<I#(0.027*CZ*U**0.14*GF)/((GF*DI/(12.0*U))**0.2*		UBARQ295	35	
(U*CZ/AK)**0.66666667)		UBARQ300		
120 II#7	CALL DINTPL(TW,CT(I),UW)	UBARQ305	39	
HI(I)# BIGK1/UW**0.14		UBARQ310		
USAVE#UBAR(I)		UBARQ315	41	42 43
DODI#DO /DI		UBARQ320		
BIK24#24.0*BIKT		UBARQ325	47	
REST#DO/BIK24*ALOG(DODI)+ R		UBARQ330	49	
II#5		UBARQ335		
125 CALL DINTPL(TV(I+1),PCT,RH0)		UBARQ340		
II#5		UBARQ345		
CALL DINTPL(TV(I+1),PCT,SMK)		UBARQ350	52	
II#7		UBARQ355		
CALL DINTPL(TV(I+1),PCT,U)		UBARQ360	55	
HFG#1093.88-0.5703*TV(I+1)+1.2819E-4*TV(I+1)**2-0.8824E-6		UBARQ365		
I*TV(I+1)**3		UBARQ370	59	
IF (S-1.0) 130, 130, 135		UBARQ375		
130 BIG<#0.728*((50.04E+8*RHO**2*SMK**3*(HFG+0.375*TVTT(I)))/		UBARQ380	63	
I(U*S))**0.25* 1.310		UBARQ385		
GO TO 140		UBARQ390		
135 BIG<#0.728*((50.04E+8*RHO**2*SMK**3*(HFG+0.375*TVTT(I)))/		UBARQ395		
I(U*S))**0.25*(1.2379476 + .35360826E-1*S - .15703466E-2*S**2)		UBARQ400		
140 HO(I)#BIGK/(DO **0.25*TVTT(I)**0.25)		UBARQ405	72	
UBAR I#DODI/HI(I)+REST+1.0/HO(I)		UBARQ410		
UBAR(I)#1.0/UBAR I		UBARQ415		
AS(I)#QH(I)/(UDAR(I)*OM(I))		UBARQ420	76	
TVTTN#TVTT(I)		UBARQ425	79	80
TVTT(I)#UBAR(I)*OM(I)/HO(I)		UBARQ430		
IF(ABS(TVTT(I)-TVTTN)/TVTTN-0.01) 150,145,145		UBARQ435		
145 TW#ARG+UBAR(I)*OM(I)*DO/(HI(I)*DI)		UBARQ440		
GO TO 120		UBARQ445		
150 IF(ABS(UBAR(I)-USAVE)/UBAR(I)-0.0005) 155,145,145		UBARQ450		
155 IF(I -VK) 160,160,165		UBARQ455		
160 W#WF		UBARQ460		
C(I)#CCF		UBARQ465		
GOTO 170		UBARQ470		
165 W#WD		UBARQ475		
C(I)#CQ		UBARQ480		
170 ARG#(SMT2(I) +SMT(I))*0.5		UBARQ485		
UB#UBAR(I)		UBARQ490		
UD#SSFUBR*UB		UBARQ495		
RETURN		UBARQ500		
END		UBARQ505		
		UBARQ510		
		UBARQ515		
		UBARQ520		
		UBARQ525		

FIGURE 6 (Continued)

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*
\$18FTC WAT DECK

WAT00000

FIGURE 6 (Continued)

WAT - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

	SUBROUTINE WATH(T,H)		WATC0005
	IF(T-360.0) 100,105,105		WATC0010
100	A0#-32.179105		WATC0015
	A1#1.0088084		WATC0020
	A2#-1.1516996E-4		WATC0025
	A3#4.8553836E-7		WATC0030
	A4#-7.3618778E-10		WATC0035
	A5#9.6350315E-13		WATC0040
	GOTO 110		WATC0045
105	A0#-9.0411706E2		WATC0050
	A1#1.0673802E1		WATC0055
	A2#-4.2753836E-2		WATC0060
	A3#9.41244E-5		WATC0065
	A4#-1.0315357E-7		WATC0070
	A5#4.560246E-11		WATC0075
110	H#A0+A1*T+A2*T**2+A3*T**3+A4*T**4+A5*T**5		WATC0080
	RETURN		WATC0085
	END		WATC0090

FIGURE 6 (Continued)

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*
\$IBFTC 80100 DECK

80100000

FIGURE 6 (Continued)

00100 - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

```

SUBROUTINEBOPR(T,C,BPR)
C *****FIT FOR 0 - 260NC AND 25 TC 260C 6/23/LL
TCOR#(T+460.0)/1.8
CC#C
CCOR#19.819*CC/(1.0-CC)
BPE#(565.757/TCOR-9.81559+1.54739*ALOG(TCOR)
1 -(337.178/TCOR-6.41981+.922753*ALOG(TCOR))*CCOR+(32.681/TCOR-.55380100035
268+.079022*ALOG(TCOR))*CCOR**2)*CCOR/ (266919.6/(TCOR**80100040
32)-379.669/TCOR+.334169)
BPR #1.8*BPE
RETURN
END

```

80100005
80100010
80100015
80100020
80100025
80100030
80100035
80100040
80100045
80100050
80100055
80100060

2

FIGURE 6 (Continued)

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*
\$IBFTC SUI00 DECK

SUI00000

FIGURE 6 (Continued)

SUI00 - CFN SOURCE STATEMENT - IFN(S) -

09/26/67

SUBROUTINE SUBAJ(CD,RATEIN,AJ)	SUI00005
COMMON /DP1/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ	SUI00010
IF(CD-80.0)100,105,105	SUI00015
100 AJTS#1.02-1.25*CD*1.0E-4	SUI00020
GO TO 110	SUI00025
105 AJTS#1.01	SUI00030
110 IF(CD-200.0)115,120,120	SUI00035
115 AJCT#1.113-0.0165*CD/100.0	SUI00040
AJSD#1.0629-0.349E-3*CD+0.930E-6*CD**2	SUI00045
GO TO 125	SUI00050
120 AJCT#1.08	SUI00055
AJSD#1.03	SUI00060
125 IF(CD-40.0)130,135,135	SUI00065
130 TIME#12.0+12.0*CD/40.0	SUI00070
GO TO 150	SUI00075
135 IF(CD-200.0)140,145,145	SUI00080
140 TIME #24.0+36.0*(CD-40.0)/160.0	SUI00085
GO TO 150	SUI00090
145 TIME#48.0	SUI00095
150 AJIC#1.0+0.0375*TIME*RATEIN	SUI00100
AJ #AJTS*AJSD*AJCT*AJIC	SUI00105
RETURN	SUI00110
END	SUI00115

FIGURE 6 (Continued)

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*
\$IBFTC DI100 DECK

DI100000

FIGURE 6 (Continued)

DI100 - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE DINTPL(ARG,ARU,AXY)
COMMON /PHYS/ II
I#II
C#ARU
T#ARG
ERR#0.0
GOTO(100,120,150,150,135,140,145),II
100 IF(C-0.005)105,105,110
C*****EQUATION SPECIFIC HEAT FOR PURE WATER
105 AXY#1.0121559 +(-.24618473E-03+ .10282155E-05*T)*T
GO TO 115
C*****EQUATION SPECIFIC HEAT FOR BRINE
110 AXY#-.9694686+(2.0*(.10404965E-03)*T)-(.91199294*C)
1 +(2.0*(-.64829659E-03)*C*T)+(-1.555779*(C**2))+
2 (2.0*(.76721469E-02)*(C**2)*T)+(6.7981008*(C**3))+
3 (2.0*(-.012610354)*(C**3)*T)
115 CONTINUE
GO TO 150
C II#2
C ENTHALPY OF SALINE SOLUTION RANGE OF DATA WAS 0 - 24 PERCENT
C CONCENTRATION AND 40 - 300 DEGREES FARENHEIT.
C
120 IF(C-0.005 ) 125,125,130
125 CALL WATH (T, AXY)
RETURN
130 AXY# -30.234836+(.96946859*T)+(.10404965E-03*(T**2))
1 +(.72.470209*C)-(.91199294*C*T)-(.64829659E-03*C*(T**2))
2 -(25.739723*(C**2))-(-1.5557791*(C**2)*T)+(.76721469E-02*
3 (C**2)*(T**2))-(386.23682*(C**3))+(.6.7981008*(C**3)*T)
4 -(.012610354*(C**3)*(T**2))
GO TO 150
C II#5
C DENSITY OF SALINE SOLUTION. RANGE OF DATA WAS 0 - 26 PERCENT
C CONCENTRATION AND 40 - 300 DEGREES FARENHEIT.
C
135 AXY#62.707172+49.364088*C-.43955304E-2*T
1-.32554667E-1*C*T-.46076921E-4*T**2+.63240299E-4
2*T**2*C
GO TO 150
C II#6 THERMAL CONDUCTIVITY OF SALINE SOLUTION. RANGE OF DATA
C 0 - 24 PERCENT CONCENTRATION AND 40 - 300 DEGREES FARENHEIT
C
140 AXY#(.30157913+.697989E-3*T-.12506E-5*T**2
1-.2072E-10*T**3)*(-.1687109*C+1.0)
GO TO 150
C II#7
C VISCOSITY OF SALINE SOLUTION. RANGE OF DATA WAS 0 - 24 PERCENT
C CONCENTRATION AND 40 - 210 DEGREES FARENHEIT.
C
145 R#T+459.69
AXY#EXP(-10.592566+.4606532E-2*R-11.591155*C
1.12602329E-1*C*R+4759.5941/R+3863.7378*C/R)
150 RETURN
END

```

DI100005
DI100010
DI100015
DI100020
DI100025
DI100030
DI100035
DI100040
DI100045
DI100050
DI100055
DI100060
DI100065
DI100070
DI100075
DI100080
DI100085
DI100090
DI100095
DI100100
DI100105
DI100110
DI100115
DI100120
DI100125
DI100130
DI100135
DI100140
DI100145
DI100150
DI100155
DI100160
DI100165
DI100170
DI100175
DI100180
DI100185
DI100190
DI100195
DI100200
DI100205
DI100210
DI100215
DI100220
DI100225
DI100230
DI100235
DI100240
DI100245
DI100250
+DI100255
DI100260
DI100265
DI100270

14

23

FIGURE 6 (Continued)

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*
\$18FTC TWO DECK

TWO00000G

FIGURE 6 (Continued)

TWO - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

SUBROUTINE DOUBLE(COOR,VALUE,NERR)	TWO00005
DIMENSION XNRL(7),YSOD(15),F(16,8),COOR(3)	TWO00010
COMMON/BLOC/XNRL,YSOD,F,NEN,ME	TWO00015
N#NEN	TWO00020
M#MEM	TWO00025
X#COOR(1)	TWO00030
Y#COOR(2)	TWO00035
IF((X.GT.XNRL(M).OR.Y.GT.YSOD(N)).OR.(X.LT.XNRL(1).OR.Y.LT.YSOD(1)	TWO00040
1)) GO TO 150	TWO00045
NERR#0	TWO00050
DO 100 I#1,M	TWO00055
JJ#I	TWO00060
DO 100 J#1,N	TWO00065
II#J	TWO00070
100 IF(X.EQ.XNRL(I).AND.Y.EQ.YSOD(J)) GO TO 145	TWO00075
IF(X.EQ.XNRL(M)) GO TO 155	TWO00080
DO 110 I#1,M	TWO00085
IF(X-XNRL(I)) 105,110,110	TWO00090
105 X1#XNRL(I-1)	TWO00095
X2#XNRL(I)	TWO00100
X#I-1	TWO00105
GO TO 115	TWO00110
110 CONTINUE	TWO00115
115 P#(X-X1)/(X2-X1)	TWO00120
IF(Y.EQ.YSOD(N)) GO TO 160	TWO00125
120 DO 130 I#1,N	TWO00130
IF(Y-YSOD(I)) 125,130,130	TWO00135
125 Y1#YSOD(I-1)	TWO00140
Y2#YSOD(I)	TWO00145
L#I-1	TWO00150
GO TO 135	TWO00155
130 CONTINUE	TWO00160
135 Q#(Y-Y1)/(Y2-Y1)	TWO00165
140 VALUE#(1.0-P)*(1.0-Q)*F(L,K)+Q*(1.0-P)*F(L+1,K)+P*(1.0-Q)*F(L,K+1)	TWO00170
1 +P*Q*F(L+1,K+1)	TWO00175
RETJRN	TWO00180
145 VALUE#F(II,JJ)	TWO00185
RETURN	TWO00190
150 NERR#1	TWO00195
RETJRN	TWO00200
155 P#0.0	TWO00205
K#M	TWO00210
GO TO 120	TWO00215
160 Q#0.0	TWO00220
L#N	TWO00225
GO TO 140	TWO00230
END	TWO00235

FIGURE 6 (Continued)

09/26/67

*
\$IBFTC BL<DAT DECK

BLK00000

FIGURE 6 (Continued)

BLKDAT - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

BLOCK DATA	BLK00005
DIMENSION XNRL(7),YSOD(15),F(16,8)	BLK00010
COMMON/BLOC/XNRL,YSOD,F,NEN,MEM	BLK00015
DATA NEN,MEM/ 9,7/	BLK00020
DATA(XNRL(1),I#1,7)/2.0E3,4.0E3,8.0E3,12.0E3,20.0E3,40.0E3,10.0E4/	BLK00025
DATA(YSOD(1),I#1,9)/1.15,1.20,1.25,1.30, 1.40,1.60,2.0,	BLK00030
I 2.5,3.5/	BLK00035
DATA((F(I,J),J#1,7),I#1,9)/	BLK00040
1.205 ,.171 ,.142 ,.128 ,.112 ,.094 ,.074 ,	BLK00045
2.195 ,.160 ,.132 ,.119 ,.1035,.086 ,.0673,	BLK00050
3.1855,.152 ,.125 ,.112 ,.097 ,.0807,.0627,	BLK00055
4.178 ,.146 ,.1195,.107 ,.0925,.0767,.058 ,	BLK00060
5.167 ,.136 ,.111 ,.099 ,.0855,.0702,.0540,	BLK00065
6.1523,.124 ,.100 ,.089 ,.0763,.0625,.0572,	BLK00070
7.136 ,.1103,.088 ,.078 ,.0665,.054 ,.040 ,	BLK00075
8.124 ,.1003,.080 ,.070 ,.0591,.0480,.035 ,	BLK00080
9.1105,.0895,.0703,.0613,.0514,.0413,.0298/	BLK00085
END	BLK00090

FIGURE 6 (Continued)

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*
\$18FTC INPU DECK

INPUCCCC

FIGURE 6 (Continued)

INPU - EFN SOURCE STATEMENT - IFN(S) -

09/26/67

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SUBROUTINE INPUT (IREAD)
C *****TEMP REVISION FOR REACTOR COUPLING 12/14/65 INPUT
C ***** INPUT SUBROUTINE FOR NORITAKE 11/19/65 INPUT IV
COMMON/GEN/CASE,G,RP, XRP,P,XO,Q,XU,CR,XCR, ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TB,XTB, TC,TP,TA,CO,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDP,HST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
IPMSTM
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
IORITE,ITER
COMMON/NOV25/ C11,C12, C13,C14, C15, C16, C21, C22, C23, C24, C31,
C32, C33, C34, C41, C42
COMMON/AZ1/DTPDP(100),TITLE(15)
DIMENSION F(10)
TWFA#0.7
TSTH#0.75
UMAX#40.0
UALP#30.0
COEFA# 1.0
C CONSTANT C11 ADJUSTED FROM 3.2048317 9/27/65
C
  IREAD#1
  100 READ ( 5,8000)(TITLE(I),I#1,12)
  8000 FORMAT(12A6)
  8005 FORMAT(9E8.5)
  BDEPH # 1.0
  DTPD#0.67
  SSF2#500000.0
  FREBD#FREBDS
  HST # FREBD + TRAYDP
  HPR#HPRS
  TB#TBSAVE
  XTB#TB
C  DIMENSION F(10)
  105 READ ( 5,8010)(F(I),I#1,9),IC
  8010 FORMAT(9F8.0,I3)
  GOT(110,115,120,125,130,135,140,145,150,155),IC
C** 1. GENERAL
  110 CASE#F(1)
  GF(2)
  RP #F(3)
  XRP#RP
  P#F(4)
  XO#P
  Q#F(5)
  XU#Q
  CR#F(6)
  XCR#CR
  ROE#F(7)

```

INPU0005
 INPU0010
 INPU0015
 INPU0020
 INPU0025
 INPU0030
 INPU0035
 INPU0040
 INPU0045
 INPU0050
 INPU0055
 INPU0060
 INPU0065
 INPU0070
 INPU0075
 INPU0080
 INPU0085
 INPU0090
 INPU0095
 INPU0100
 INPU0105
 INPU0110
 INPU0115
 INPU0120
 INPU0125
 INPU0130
 INPU0135
 INPU0140
 INPU0145
 INPU0150
 INPU0155
 INPU0160
 INPU0165
 INPU0170
 INPU0175
 INPU0180
 INPU0185
 INPU0190
 INPU0195
 INPU0200
 INPU0205
 INPU0210
 INPU0215
 INPU0220
 INPU0225
 INPU0230
 INPU0235
 INPU0240
 INPU0245
 INPU0250
 INPU0255
 INPU0260
 INPU0265
 INPU0270
 INPU0275

2
9

FIGURE 6 (Continued)

INPU - EFN SOURCE STATEMENT - IFN(S) -		09/26/67
	ROER#F(8)	INPU0280
	GOTO105	INPU0285
C**	II. TEMPERATURES AND CONCENTRATIONS	INPU0290
115	TSTEAM#F(1)	INPU0295
	TS(1)#F(1)	INPU0300
	THF#F(2)	INPU0305
	TB#F(3)	INPU0310
	XTB#TB	INPU0315
	TBSAVE#TB	INPU0320
	TO#F(4)	INPU0325
	TP#F(5)	INPU0330
	TA#F(6)	INPU0335
	CO#F(7)	INPU0340
	CP#F(8)	INPU0345
	GOTO105	INPU0350
C**	III. GEOMETRY	INPU0355
120	AMODU#F(1)	INPU0360
	ALFV#F(2)	INPU0365
	AUNIT # F(3)	INPU0370
	TOTAL#F(4)	INPU0375
	TOTALR#F(5)	INPU0380
	FREBD#F(6)	INPU0385
	FREBDS#FREBD	INPU0390
	TRAYDP # F(7)	INPU0395
	HST # FREBD + TRAYDP	INPU0400
	CL#F(8)	INPU0405
	SPL#F(9)	INPU0410
	GO TO 105	INPU0415
C**	IV. ECONOMIC FACTORS	INPU0420
125	SMALLE#F(1)	INPU0425
	SMALLD#F(2)	INPU0430
	SMALLB#F(3)	INPU0435
	SMALLP#F(4)	INPU0440
	RATEIN#F(5)	INPU0445
	WPL#F(6)	INPU0450
	CAPF#F(7)	INPU0455
	THERM#F(8)	INPU0460
	PMSTMC # F(9)	INPU0465
	GOTO105	INPU0470
C**	V. TUBING INFORMATION	INPU0475
130	DOH#F(1)	INPU0480
	WALLH # F(2)	INPU0485
	DIH # DOH - 2.0 * WALLH	INPU0490
	DOE#F(3)	INPU0495
	WALLE # F(4)	INPU0500
	DIE # DOE - 2.0 * WALLE	INPU0505
	DOR#F(5)	INPU0510
	WALLR # F(6)	INPU0515
	DIR # DOR - 2.0 * WALLR	INPU0520
	A3#F(7)	INPU0525
	SMA1#F(8)	INPU0530
	A1#SMA1	INPU0535
	SMA2#F(9)	INPU0540
	A2#SMA2	INPU0545
	GOTO105	INPU0550
C**	VI. TUBING INFORMATION	INPU0555

FIGURE 6 (Continued)

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INPU - EFN SOURCE STATEMENT - IFN(S) -

135	BIKTH#F(1)	INPU0560
	BIKTE#F(2)	INPU0565
	BIKTR#F(3)	INPU0570
	CSLTBH#F(4)	INPU0575
	CSLTBP#F(5)	INPU0580
	CSLTBR#F(6)	INPU0585
	GO TO 105	INPU0590
C**	VII. FOULING AND FLOODING FACTORS	INPU0595
140	RH # F(1)	INPU0600
	RE#F(2)	INPU0605
	RSR # F(3)	INPU0610
	SH # F(4)	INPU0615
	SE#F(5)	INPU0620
	SR # F(6)	INPU0625
	VH # F(7)	INPU0630
	VE#F(8)	INPU0635
	VR # F(9)	INPU0640
	GOTO 105	INPU0645
C**	VIII. PUMPING HEAD AND HEAT LOSSES	INPU0650
145	HD#F(1)	INPU0655
	HH#F(2)	INPU0660
	HDL#F(3)	INPU0665
	HPR#F(4)	INPU0670
	HPRS#HPR	INPU0675
	FFHL#F(5)	INPU0680
	SSFI#F(6)	INPU0685
	GOTO 105	INPU0690
C**	IX. MISCELLANEOUS	INPU0695
150	CPSTB#F(1)	INPU0700
	FACID # F(2)	INPU0705
	ACACID # F(3)	INPU0710
	DPLIM#F(4)	INPU0715
	A6 #F(5)	INPU0720
	A7 #F(6)	INPU0725
	XSOD#F(7)	INPU0730
	XVNV # F(8)	INPU0735
	NNN # XNVN + 0.1	INPU0740
	XLLE#F(9)	INPU0745
	LLL#XLLE+0.1	INPU0750
	GO TO 105	INPU0755
155	CONTINUE	INPU0760
	TOTAL#TOTALE+TOTALR	INPU0765
	JTOTAL#TOTAL + 1.1	INPU0770
	DO 160 I#1,JTOTAL	INPU0775
160	DTPDP(I)#DTPD	INPU0780
	WRITE (6,8015)CASE, G,RP, O,L, CR, ROE ,ROER,TSTEAM,THF,	INPU0785
	1 TB,TO,TP, TA, CO, CP,AMODU,ALEV,	INPU0790
	2AUNIT, TOTALE, TOTALR, FREED, TRAYDP,CL,SPL,SMALLE,SMALLD,	INPU0795
	3 SMALLB, SMALLP ,RATEIN, WPL, CAPF ,THERM , PMSTMC,DCH, WALLH,	INPU0800
	4 DOE,WALLE ,DOR,WALLR, A3, SMA1,SMA2,BIKTH,BIKTE,	INPU0805
	5 BIKTR, CSLTBH,CSLTBP,CSLTBR, RH,RF,RSR,	INPU0810
	6 SH, SE, SR,VH,VE,VR,HD,HH,HBL,	INPU0815
	7HPR,FFHL,SSFI,CPSTB,FACID,	INPU0820
	8 ACACID,DPLIM, A6 , A7 , XSOD ,NNN ,LLL	INPU0825
8015	FORMAT(IHD,5X,16HINPUT DATA INPUT/IH ,	INPU0830
	1 7HCARD 06/IH 8E15.6/IH 7HCARD 07/IH 8E15.6/IH 7HCARD 08/	INPU0835

45

FIGURE 6 (Continued)

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INPU	- EFN	SOURCE STATEMENT - IFN(S) -	
2	1H	9FID.2/1H 7HCARD 09/1H 9FID.6/1H 7HCARD 10/1H 9FID.6/	INPU0840
3	1H	7HCARD 11/1H 6FID.4/1H 7HCARD 12/1H 9FID.5/1H 7HCARD 13/	INPU0845
4	1H	6FID.2/1H 7HCARD 14/1H 7FID.6,216)	INPU0850
165		IF(TB)170,185,170	INPU0855
170		CAL CHKT8(RP,TB,G,CO,CR,CP,DTPD,TO,TBMICK)	INPU0860
		IF(TB-TBMICK)185,175,175	INPU0865
175		TBE#TBMICK-1.0	INPU0870
		TB#TBE	INPU0875
		XTB#TB	INPU0880
		WRITE (6,8020)TBE,TBMICK	INPU0885
8020		FORMAT(1H 25HTB ADJUSTED FOR THIS CASE 2E16.8)	INPU0890
		IF(TB-TO +5.0) 180,180,185	INPU0895
180		WRITE (6,8025)TB,TO	INPU0900
8025		FORMAT(27H PERFORMANCE RATIO TOO HIGH 2E16.8)	INPU0905
185		CONTINUE	INPU0910
		C11#2.565	INPU0915
		C12 # .34935994E-01	INPU0920
		C13 # -.44260299E-01	INPU0925
		C14 # .95146883E-02	INPU0930
		C15 # -.45266271E-02	INPU0935
		C16 # .25147928E-02	INPU0940
CCONSTANT		C21 ADJUSTED FROM 3.5371004 9/27/65	INPU0945
		C21#5.866	INPU0950
		C22 # 0.23733728	INPU0955
		C23 # 0.13482249	INPU0960
		C24 # .38165671E-02	INPU0965
CCONSTANT		C31 ADJUSTED FROM 6.3705619 9/27/65	INPU0970
		C31#11.9995	INPU0975
		C32 # 0.35156805	INPU0980
		C33 # 0.19559172	INPU0985
		C34 # .61242599E-02	INPU0990
CCONSTANT		C41 ADJUSTED FROM 1.93615 10/6/65	INPU0995
		C41#(3.406+4.762*(ALEV-1.0))/ALEV	INPU1000
		C42 # 0.0712644	INPU1005
190		RETURN	INPU1010
		END	INPU1015

FIGURE 6 (Continued)

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*
\$IRFTC CND DECK

CND00000

FIGURE 6 (Continued)

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CND - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE CNDNS (LLLL,COGR)                                CND000005
C**** CONDENSER SUBROUTINE FOR STAGE BY STAGE CALCULATION    CND000010
C**** SIMPLIFIED CONDENSER CALCULATION - MOD HORIZONTAL FLCW 8/6/65 CND000015
C**** THIS SUBROUTINE REQUIRES INTPL, APPROX, AMATQ2, EVAL SUBROUTINES CND000020
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDX,HST,CL, CND000025
1SPL                                                         CND000030
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL CND000035
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,CCEFA, CND000040
1ORITE,ITER                                                  CND000045
COMMON/AZI/DTPDP(100),TITLE(15)                            CND000050
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100), CND000055
1C(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100) CND000060
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), CM(100), CND000065
1HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWD(100), CND000070
2RESIDT(100), PV(100),DELP(100), DTPDPS(100)              CND000075
COMMON/CNDI/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100), CND000080
1DTCND(100)                                                  CND000085
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,FBLE,HBLR, CND000090
1HLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHLL, TBNOE,TNCR, CND000095
2UBARH, VBLE,VBLR,VNOE, VNOR, WTME, WTRM, WY               CND000100
COMMON /STG1/ ATR, BTR, CTR, CTA                            CND000105
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), CO, DI, R, S, CND000110
1 V, TVTT(100), Z(100), HV, HS(100), KWS(100)             CND000115
COMMON /CNDR1/ NERR, COCR(3), K                             CND000120
COMMON /DEMI/ SLKP2, SUNDMA, TOMP(100), APTSE, VCLM, APTSR   CND000125
COMMON /DEM3/ VNO(1), DTUBE, TUBENO, HNO(1),VBL(1),HBLG, TRAYDP, CND000130
1TRAYHT(                                                    CND000135
15), HBL1, TRAYW2, ZZZZZ                                    CND000140
COMMON/CVDLWK/WG(100),IDNO,WCNDT,WL,SPATRA,DTUBE,TSAT(100),PSAT(100) CND000145
1D),VSAT(100),VEL(1),SOD(1),HBL(1),AREAB(1),AREAT(1)       CND000150
COMMON /CPI/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO, CND000155
1UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THFN, HFE, THEHCND000160
2T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPEAR, PMC2, PMC1, CCCAP2, CND000165
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1, CND000170
4 BHC2, BHC1, VPC2, VPC1, UBPH, EEC2, EEC1, PO, CC2, CC1, CND000175
5 SCM2, SCM1, CIBC2, CIBC1, DEA2, DEA1, TC2, TC1, CAPI1, CND000180
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT, CND000185
7 ES, EA, CIBC, BHC, CCCAP, CCSTIN, WEIRC, CRANE, BLDG, CND000190
8 DEACST, PMCP0, PMCFLO, RETUB2, RETUB1, DPREQ(100), AMSC2, CND000195
9 AMSC1                                                       CND000200
DIMENSION                                                    CND000205
2DPFG(100), DPFTP(100), DPM(100),FFX(100), DPT(100)       CND000210
YPSAT(Q000FL) #EXP(CTR + BTR/Q000FL+ ATR/ (Q000FL*Q000FL)) CND000215
YVSAT(Q001FL,Q002FL)#EXP(-0.72240 + 1.10267 * ALOG(Q001FL/Q002FL) CND000220
1 -0.0177861 * (ALOG(Q001FL/Q002FL)) **2 CND000225
2 + 0.00103752 * (ALOG(Q001FL/Q002FL))**3) CND000230
YVISG(Q003FL) #(((-.7693E-10*Q003FL+.2892E-6)* Q003FL+ .1001E-2)* CND000235
1Q003FL+ .1220) * 1.0E-5 CND000240
VL1Q(Q004FL) #.16153716E-1 + (.48841151E-4 + (-.82269193E-6 + CND000245
1.57044577E-8 * Q004FL) *Q004FL) * Q004FL CND000250
YTPG1(Q005FL)#EXP(-.93620189 +(-0.7500582 +(-0.11991543 CND000255
1+.12224994E-01*Q005FL)*Q005FL)*Q005FL) CND000260
YTPG2(Q006FL)#EXP(-0.94283631 +(-0.80225485 +(-.79487734E-01+.9212 CND000265
1.6780E-2*Q006FL)*Q006FL) *Q006FL) CND000270
TRSAT(Q007FL) #-2.0 * ATR/ (BTR+ SQRT(BTR*BTR-4.0 * ACND000275

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FIGURE 6 (Continued)

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CND - EFN SOURCE STATEMENT - IFN(S) -

ITR* (CTR- ALOG(Q007FL))))	CND00280	19	20
I#0	CND00285		
NNN#NNN	CND00290		
NNNS # NVN	CND00295		
LEFTOV#IDNO	CND00300		
DO 235 J#1, IDNO ,NNN'	CND00305		
I#I+1	CND00310		
K#I+1	CND00315		
LPI28#0	CND00320		
LEFTOV#LEFTOV-NNN	CND00325		
IF (LEFTOV)100,105,105	CND00330		
100 K#I+1	CND00335		
105 IF(I-IDNO)115,110,115	CND00340		
110 K#I+1	CND00345		
115 WG(K) # WG(I) - WCDT *FLCAT(NNN)	CND00350		
IF (WG (K))120,125,125	CND00355		
120 WG(K) # 0.0	CND00360		
125 WGAVG#(WG(I) + WG(K))*C.5	CND00365		
GSTAR #(WL +WGAVG) / SPATRA	CND00370		
XTR # TSAT(I) + 459.69	CND00375		
VISG #YVISG(XTR)	CND00380		
XNREX # DTUBE * GSTAR /VISG	CND00385		
IF(XNREX -2000.0)130,135,135	CND00390		
130 COOR (I)#2000.0	CND00395		
GO TO 140	CND00400		
135 COOR(I) # XNREX	CND00405		
140 CALDOUBLE(COOR ,FFX(I),IERR)	CND00410	55	
IF(IERR)145,150,145	CND00415		
145 WRITE (6,8000)IERR,COOR(1),COOR(2),COOR(3) ,FFX(I)	CND00420	59	
8000 FORMAT (16H0ERROR IN INTPL 15,4E16.8)	CND00425		
RETURN	CND00430		
150 XPI # PSAT(I)	CND00435		
IF(XPI)155,155,160	CND00440		
155 WRITE (6,8005)I, PSAT (I)	CND00445	64	
8005 FORMAT (1H0 4X 5H I # 14, 4X2CHPSAT (I) TOO LOW # E14.6)	CND00450		
RETURN	CND00455		
160 VL # VL IQ(YPI)	CND00460		
VSAT(I)#YVSAT(XTR,XPI)	CND00465		
VQV # VL/VSAT(I)	CND00470		
XLVFX # 1.0 /(VOV + WGAVG/ WL)	CND00475		
IF(XLVFX - 0.1) 165,165,170	CND00480		
165 TPOG # 1.0	CND00485		
GO TO 185	CND00490		
170 IF(XLVFX-1.0)175,175,180	CND00495		
175 XLVFLN#ALOG(XLVFX)	CND00500	75	
TPOG#YTPG1(XLVFLN)	CND00505		
GO TO 185	CND00510		
180 XLVFLN#ALOG(XLVFX)	CND00515	78	
TPOG#YTPG2(XLVFLN)	CND00520		
185 IF(TPOG-1.0E-3)190,195,195	CND00525		
190 TPOG#1.0E-3	CND00530		
195 PSAT(K) # PSAT(I) - DELP(I)	CND00535		
XPI # PSAT(K)	CND00540		
IF(XPI)155,155,200	CND00545		
200 TSAT(K) # TRSAT(XPI) - 459.69	CND00550		
XTR # TRSAT(XPI)	CND00555		

FIGURE 6 (Continued)

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CND - EFN SOURCE STATEMENT - IFN(S) -

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VSAT(K ) #YVSAT(XTR,XPI)                                CND0056C
VSATAV #(VSAT(I) + VSAT( K )) * 0.5                      CND00565
DPFG(I) # 4.0 *FFX(I) * GSTAR **2 *VSATAV/9266.112      CND00570
I*FLJAT(NNN)                                              CND00575
DPFTP(I) # DPFG(I) * TPOG                                CND00580
DPM(I) #(WG( K ) * WG( K ) * VSAT( K ) - WG(I) * WG(I) * VSAT(I))
I/(9266.112 * SPATRA ** 2 )                               CND00585
DPT(I) # DPFTP(I)                                         CND00590
IF(ABS(DELP(I)/ DPT(I) - 1.0) - .001)205,205,225         CND00595
205 PSAT( K ) # PSAT(I) - DPT (I)                          CND00600
XPI # PSAT( K )                                           CND00605
IF(XPI)155,155,210                                        CND00610
210 TSAT( K ) # TRSAT(XPI) - 459.69                       CND00615
XTR # TRSAT(XPI)                                          CND00620
VSAT( K ) #YVSAT(XTR, XPI)                               CND00625
IF(LEFTOV )215,235,235                                    CND00630
215 IF (J - IDNO) 220,235,235                             CND00635
220 I#I+1                                                  CND00640
J # IDNO                                                  CND00645
K#I+1                                                     CND00650
NNN# NNN-LEFTOV -1                                       CND00655
GO TO 115                                                 CND00660
225 DELP(I)# DPT(I)                                       CND00665
LP128#LP128+1                                             CND00670
IF(LP128-ID)195,195,230                                   CND00675
230 WRITE (6,8010 )I,DELP(I),DPT(I),I STAGE             CND00680
8010 FORMAT(3H I 16, 2E16.8, 6H1 STAGE 316)              CND00685
235 CONTINUE                                              CND00690
NNN # NNN.S                                              CND00695
RETURN                                                    CND00700
END                                                       CND00710

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FIGURE 6 (Continued)

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*
\$18FTC DEMST DECK

DEMSECC00

FIGURE 6 (Continued)

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DEMST - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE DEMIST
C**** STAGEGEOM FOR NORITAKE DEAEERATOR AND 421 DEMISTER 10/12/65
COMMON/GEN/CASE,G,RP,XRP,P,XO,Q,XU,CR,XCR,RCE,ROER
COMMON/TEMPC/TSTEAM,TS(100),THF,TB,XTB,TC,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDP,HST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL,CAPE,TERM,
IPMSTMC
COMMON/TURING/DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTF,BIKTE,
IBKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FJULIN/RH,RE,RJR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACTD,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
IORITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ACPSN,ACPSNK,ACPTNK,CPBT,CPTK,CPTNK,AMBN,TCF,WX,
IWF,W0,CB,WC,WB,WR,RHONK,RHOK,ERR,CCF,NITER,NK,NTOTAL,PN,RPN,
2TC,ALPHA1,WPN,DELCT,DELST,IGSC,SMAQ,SUMA,TK
COMMON/TCVL2/TTD(100),SMT(100),SMT2(100),CT(100),WS(100),
IC(100),TV(100),WV(100),GH(100),WP(100),AS(100),SLS(100)
COMMON/STAGE1/A(100),CFMWV(100),CFMWZ(100),UBAR(100),OM(100),
IHO(100),HI(100),WWFS(100),VVEV(100),TRAYFL(100),TRAYWC(100),
2RESIDT(100),PV(100),DELP(100),DTPDS(100)
COMMON/DNST1/AREADM(100),DPTDM(100),DTOM(100),CPROD(100),WICCM(
100)
COMMON/CND1/DPINIT(100),DTINIT(100),DPCLR(100),DTCLR(100),
IDTCVD(100)
COMMON/STAGE2/AH,BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HRR,HBLE,HBLR,
IHLH,HNOE,HNOR,HN,HSTE,HSTR,JJ,KK,RLR,RSHELL,TBNOE,TENOR,
2UBARH,VBLE,VBLR,VNOE,VNOR,WTE,WTR,WY
COMMON/PHYS/II
COMMON/MAIN1/SSF,HFG
COMMON/STG1/ATR,BTR,CTR,CTA
COMMON/STG2/HOH,PR,DEFNR(100),SUMLS,WVST(100),DO,DI,R,S,
I V,TVTT(100),Z(100),HV,HS(100),WBS(100)
COMMON/CST1/ASIEV,ANPLAT,SLPLAT,APLAT
COMMON/CNDR1/NEER,COCR(3),K
COMMON/DEM1/SLKP2,SUMDMA,TMP(100),APTSE,VCLM,APTSR
COMMON/DEM3/ARGZ(15)
COMMON/DEA10/RNR
DIMENSION WPROD(100),EINDM(100),SMPRD(100),WSALT(100),SMSALT(100)
COMMON/STG21/TRAYLN,SLDEA,GR,WVKEEP,TTRAY,WVDEA1
YPSAT(Q000FL)*EXP(CTR+BTR/Q000FL+ATR/(Q000FL*Q000FL))
FTIH(Q001FL)*2.1786818-.70443622E-01*Q001FL+.93941286E-03*Q001FL**0.5
12-.53958083E-05*Q001FL**3+.18139197E-07*Q001FL**4
HFGH(Q002FL)*1.093.88-0.5703*Q002FL+1.2819E-4*Q002FL**2-0.8824E-6*Q002FL**3
1002FL**3
NTOT1#NTOTAL+1
SLKP2#SLS(NTOTAL)
WVKP2#WV(NTOTAL)
WV(NTOTAL)#WVKEEP
SLS(NTOTAL)#TRAYLN+0.5-TSTH/12.0
C*** YORK DEMISTER TYPE 421 10/11/65
IF(UMAX)100,105,100

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2

FIGURE 6 (Continued)

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DEMST - EFN SOURCE STATEMENT - IFN(15) -

100	IF(UALP)110,105,110	DEMSQ280	
105	RETURN	DEMSQ285	
110	SUMDMA#0.0	DEMSQ290	
	OTPD# DTPD	DEMSQ295	
	DO 260 I#1,NTOTI	DEMSQ300	
	IF (I - NTOTI) 120, 115, 115	DEMSQ305	
115	TS AVG # TTRAY	DEMSQ310	
	CAVE# CO * (WB+ WX) / (WB + WX - WDEAI)	DEMSQ315	
	C(NTOTAL+2)#CAVE	DEMSQ320	
	GO TO 125	DEMSQ325	
120	TS AVG # (TS(I) + TS(I+1)) * 0.5	DEMSQ330	
	CAVE#(C(I)+C(I+1))*0.5	DEMSQ335	
125	TSAVE # TSAVG + 459.69	DEMSQ340	
	SLSP#SL S(I)-0.5+TSTH/12.0	DEMSQ345	
	CALL BOPR (TSAVG,CAVE,BPR)	DEMSQ350	33
	DIGTE#TSAVE-BPR	DEMSQ355	
	PS # EXP(14.150119 - 6452.5621/ BIGTE - 837533.21 /BIGTE**2)	DEMSQ360	35
	VG # 10.729 * TSAVE / (18.015 * PS)	DEMSQ365	
	IF(WV(I))130,130,135	DEMSQ370	
130	AREADM(I)#0.0	DEMSQ375	
	DPTDM(I)#0.0	DEMSQ380	
	WIDDM(I)#0.0	DEMSQ385	
	WPRJDM(I)#0.0	DEMSQ390	
	GO TO 240	DEMSQ395	
135	IF (I - NTOTI) 145, 140, 140	DEMSQ400	
140	GDM #WV (I) / (AMODU *ALEV *SLSP *TRAYWD(I-I))	DEMSQ405	
	GO TO 150	DEMSQ410	
145	GDM # WV(I)/ (AMODU *ALEV *SLSP *TRAYWD(I))	DEMSQ415	
150	XDM # GDM **3* VG **2 *1.0E-8	DEMSQ420	
	XDM LN# ALOG(XDM)	DEMSQ425	54
	IF(XDMLN -5.9) 155, 160,160	DEMSQ430	
C	IF(XDMLN -4.4) 399, 400,400	DEMSQ435	
155	EINDM(I) # EXP(10.441-0.1570*XDMLN)	DEMSQ440	
C 399	EINDM(I) # EXP(8.941-0.1570*XDMLN)	DEMSQ445	57
	GOTO165	DEMSQ450	
160	EINDM(I)# EXP(4.42+C.870*XDMLN)	DEMSQ455	61
165	XLDM #0.333	DEMSQ460	
	EFFDM#1.0-100.0/(EINDM(I)*CAVE)	DEMSQ465	
	IF(EFFDM)170,170,180	DEMSQ470	
170	EOUTMX#EINDM(I)*CAVE	DEMSQ475	
	AREADM(I)#0.0	DEMSQ480	
	DPTDM(I)#0.0	DEMSQ485	
	DTDM(I)#0.0	DEMSQ490	
175	WRITE (6,8000)I,EOUTMX	DEMSQ495	71
8000	FORMAT(31HONO DEMISTER REQUIRED, STAGE NO 12, 25H MAX ENTRAINMENT	DEMSQ500	
	I # E13.6)	DEMSQ505	
	GO TO 220	DEMSQ510	
180	II#5	DEMSQ515	
	CALL DINTPL(TSAVG, CAVE, RHOY)	DEMSQ520	75
	VL# 1.0/RHOY	DEMSQ525	
	XYORK# ALOG(EINDM(I) *1.0E-6 *(VL/VG) **0.5)	DEMSQ530	77 79
	YYORK # EXP(-4.99499 + (-0.725195 - 0.0301573 *XYORK) *XYORK)	DEMSQ535	80
	II# 7	DEMSQ540	
	CALL DINTPL(TSAVG, CAVE,VIS)	DEMSQ545	82
	UPL # VIS/2.42	DEMSQ550	
	UYORK # (YYORK * .27277 *VG / (VL * UPL ** 0.2)) ** 0.5	DEMSQ555	84 85

FIGURE 6 (Continued)

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DEMST      - EFN  SOURCE STATEMENT - IFN(S) -

      IF(JYORK-UMAX)190,185,185
185 UYORK#UMAX
190 UDMIN# UYORK
      IF (I - VTOTI) 200,195,195
195 AREADM(I) # ( WV(I)* VG / (AMCDU * ANPLAT * 3600.0 * UDMIN) )
      I *ANPLAT/ALEV
      ADMMAX # APLAT * ANPLAT/ ALEV
      GO TO 205
200 AREADM(I) # WV(I)* VG / (AMCDU * ALEV * 3600.0 * UDMIN)
      ADMMAX#SLSP *TRAYWD(I)
205 IF(AREADM(I)-ADMMAX)215,215,210
210 WRITE (6,8005)I,AREADM(I),ADMMAX
8005 FORMAT(42H0AREA DM IS GREATER THAN ADMMAX. STAGE # 18,
12E15.8)
      UDMIN #WV(I)*VG/(AMCDU*ALEV*3600.0*AREADM(I))
      ALPDM#0.666*ALOG(UDMIN)-0.1873
      EOUTDM#EINDM(I) *EXP(ALPDM*XLDM*(-1.0))
      COUTDM #EOUTDM*CAVE
      EFFDM#1.0-EOUTDM/EINDM(I)
215 SUMDMA # SUMDMA + AREADM(I)
      UG# 1.0E-5 *(0.122 + 1.001E-3 * TSAVE + 2.892E-7 * TSAVE **2
1-7.693 E-11 * TSAVE **3 )
      WIDDM(I)#AREADM(I)/SLSP
      AVRE DM #UDMIN /(110.0* VG * UG)
      FFDM # 1.1297 * ANREDM **(-0.2747)
      DPDM # FFDM * XLDM *110.0* UDMIN **2 / (4320.7 * VG)
      CIDM#EINDM(I)*1.0E-6*UDMIN*3600.0/VG
      S2DM#SQRT(VG/VL -1.0)
      S2LDM#ALOG(DIDM)
      C3DM#10.51 -1.287*S2LDM +0.3784 *S2LDM **2
      DPWDM# 4.332E-4 *EXP(C3DM*(UDMIN / S2DM -0.075))
      DPTDM(I) # DPDM + DPWDM
      POUT DM # PS - DPTDM(I)
      TOUTDM#1675066.42/(-6452.5621 +SQRT(41635557.0+3353132.8*(14.15011
19-ALOG(POUTDM)))) -459.69
      TSP#1675066.42/(-6452.5621 +SQRT(41635557.0+3353132.8*(14.150119-
1LOG(PS)))) -459.69
      DTD(I)# TSP -TOUTDM
220 CTPDPS(I)#CTPD(I)
      IF(JYORK-UALP)230,230,225
225 ALPDM#0.666*ALOG(UALP)-0.1873
      GO TO 235
230 ALPDM#0.666*ALOG(UYORK)-0.1873
235 EOUTDM#EINDM(I)*EXP(-1.0*ALPDM*XLDM*12.0)
      COUTDM # (EOUTDM*1.0E-6*CAVE)/(1.0+EOUTDM*1.0E-6)
      WPRDM(I)#WVST(I)*(1.0+EOUTDM*1.0E-6)
240 IF(I-1)245,245,250
245 SMPRD(I)#WPRDM(I)
      WSALT(I)#WPRDM(I)*COUTDM
      SMSALT(I)#WSALT(I)
      GO TO 255
250 SMPRD(I)#SMPRD(I-1)+WPRDM(I)
      WSALT(I)#WPRDM(I)*COUTDM
      SMSALT(I)#SMSALT(I-1)+WSALT(I)
255 CPRDM(I)#SMSALT(I)/SMPRD(I)
      TDMP(I)#BIGIE-DTDM(I)

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DEMSC560
 DEMSC565
 DEMSC570
 DEMSC575
 DEMSC580
 DEMSC585
 DEMSC590
 DEMSC595
 DEMSC600
 DEMSC605
 DEMSC610
 DEMSC615 101
 DEMSC620
 DEMSC625
 DEMSC630
 DEMSC635 105
 DEMSC640 106
 DEMSC645
 DEMSC650
 DEMSC655
 DEMSC660
 DEMSC665
 DEMSC670
 DEMSC675
 DEMSC680 113
 DEMSC685
 DEMSC690
 DEMSC695 115
 DEMSC700 116
 DEMSC705
 DEMSC710 117
 DEMSC715
 DEMSC720
 DEMSC725
 DEMSC730 120 121
 DEMSC735
 DEMSC740 122 123
 DEMSC745
 DEMSC750
 DEMSC755
 DEMSC760 130
 DEMSC765
 DEMSC770 133
 DEMSC775 135
 DEMSC780
 DEMSC785
 DEMSC790
 DEMSC795
 DEMSC800
 DEMSC805
 DEMSC810
 DEMSC815
 DEMSC820
 DEMSC825
 DEMSC830
 DEMSC835

FIGURE 6 (Continued)

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DEMST		-	EFN	SOURCE STATEMENT	-	IFN(S)	-
260	CONTINUE						DEMS0840
	I#0						DEMS0845
	TOPROD#SMPROD(NTOTI)						DEMS0850
	TOCPRO#CPROD(NTOTI)						DEMS0855
	TOSALT#SMSALT(NTOTI)						DEMS0860
265	IF(CPROD(NTOTI) - CP	)		270,325,325			DEMS0865
270	I#I+1						DEMS0870
	WPRSAV#WPRODM(I)						DEMS0875
	WSALSV#WSALT(I)						DEMS0880
	IF(WV(I))280,280,275						DEMS0885
275	EOUTDM#EINDM(I)						DEMS0890
	CNCSAV	#(C(I)+C(I+1))*0.5					DEMS0895
	COUTDM	# EINDM(I) * 1.0E-6 * CNCSAV		/ (1.0 +			DEMS0900
	! EINDM(I) * 1.0E-6)						DEMS0905
	WPRODM(I)#WVST(I)*(1.0+EOUTDM*1.0E-6)						DEMS0910
	WSALT(I)#WPRODM(I)*COUTDM						DEMS0915
280	IF(I-1)285,285,290						DEMS0920
285	SMSALT(I)#WSALT(I)						DEMS0925
	SMPROD(I) # WPRODM(I)						DEMS0930
	GO TO 295						DEMS0935
290	SMSALT(I)#SMSALT(I-1)+WSALT(I)						DEMS0940
	SMPROD(I) # SMPROD(I-1) + WPRODM(I)						DEMS0945
295	CPROD(I)#SMSALT(I)/SMPROD(I)						DEMS0950
	SMSALT(NTOTI) #SMSALT(NTOTI)			+WSALT(I)-WSALSV			DEMS0955
	SMPROD(NTOTI) #SMPROD(NTOTI)			+WPRODM(I)-WPRSAV			DEMS0960
	CPROD(NTOTI) #SMSALT(NTOTI)/SMPROD(NTOTI)						DEMS0965
	IF (CPROD(NTOTI) - CP	) 320, 320, 300					DEMS0970
300	WPRODM(I) # WPRSAV						DEMS0975
	WSALT(I) # WSALSV						DEMS0980
	IF(I-1)310,305,310						DEMS0985
305	SMPROD(I)#WPRODM(I)						DEMS0990
	SMSALT(I)#WSALT(I)						DEMS0995
	CPROD(I)#SMSALT(I)/SMPROD(I)						DEMS1000
	SMSALT(NTOTI)#TOSALT						DEMS1005
	SMPROD(NTOTI)#TOPROD						DEMS1010
	CPROD(NTOTI)#TOCPRO						DEMS1015
	GO TO 325						DEMS1020
310	SUMDMA#0.0						DEMS1025
	DO 315 K # 1, NTOTI						DEMS1030
	SMPROD(K) # SMPROD(K-1) + WPRODM(K)						DEMS1035
	SMSALT(K) # SMSALT(K-1) + WSALT(K)						DEMS1040
	CPROD(K) # SMSALT(K) / SMPROD(K)						DEMS1045
	SUMDMA#SUMDMA+AREADM(K)						DEMS1050
315	CONTINUE						DEMS1055
	GO TO 325						DEMS1060
320	DTOM(I)#0.0						DEMS1065
	SUMDMA # 0.0						DEMS1070
	AREADM(I)#0.0						DEMS1075
	DPTDM(I)#0.0						DEMS1080
	DTOM(I)#0.0						DEMS1085
	DTPDP(I)#DTPDS						DEMS1090
	IF(I-NTOTI) 270,325,325						DEMS1095
325	COSTDM#(19.80* XLDM/C.333			) *SUMDMA* ALEV*AMOCU			DEMS1100
	SLS(NTOTAL) # SLKP2						DEMS1105
	WV(NTOTAL)#WVKP2						DEMS1110
	IF (VVEV(NK) - 150.0) 340, 340, 330						DEMS1115

FIGURE 6 (Continued)

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DEMST - EFN SOURCE STATEMENT - IFN(S) -		
330	FREBDP # FREBD * VVEV (NK) / 150.0	DEMS1120
335	WRITE (6,8010)FREBDP, FREBD	DEMS1125
	TRAYDP # HST - FREBD	DEMS1130
	FREBD # FREBDP	DEMS1135
	HST # TRAYDP + FREBD	DEMS1140
8010	FORMAT (1HD 20HFREBOARD REVISED TO , E13.6, 2X 4HFRM , E13.6)	DEMS1145
340	ARGZ (2) # DOE	DEMS1150
C*****	TRAYDP#ARGZ(7)	DEMS1155
	ARGZ(7)#HST-FREBD	DEMS1160
C*****	TRAYHT#ARGZ(8)	DEMS1165
	ARGZ(8)#FREBD	DEMS1170
	ARGZ(14)#TRAYWD(NK)*0.5	DEMS1175
	JERR#0	DEMS1180
	JJ#1	DEMS1185
	KK#VK	DEMS1190
	CALL CNDVSR (TITLE(1), JERR)	DEMS1195
	IF(JERR)350,345,350	DEMS1200
C*****	BUNDLE WIDTH # ARGZ(13)	DEMS1205
345	BWE#ARGZ(13)	DEMS1210
	HSTE#ARGZ(7)+ARGZ(8)	DEMS1215
	VNOE#ARGZ(1)	DEMS1220
	TBNDE#ARGZ(3)	DEMS1225
	HNOE#ARGZ(4)	DEMS1230
	ESHELL#HSTE*ALEV*ELE*(WTME+2.0*BWE)	DEMS1235
	VBLE#ARGZ(5)	DEMS1240
	HBLE#ARGZ(6)	DEMS1245
	APTSE # (VBLE + 0.667) * (HBLE + 0.667)	DEMS1250
	ARGZ(2)#DOR	DEMS1255
	ARGZ(14)#TRAYWD(NTOTAL)*0.5	DEMS1260
	JERR#0	DEMS1265
	JJ#VK+1	DEMS1270
	KK#NTOT1	DEMS1275
	SXLLL#XLLL	DEMS1280
	XLLL#1.0	DEMS1285
	CALL CNDVSR (TITLE(1), JERR)	DEMS1290
	XLLL#SXLLL	DEMS1295
	IF(JERR)350,355,350	DEMS1300
350	ERR#23.0	DEMS1305
	RETURN	DEMS1310
355	BWR#ARGZ(13)	DEMS1315
	HSTR#ARGZ(7)+ARGZ(8)	DEMS1320
	TBNOR#ARGZ(3)	DEMS1325
	VVOR#ARGZ(1)	DEMS1330
	HVOR#ARGZ(4)	DEMS1335
	RSHELL#HSTR*ALEV*RLR*(WTMR+2.0*BWR)	DEMS1340
360	VOL#ESHELL+RSHELL	DEMS1345
	VBLR#ARGZ(5)	DEMS1350
	HBLR#ARGZ(6)	DEMS1355
	APTSR#(VBLR + 0.667) * (HBLR+0.667)	DEMS1360
	DO 375 I#1,NTOT1	DEMS1365
	DTCDV(I)#DTINIT(I)+DTCLR(I)	DEMS1370
	IF (TS(I+1) - 180.0) 365, 365, 370	DEMS1375
365	DTDPD(I)#DTDM(I)+DTINIT(I)+DTCLR(I) + FACID	DEMS1380
	I+ACACID * (180.0- TS (I+1))	DEMS1385
	GO TO 375	DEMS1390
370	DTDPD(I)#DTDM(I)+DTINIT(I)+DTCLR(I) + FACID	DEMS1395

FIGURE 6 (Continued)

	DEMST	-	EFN	SOURCE STATEMENT	-	IFN(S)	-	09/26/67
375	CONTINUE							DEMS1400
	I # VTOTI							DEMS1405
	DTDPD(I)			#DTDM(I)+DTINIT(I)+DTCLR(I)				DEMS1410
380	RETURN							DEMS1415
	END							DEMS1420

FIGURE 6 (Continued)

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*
\$IBFTC DEARIV DECK..

DEARC000

FIGURE 6 (Continued)

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DEARIV - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE DEARI
C**** STAGEGEOM FOR NORITAKE DEAERATOR AND 421 DEMISTER 10/12/65
COMMON/GEN/CASE,G,RP,XRP,P,XO,Q,XU,CR,XCR,ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100),THF,TR,XTR,TC,TP,TA,CG,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYCF,HST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL,CAPE,THERM,
IPMSTMC
COMMON/TUBING/DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XIII,III
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
IQRITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ACPSN,ACPSNK,ACPTNK,CPBT,CPTK,CPTNK,AMBN,TCF,WX,
IWF,WJ,CB,WC,WB,WR,RHONK,RHCK,ERR,CCF,NITER,NK,NTOTAL,PN,RPN,
2TC,ALPHA1,WPN,DELCT,DELST,IGSC,SMAQ,SUMA,TK
COMMON/TCVL2/TTD(100),SMT(100),SMT2(100),CT(100),WS(100),
IC(100),TV(100),WV(100),QH(100),WP(100),AS(100),SLS(100)
COMMON/STAGE1/A(100),CFMWV(100),CFMWZ(100),UBAR(100),QM(100),
IHO(100),HI(100),WWFS(100),VVEV(100),TRAYFL(100),TRAYWC(100),
2RESIDT(100),PV(100),DELP(100),DTPDPS(100)
COMMON/DMST1/AREADM(100),DPTDM(100),DTDM(100),CPROD(100),WIDDM(
100)
COMMON/CONDI/DPINIT(100),DTINIT(100),DPCLR(100),DTCLR(100),
IDTCND(100)
COMMON/STAGE2/AH,BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,PBLE,HBLR,
IHLH,HNOE,HNOR,HN,HSTE,HSTR,JJ,KK,RLR,RSHELL,TBNOE,TBNOR,
2UBARH,VBLE,VBLR,VNOE,VNOR,WTME,WTMR,WY
COMMON/PHYS/II
COMMON/MAIN/SSF,HFG
COMMON/STG1/ATR,BTR,CTR,CTA
COMMON/STG2/HOH,PR,DENBR(100),SUMLS,WVST(100),DO,DI,R,S,
I V,TVTT(100),Z(100),HV,HS(100),WBS(100)
COMMON/CST1/ASIEV,ANPLAT,SLPLAT,APLAT
COMMON/CNDR1/NERR,COCR(3),K
COMMON/DEMI/SLKP2,SUMDMA,TOMP(100),APTSE,VCLM,APTSR
COMMON/DEAID/RNR
COMMON/STG21/TRAYLN,SLDEA,GR,WVKEEP,ITRAY,WVDEA1
YPSAT(Q000FL)#EXP(CTR+BTR/Q000FL+ATR/(Q000FL*Q000FL))
FTIH(Q001FL)#2.1786818-.70443622E-01*Q001FL+.93941286E-03*Q001FL**
I2-.53958083E-05*Q001FL**3+.18139197E-07*Q001FL**4
HFGH(Q002FL)#1093.8E-0.57C3*Q002FL+.12819E-4*Q002FL**2-0.8824E-6*Q
1002FL**3
I#NTOTAL
SLKPI#SLS(NTOTAL)
CALL BOPR(TS(I),C(I),BPR)
TRAYLN#SLS(NTOTAL)-0.5+TSTH/12.0
NTOTI#NTOTAL+I
I#NTOTI
KNTTV#0.0
TVLAST#TS(I)-BPR-0.5
TVLASX#TVLAST+459.69

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FIGURE 6 (Continued)

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DEARIV - EFN SOURCE STATEMENT - IFN(S) -

PVLAST#YPSAT(TV, LASX)
PVTRAY#PVLAST-2.0*0.0542
PVTRAY#PVLAST
SMTI#TVLAST
SMTIX#TVLAST+459.69
100 FTI#YPSAT(SMTIX)-PVTRAY
FTIP#(-BTR/SMTIX**2 - 2.0 *ATR/ SMTIX**3)*PVTRAY
TVTRAY#SMTI
IF(ABS(FTI)/(PVLAST -PVTRAY)-0.001)120,105,105
105 SMTI#SMTI-FTI/FTIP
SMTIX#SMTI + 459.69
KNTTV#KNTTV+1
IF(15-KNTTV)110,110,100
110 WRITE (6,8000)
8000 FORMAT( 68H TROUBLE IN DEARATOR. TV CALC WONT CONVERGE AFTER 50
1 ITERATIONS )
WRITE (6,8005)KNTTV,FTI,FTIP,SMTI,PVLAST,PVTRAY
8005 FORMAT(1H0I4,7E16.8)
ERR#954.0
115 RETURN
120 TVDEA#TVTRAY-DTPDP(NTOTI )
CALL BOPR (TB,CO ,BPR)
TTRAY#TVTRAY + BPR
IF(TTRAY-TB)130,130,125
125 TTRAY#TB
TVTRAY#TTRAY-BPR
TVDEA # TVTRAY -DTPDP(NTOTI)
PVTRAY#2.1786818-.70443622E-01*TVTRAY+.93941286E-03*TVTRAY**2-.539
158093E-05*TVTRAY**3+.18139197E-07*TVTRAY**4
WRITE (6,8010)PVTRAY,PVLAST
8010 FORMAT (1H0 4X 9HPVTRAY # , E16.8, 4X 9HPVLAST # , E16.8)
130 TV(NTOTI+1)#TVDEA
TV (NTOTI +1) # TVDEA
TVX#TV(I+1)+ 459.69
PV(I)# YPSAT(TVX)
HFG#HFGH(TB)
IF(TTRAY- TB)140,140,135
135 WVDEA1#0.0
II#1
CALL DINTPL(TB, CO, CPZ)
WVDEA2#(WB+WX)/320.0+(WB+WX) * (TTRAY -TB) *CPZ / HFG
GO TO 145
140 II#2
CALLDINTPL(TB,CO ,HTR)
CALLDINTPL( TTRAY,CO ,HTVT)
WVDEA1#((WB+WX)*(HTR-HTVT))
1/(HFG+(HTB-HTVT))
WVDEA2#(WB+WX)/320.0
145 WVKEEP#WV(NTOTAL)
DEAR#1.0
WV(NTOTAL) # WV(NTOTAL) - WVDEA2 - WVDEA1
WVST(NTOTAL)#WV(NTOTAL)/(AMODU*ALEV)
IF(WV(NTOTAL))150,150,165
150 WVDE1P#WVDEA1
WVDE2P#WVDEA2
WVDEA2 # WVKEEP -WVDEA1

```

FIGURE 6 (Continued)

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DEAR IV - EFN SOURCE STATEMENT - IFN(S) -

WRITE (6,8015)WVKEEP, WVDEIP, WVDE2P, WV (NTOTAL), WVDEA2	DEAR0560	62
8015 FORMAT(44H0WVDEA1 + WVDEA2 IS GREATER THAN WV(NTOTAL) /1H 5E16.8)	DEAR0565	
WV(NTOTAL)#0.0	DEAR0570	
WVST (NTOTAL) # 0.0	DEAR0575	
IF(WVDEA2)155,155,160	DEAR0580	
155 WVDEA2#0.0	DEAR0585	
WVDEA1#WVKEEP	DEAR0590	
WRITE (6,8020)WVDEIP, WVKEEP	DEAR0595	68
8020 FORMAT (35H0WVDEA1 IS GREATER THAN WV(NTOTAL) /1H 2E16.8)	DEAR0600	
160 CONTINUE	DEAR0605	
DEAR#(WVDE2P + WVDEIP)/WVKEEP	DEAR0610	
165 WV(NTOTAL) # WVDEA2 + WVDEA1	DEAR0615	
WVST(I)#WV(I)/(AMODU*ALEV)	DEAR0620	
QDEA#(WVDEA1+WVDEA2)*HFGH(TVDEA)	DEAR0625	
QH(NTOTAL) #QDEA	DEAR0630	
QH(NTOTAL)#QH(NTOTAL)-QH(NTOTAL)	DEAR0635	
II#1	DEAR0640	
CALLDINTPL(TO,C(NTOTAL),CPTO)	DEAR0645	80
SMTDEA#TO+QDEA/(WO*CPTO)	DEAR0650	
IF(TVDEA-SMTDEA)170,170,175	DEAR0655	
170 WRITE (6,8025)SMTDEA, TVDEA	DEAR0660	83
8025 FORMAT(30H0 SMTDEA IS GREATER THAN TVDEA 3E16.8)	DEAR0665	
SMTDEA#TVDEA-5.0	DEAR0670	
175 SMT2 (NTOTAL) # SMTDEA	DEAR0675	
SMT(I)#TO	DEAR0680	
CT(NTOTAL+1)#CT(NTOTAL)	DEAR0685	
CALL UBARHM(I, UBRDEA)	DEAR0690	89
UBAR (I) # 1.0/UBRDEA + 0.667 / HC (I)	DEAR0695	
UBAR (I) # 1.0 / UBAR (I)	DEAR0700	
ADEA#(QDEA*ALOG((TVDEA-TO)/(TVDEA-SMTDEA)))	DEAR0705	
I/(UBAR(I)*(SMTDEA-TO))	DEAR0710	95
ADEA#ADEA*DEAR	DEAR0715	
AS(NTOTAL) #ADEA	DEAR0720	
RNR#576.0*WO/(PI*DIR**2*GR)	DEAR0725	
SLDEA#ADEA/(PI*DOR/12.0*RNR)	DEAR0730	
SLS(I) #SLDEA	DEAR0735	
WP(NTOTAL) #WP(NTOTAL)+WV(NTOTAL)	DEAR0740	
WP(NTOTAL+1)#WP(NTOTAL)+WV(NTOTAL)	DEAR0745	
Z(NTOTAL)#12.0*AS(NTOTAL)/(DO *PI*SLS(NTOTAL))	DEAR0750	
I # NTOTAL	DEAR0755	
SMT (I)#SMTDEA	DEAR0760	
CALL UBARHM(I,UBARZ)	DEAR0765	110
UBAR (I) # UBARZ	DEAR0770	
CT(I+1)#CT(I)	DEAR0775	
WVST(I)#WV(I)/(AMODU*ALEV)	DEAR0780	
IF(WV(I))180,180,185	DEAR0785	
180 ALAST#0.0	DEAR0790	
AS(I)#ALAST	DEAR0795	
SLS(NTOTAL) # 0.0	DEAR0800	
Z(NTOTAL)#0.0	DEAR0805	
GO TO 195	DEAR0810	
185 ALAST#WO*CPTO*ALOG((TV(NTOTAL)-SMTDEA)/(TV(NTOTAL)-SMT2(NTOTAL)))/UBAR(NTOTAL)	DEAR0820	128
190 AS(I)#ALAST	DEAR0825	
SLS(NTOTAL)#ALAST/(PI*DCR/12.0*RNR)	DEAR0830	
Z(I)#12.0*AS(I)/(DO *PI*SLS(I))	DEAR0835	

FIGURE 6 (Continued)

DEAR IV - EFN SOURCE STATEMENT - IFN(S) -
195 RETURN:
END

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DEAR0840
DEAR0845

FIGURE 6 (Continued)

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\$ORIGIN COSTLY
\$IBFTC UCALCM DECK

UCALC00C
UCALC00S

PO

FIGURE 6 (Continued)

UCALCM - EFN SOURCE STATEMENT - IFN(S) -

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```

SUBROUTINE UCALC(UDELTA,TUBLEN,T,CMT,ZUBAR)
C   UBAR VALUE BASED ON ACTUAL AREA
C   UBAR VALUE BASED ON K#125, 65 WALL
C   A RUBBER BAND/A REAL#1.28
      BAR#CMT
      ITUBLN#TUBLEN
      IF(ITUBLN.GT.5) GOTO100
      CFN2#1.0/(0.6736 + 0.001088 * T )
      GO TO 105
100  CFN2#1.0
105  CONTINUE
C   FIT A FOR LOW TEMPERATURES
C***  FIT A FOR TEMP. RANGE 100 TO 300
C***  VERTICAL DOUBLE FLUTED TUBES, CLIN ALLOY, 12/12/66
      A1# 0.94598989E+03
      A2# 0.55243699E+01
      A3#-0.11646098E+05
      A4#-0.45611828E+02
      A5# 0.79308461E-02
      A6# 0.20333492E+06
      A7#+0.39411727E+01
      A8#-0.25223411E+00
      A9#-0.28923398E-04
      A10#-0.16531411E+07
      A11# 0.41778945E+04
      A12# 0.83445326E-03
      A13# 0.56979017E+01
      A14#-0.43195339E+02
      A15#-0.14243670E-01
      A16# 0.88897284E-01
      Y#T
      IF(Y.LT.100.)GOTO 130
110  Z#BAR
      IF(Z.LE..1008) GOTO 125
      IJK#0
      Z#.1008
115  X#A1+A2*Y +A3*Z +A4*Z *Y +A5*Y **2+A6*Z **2
      1+A7*Y * Z**2+A8*Y **2*Z +A9*Y **3+A10*Z **3
      2+A11*Y *Z **3+A12*Y **3*Z +A13*Y **2*Z **2
      3+A14*Y **2*Z **3+A15*Y **3*Z **2+A16*Y **3*Z **3
      IF(IJK.EQ.0)GOTO120
      URBC2#X
      DUDC#(URBC1-URBC2)/.0008
      URBC#URBC1+(BAR-.1008)*DUDC
      GO TO 135
120  URBC1#X
      Z#.1000
      IJK#1
      GO TO 115
125  X#A1+A2*Y +A3*Z +A4*Z *Y +A5*Y **2+A6*Z **2
      1+A7*Y * Z**2+A8*Y **2*Z +A9*Y **3+A10*Z **3
      2+A11*Y *Z **3+A12*Y **3*Z +A13*Y **2*Z **2
      3+A14*Y **2*Z **3+A15*Y **3*Z **2+A16*Y **3*Z **3
      URBC#X
      GO TO 135
130  WRITE(6,8000)Y
8000  FORMAT(3H T#E16.8)
      Y#100.
      GO TO 110
135  CONTINUE
      CFN1#1.0
      AKFT#125.0
C   RATIO ACTUAL AREA/RUBBER BAND # 1.28
      CFN3#(1.0/URBC)/(1.0/URBC -0.000043 +(0.000043*125.0)/AKFT)
      ZUBAR #URBC*CFN1 *CFN2 *CFN3
      RETURN
      END

```

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FIGURE 6 (Continued)

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*
\$IBFTC CHKTBI DECK

CHKT0000

FIGURE 6 (Continued)

CHKTB1 - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE CHKTB (RP,TB,FF,CG,CR,CP,DT ,TC,TBMICK)	CHKTC005
COMMON/PHYS/II	CHKTC010
DTPD#DT+0.5	CHKTC015
WP#.344432 *FF	CHKTC020
CB#CR*CO	CHKTC025
WB#WP*(CO-CP)/(CB-CO)	CHKTC030
II#2	CHKTC035
CALL DINTPL(TO,CO,X1)	CHKTC040
TBA#TB	CHKTC045
100 CALL BOPR(TBA,CB,BPR)	CHKTC050
TPA#TBA-BPR-DTPD	CHKTC055
CALL DINTPL(TPA,CP,X3)	CHKTC060
CALL DINTPL(TPA,CB,X2)	CHKTC065
DMICK#X2-X3	CHKTC070
CALL DINTPL(TBA,CB,X4)	CHKTC075
CMICK#(X4-X2)/(TBA-TPA)	CHKTC080
CRX# WP/(WP+WB)	CHKTC085
HMICK#1000.0*CRX /RP + (CMICK *(TBA -TPA) +DMICK)*CRX +X1	CHKTC090
TPMICK#90.0	CHKTC095
CALL DINTPL (TPMICK,CB,YMICK)	CHKTC100
TPCOLE #TPMICK +5.0	CHKTC105
105 II#2	CHKTC110
CALL DINTPL(TPCOLE,CB,YCOLE)	CHKTC115
IF(ABS((HMICK-YCOLE)/HMICK)-0.0001)115,110,110	CHKTC120
110 TLEON # TPCOLE -(HMICK-YCOLE)*(TPMICK-TPCOLE)/(YCOLE-YMICK)	CHKTC125
TPMICK#TPCOLE	CHKTC130
YMICK#YCOLE	CHKTC135
TPCOLE#TLEON	CHKTC140
GO TO 105	CHKTC145
115 TBMICK#TPCOLE	CHKTC150
IF(ABS((TBMICK-TBA)/TBMICK)-0.0001)125,120,120	CHKTC155
120 TBA#TBMICK	CHKTC160
GO TO 100	CHKTC165
125 CONTINUE	CHKTC170
RETURN	CHKTC175
END	CHKTC180

FIGURE 6 (Continued)

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*
\$IBFTC PSIAA DECK

PSIAC000

FIGURE 6 (Continued)

PSIAA - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE PSIA(TF,P)	PSIAQ005	
T#(TF+459.69)/1.8	PSIAQ010	
IF(TF.LE.122.)GOTO100	PSIAQ015	
A#3.346313	PSIAQ020	
B#4.14113E-2	PSIAQ025	
C#7.515484E-9	PSIAQ030	
D#1.3794481E-2	PSIAQ035	
E#6.56444E-11	PSIAQ040	
X#647.27-T	PSIAQ045	
P#14.6959*218.167/EXP((2.3025851*X/T)*((A+B*X	PSIAQ050	
1+C*X**3+E*X**4)/(1.+D*X)))	PSIAQ055	5
GOTO105	PSIAQ060	
100 CONTINUE	PSIAQ065	
X#647.27-T	PSIAQ070	
A#3.2437814	PSIAQ075	
B#5.86826E-3	PSIAQ080	
C#1.1702379E-8	PSIAQ085	
D#2.1878462E-3	PSIAQ090	
P#14.6959*218.167/EXP((2.3025851*X/T)*((A+P*X+	PSIAQ095	
1C*X**3)/(1.+D*X)))	PSIAQ100	8
105 RETURN	PSIAQ105	
END	PSIAQ110	

FIGURE 6 (Continued)

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*
\$IBFTC VAPTSS DECK

VAPTCC00

FIGURE 6 (Continued)

VAPTSS - EFN SOURCE STATEMENT - IFN(S) -		09/26/67
	SUBROUTINE VAPTS(P,S,T)	VAPTC005
	ZED#.57477*ALOG10(P)-3.2949+.93551*S+.32531*S**2	VAPTC010 2
	A2#440.-24.86*S	VAPTC015
	A1#477.3+70.*S	VAPTC020
	A0#203.	VAPTC025
	T#A0+A1*ZED+A2*ZED**2	VAPTC030
	CP#1./(-9.513+11.342*S-2.736*S**2)	VAPTC035
100	CALL VAPS(T,P,SC)	VAPTC040 4
	DELS#SC-S	VAPTC045
	DELT#-(T+459.69)*DELS*(1.+DELS/(2.*CP))/CP	VAPTC050
	IF(ABS(DELT).LT..005)GOTO105	VAPTC055
	T#T+DELT	VAPTC060
	GOTO100	VAPTC065
105	RETURN	VAPTC070
	END	VAPTC075

FIGURE 6 (Continued)

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*
\$IBFTC VAPTHH DECK

VAPTCDDG

FIGURE 6 (Continued)

VAPTHH - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE VAPTH(P,H,T)	VAPTC005	
A0#-2827.7	VAPTC010	
A1#3.0391	VAPTC015	
A2#-.00035413	VAPTC020	
B0#24.318	VAPTC025	
B1#-.071479	VAPTC030	
B2#.45305E-4	VAPTC035	
T#A0+A1*H+A2*H**2+P/(B0+B1*H+B2*H**2)	VAPTC040	
CP1V#A1+2.*A2*H-P*(B1+2.*B2*H)/(B0+B1*H+B2*H**2)**2	VAPTC045	
100 CALL VAPH(T,P,HC)	VAPTC050	3
DELT#CP1V*(H-HC)	VAPTC055	
IF(ABS(DELT).LT..005)GOTO105	VAPTC060	
T#T+DELT	VAPTC065	
GOTO100	VAPTC070	
105 RETURN	VAPTC075	
END	VAPTC080	

FIGURE 6 (Continued)

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*
\$IBFTC VAPVV DECK

VAPV0000

FIGURE 6 (Continued)

VAPVV - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE VAPV(TS,PS,V)	VAPV0005	
P#PS/14.6959	VAPV0010	
T#(TS+459.69)/1.8	VAPV0015	
TAU#1./T	VAPV0020	
B0#1.89-2641.62*TAU*10.** (80870.*TAU**2)	VAPV0025	2
G1#92.546*TAU-1.6246E5*TAU**2	VAPV0030	
G2#2.21828-1.2697E5*TAU**2	VAPV0035	
G3#3.635E-4-6.768*(TAU**3*1.6E8)**8	VAPV0040	3
PHE1#B0**2*G1*TAU	VAPV0045	
PHE3#B0**4*G2*TAU**3	VAPV0050	
PHE12#B0**13*G3*TAU**12	VAPV0055	4
PHE12#-PHE12	VAPV0060	5
B#B0+PHE1*P+PHE3*P**3+PHE12*P**12	VAPV0065	6
VC#4.55504*T/P+B	VAPV0070	
V#(1./62.428)*VC	VAPV0075	
RETURN	VAPV0080	
END	VAPV0085	

FIGURE 6 (Continued)

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*
\$IRFTC VAPHH DECK

VAPHC00C

FIGURE 6 (Continued)

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VAPHH - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE VAPH(TS,PS,H)
P#PS/14.6959
T#(TS+459.69)/1.8
TAU#1./T
BO#1.89-2641.62*TAU*10.***(80870.*TAU**2)
DBO#-2641.62*10.***(80870.*TAU**2)*(2.3025851*80870.*2.*TAU**2
I+1.)
G1#82.546*TAU-1.6246E5*TAU**2
DG1#82.546-2.*1.6246E5*TAU
G2#-.21828-1.2697E5*TAU**2
DG2#-2.*1.2697E5*TAU
G3#3.635E-4-6.768*(TAU**3*1.E8)**8
DG3 # -24.*6.768*(1.E8*TAU**3)**8/TAU
FO#BO+TAU*DBO
F1#BO**2*G1*TAU+TAU*BO**2*G1+TAU**2*BO**2*DG1
I+2.*TAU**2*BO*G1*DBO
F3#BO**4*G2*TAU**3+3.*TAU**3*BO**4*G2+TAU**4
I*BO**4*DG2+4.*BO**3*TAU**4*G2*DBO
F12#TAU**12*BO**13*G3+12.*TAU**12*BO**13*G3+
I*TAU**13*BO**13*DG3+13.*TAU**13*BO**12*G3*DBO
F12#-F12
FP#(1.0E4/1012.95)*(1.472*(T-273.16)+(7.5566E-4/2.)*(T**2-
1273.16**2)+47.8365*ALOG(T/273.16)+2502.36)
HC#FO*P+F1*P**2/2.+F3*P**4/4.+F12*P**13/13.
I+FP
H#(435.57/10000.)*HC
RETURN
END

```

```

VAPHC005
VAPHC010
VAPHC015
VAPHC020
VAPHC025      2
VAPHC030
VAPHC035      3
VAPHC040
VAPHC045
VAPHC050
VAPHC055
VAPHC060      4      5
VAPHC065      6      7
VAPHC070
VAPHC075
VAPHC080
VAPHC085
VAPHC090      8      9
VAPHC095
VAPHC100     10     11     12     13
VAPHC105
VAPHC110
VAPHC115     14
VAPHC120
VAPHC125     15
VAPHC130
VAPHC135
VAPHC140

```

FIGURE 6 (Continued)

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*
\$IBFTC VAPSS DECK

VAPSCCCC

FIGURE 6 (Continued)

VAPSS EFN SOURCE STATEMENT - IFN(S) -

09/26/67

SUBROUTINE VAPS(TS,PS,S)	VAPSC005			
REAL MO,M1,M3,M12	VAPSC010			
P#PS/14.6959	VAPSC015			
T#(TS+459.69)/1.8	VAPSC020			
TAU#1./T	VAPSC025			
BO#1.89-2641.62*TAU*10.** (80870.*TAU**2)	VAPSC030	2		
CB0#-2641.62*10.** (80870.*TAU**2)*(2.3025851*80870.*2.*TAU**2	VAPSC035			
+1.)	VAPSC040	3		
G1#82.546*TAL-1.6246E5*TAU**2	VAPSC045			
DG1#82.546-2.*1.6246E5*TAU	VAPSC050			
G2#2.1828-1.2697E5*TAU**2	VAPSC055			
DG2#-2.*1.2697E5*TAU	VAPSC060			
G3#3.635E-4-6.768*(TAU**3*1.0E8)**8	VAPSC065	4	5	
DG3 # -24.*6.768*(1.E8*TAU**3)**8/TAL	VAPSC070	6	7	
FO#BO+TAU*DBO	VAPSC075			
F1#BO**2*G1*TAU+TAU*BO**2*G1+TAU**2*BO**2*DG1	VAPSC080			
+2.*TAU**2*BO*G1*DBO	VAPSC085			
F3#BO**4*G2*TAU**3+3.*TAU**3*BO**4*G2+TAU**4	VAPSC090			
+BO**4*DG2+4.*BO**3*TAU**4*G2*DBO	VAPSC095	8	9	
F12#TAU**12*BO**13*G3+12.*TAU**12*BO**13*G3+	VAPSC100			
+TAU**13*BO**13*DG3+13.*TAU**13*BO**12*G3*DBO	VAPSC105	10	11	12
F12#-F12	VAPSC110			13
PHE1#BO**2*G1*TAU	VAPSC115			
PHE3#BO**4*G2*TAU**3	VAPSC120	14		
PHE12#BO**13*G3*TAU**12	VAPSC125	15	16	
PHE12#-PHE12	VAPSC130			
MO#(FO-BO)*TAU	VAPSC135			
M1#(F1-PHE1)*TAU	VAPSC140			
M3#(F3-PHE3)*TAU	VAPSC145			
M12#(F12-PHE12)*TAU	VAPSC150			
SC#-4.55504*ALOG(P)+MO*P+M1*P**2/2.+M3*P**4/4.	VAPSC155			
+M12*P**13/13.+(10000./1012.95)*(1.472*ALOG(T))+	VAPSC160			
27.5566E-4*T-47.8365/T-1.48247)	VAPSC165	17	18	19
S#(435.57/18000.)*SC	VAPSC170			
RETURN	VAPSC175			
END	VAPSC180			

FIGURE 6 (Continued)

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\$ORIGIN COSTLY
\$IBFTC SMAP I DECK

SMAP0000
SMAP0005

FIGURE 6 (Continued)

SMAP1 - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE SMAP (WPL,CSLTUB,RATEIN,SMAPP)	SMAPC01C	
IF(WPL-CSLTUB)105,100,105	SMAPC015	
100 SMAPP#C.0	SMAPC02C	
GO TO 125	SMAPC025	
105 TERP#WPL/CSLTUB	SMAPC03C	
SUMI#0.0	SMAPC035	
ITERP#TERP	SMAPC040	
IF(ITERP-FLOAT(ITERP))115,110,115	SMAPC045	
110 ITERP#ITERP-1	SMAPC050	
115 DO 120 I#1,ITERP	SMAPC055	
120 SUMI#SUMI+((1.0+RATEIN)**(WPL-FLCAT(I)*CSLTUB)	SMAPC060	14
SMAPP#RATEIN*SUMI/((1.0+RATEIN)**WPL-1.0)	SMAPC065	17
125 RETURN	SMAPC07C	
END	SMAPC075	

FIGURE 6 (Continued)

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*
\$IBFTC COS DECK

COS00000

FIGURE 6 (Continued)

COS - EFN SOURCE STATEMENT - IFN(S) -

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```

SUBROUTINE COST(JJ)                                COS00005
COMMON/MAR22/GTOT                                COS00010
COMMON/GEN/CASE,G,RP, XRP,P,XO,G,XU,CR,XCR, ROE,ROER COS00015
COMMON/TEMPC/TSTEAM,TS(100), THF,TR,XTB, TC,TP,TA,CC,CP COS00020
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FRERC,TRAYDP,HST,CL, COS00025
ISPL                                              COS00030
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM, COS00035
IPMSTMC                                          COS00040
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTR,RIKTE, COS00045
IRIKTR,CSLTRH,CSLTBP,CSLTBR COS00050
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR COS00055
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1 COS00060
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL COS00065
COMMON/DATA1/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTF,COEFA, COS00070
IORITE,ITER COS00075
COMMON/AZ1/DTPDP(100),TITLE(15) COS00080
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMEN,TCF,WX, COS00085
IWF,WJ,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN, COS00090
2TC, ALPHAI, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK COS00095
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100), COS00100
IC(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100) COS00105
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UPAR(100), CM(100), COS00110
IHO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWC(100), COS00115
2RESTDT(100), PV(100),DELP(100), DTPDPS(100) COS00120
COMMON/DMST1/ AREADM(100),OPTDM(100),DTDM(100), CPROC(100),WIDCM(100) COS00125
ICD) COS00130
COMMON/CONDI/ DPINIT(100), DTINIT(100), DPCLR(100), CTCLR(100), COS00135
ICTCVD(100) COS00140
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELF,FSHELL,HRH,FBLE,HBLR, COS00145
IHLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TRNCE,TBNOR, COS00150
2UBARH, VBLE,VBLR,VNOE, VNOR, WIME, WIMR, WY COS00155
COMMON/PHYS/II COS00160
COMMON /MAIN1/ SSF, HFG COS00165
COMMON /STG1/ ATR, RTR, CTR, CTA COS00170
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), DO, DI, R, S, COS00175
1 V, TVTT(100), Z(100), HV, HS(100), WBS(100) COS00180
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT COS00185
COMMON /CND1/ NERR, CCCR(3), K COS00190
COMMON /DEM1/ SLKP2, SUNDMA, TDM(100), APTSE, VCLM, APTSR COS00195
COMMON /DEM3/ ARGZ(15) COS00200
COMMON /DEA1C/ RNR COS00205
COMMON /DPI/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO, COS00210
1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, FFE, FFR, THEHCOS00215
2T, HC2, HCI, CC2, CCI, POCST2, POCST1, ALPEAR, PMC2, PMCI, CCCAP2,COS00220
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, CSI, EA2, EAI, COS00225
4 BHC2, BHCI, VPC2, VPCI, URPH, EEC2, EEC1, PO, CC2, CCI, COS00230
5 SCM2, SCMI, CIBC2, CIBCI, DEA2, DEAI, TC2, TCI, CAPI1, COS00235
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT, COS00240
7 ES, EA, CIBC, BHC, CCCAP, CCSTIN, WEIRC, CRANE, BLDG, COS00245
8 DEACST, PMCPD, PMCFLO, RETUR2, RETUR1, CPREQ(100), AMSC2, COS00250
9 AMSC1 COS00255
COMMON/NOV25/C11, C12, C13, C14, C15, C16,C21, C22, C23, C24, C31,COS00260
1 C32, C33, C34, C41, C42 COS00265
COMMON/CSTLK/ADEA,ENITSD,WOCN,GPMP, FG, SMAPPR, DEARTB, EAR, EAE,TCOS00270
ICBH,AMBDAS COS00275

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FIGURE 6 (Continued)

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COS - CFN SOURCE STATEMENT - IFN(S) -

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COMMON/CSTLK1/SITEW,CTUBED,CTUREE,CTUBER,SMA1,SMA2,SUMLEV,TRBCND, COS00280
IENITSR COS00285
COMMON/JAN31/KOUTPT COS00290
GTV2(Q000FL) COS00295
1 #2.1786818-.70443622E-01*Q000FL+.93941286E-03*Q000FL**2 COS00300
2-.53958083E-05*Q000FL**3 +.18139197E-07*Q000FL**4 COS00305
FGAD(Q001FL)#EXP(0.0748067*ALOG(Q001FL)+0.2138177*ALCG(Q001FL)**2) COS00310
FLAD(Q002FL)#0.74391/SQRT(Q002FL) COS00315
COST1(Q003FL,Q004FL,Q005FL)#C11+C12*Q004FL+C13*Q003FL+CCOS00320
114*Q004FL*Q003FL+C15*Q005FL+C16*Q004FL*Q005FL COS00325
COST2(Q006FL,Q007FL)#C21+C22*Q006FL+C23*Q007FL+C24*Q00 COS00330
16FL*Q007FL COS00335
COST3(Q008FL,Q009FL)#C31+C32*Q008FL+C33*Q009FL+C34*Q00 COS00340
18FL*Q009FL COS00345
COST4(Q010FL)#C41+C42*Q010FL COS00350
8000 FORMAT (1H0 4X 19H DIV CHECK ON, I # 14) COS00355
SMA1#A1 COS00360
SMA2#A2 COS00365
IF(KOUTPT.NE.1)GOTO100 COS00370
CALL AREA COS00375
100 CALL SHELL COS00380
IF(COUTPT.NE.1)GOTO285 COS00385
C COS00390
C*** V. SEAWATER INTAKE COST REVISED 9/24/65 COS00395
105 IWAIT#5.0/AUNIT COS00400
AINTAK#1.0 COS00405
110 IYWAIT#0.002353*SQRT(WOCN/(AINTAK*8.0)) COS00410
IF(IYWAIT-18)120,120,115 COS00415
115 AINTAK#1.0+AINTAK COS00420
GOTO 110 COS00425
120 YWAIT#FLOAT(IYWAIT)/15.0 COS00430
WAITSL#(1.2668E-3 + 5.635E-4 + 1.2915E-3)*WOCN COS00435
1 + 416.90 * 6000.0* YWAIT**1.90 * AINTAK** 0.97 *1.25 COS00440
2 + 244.08 * 6000.0* YWAIT **1.10 * AINTAK **0.80 *1.25 COS00445
WAIT1 # 154610.0+ 8.2245E-4 * WCCN COS00450
WAIT2 # 98000.0*2.0 * AINTAK COS00455
WAIT3# 0.7178 * ( WOCN / AUNIT )**0.65 *AUNIT COS00460
WAIT4# 416.90 * 6000.0* YWAIT**1.90 * AINTAK** 0.97 *1.25 COS00465
WAIT5# 244.08 * 6000.0* YWAIT **1.10 * AINTAK **0.80 *1.25 COS00470
WAITSL # WAIT1 + WAIT 2 + WAIT3 + WAIT4 + WAIT5 COS00475
C** OPEN CHANNEL INTAKE SYSTEM 1/20/66 COS00480
AINTAK # 1.0 COS00485
WOUT # WCCN - WX COS00490
125 IYWAIT # .002353 * SQRT(WOUT /(AINTAK * 6.0) ) COS00495
IF (IYWAIT - 18) 135,135,130 COS00500
130 AINTAK # AINTAK + 1.0 COS00505
GO TO 125 COS00510
135 YWAIT # FLOAT(IYWAIT) / 15.0 COS00515
WAIT6 # 297680.0+ 8.2245E-4 * WCCN COS00520
WAIT7 # 436.92 * 1000.0*YWAIT **1.9 * AINTAK **0.86 * 1.25 COS00525
1 + 132.25 * 1000.0* YWAIT **1.1 * AINTAK **1.56 * 1.25 COS00530
WAIT8 # (138910.0+ 2.2518E-5 * WCCN) * 1.25 COS00535
1 + (1240880.0+ 3.1414E-4 * WCCN) * 1.25 COS00540
WAIT9 # 578870.0+ 2.3582E-4 * (WCCN - WX) COS00545
WAIT10 # 48000.0* AINTAK COS00550
WAIT11 # 1.0450 * (WOCN/AUNIT) ** 0.65 * AUNIT COS00555

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FIGURE 6 (Continued)

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WAITCH # WAIT6 + WAIT7 + WAIT8 + WAIT9 + WAIT10 + WAIT11	COS00560					
AJP# 1.22	COS00565					
IAJ # 0	COS00570					
140 WAITS2 # WAITS1 * SMALLP * AJP	COS00575					
DREDGE # 75000.0	COS00580					
WAITC2 # WAITCH * SMALLP * AJP+ DREDGE	COS00585					
145 IF (WAITS2 - WAITC2) 150, 15C, 155	COS00590					
150 WAIT # WAITS1	COS00595					
DREDGE # 0.0	COS00600					
WRITE (6,8005)WAITS2, WAITC2	COS00605	63				
8005 FORMAT(43HOSUBMARINE LINES USED ANNUAL COSTS ARE E16.8,3X	COS00610					
1 2HVS E16.8)	COS00615					
GO TO 160	COS00620					
155 WAIT # WAITCH	COS00625					
WRITE (6,8010)WAITC2, WAITS2	COS00630	66				
8010 FORMAT(40HOPEN CHANNEL USED ANNUAL COSTS ARE E16.8,3X2HVS	COS00635					
1 E16.8)	COS00640					
160 IF (IAJ) 165, 165, 220	COS00645					
165 CONTINUE	COS00650					
C THIS SUBROUTINE COMPUTES VALVE AND PIPING COST ALSO BRINE HEATER	COS00655					
CALL VALVE	COS00660					
C	COS00665					
C	COS00670					
C*** VIII. ELECTRICAL EQUIPMENT REVISED FOR SCALING 9/29/65	COS00675	70				
170 EEPER#2.0* SITEW +2.0*(HLH+CLE+RLR + SLS(NTOTAL+1))	COS00680					
EEC#117509.0 + 7320.0 *AUNIT +60.164 *EEPER +1.94506E+6*(P0/75.2)*	COS00685					
1*1	COS00690					
C	COS00695					
C**** IX. CHEMICAL TREATMENT CAPITAL COST REVISED 9/21/65	COS00700	73				
175 TNACDY#4.494E-4*(WB+WX)	COS00705					
CLORIN#1.6425E-6*WOCN	COS00710					
CALCIT#1.281E-4*WX	COS00715					
DEFOM#1.971E-6*(WB+WX)	COS00720					
CCCAP#1.2845E+6*(TNACDY/77300.0)**0.7	COS00725					
1+3.1964E+5*(CLORIN/642.0)**0.7	COS00730					
2+4.2325E+5*(CALCIT/10800.0)**0.7	COS00735					
3+4.3890E+4*(DEFOM/338.0)**0.7	COS00740					
4+2.083E+4*((WX+WB)/172.0E+6)**0.7	COS00745					
5 + 58750.0* (G/250.E+6) **0.7	COS00750	75	76	77	78	79 80
IF(XCR)185,180,185	COS00755					
180 THET#TCF	COS00760					
GO TO 190	COS00765					
185 THET#TB	COS00770					
C*** CHEMICAL SYSTEM CHEM COST 8/25/65	COS00775					
190 CC2#8.0*TNACDY + 0.0576 *(1.2845E+6*(TNACDY/77300.0)**0.7)	COS00780					
1 +83.0*CLORIN +10.0*CALCIT +840.0*DEFOM	COS00785	86				
UNCHEM#CC2/ (WB + WX)	COS00790					
C	COS00795					
C*** X. INSTRUMENTATION COST. SCALING FACTOR 9/22/65	COS00800					
COSTIN	COS00805					
1 # 160661.0* (G/(AUNIT * 50.E+6))**0.2 * AUNIT * (5.0/AUNIT)**0.2	COS00810					
2 + 2565.0* (G/(AUNIT * TOTAL) / (250.E+6/ 210.0)) **0.2	COS00815					
3 * TOTAL * AUNIT * (210.0/ (AUNIT * TOTAL)) **0.2	COS00820					
C	COS00825					
C*** XI SITE WORK REVISED 3/P/66	COS00830	87	88	89	90	

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COS - EFN SOURCE STATEMENT - IFN(S) -		09/26/67		
195	TOTAL # HLH + ELE + RLR + SLS (NTOTAL +1)	COS00835		
200	SITEI# TOTAL * SITEW * (0.8735 + 0.06295)	COS00840		
	SITE#SITEI	COS00845		
1	+ (TOTAL + SITEW) * (86.75E + 41.436 + 71.04) + 16.177)	COS00850		
2	+ (2.0* TOTAL + SITEW) * 16.670	COS00855		
C		COS00860		
C***	XII-A. CRANES FOR TURBINE PLANT REVISED 9/24/65	COS00865		
205	CRANE	COS00870		
1	# 220000.0* (WF/ (AUNIT * 123.8 E+6))**0.5 * (G/250. E+6) **0.3	COS00875		
2	+ 171880.0* (WOCN/(AUNIT * 69.92 E+6))**0.5 * (G/250. E+6) **0.3	COS00880		
C		COS00885		
C***	XII-B. BUILDINGS WITH SCALING FACTOR REVISED 9/21/65	COS00890	95	96 97
	BLDG # (26043.0+ 143287.0+ 4725C.C) * (G/250.E+6) **0.4	COS00895		
C		COS00900	98	
	CIRC#CRANE+BLDG +COSTIN	COS00905		
	WPROD # GMP	COS00910		
210	UNOPR#0.11044E+6*(G*1.0E-6)**0.3238/WPROD	COS00915	100	
215	OC2 # UNOPR * WPROD + DREDGE	COS00920		
220	CD#(PMC+SITE +WAIT +EA +ES +VPC +DEACST +EEC +BHC +CIRC+CCCAP)	COS00925		
	I*1.0E-6	COS00930		
225	CALL SUBAJ(CD,RATEIN,AJ)	COS00935	104	
	IF (IAJ) 230, 230, 235	COS00940		
230	AJP # AJ	COS00945		
	IAJ # I	COS00950		
	GO TO 140	COS00955		
C	COST BOOKKEEPING	COS00960		
235	DYEAR # SMALLP * AJ	COS00965		
	SAVEG#G	COS00970		
	G#GTOT	COS00975		
	FG#CAPF*G	COS00980		
	CHRIS#1.0E+3/365.0	COS00985		
	PJ#SMALLP*AJ	COS00990		
240	CAP11#CD*1.0E6*AJ	COS00995		
	CAP12#CAP11/G	COS01000		
	CAP13#SMALLP* CAP11/(0.365*FG)	COS01005		
245	UNMAIN#0.0060	COS01010		
250	AMSC2#UNMAIN*CAP11	COS01015		
C**	POWER COST OF ELECTRICITY FOR MOTORS 3 / 23 /66	COS01020		
255	PORTU # PO * 3.413 E+6	COS01025		
	POCST1 # 24.0E+6 *SMALLD *PO/G	COS01030		
	POCST2#0.365*FG*POCST1	COS01035		
	FG365#0.365*FG	COS01040		
260	DKGAL#1.0E+3/(365.0*FG)	COS01045		
	HC1#24.0*SMALLB*WX/(RP*G)	COS01050		
	HC2#HC1/DKGAL	COS01055		
	CC1#CC2/FG365	COS01060		
	OC1#OC2/FG365	COS01065		
C		COS01070		
C		COS01075		
C	OPERATING COST IS CALCULATED IN VAPOR COMPRESSOR PROGRAM	COS01080		
C		COS01085		
C		COS01090		
	OC2#0.0	COS01095		
	OC1#0.0	COS01100		
	AMSC1#AMSC2/FG365	COS01105		
C		COS01110		

FIGURE 6 (Continued)

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QOS - EFN SOURCE STATEMENT - IFN(S) -

C	MAINT AND SUPPLIES COST IS CALCULATED IN VAFOR CCNP PROGRAM	COSQ1115
C		COSQ1120
C		COSQ1125
	AMSC2#0.0	COSQ1130
	AMSC1#0.0	COSQ1135
	PAJ#SMALLP*AJ	COSQ1140
	CCCAP2#CCCAP*PAJ	COSQ1145
	CCCAP1#CCCAP2/FG365	COSQ1150
	DEA2 # DEACST * PAJ + SMAPPR * CTUBED	COSQ1155
	PMC2# PMC*PAJ	COSQ1160
	EEC2#EEC*PAJ	COSQ1165
	VPC2#VPC*PAJ	COSQ1170
	WAIT2#WAIT*PAJ	COSQ1175
	SITE2#SITE*PAJ	COSQ1180
	EAE2 # EAE * PAJ + SMAPPP * CTUBEF	COSQ1185
	EAR2 # EAR * PAJ + SMAPPR * CTUBER	COSQ1190
	EA2 # EAE2 + EAR2	COSQ1195
	BHC2 # BHC * PAJ + SMAPPH * TCBH * AMODU	COSQ1200
	ES2#ES* PAJ	COSQ1205
	CIRC2#CIRC*PAJ	COSQ1210
	DEA1#DEA2/FG365	COSQ1215
	PMC1#PMC2/FG365	COSQ1220
	EEC1#EEC2/FG365	COSQ1225
	VPC1#VPC2/FG365	COSQ1230
	WAIT1#WAIT2/FG365	COSQ1235
	SITE1#SITE2/FG365	COSQ1240
	EAI#EA2/FG365	COSQ1245
	RHC1# RHC2/FG365	COSQ1250
	ESI# ES2/ FG365	COSQ1255
	CIRC1#CIRC2/FG365	COSQ1260
	SCM1#AMSC1	COSQ1265
	SCM2#AMSC2	COSQ1270
	TC1#HC1+CC1+POCST1+PMC1+SITE1+WAIT1+ESI+EAI+VPC1+EEC1+BHC1+CC1	COSQ1275
	I+AMSC1+CIRC1+DEA1 +CCCAP1	COSQ1280
	TC2#TC1* 0.365*FG	COSQ1285
	WT#1.55E6/RHONK**0.8925	COSQ1290
	WTRAY#WF/WT	COSQ1295
	REST4#(WTRAY*(ELE+RLR)*112230.0)/(TOTAL*WF)	COSQ1300
	CSUBP#AMBDA/(ACPSN+ACPTNK)	COSQ1305
	TC#TC1	COSQ1310
	CAPI3#CHRIS*SMALLP*CAPI1/FG	COSQ1315
	RETUR2 # CTUBEE * SMAPPP +(CTUBER + CTUBED) * SMAPPR	COSQ1320
	I + SMAPPH * TCBH * AMODU	COSQ1325
	RETJBI#CHRIS*RETUR2/FG	COSQ1330
	RLR # RLR + SLS (NTOTAL +1)	COSQ1335
	AR # AR + PI * DOR/12.0 * RNR * SLS (NTOTAL+1)	COSQ1340
8015	FORMAT (IHO I6, 6E16.8)	COSQ1345
265	CONTINUE	COSQ1350
	G#SAVEG	COSQ1355
	RETURN	COSQ1360
	END	COSQ1365

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FIGURE 6 (Continued)

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*
\$IBFTC AREAY DECK

AREACCCO

FIGURE 6 (Continued)

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AREAY - EFN SOURCE STATEMENT - IFN(5) -

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SUBROUTINE AREA
C*****COST FOR MOTOR DRIVEN PLANT 3 / 23 / 66
COMMON/GEN/CASE,G,RP, XRP,P,XO,Q,XU,CR,XCR, ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TR,XTB, TC,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREEC,TRAYDF,HST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
IPMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTH,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BOEPH,UTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,COEFA,
IORITE,ITER
COMMON/AZI/DTPDP(100),TITLE(15)
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
IWF,WO,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
IC(100), TV(100), WV(100), GH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), URAR(100), QM(100),
IHO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWC(100),
2RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/DMS1/ AREADM(100),OPTDM(100),DTDM(100), CPROD(100),WIDDM(100)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100),
IDTCND(100)
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,FBLE,HBLR,
IHLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TBNOE,TBNCR,
2URARH, VBLE,VBLR,VNOE, VNOR, WTE, WTM, WY
COMMON/PHYS/II
COMMON /MAIN1/ SSF, HFG
COMMON /STG1/ ATR, PTR, CTR, CTA
COMMON /STG2/ HOH, PR, DENBR(100), SUMLS, WVST(100), CO, DI, R, S,
I V, TVIT(100), Z(100), HV, HS(100), WBS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON /CND1/ NERR, COGR(3), K
COMMON /DEM1/ SLKP2, SUMDMA, TDMP(100), APTSE, VCLM, APTSR
COMMON /DEM3/ ARGZ(15)
COMMON /DEATU/ RNR
COMMON /DPI/ SMAPP, HR, SMAPP, HF, UNARAR, UNARAE, A4, AJ, WCO,
I UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHARE
2T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPEAR, PMC2, PMCI, CCCAP2,
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EAI,
4 BHC2, BHC1, VPC2, VPC1, UBP, EEC2, EEC1, PC, CC2, CC1,
5 SCM2, SCM1, CIBC2, CIBC1, DEA2, DEAI, TC2, TCI, CAPI1,
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7 ES, EA, CIBC, BHC, CCCAP, COSTIN, WEIRC, CRANE, BLDG,
8 DEACST, PMCP0, PMCFLO, RETUB2, RETUB1, CPREQ(100), AMSC2,
9 AMSC1
COMMON/NOV25/C11, C12, C13, C14, C15, C16,C21, C22, C23, C24, C31,
I C32, C33, C34, C41, C42
COMMON/CSTLK/ADEA,ENITSD,WOCN,GPMP, FG, SMAPPR, DEARTD, EAR, EAE,TAREAD
1CBH,AMBDAS

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FIGURE 6 (Continued)

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AREAY      -   EFN   SOURCE STATEMENT -   IFN(S) -

COMMON/CSTLK I/SITEW,CTUBED,CTUBEE,CTUBER,SMA1,SMA2,SUMLEV,TRBCND, AREA0280
IENITSR    AREA0285
COMMON/STGCST/TRAWDP,PTRAWO    AREA0290
NTOTAL#NTOTAL    AREA0295
100 WTME#0.0    AREA0300
   WTR#0.0    AREA0305
   SUMLEV#(HST*(ALEV-1.0)+HST+5.4)    AREA0310
   CALL SMAP(WPL,CSLTRP,RATEIN,SMAPPP)    AREA0315
   CALL SMAP(WPL,CSLTRB,RATEIN,SMAPPR)    AREA0320
   CALL SMAP(WPL,CSLTRB,RATEIN,SMAPPH)    AREA0325
C COSTS    AREA0330
   SUBA2#0.0    AREA0335
   SUBA1#0.0    AREA0340
   SUMAS1#0.0    AREA0345
   HFE#0.0    AREA0350
   HFR#0.0    AREA0355
   AE#0.0    AREA0360
   AR#0.0    AREA0365
   ELE#0.0    AREA0370
   RLR#0.0    AREA0375
   ENE#0.0    AREA0380
   RNR#0.0    AREA0385
   TSTEM#TSTEM    AREA0390
   AMODAS#1093.88-0.5703*TSTEM+1.2819E-4*TSTEM**2-0.8824E-6*TSTEM**3    AREA0395
   SUMAS#0.0    AREA0400
   F#(0.0056+0.02436/(DIR*VR)**C.32)*SSF    AREA0405
   FR#F    AREA0410
   CNEW#0.126472*DIR/DOR    AREA0415
   FG#CAPF*G    AREA0420
   GE#G*SMALLE    AREA0425
C CALCULATE TUBE LENGTH,NO. TUBES, AREA IN RECOVERY    AREA0430
   DO110I#1,NK    AREA0435
   HFE#HFE+HS(I)    AREA0440
   ELE#ELE+SL(S(I))    AREA0445
   ENE#ENE+Z(I)    AREA0450
   SUBA1#SUBA1+UBAR(I)*AS(I)    AREA0455
   IF(WTME-TRAYWD(I))105,110,11C    AREA0460
105 WTME#TRAYWD(I)    AREA0465
110 SUMAS1#SUMAS1+AS(I)    AREA0470
   AMODWD#(ALEV*(TRAWDP+0.8333)+(ALEV-1.0)*2.0*BWE    AREA0475
   +2.0*PTRAWO)/ALEV    AREA0480
   WDTRA1#AMODWD-0.8333-2.0*BWE    AREA0485
   WDTRA2#AMODWD-0.8333-2.0*PTRAWO    AREA0490
   SITEW#AMODU*(WDTRA1*TRAYWD(I)/TRAYWD(NK)+0.8333+2.0*BWE)    AREA0495
   +0.8333*(AUNIT-1.0)-1.5*(AMODU-AUNIT)    AREA0500
   WDTRA3#WDTRA1*TRAYWD(I)/TRAYWD(NK)    AREA0505
   UNITW#SITEW/AUNIT    AREA0510
C CALCULATE TUBE LENGTH, NO. TUBES, AREA IN REJECT    AREA0515
   J#NK+1    AREA0520
   DO125I#J,NTOTAL    AREA0525
   HFR#HFR+HS(I)    AREA0530
   RLR#RLR+SL(S(I))    AREA0535
   RNR#RNR+Z(I)    AREA0540
115 SUBA2#SUBA2+UBAR(I)*AS(I)    AREA0545
   IF(WTR-TRAYWD(I))120,125,125    AREA0550
120 WTR#TRAYWD(I)    AREA0555

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FIGURE 6 (Continued)

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AREAY - EFN SOURCE STATEMENT - IFN(S) -

125	SUMAS#SUMAS+AS(I)	AREAC560		
C	CALCULATE EVAP. AND REJECT OVERALL GEOMETRY	AREAC565		
	SUBAS#SUBA1+SUBA2	AREAC570		
	UBARE#SUBA1/SUMAS1	AREAC575		
	UBARR#SUBA2/SUMAS	AREAC580		
	ZNK#NK	AREAC585		
	RNR#RNR/(TOTAL-ZNK)	AREAC590		
	EVE#ENC/ZNK	AREAC595		
	ELF#ELE+FLOAT(NK-1)*TSTH/12.0	AREAC600		
	AE#PI*DOE*ELE*ENE/12.0	AREAC605		
	RASB#FLOAT(NTOTAL-NK-1)*TSTH/12.0	AREAC610		
	RLR#RLR+RASB	AREAC615		
	AR#PI*COR*RLR*RNR/12.0	AREAC620		
130	AP#SUMAS+SUMAS1	AREAC625		
	SMALLA#A1+A2	AREAC630		
	AT#SUMAS+SUMAS1	AREAC635		
	UBPH# SUBAS/AP	AREAC640		
C		AREAC645		
C****	1. TUBING AND TUBE SHEET COST CALCN REVISED FOR SCALING 9/20/65	AREAC650		
	TBLBR # 0.9844 - 1.2903 * DOE + 0.57707 * DOE **2	AREAC655		
	CTUBEE#SMA1* (1.22855E+7/AE)**C.C * AE * 1.20	AREAC660		
	1+TBLBR*(1.22855E+7/AE)**0.1*AE*1.20	AREAC665	47	48
	IF(DOE-1.0) 135,140,140	AREAC670		
135	ENITSE#FLOAT(NK-1)*2.0*ALEV*AMODU	AREAC675		
	GO TO 145	AREAC680		
140	ENITSE#FLOAT(2*NK-1)*2.0*ALEV*AMODU	AREAC685		
145	CITSE#ENITSE*1.20*(4.59C*APTSE	AREAC690		
	1+1.530*(63426.0/(APTSE*ENITSE))**0.1*APTSE	AREAC695		
	2.024*(8.24176E+8 / (ENE*ENITSE))**0.1	AREAC700		
	3NE/(2.0*ALEV*AMODU))	AREAC705	54	55
	ENETSE#4.0*ALEV*AMODU	AREAC710		
	CETSE#ENETSE*1.20*(35.820*APTSE	AREAC715		
	1+4.080*(3252.62 / (APTSE*ENETSE))**0.1*APTSE	AREAC720		
	2+.0670*(528318.0/(ENE*2.0))**0.1*ENE/(2.0*ALEV*AMODU))	AREAC725		
C*****	UNIT COST FOR TUBES + TUBE SHEETS	AREAC730	56	57
	EAE # CTUBEE + CITSE + CETSE	AREAC735		
	UNARAE # EAE / AE	AREAC740		
C*****	REJECT SECTION	AREAC745		
	TBLBR # 0.9844 - 1.2904 * DOR + 0.57707 * DOR **2	AREAC750		
	ADEA #RNR*PI*DOR/12.0*SLS(NTOTAL+1)	AREAC755		
	NITSD# SLS(NTOTAL+1)/4.0	AREAC760		
	ENITSD # 2.0 * ALEV * AMODU * FLOAT(NITSD)	AREAC765		
	CTUBER#SMA2* (1.6078E+6 / (AR + ADEA))**0.1 * AR * 1.20	AREAC770		
	1+TBLBR*(1.6078E+6/(AR + ADEA))**0.1 * AR * 1.20	AREAC775		
C*****	COST FOR ENTERMED TUBE SHEETS	AREAC780	61	
	NITSR#RLR/6.0 - 1.0	AREAC785		
	IF(DOR-1.0) 150,155,155	AREAC790		
150	ENITSR#FLOAT(NITSR) * 2.0 * ALEV * AMODU	AREAC795		
	GO TO 160	AREAC800		
155	ENITSR#FLOAT(2* NITSR) * 2.0 * ALEV * AMODU	AREAC805		
160	CITSR#ENITSR*1.20*(6.81*APTSR	AREAC810		
	1+0.510*(.84918E+4/(APTSR*(ENITSR + ENITSD)))*0.1 * APTS	AREAC815		
	2+0.048 *(1.07437 E+8 / (RNR*(ENITSR + ENITSD)))*0.1	AREAC820		
	3 *RNR/(2.0*ALEV*AMODU))	AREAC825	68	69
	ENETSR#4.0*ALEV*AMODU	AREAC830		
	CETSR#ENETSR*1.20*(45.145*APTSR	AREAC835		

FIGURE 6 (Continued)

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AREAY - EFN SOURCE STATEMENT - IFN(S) -

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1+4.083*( 2123.0 / (APTSR*ENE TSR))**0.1*APTSR
2+0.201*(335740.0/(RNR*2.0))**0.1*RNR/(2.0*ALEV*AMODU))
  EAR # CTUBER + CITSR + CETSr
  UNARAR # EAR / AR
165 EA # EAE + EAR
  RETURN
  END

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AREA0840
AREA0845
AREA0850
AREA0855
AREA0860
AREA0865
AREA0870

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70 71

FIGURE 6 (Continued)

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* \$18FTC SHEL DECK

SHELCCOO

FIGURE 6 (Continued)

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SHEL - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE SHEL
C*****COST FOR MOTOR DRIVEN PLANT 3 / 23 / 66
COMMON/GEN/CASE,G,RP, XRP,P,XO,Q,XU,CR,XCR, RCE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TB,XTB, TO,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREBC,TRAYDP,HST,CL,
1 SPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
1 PMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTF,BIKTE,
1 BIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SK,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/BDEPH,DTPD,SSF2,TCTAL,UMAX,UALP,PI,TWFA,TSTH,CCEFA,
1 ORITE,ITER
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
1 WF,W0,CB,WC,WB, WR,RHONK, RHOK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2 TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
1 C(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UPAR(100), CM(100),
1 HO(100),HI(100),WVFS(100),VVEV(100), TRAYFL(100),TRAYWC(100),
2 RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/DMST1/ AREADM(100),OPTDM(100),DTDM(100), CPROD(100),WIDDM(1
1 00)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100),
1 DTCND(100)
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,H2H,HBLE,HBLR,
1 HLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TBCE,TPNOR,
2 UBARH, VBLE,VBLR,VNOE, VNOR, WME, WTMR, WY
COMMON/PHYS/II
COMMON /MAIN/ SSF, HFG
COMMON /STG1/ ATR, RTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), CO, Q1, R, S,
1 V, TVTT(100), Z(100), HV, HS(100), WRS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON /CNDR1/ NEER, GGR(3), K
COMMON /DEM1/ SLKP2, SUMDMA, TMP(100), APTSE, VCLM, APTSR
COMMON /DEM3/ ARGZ(15)
COMMON /DEA10/ RNR
COMMON /OP1/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO,
1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEH
2 T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPPAR, PMC2, PMC1, CCCAP2,
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ESI, EA2, EAI,
4 BHC2, BHC1, VPC2, VPC1, URPH, EEC2, EEC1, PO, CC2, CC1,
5 SC42, SCM1, CIBC2, CIBC1, DEA2, DEAI, TC2, TCI, CAPI1,
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7 ES, EA, CIBC, BHC, CCCAP, COSTIN, WEIRC, CRANE, BLDG,
8 DEACST, PMCP0, PMCFLO, RETUR2, RETUR1, CPREG(100), AMSC2,
9 AMSC1
COMMON/NOV25/C11, C12, C13, C14, C15, C16,C21, C22, C23, C24, C31,
1 C32, C33, C34, C41, C42
COMMON/CSTLK/ADEA,ENITSD,WCCN,GMPM, FG, SMAPPR, DEARTB, EAR, EAE,T
1 CRH,AMRDAS

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FIGURE 6 (Continued)

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SHEL - EFN : SOURCE STATEMENT - IFN(S) -

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COMMON/POWR21/PO1,PO2,WPROD          SHELO280
DIMENSION DP(100),COLCST(100),EXTCST(100),XINTCS(100) SHELO285
I,TRACST(100)                          SHELO290
DIMENSION AR1(100)                     SHELO295
COMMON/CSTLK1/SITEW,CTUBED,CTUBEH,CTUBER,SMA1,SMA2,SUMLEV,TRBCND, SHELO300
IENITSR                                SHELO305
GTV2(QC00FL)                           SHELO310
1      #2.1786818-.70443622E-01*QC00FL+.93941286E-03*QC00FL**2 SHELO315
2-.53958083E-05*QC00FL**3+.18139197E-07*QC00FL**4 SHELO320
FGAD(QC01FL)*EXP(0.0748E67*ALOG(QC01FL)+0.2138177*ALCG(QC01FL)**2) SHELO325
FLAD(QC02FL)*0.74391/SQRT(QC02FL)      SHELO330
COST1(QC03FL,QC04FL,QC05FL) #C11 + C12 * QC04FL+ C13 * QC03FL+ C14 * QC04FL* QC05FL SHELO335
COST2(QC06FL,QC07FL) #C21 + C22 * QC06FL+ C23 * QC07FL+ C24 * QC0 SHELO340
16FL* QC07FL                           SHELO345
COST3(QC08FL,QC09FL) #C31 + C32 * QC08FL+ C33 * QC09FL+ C34 * QC0 SHELO350
18FL* QC09FL                           SHELO355
COST4(QC10FL) #C41+C42*QC10FL          SHELO360
C**** II. SHELL COST BASED ON MODULATION 9/27/65 SHELO365
100 SMCOLC # 0.0                        SHELO370
SMEXTW # 0.0                            SHELO375
SMINTW # 0.0                            SHELO380
SMTRAC # 0.0                            SHELO385
AR1#0.0                                 SHELO390
AR2#0.0                                 SHELO395
AR3#0.0                                 SHELO400
AR4#0.0                                 SHELO405
NTOT1#NTOTAL+1                          SHELO410
105 DO 115 I # 1, NTOT1                 SHELO415
DP(I) # ABS(PV(I) - 14.696)             SHELO420
IF (DP(I) - DPLIM) 110, 115, 115      SHELO425
110 DP(I) #DPLIM                        SHELO430
115 CONTINUE                            SHELO435
DO 195 I # 1, NTOTAL                    SHELO440
IF (I - NK) 120, 120, 125              SHELO445
120 BWD # BWE                           SHELO450
GO TO 130                               SHELO455
125 BWD #BWR                             SHELO460
C**** COST OF COLUMNS, FOOTINGS,PARTITIONS SHELO465
8000 FORMAT(1H 7E16.8)                 SHELO470
130 AREA1# SITEW *SUMLEV                 SHELO475
ARI(I) # AREA1                          SHELO480
AR11#AREA1+AR11                         SHELO485
FUNC1 # COST1(ALEV, SLS(I), DP(I))      SHELO490
IF (ALEV - 1.0) 135, 135, 140          SHELO495
135 FUNC1 # 0.8 * FUNC1                 SHELO500
140 COLCST(I) # FUNC1 * AREA1            SHELO505
IF (I - NTOTAL) 145, 150, 150          SHELO510
145 SMCOLC #SMCOLC +COLCST(I)           SHELO515
C**** COST OF EXTERIOR WALLS             SHELO520
150 AREA2#(SLS(I)+1STH/12.0)*2.0*(SUMLEV+ SITEW ) SHELO525
AR22#AR22+AREA2                         SHELO530
FUNC2 # COST2(SLS(I), DP(I))            SHELO535
EXTCST(I) # FUNC2 * AREA2               SHELO540
155 SMEXTW #SMEXTW +EXTCST(I)           SHELO545
C**** COST OF INTERIOR LONGITUDINAL WALLS SHELO550

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FIGURE 6 (Continued)

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SHFL - EFN SOURCE STATEMENT - IFN(S) -

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160 AREA3#(SLS(I)+TSTH/12.0)*SUMLEV*(AUNIT-1.0)          SHELO560
   AR33#AR33+AREA3                                          SHELO565
   FUNC3 # COST3( SLS(I), DP(I))                            SHELO570
   XINTCS(I) # FUNC3 * AREA3                                SHELO575
165 SMINTW # SMINTW + XINTCS (I)                            SHELO580
C**** COST OF BRINE TRAY                                     SHELO585
170 AREA4#(TRAYWD(I)+2.0*(HST-FREED))*(SLS(I)+TSTH/12.0)*AMCDU*ALEV SHELO590
   AR44#AR44+AREA4                                          SHELO595
   IF (SLS(I) - 7.0) 175, 175, 180                          SHELO600
C**FUNC4 CHANGED FROM FUNC4 # 2.435 10/6/65                SHELO605
175 FUNC4#(3.903+5.258*(ALEV-1.0))/ALEV                     SHELO610
   GO TO 185                                                 SHELO615
180 FUNC4#COST4(SLS(I),ALEV)                                SHELO620
185 TRACST (I) # FUNC4 * AREA4                              SHELO625
190 SMTRAC # SMTRAC +TRACST (I)                             SHELO630
195 CONTINUE                                                SHELO635
C**** COST OF END WALLS                                     SHELO640
200 FUNC2 # COST2(SLS (NTOTAL+1), DP (NTCTAL+1))           SHELO645
205 ENDWL2#FUNC2* SITEW * SUMLEV                             SHELO650
   FUNC2#COST2(SLS(NK+1),DP(NK+1))                         SHELO655
210 ENDWL3#FUNC2 *SITEW *SUMLEV                             SHELO660
   SMEXTW#SMEXTW*(196330.0/AR22)**0.03                     SHELO665
215 SMEXTW#SMEXTW+ENDWL2+ENDWL3                             SHELO670
C*** WATER DEFLECTOR COSTS (TUBE BUNDLE)                   SHELO675
   AREA5#(ALEV-1.0)*(2.0*BWE-3.0)*ELE*AMODU                SHELO680
   AREA5R#(ALEV-1.0)*(2.0*BWR-3.0)*RLR*AMODU                SHELO685
   DFLECR#3.826*AREA5E + 11.730*AREA5R                     SHELO690
C*** WATERFALL DISTRIBUTION SYSTEM IX.A.1(MISC.)           SHELO695
   WTRDSA#SUMLEV*(0.5*(SUMLEV-HST-5.4) + 2.0)               SHELO700
   WTRDSV#WTRDSA*SITW                                       SHELO705
   WTRDST#WTRDSV*3.277                                       SHELO710
C*** CONCRETE FDNS AND SLAB COSTS                           SHELO715
   SUML#ELE+RLR+SLS(NTOTAL+1)                                SHELO720
   FVDSLR# RDEPH *ALEV*SUML*WTIME*AMODU/ 3.9443 E+5        SHELO725
   I#1134500.0                                              SHELO730
C*** EXPANSION JOINT COSTS (COULD BE TEMP,PRESS FUNCTION) SHELO735
   UNITW#SITEW/AUNIT                                         SHELO740
   XNVERT # 0.0                                              SHELO745
   PERIM1 # (2.0 * UNITW + 2.0 * SUMLEV) * (THF - TB) / 157.4 * 8.0 SHELO750
   EXPJ01 # PERIM1 * AUNIT * 28.03                          SHELO755
   PERIM2 # 2.0 * SUML+ SUMLEV * TCAL                       SHELO760
   EXPJ02 # PERIM2 *(AUNIT - 1.0) * 2.0 * 28.03            SHELO765
C** INTERMEDIATE LONGITUDINAL JOINTS                        SHELO770
   IF(UNITW-50.0)220,220,225                                SHELO775
220 PERIM3#0.0                                              SHELO780
   GO TO 265                                                 SHELO785
225 TJNT1#TS(I)                                              SHELO790
   ALTJNT#3.941E+5/TS(I)**1.625                             SHELO795
   NJNT #UNITW/ALTJNT                                       SHELO800
   NJNTS # VJNT                                             SHELO805
   ANJNT # FLOAT( NJNT)                                     SHELO810
   PERIM3#0.0                                              SHELO815
   AJNT1 #0.0                                              SHELO820
   DO 260 I#1,NTOTAL                                       SHELO825
230 IF(TJNT1-TS(I+1)-20.0)255,255,235                     SHELO830
235 PERIM3#PERIM3+AJNT1*ANJNT*2.0                          SHELO835

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FIGURE 6 (continued)

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SHEL      - EFN  SOURCE STATEMENT - IFN(S) -

TJNT1#TS(I)
AJNTL#0.0
ALTJNT#3.941E+5/TS(I)**1.625
NJNT #UNITW/ALTJNT
ANJNT # FLOAT( NJNT)
IF (NJNTS - NJNT) 245, 245, 240
240 XNVERT # XNVERT + ANJNT
NJNTS # NJNT
245 IF ( TS(I) - TS (I+1) - 20.0 ) 230, 230, 250
250 PERIM3 # PERIM3 + SLS(I) * ANJNT * 2.0
XNVERT # XNVERT + ANJNT * 2.0
TJNT1#TS(I + 1)
AJNTL#0.0
ALTJNT#3.941E+5/TS(I+1)**1.625
NJNT #UNITW/ALTJNT
ANJNT # FLOAT( NJNT)
GO TO 260
255 AJNTL#AJNTL+SLS(I)
XNVERT # XNVERT + ANJNT
260 CONTINUE
XNVERT # XNVERT + ANJNT
PERIM3#PERIM3+ (AJNTL + SLS(NTOT1)) * ANJNT * 2.0
265 EXPJC3#PERIM3*AUNIT*28.03
C** VERTICAL JOINTS FOR INTERMEDIATE LONGITUDINAL JOINTS
PERIM4# SUMLEV * XNVERT
EXPJC4 # PERIM4 * AUNIT * 28.03 * 2.0
EXPJNT#EXPJC1+EXPJC2+EXPJC3 + EXPJC4
C**** TOTAL COST OF EVAPORATOR SHELL
C**** REVISIONS TO EVAP SHELL COST 9/29/65
SMCOLC#SMCOLC-COLCST(NK)-COLCST(NTOTAL)
AR11#AR11-AR1(NK)-AR1(NTOTAL)
SMCOLC#SMCOLC*(514000.0/AR11)**0.03
SMINTW#SMINTW*(65662.0/AR33)**0.03
SMTRAC#SMTRAC*(540204.0/AR44)**0.1
C*** REVISION TO SMVALV 1/18/66
HATCH# AMODU * (4.0 * ALEV + 8.0 + (0.1 * TOTAL + 1.0) + (TOTAL-1.0))
PRLIEZ#0.0
VRLIEZ#0.0
DO 285 I#1,NTOT1
IF(PV(I)-14.696) 275,270,270
270 PRLIEZ#PRLIEZ+1.0
GO TO 285
275 IF(PV(I)-3.75)290,280,280
280 VRLIEZ#VRLIEZ+1.0
285 CONTINUE
290 VRLIEZ#VRLIEZ+PRLICZ
SMVALV#(825.50*PRLIEZ+ 660.40*VRLIEZ) * AMODU
I + 205680.0*(HATCH / 431.0) **0.8
IF(ALEV-1.0)295,295,300
295 DFLECR#0.0
GO TO 305
300 DFLECR#DFLECR*(100240.0/(AREASE+AREASR))**0.1
305 WTRDST # WTRDST * (772723.0/ WTRDST) **0.03
FNOSLB # FNOSLB * ( 1134500.0/ FNOSLB) **0.03
C*** DEMISTER + SUPPORT COST 10/12/65
COSTDM # COSTDM + 10.05 * SUMDMA * ALEV * AMODU

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FIGURE 6 (Continued)

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SHEL - EFN SOURCE STATEMENT - IFN(S) -

C*** II-E ADJUSTABLE WEIRS REVISED 9/24/65	SHEL1120	
WEIRC # 1909240.0*((WTME - (WTME/8.0) * 0.8)	SHEL1125	
I * FLOAT(NTOTAL - 1) * ALEV * AMODU) / 50430.0) **0.9	SHEL1130	159
310 ES # SMCOLC + SMEXTW + SMINTW + SMTRAC + COSTDM	SHEL1135	
I+WEIRC+SMVALV+DFLECR+WTRDST+EXPJNT+FNDSL	SHEL1140	
ESHELL # ELE * SITEW * SUMLEV	SHEL1145	
RSHELL # RLR * SITEW * SUMLEV	SHEL1150	
VOLM # ESHELL + RSHELL	SHEL1155	
USHELV # ES / VOLM	SHEL1160	
C*** III.PUMPS AND DRIVES WITH SCALING REVISED 9/20/65	SHEL1165	
C CALCULATE SYSTEM HEAD IN TOP AND BOTTOM STAGES	SHEL1170	
GTV21#GTV2(TV(2))	SHEL1175	
IF(XCR)315,320,315	SHEL1180	
315 GTV2N#GTV2(TV(NTOTAL+1))	SHEL1185	
HS1#2.3*(GTV21-GTV2N)	SHEL1190	
GO TO 325	SHEL1195	
320 HS1#2.3*(GTV21-14.7)	SHEL1200	
325 H2#HH+HS1	SHEL1205	
C CALCULATE HEADS AND POWER	SHEL1210	
FRICR#SSF*(0.0056+0.02436/(DIR*VR)**0.32)	SHEL1215	167
FRICE#SSF*(0.0056+0.02436/(DIE*VE)**0.32)	SHEL1220	168
FRICH#SSF*(0.0056+0.02436/(DIH*VH)**0.32)	SHEL1225	169
HEADR#6.0*FRICR*RLR*VR**2/(DIR*32.174)	SHEL1230	
HEADE#6.0*FRICE*ELE*VE**2/(DIE*32.174)	SHEL1235	
HEADH#6.0*FRICH*HLH*VH**2/(DIH*32.174)	SHEL1240	
HE#SUMLEV	SHEL1245	
HR#SUMLEV	SHEL1250	
IF(XCR)335,335,330	SHEL1255	
C*** CALCULATIONS FOR HEAD REQUIREMENTS REVISED 10/ 5 65	SHEL1260	
330 HDEL # HD + HEADR + 20.0	SHEL1265	
GTV21 # GTV2(TS(1))	SHEL1270	
GTV2N # GTV2(TS(NTOTAL +1))	SHEL1275	
HS1 # 2.3 * (GTV21 - GTV2N)	SHEL1280	
HREC # HE + HH + HS1 + HEADE + HEADH + 14.5	SHEL1285	
GTV31 # 29.7	SHEL1290	
GTV3N # GTV2(TV (NTOTAL +1))	SHEL1295	
HS2 # 2.3 * (GTV31 - GTV3N)	SHEL1300	
HPR # HS2 + 35.0 + 5.0	SHEL1305	
HDEA # HE + 25.0 - 20.0	SHEL1310	
GO TO 340	SHEL1315	
335 HDEL #HD+HR+HH+HS1+HEADR+HEADE+HEADH	SHEL1320	
HRFC#0.0	SHEL1325	
340 PCNST#3.7676768E-10	SHEL1330	
II # 1	SHEL1335	
CALL DINTPL (TO, CO, CPIN)	SHEL1340	178
WOTJRB # 0.0	SHEL1345	
WOVENT # 0.036 * (WP + WX)	SHEL1350	
POREC#PCNST*HREC*WF/SMALLE	SHEL1355	
POBLD#PCNST*HBL*WB/SMALLE	SHEL1360	
POPRD#PCNST*HPR*WX/SMALLE	SHEL1365	
PODEA # PCNST * HDEA * (WX + WB + WOVENT) / SMALLE	SHEL1370	
345 WOCN # WO + WOVENT	SHEL1375	
PODEL # PCNST * HDEL * WOCN / SMALLE	SHEL1380	
PO1#PODEL+POBLD+POPRD +PODEA	SHEL1385	
PO2#POREC	SHEL1390	
PO3#EXP(.0137*TB-6.121)*(WO-WC)/0.34667F+6	SHEL1395	181

FIGURE 6 (Continued)

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SHEL - EFN SOURCE STATEMENT - IFN(S) -

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PO#PO1+PO2+PO3
350 IF(XCR)355,355,360
355 PMCPD#27573.726*(PO1+PO2)
GOTO365
360 PMCPD#1340.4826*(20.57*PO1+20.98*PO2)
365 UNDRVE#PMCPD/(1340.4826*(PO1+PO2))
8005 FORMAT (1H0 16, 6E16.8)
C
370 II # 5
CALL DINTPL (TO, CO, RHO )
GPMO # WOCN / (8.022 * RHO )
CALL DINTPL ( SMT (NK), C (NK) , RHO )
GPMR # WF / (8.022 * RHO )
CALL DINTPL (TS(NTOTAL+1), CP , RHO )
GPM # WX / (8.022 * RHO )
CALL DINTPL ( SMT (NK+1), CO, RHO )
GPMDE#(WR + WX + WOVENT) / (8.022 * RHO )
UDEL # 0.927 + .00175 * HDEL
UREC # 1.534 + .00175 * HREC
UPROD # 0.786 + .00175 * HPR
UDEA # 1.5225 + 0.00175 * HDEA
PUMPO
I # UDEL * (142300.0* AUNIT / GPMO)** 0.2 * GPMO * (5.0/AUNIT)**0.1
PUMPR
I # UREC * (231700.0*AUNIT/ GPMR) **0.2 * GPMR * (5.0/AUNIT) **0.1
PUMPP
I # UPROD* (34500.0* AUNIT/ GPM) ** 0.2 * GPM * (5.0/AUNIT)** 0.1
PUMPDE
I # UDEA * (71300.0* AUNIT /GPMDE)** 0.2 * GPMDE * (5.0/AUNIT)**0.1
PMPPIT
I # 2.023 * (231700.0* AUNIT/ GPMR) **0.1 *GPMR * (5.0/AUNIT) **0.1
PMCFLO #
I PUMPO + PUMPR + PUMPP + PUMPDE + PMPPIT
C
C*** MOTOR DRIVES 3 / 23 / 66
DRVMO
I # 51927.0* (2.237 *AUNIT /PCDEL)**0.2 * PCDEL * (5.0/AUNIT)**0.1
DRVMR
I # 40638.0*(11.931 *AUNIT /PCREC)**0.2 * PCREC * (5.0/AUNIT)**0.1
DRVMP
I # 76233.0* (0.746 *AUNIT /PCPRD)**0.2 * PCPRD * (5.0/AUNIT)**0.1
DRVME
I # 66863.0* (0.932 *AUNIT /PCDEA)**0.2 * PCDEA * (5.0/AUNIT)**0.1
PMCPD #
ICRVMO + DRVMR + DRVMP + DRVME
PMC#PMCFLO +PMCPD
I + TRBCND
C**** IV DEGASSIFICATION SYSTEM COSTS (DEAERATOR) 9/29/65
C*** DEAEERATOR FOUNDATION
375 DEFNAR# SITEW *SLS(NTOTAL+1)
DEAFND#12.903*DEFNAR
C*** DEAEERATOR EXTERIOR WALLS
DEXWAR#2.0*SLS(NTOTAL+1)*(SUMLEV+ SITEW )
FUNC2#COST2(SLS(NTOTAL+1),DP (NTOTAL+1))
CEFN2#FUNC2
DEXWLC#FUNC2*DEXWAR

```

FIGURE 6 (Continued)

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SHEL - EFN SOURCE STATEMENT - IFN(S) -

C*** DEAERATOR CONDENSER 11/ 1/65	SHEL1680		
TBLBR # 0.9844 - 1.2903 * DOR + 0.57707 * DOR **2	SHEL1685		
CTUBED#SMA2* (1.6078E+6 / (AR + ADEA))**0.1 * ADEA * 1.20	SHEL1690		
1+TBLBR*(1.6078E+6/(AR + ADEA))**0.1 * ADEA * 1.20	SHEL1695		
C*****COST FOR INTERMED TUBE SHEETS	SHEL1700	225	
CITSD#ENITSD*1.20*(6.81*APTSR	SHEL1705		
1+0.510*(.84918E+4/(APTSR*(ENITSR + ENITSD)))*0.1 * APTS	SHEL1710		
2+0.0480*(1.07437 E+8 / (RNR*(ENITSR + ENITSD)))*0.1	SHEL1715		
3 *RNR/(2.0*ALEV*AMODU))	SHEL1720	226	227
DEARTB # CTUBED + CITSD	SHEL1725		
C*** DEAERATOR TRAY AND SUPPORTS	SHEL1730		
DETRAR#ASIEV	SHEL1735		
DETRAC#ASIEV*38.486	SHEL1740		
C*** DEAERATOR BLOWER COSTS	SHEL1745		
BLOWRC#R.5498E-3*(WX+WR)	SHEL1750		
DEAFND#DEAFND*(7750.C/DEFNAR)**0.03	SHEL1755	228	
DEXWLC#DEXWLC*(18600.C/DEXWAK)**0.03	SHEL1760	229	
DETRAC#DETRAC*(69750.C/DETRAR)**0.03	SHEL1765	230	
BLOWRC#BLOWRC*(172.2E6/(WX+WR))**0.1	SHEL1770	231	
DEACST#DEAFND+DEXWLC+DEARTB+DETRAC+BLOWRC	SHEL1775		
RETURN	SHEL1780		
END	SHEL1785		

FIGURE 6 (Continued)

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*
\$IBFTC VAL DECK

VAL00000

FIGURE 6 (Continued)

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VAL - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE VALVE
C *****COST FOR MOTOR DRIVEN PLANT 3 / 23 / 66
COMMON/GEN/CASE,G,RP, XRP,P,XO,Q,XU,CR,XCR, ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TR,XTB, TC,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREED,TRAYDP,HST,CL,
1 SPL
COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
1 PMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKT,BIKTE,
1 BIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FOULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSFI
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATA1/RDEPH,DTPD,SSF2,TCTAL,UMAX,UALP,PI,TWFA,TSTH,CGEFA,
1 ORITE,ITER
COMMON/AZ1/DTPDP(100),TITLF(15)
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
1 WF,WO,CB,WC,WB, WR,RHONK, RHCK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2 TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
1 C(100), TV(100), WV(100), OH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UPAR(100), CM(100),
1 HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWC(100),
2 RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/DMST1/ AREADM(100),OPTDM(100),DTDM(100), CPROC(100),WIDCM(1
1 00)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), CTCLR(100),
1 DTCND(100)
COMMON/STAGE2/ AH, BAROM,BWF,BWR,COSTDM,ELE,ESHELL,HRH,HBLE,HBLR,
1 HLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TENGE,TENCR,
2 UBARH, VBLE,VBLR,VNOE, VNOR, WIME, WIMR, WY
COMMON/PHYS/II
COMMON /MAIN1/ SSF, HFG
COMMON /STG1/ ATR, BTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), CC, DI, R, S,
1 V, TVTT(100), Z(100), HV, HS(100), WBS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON /CND1/ NERR, CCGP(3), K
COMMON /DEM1/ SLKP2, SUMDMA, TUMP(100), APTSE, VCLM, APTSR
COMMON /DEM3/ ARGZ(15)
COMMON /DEA1C/ RNR
COMMON /DPI1/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO,
1 UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHVAL
2 T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPEAR, PMC2, PMC1, CCCAP2,
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1,
4 BHC2, BHC1, VPC2, VPC1, URPH, EEC2, EEC1, PC, CC2, CC1,
5 SCM2, SCM1, CIBC2, CIBC1, DEA2, DEA1, TC2, TC1, CAP11,
6 CAP12, CAP13, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7 ES, EA, CIBC, BHC, CCCAP, CCSTIN, WEIRC, CRANE, BLDG,
8 DEACST, PMCP0, PMCFLO, RETUB2, RETUB1, CPREG(100), AMSC2,
9 AMSC1
COMMON/NOV25/C11, C12, C13, C14, C15, C16,C21, C22, C23, C24, C31,
1 C32, C33, C34, C41, C42
COMMON/CSTLK/ADEA,ENITSD,WOCN,GMPM, FG, SMAPPR, CEARTB, EAR, EAE,TVAL
1 CBH,AMPDAS

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FIGURE 6 (Continued)

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VAL - EFN SOURCE STATEMENT - IFN(S) -

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COMMON/CSTLK I/SITEW,CTURED,CTUREE,CTURER,SMA1,SMA2,SUMLEV,TRBCND, VALCO280
IENITSR VALCO285
NTOTAL#NTOTAL VALCO290
C D, VALVES AND PIPING VALCO295
C VALCO300
C** VI VALVES AND PIPING TURBINE PLANT 11/15/65 VALCO305
SITEWR#SITEW/237.60 VALCO310
UFCTR # AUNIT / AMODU + 0.6667 * (1.0 - (AMODU / AUNIT) ** (-1.5)) VALCO315 3
VPR1 # WO / (AUNIT * 6.44E7) VALCO320
IF(WC)100,105,105 VALCO325
100 SAVEWC#WC VALCO330
WC#0.0 VALCO335
105 CONTINUE VALCO340
VPR14 # WC / (AUNIT * 3.0058E+7) VALCO345
VP11 #13340.0* VPR1**1.2 * AUNIT VALCO350 7
VP12 # 26925.0*VPR1**0.5 * SQRT(6.25 E+4 + ( 0.25 * SITEW) **2) VALCO355
1 / 255.84 * AUNIT VALCO360 8 9
VP14 # 164751.0* VPR14**0.5 * UFCTR * SITEWR VALCO365 10
VP13 # 9598.6 * VPR1 ** 0.8 * AUNIT VALCO370 11
VPC1 # VP11 + VP12 + VP13 + VP14 VALCO375
VPR2 # (WB + WX)/(AUNIT * 3.4430 E +7) VALCO380
VPR23# (WB + WX)/(AMODU * 3.4430 E +7) VALCO385
VPR24 # (WB + WX) / 1.7215 E+8 VALCO390
VP21 # 20542.0* VPR2**1.2 * AUNIT VALCO395 12
VP22 # 24400.0* VPR2 **0.5 * AUNIT VALCO400 13
VP24 # 159373.0* VPR24**0.5 VALCO405 14
VP25 # 90119.0* VPR2 ** 0.5 * UFCTR * SITEWR VALCO410 15
VP23 # 36682.0* VPR23** 0.8 * AMODU VALCO415 16
VPC2 # VP21 + VP22 + VP23 + VP24 + VP25 VALCO420
VPR3 # (WO-WB-WX)/(AUNIT * 3.0058E7) VALCO425
VPR32# (WO-WB-WX)/ 1.5029 E+8 VALCO430
VPR33# (WO-WB-WX)/(AMODU * 3.0058E7) VALCO435
VP31 # 11835.0* VPR3 ** 1.2 * AUNIT + 72732.0* VPR32 **1.2 VALCO440 17 18
VP32 # 147725.0* VPR32** 0.5 VALCO445 19
VP34 # 89681.0* VPR32 ** 0.5 * SITEWR VALCO450 20
VP33 # 7367.2 * VPR33** 0.8 * AMODU VALCO455 21
VPC3 # VP31 + VP32 + VP33 + VP34 VALCO460
VPR4 # WF/(AUNIT * 1.2081E8) VALCO465
VPR44# WF/(AMODU * 1.2081E8) VALCO470
VP41 # 93318.0* VPR4**1.2 * AUNIT VALCO475 22
VP42 # 40794.0* VPR4 **0.5 * (RLR + SLS (NTOTAL + 1) + 60.0) VALCO480
1 / 119.54 * AUNIT VALCO485 24
VP44 # 20395.0* VPR4 ** 0.5 * UFCTR * SITEWR * 5.0 VALCO490 25
VP43 # 21357.0* VPR4 ** 0.8 * AUNIT VALCO495 26
VPC4 # VP41 + VP42 + VP43 + VP44 VALCO500
VPR5 # G / ( AUNIT * 50.E+6) VALCO505
VPC5 # 12986.0* VPR5 * AUNIT VALCO510
VPR6 # WF/(AUNIT*1.2081 E+8) VALCO515
VP62 # 48484.0* VPR6 **0.5 * AUNIT VALCO520 27
VP64 # 116029.0* VPR6 ** 0.5 * UFCTR * SITEWR VALCO525 28
VP63 # 16336.0* VPR6 ** 0.8 * AUNIT VALCO530 29
VPC6 # VP62 + VP63 + VP64 VALCO535
VPR7 # WX/(AUNIT * 1.7221 E+7) VALCO540
VPR72 # WX / 8.6105 E+7 VALCO545
VP71 # 6876.2 * VPR7**1.2 * AUNIT VALCO550 30
VP72 # 432044.0* VPR72** 0.5 VALCO555 31

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FIGURE 6 (Continued)

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VAL - EFN SOURCE STATEMENT - IFN(S) -

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VP74 # 54540.0* VPR72 ** 0.5 * SITEWR          VALCC56C 32
VP73 # 16842.0* VPR7 ** 0.8 * AUNIT             VALCC56S 33
VPC7 # VP71 + VP72 + VP73 + VP74               VALCC57C
VPR8 # WB/(AUNIT * 1.7209 E7)                   VALCC57S
VPR82 # WB / 8.6045 E+7                          VALCC58C
VP81 # 5019.4 * VPR8 ** 1.2 * AUNIT             VALCC58S 34
VP82 # 120306.0* VPR82** 0.5                   VALCC59C 35
VP84 # 37603.0* VPR82**0.5 * SITEWR            VALCC59S 36
VP83 # 5873.2 * VPR8 ** 0.8 * AUNIT             VALCC60C 37
VPC8 # VP82 + VP83 + VP81 + VPR4               VALCC60S
VPR9 # ( WB + WX) / (AUNIT * 3.443 E+7)         VALCC61C
VPR92# ( WB + WX) / 1.7215 E+8                 VALCC61S
SITELR #(ELE + RLR + SLS (NTOTAL+1) )/326.48    VALCC62C
VP91 # 10858.0* VPR9 ** 1.2 * AUNIT             VALCC62S 39
VP92 # 315196.0* VPR92** 0.5 * (2.0 * AMODU * ALEV / 80.0)* SITELRVALCC63C 40
VPC9 # VP91 + VP92                             VALCC63S
VPR10 # PO / (AUNIT * 16.426)                   VALCC64C
SITEWR #( SITEW + ELE + RLR + SLS (NTOTAL +1) + 500.00)/1043.96 VALCC64S
VP101 # 4972.6 * VPR10 ** 1.2 * AUNIT           VALCC65C 42
VP102 # 74687.0* VPR10 ** 0.5 * SITWLR          VALCC65S 43
VP103 # 2625.0 * VPR10 ** 0.8 * AUNIT           VALCC66C 44
VP104 # 10521.0* VPR10 ** 0.5 * AUNIT           VALCC66S 45
VP105 # 700.0* VPR10 * AUNIT                   VALCC67C
VPCP# VPC1 + VPC2 + VPC3 + VPC4 + VPC5 + VPC6 + VALCC67S
I VPC7 + VPC8 + VPC9                             VALCC68C
VPC11 # 0.07861 * VPCP                         VALCC68S
VPC # VPCP + VPC11                             VALCC69C
110 UNPIPE#VPC/WF                             VALCC69S
C VALCC70C
C*** VII. BRINE HEATER COST SCALING FACTOR ADDED 9/25/65 VALCC70S
115 DTSBH#DOH/12.0*SQRT(3.594*HN/AUNIT)          VALCC71C 48
ATSBH # PI * DTSBH **2 / 4.0                   VALCC71S
NITS# 0.20 *HLH/DOH -0.5                       VALCC72C
ANITS#NITS                                       VALCC72S
TBLBR # 0.9844 - 1.2903 * DOH + 0.57707 * DOH **2 VALCC73C
TCRH # A3 *(1.11469E+6/ AH)**0.1 * AH /AUNIT * 1.25 VALCC73S
I + TBLBR *(1.11469E+6 / AH) **0.1 * AH / AUNIT * 1.25 VALCC74C 50
TSCBH # ATSRH * (30.70 * 2.C + 6.12 * ANITS) * 1.25 VALCC74S
I + (0.049*2.0 +0.024*ANITS) * 1.25*HN/AUNIT    VALCC75C
SHELLC # (12.29* ATSBH * HLH)                   VALCC75S
I * (1.1079E+4 / (ATSBH * HLH )) **0.1 * 1.25   VALCC76C 51
BHC#(TCRH+TSCBH+SHELLC )*AUNIT                 VALCC76S
A4 #(TSCBH+SHELLC)*AUNIT/AH                     VALCC77C
120 UNSHHT#A4                                   VALCC77S
RETURN                                           VALCC78C
END                                              VALCC78S

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FIGURE 6 (Continued)

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\$ORIGIN
\$IBFTC OUTPCOSTLY
DECKOUTPCC00
OUTPCC05

FIGURE 6 (Continued)

OUTP - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE OUTPUT
C**** OUTPUT FOR NORITAKE 8/25/65
COMMON/GEN/CASE,G,RP, XRP,P,XC,C,XU,CR,XCR, ROE,ROER
COMMON/TEMPC/TSTEAM,TS(100), THF,TB,XTB, TC,TP,TA,CC,CP
COMMON/GEOME/AMODU,ALEV,AUNIT,TCTALE,TOTALR,FREED,TRAYCP,FST,CL,
ISPL
COMMON/ECON/SMALLE,SMALLO,SMALLB,SMALLP,RATEIN,WPL, CAPF,THERM,
IPMSTMC
COMMON/TUBING/ DOH,DIH,DOE,DIE,UOR,DIR,A1,A2,A3,BIKTF,BIKTE,
IBIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/FJULIN/RH,RE,RSR,SH,SE,SR,VH,VE,VR
COMMON/PUMPH/HD,HH,HBL,HPR,FFHL,SSF1
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNN,NNN,XLLL,LLL
COMMON/DATAI/BDEPH,DTPD,SSF2,TOTAL,UMAX,UALP,PI,TWFA,TSTH,CCEFA,
IURITE,IIER
COMMON/AZI/DTPDP(100),TITLE(15)
COMMON/TCVLI/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMBN,TCF,WX,
IWF,WJ,CB,WC,WB, WR,RHONK, RICK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
IC(100), TV(100), WV(100), QH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), CM(100),
IHO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWC(100),
2RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/DMSTI/ AREADM(100),DPTDM(100),DPTDM(100), CPROD(100),WIDDM(100)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100),
ICTCND(100)
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,FBLE,FBLR,
IHLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHLL, TENOE,TENCR,
2UBARH, VBLE,VBLR,VNOE, VNOR, WINE, WTRM, WY
COMMON/PHYS/II
COMMON /MAIN/ SSF, HFG
COMMON /STG1/ ATR, BTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), CO, DI, R, S,
I V, TVTT(100), Z(100), HV, HS(100), WBS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON /CNDRI/ NERR, CGOR(3), K
COMMON /DEMI/ SLKP2, SUMDMA, TDMPI(100), APTSE, VCLM, APTSR
COMMON /DEM3/ ARGZ(15)
COMMON /DEAIC/ RNR
COMMON /DPI/ SMAPPP, HR, SMAPPH, HF, UNARAR, UNARAE, A4, AJ, WCO,
I UBARE, UBARR, UTHE, AE, AR, ATHE, THEL, ENE, THEN, HFE, HFR, THEHOUTPQ220
2T, HC2, HCI, CC2, CCI, POCST2, POCST1, ALPEAR, PMC2, PMC1, CCCAP2,OUTPQ225
3 CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1,
4 BHC2, BHC1, VPC2, VPC1, UBPH, EEC2, EEC1, PO, CC2, CCI,
5 SCM2, SCM1, CIRC2, CIRC1, DEA2, DEAI, TC2, TCI, CAPI1,
6 CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7 ES, EA, CIBC, BHC, CCCAP, CCSTIN, WEIRC, CRANE, BLDG,
8 DEACST, PMCPO, PMCFLO, RETUB2, RETUB1, CPREQ(100), AMSC2,
9 AMSC1
COMMON/JAN18/WPI
COMMON/JAN27/WM, SUMALP,SUMGH,WPNK,CPSN,CPSNK
DIMENSION ALPHA(100)
NN#NTOTAL

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FIGURE 6 (Continued)

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      OUTP      - EFN  SOURCE STATEMENT - IFN(S) -

NNK#NN-NK                                OUTPC285
C(1)#CCF                                OUTPC29C
CSURP#2.0*AMBN/(ACPSN+ACPTNK)           OUTPC295
PLP#SUMLS                                OUTPC30C
PNP#SUMN'                                OUTPC305
WRITE (6,8000)( TITLE(I),I#1,I2)        OUTPC310
8000 FORMAT(1H1 12A6)                     OUTPC315
WPMWP1#WP(NTOTAL+2)-WP1                  OUTPC32C
WZ#WPMWP1                                OUTPC325
WP1#WP1*2.90333                           OUTPC33C
WPMWP1#WPMWP1*2.90333                     OUTPC335
WZY          # (WP(NTOTAL+2))*2.9C333     OUTPC340
WRITE (6,8005)WP1,WPMWP1, WZY             OUTPC345
WP1#WP1/2.90333                           OUTPC35C
8005 FORMAT(1H0,17HPRODUCT ABOVE-GPD,E17.6,3X,17HPRODUCT FROM SEMS, OUTPC355
1E20.8,3X,22HTOTAL PRODUCT RATE-GPD,E20.8) OUTPC36C
WRITE (6,801C)FFHL,SMALLD,TOTAL,CAPE,SMALLP,TSTEAM, SPALLE, OUTPC365
1SMALLP,THF,HD ,SMAPPP                     OUTPC37C
8010 FORMAT(1H0,37X,                      21HEVAP HEAT LCSS (PCT) OUTPC375
1 7XF 8.3,4X15HPOWER ($/KW HR)17XF10.6/ OUTPC38C
213H TOTAL STAGES14XFR.0,3X17HPLANT LCAD FACTOR 8XF10.4,5X OUTPC385
313HHEAT ($/MBTU)17XF12.6/11H STEAM TEMPI4XF10.2,3X, OUTPC39C
48HPUMP EFF17XF10.4,5X17HANNUAL CAP 1/YEAR14X,F10.4/ OUTPC395
515H MAX BRINE TEMP 10X F10.2,3X 13HDELIVERY HEAC 14XF 8.2,5X OUTPC40C
6 28HEVAP AND REJ RETUBING CHARGE F14.6) OUTPC405
WRITE (6,8015)TO,HR, SMAPPH, TA,HE,UNARAR,CO,HH,UNARAE,CP,HBL,A3 OUTPC410
8015 FORMAT(11H OCEAN TEMP F24.2,3X11HREJECT HEAD14XF10.2,5X OUTPC415
1 22HHEATER RETUBING CHARGE F20.6, /13H AMBIENT TEMPI2XF10.2, OUTPC42C
23X9HEVAP HEAD,16X,F1C.2,5X20HREJECT AREA ($/SQFT) 9X,F11.4/ OUTPC425
320H SEA WATER SALT CONC5XF10.5,3X,11HHEATER HEAC14XF10.2,5X, OUTPC43C
418HEVAP AREA ($/SQFT)12X,F10.4/ OUTPC435
518H PRODUCT SALT CONC7XF10.5,3X13HRLCWDOWN HEAD 12X F10.2,5X OUTPC44C
621HBRINE HEATER ($/SQFT) 9X F1C.4) OUTPC445
WRITE (6,8020)CR,HPR,A4,P,RP,AJ, RATEIN,Q,SSFI,TP,WPL, OUTPC45C
1CSLTBH,CSLTBP                             OUTPC455
8020 FORMAT(21H CONC RATIO C(B)/C(0)4XF10.5,3X12HPRODUCT HEAC12XF11.2,5 OUTPC46C
1X25HBRINE HEATER SHELL $/SQFT F15.4 , OUTPC465
2 /16H RECCVER RATIO P9XF10.5/ OUTPC47C
418H PERFORMANCE RATIO7XF10.3,3X11HHIGHER COST15XF10.4,4X, OUTPC475
5 13HINTEREST RATE 16X, F11.4/ OUTPC48C
625H REJECT/EVAP TUBE FLOW C. F10.4,3X, OUTPC485
7 23HHEATER HEAT LOSS (PCT) 3XF 9.2,5X 12HPRODUCT TEMP 17X F11.3/ OUTPC49C
811H PLANT LIFE 14X F10.1,3X, 17HTURE LIFE, HEATER 7XF10.2, 7X, OUTPC495
9 16HTUBE LIFE, EVAP. 11X F10.2) OUTPC50C
WRITE (6,8025)SH,SE,SR,BIKTH,BIKTE,BIKTR,VH,VE,VR, OUTPC505
1 DOH,COE,DOR,DIH,DIE,DTR,RH,RE,RSR,RHONK, OUTPC51C
2 RHOK,Wf,Wf,Wo,NK,NNK,UBARRH,LBARE,UBARR, OUTPC515
3 AH,AE,AR,HLH,ELE,RLR,HN,ENE,RNR, OUTPC52C
4HBH,HFE,HFR                                OUTPC525
8025 FORMAT(1H030X12HBRINE HEATER 9X 10HEVAPORATOR 13X6HREJECT OUTPC53C
1 /16HDFLOODING FACTOR 4X3F20.2/ OUTPC535
218H TUBE CONDUCTIVITY2X3F20.2/14H TUBE VELOCITY 6X3F20.2/ OUTPC54C
38H TUBE OD12X3F20.5/8H TUBE ID12X3F20.5/ OUTPC545
4 15H FOULING FACTOR 5X3F20.6/20H TEMP CROP/STAGE RHC20X2F20.7/ OUTPC55C
516H TUBE FLOW LB/HR4X3F20.8/13H NC OF STAGES 27X2I20/ OUTPC555
620H HEAT TRANSFER COEF 3E20.8/15H CONDENSER AREA5X3F20.8/ OUTPC56C

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FIGURE 6 (Continued)

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OUTP - EFN SOURCE STATEMENT - IFN(S) -

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712H TUBE LENGTH8X3E20.8/12H NO CF TUBES9X3E20.8/      OUTPC565
815H TUBE HEAD LOSS 5X3E20.8)      OUTPC57C
IF(ERR)115,1C0,115      OUTPC575
100 WRITE (6,8030)      OUTPC58C 19
8030 FORMAT(1H012X4HCOST25X6H$/YEARI3X6H$/KGAL )      OUTPC585
WRITE (6,8035)HC2,HC1,PN,CC2,CCI,RPN,POCST2,POCST1,ALPBAR, PMC2,      OUTPC59C
1 PMC1,HAROM,CCCAP2,CCCAPI      OUTPC595 20
8035 FORMAT(5H0HEAT 28X 2E20.8,3X21HRECOVERY RATIO (CALC)4XF16.5/      OUTPC60C
19H CHEMICAL24X2E20.8, 3X24HPERFORMANCE RATIO (CALC)F17.3/      OUTPC605
228H POWER      5X2E20.8,3X22HAVE BOILING POINT RISOUTPC61C
3E F19.3/      17H PUMPS AND MOTORS 16X2E20.8,OUTPC615
43X23HAVE THERMAL FORCE/STAGE F18.3/23H CAP CHEM      OUTPC62C
510X 2E20.8)      OUTPC625
WRITE (6,8040)SITE2,SITE1,TB,WAIT2,WAIT1,      OUTPC63C
ITCF ,ES2,ESI,      EA2,EA1,BHC2,BHC1      OUTPC635 21
8040 FORMAT(10H SITE WORK23X,2E20.8,3X,13HBLWDOWN TEMP F28.3/      OUTPC64C
111H SEA-INTAKE22X2E20.8,      OUTPC645
2 3X22HBRINE TEMP INTO HEATER F19.3/      OUTPC65C
317H EVAPORATOR SHELL16X2E20.8,5X/      OUTPC655
416H EVAPORATOR AREA17X2E20.8/      OUTPC66C
513H BRINE HEATER20X2E20.8)      OUTPC665
WRITE (6,8045)VPC2,VPC1,UBPH,EFC2,EFC1,PO,CC2,CCI,WZ,SCM2,SCM1,      OUTPC67C
1 WR,CIBC2,CIBC1,WC,DEA2,DEA1,TC2,TC1,WB,WY,CAP11,CAP12,CAP13      OUTPC675 22
8045 FORMAT(18H VALVES AND PIPING15X2E20.8,3X13HU-BAR AVERAGE F28.2/      OUTPC68C
115H ELEC EQUIPMENT18X,2E20.8,3X18HPOWER (MEGA-WATTS) 7XF16.3/      OUTPC685
215H OPERATING COST18X2E20.8,3X2CHPRODUCT RATE (LB/HR)5XE16.8/      OUTPC69C
325H MAINTENANCE AND SUPPLIES 8X2E20.8,3X20HRECYCLE FLOW (LB/HR)      OUTPC695
45XE16.8/36H CRANES, INSTRU, BUILDINGS, CCNCRETE E17.8,E20.8, 3X      OUTPC70C
524HSEA WATER RETURN (LB/HR) E17.8 /10H DEAERATOR 23X 2E20.9/      OUTPC705
611H TOTAL COST 22X 2E20.8,3X      OUTPC71C
721HBLWDOWN FLOW (LB/HR)4XE16.8/76X18HSTEAM FLOW (LB/HR)7XE16.8/1HOUTPC715
8046X1H$15X5H$/GPD14X6H$/KGAL/19H CAPITAL INVESTMENT 14X3E20.8)      OUTPC72C
WRITE (6,8050)PO3,HS1,PMC,EEC,VPC,SITE,WAIT,ES,EA,CIBC,BHC ,COSTCMOUTPC725
1 ,CCCAP,COSTIN ,WEIRC,CRAVE,BLDG,DEACST,PMCFIC,PMCFIC      OUTPC73C 23
8050 FORMAT(1H119HDEAERATOR POWER, W4E16.8,3X18HSTAGE 1 PRESS HEAD11X,EOUTPC735
116.8/1H 16HPUMPS AND MOTORS E19.8,3X,14HFLIC EQUIPMENT      OUTPC74C
215X,F16.8,3X      OUTPC745
217HVALVES AND PIPINGE16.8/10H SITE WORKE26.8,3X      OUTPC75C
312HWATER INTAKE17XE16.8, 3X17HSHELL, DMSTR,WEIR E16.8/      OUTPC755
416H EVAPORATOR AREA2E20.8,3X29HCRANES INSTRU, BLDG, CCNCRETE E16.8,      OUTPC76C
5 3X,12HBRINE HEATER E21.8/ 10H DEMISTER 10X E16.8,3X      OUTPC765
618HCHEM SYS CAP COST 11X E16.8,3X17HINSTRUMENTATION E16.8/      OUTPC77C
7 6H WEIRS 14XE16.8, 3X6HCRANE 23XE16.8, 3X10HBUILDINGS 7XE16.8/      OUTPC775
8 11H DEAERATOR 9XE16.8, 3X11HMOTOR COST 18XE16.8,      OUTPC78C
9 3X10HPUMP COST 7XE16.8)      OUTPC785
WRITE (6,8055)RETUR2,RETUP1      OUTPC79C 24
8055 FORMAT(1H0,18HRETUR CHARGE($/YR),E15.6,5X,      OUTPC795
120HRETUR CHARGE($/KGAL),E23.6)      OUTPC80C
RSHELL#HSTR#ALEV*RLR*(WTMR+2.0*BWR)      OUTPC805
ESHELL#HSTE#ALEV*ELE*(WTME+2.0*BWE)      OUTPC81C
VOLM#ESHELL#RSHELL      OUTPC815
WRITE (6,806C)AMODU,ALEV,TSTH,FREPD,TWFA,SPL,BDEPH,HST,SSF2,CCEFA,OUTPC82C
1 ESHELL,RSHELL,BWE,BWR,WTME,WTMR,HSTE,HSTR      OUTPC825 25
806C FORMAT(15H NO. OF MODULES 5X E16.8, 3X 17HNO OF TRAY LEVELS 12X      OUTPC83C
1E16.8, 3X 24HTUBE SHEET THICKNESS IN F9.4/15H FREE BCARD, FT 5X      OUTPC835
2E16.8,3X 17HTRAY WIDTH FACTOR 12X E16.8, 3X 23HSPLASH PLATE LENGTHOUTPC84C

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FIGURE 6 (Continued)

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      OUTP      -   EFN      SOURCE STATEMENT      -   IFN(S)      -
3,  IN F10.2/ 16H BRINE DEPTH, FT 4X E16.8, 3X 12H LEVEL HEIGHT 17X  OUTP0845
4 E16.8, 3X 23H MAX TRAY FLOW      F10.3/ 7H COEF A 13X F16.3/  OUTP0850
5 1H030X 13H FOR 1 MODULE /18H EVAP SHELL VOLUME2XE16.9, 3X  OUTP0855
6 19H REJECT SHELL VOLUME 10X E16.8/24H EVAP TUBE BUND WID (FT)  OUTP0860
2F12.4  OUTP0865
7, 3X, 22H REJ TUBE BUND WID (FT), F23.4/  OUTP0870
85H WTME 14X E16.8, 3X 4HWTMR 25XE16.8/ 5H HSTE, 14X, E16.8, 3X,  OUTP0875
94HHSTR, 25X, E16.8)  OUTP0880
  RFSA#TRAYWD(NTOTAL)*(RLR-FLOAT(NTCTAL -NK-1)*0.5)*ALEV*AMODU  OUTP0885
  EFSA#TRAYWD(NK)*(ELE-FLOAT(NK-1)*0.5)*ALEV*AMODU  OUTP0890
  AME#WTME*(BDEPH-0.25)  OUTP0895
  AMR#WTMR*(BDEPH-0.25)  OUTP0900
  WRITE (6,8065)EFSA,RFSA ,AME,AMR ,CL  OUTP0905
8065 FORMAT(1H0,18HEVAP FLASHING AREA,E17.6,3X,  OUTP0910
120H REJECT FLASHING AREA,9X,E16.8/1H ,  OUTP0915
224H MAX AREA OF ORIFICE-EVAP,F11.5,3X,  OUTP0920
326H MAX AREA OF ORIFICE-REJECT,E19.8/  OUTP0925
41H 18HORIFICE LOSS COEFF,F16.4)  OUTP0930
DO 105 I#1,NK  OUTP0935
  II#5  OUTP0940
  CALL DINTPL(TS(I),C(I),RHOR)  OUTP0945
  DPREQ(I)#CL/(9266.112*RHOR)*(WS(I)/(3600.0*AME*AMODU*ALEV))*2  OUTP0950
105 CONTINUE  OUTP0955
  JNK#NK+1  OUTP0960
  DO 110 I#JNK,NTOTAL  OUTP0965
  II#5  OUTP0970
  CALL DINTPL(TS(I),C(I),RHOR)  OUTP0975
  DPREQ(I)#CL/(9266.112*RHOR)*(WS(I)/(3600.0*AMR*AMODU*ALEV))*2  OUTP0980
110 CONTINUE  OUTP0985
115 CONTINUE  OUTP0990
  WRITE (6,8000)( TITLE(I),I#1,12)  OUTP0995
  CALL OUTPUX  OUTP1000
  RETURN  OUTP1005
  END  OUTP1010

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FIGURE 6 (Continued)

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*
\$IBFTC OUTPI DECK

OUTPGCOC

FIGURE 6 (Continued).

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OUTP1 - EFN SOURCE STATEMENT - IFN(S) -

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SUBROUTINE OUTPUX
C**** OUTPUT FOR NORITAKE 8/25/65
COMMON/TEMPC/TSTEAM,TS(100), THF,TR,XTB, TC,TP,TA,CC,CP
COMMON/TUBING/ DOH,DIH,DOE,DIE,DOR,DIR,A1,A2,A3,BIKTF,BIKTE,
1BIKTR,CSLTBH,CSLTBP,CSLTBR
COMMON/SUBMAR/IDEMST,SUBA(100)
COMMON/MARH2O/NTOT1
COMMON/TCVL1/ ACPSN, ACPSNK, ACPTNK,CPBT,CPTK, CPTNK,AMEN,TCF,WX,
1WF,W0,CB,WC,WB, WR,RHONK, RHOK, ERR,CCF, NITER, NK,NTOTAL, PN,RPN,
2TC, ALPHA1, WPN, DELCT, DELST, IGSC, SMAQ, SUMA, TK
COMMON/TCVL2/ TTD(100),SMT(100), SMT2(100), CT(100), WS(100),
1C(100), TV(100), WV(100), WH(100), WP(100), AS(100),SLS(100)
COMMON/STAGE1/ A(100),CFMWV(100), CFMWZ(100), UBAR(100), OM(100),
1HO(100),HI(100),WWFS(100),VVEV(100), TRAYFL(100),TRAYWC(100),
2RESIDT(100), PV(100),DELP(100), DTPDPS(100)
COMMON/DMST1/ AREADM(100),DPTDM(100),DTPDM(100), CPROD(100),WIDCM(
100)
COMMON/COND1/ DPINIT(100), DTINIT(100), DPCLR(100), DTCLR(100),
1DTCVD(100)
COMMON/STAGE2/ AH, BAROM,BWE,BWR,COSTDM,ELE,ESHELL,HBH,FBLE,HBLR,
1HLH, HNOE, HNOR,HN, HSTE, HSTR, JJ, KK, RLR, RSHELL, TENOE,TENOR,
2UBARH, VBLE,VBLR,VNOE, VNOR, WIME, WIMR, WY
COMMON /MAIN1/ SSF, HFG
COMMON /STG1/ ATR, BTR, CTR, CTA
COMMON /STG2/HOH, PR, DENBR(100), SUMLS, WVST(100), CO, CI, R, S,
1V, TVTT(100), Z(100), HV, HS(100), WBS(100)
COMMON /CST1/ ASIEV, ANPLAT, SLPLAT, APLAT
COMMON/AMISC/CPSTB,FACID,ACACID,DPLIM,A6,A7,XSOC,XNNA,KNN,XLLL,LLL
COMMON /CNDRI/ NERR, CCCR(3), K
COMMON /DEM1/ SLKP2, SUMDMA, TDMP(100), APTSE, VOLM, APTSR
COMMON /DEM3/ ARGZ(15)
COMMON/AZ1/DTPDP(100),TITLE(15)
COMMON /DEA10/ RNR
COMMON /JPI/ SMAPPP, HR, SMAPPH, HE, UNARAR, UNARAE, A4, AJ, WCO,
1UBARE, UBARK, UTHE, AE, AR, ATHE, THEL, ENE, THEN, FFE, FFR, THEH
2T, HC2, HC1, CC2, CC1, POCST2, POCST1, ALPEAR, PMC2, PMC1, CCCAP2,
3CCCAP1, SITE2, SITE1, WAIT2, WAIT1, ES2, ES1, EA2, EA1,
4RHC2, RHC1, VPC2, VPC1, URPB, EEC2, EEC1, PO, CC2, CC1,
5SCM2, SCM1, CIBC2, CIBC1, DEA2, DEA1, TC2, TC1, CAPI1,
6CAPI2, CAPI3, PO3, HSI, PMC, EEC, VPC, SITE, WAIT,
7ES, EA, CIBC, BHC, CCCAP, CCSTIN, WFIRC, CRANE, BLDG,
8DEACST, PMCP0, PMCFLO, RETUR2, RETUB1, CPREQ(100), AMSC2,
9AMSC1
DIMENSION ALPHA(100)
IDEMST#0
DECALC#0.0
NTOT1#NTOTAL+1
NN#NTOTAL
NNK#NN-NK
WRITE (6,8000)
8000 FORMAT(6H0STAGE 2X 3HTTD6X2HCT5X2HC16X2HC210X2HGN
19X4HUBAR5X2HH16X2HHC7X2HOM9X2HAS7X2HLS6X7HW-W SF
2/1H )
WRITE (6,8005)(I,TTD(I),CT(I),C(I),C(I+1),CH(I),
1(I),HO(I),OM(I),AS(I),SLS(I),WWFS(I),I#1,NTOTAL)
UBAR(I),HI

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FIGURE 6 (Continued)

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OUTP1 - EFN SOURCE STATEMENT - IFN(S) -

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8005 FORMAT(I4,F8.4,3F8.5,E16.8,4F8.2,F14.6,F8.3,E14.6)      OUTPC28C
      IF(DECALC.EQ.1.0) GO TO 100      OUTPC28S
      I#NTOTAL+1      OUTPC29C
      WRITE (6,8010)I,CT(I),C(I+1),CH(I),UBAR(I),HI(I),HC(I),CM(I),AS(      OUTPC29S
      I),SLS(I)      OUTPC30C      27
8010 FORMAT(I4,8X,2F8.5, 8X,E16.8,4F8.2,E14.6,F8.3)      OUTPC30S
      100 WRITE (6,8045)( TITLE(I),I#I,12)      OUTPC31C      37
      WRITE (6,8015)      OUTPC31S      44
8015 FORMAT(6H0STAGE5X2HWV14X3HWS213X3HWP210X3HTV25X 3HTSI 5X      OUTPC32C
      13HTS25X2HT16X2HT23X9HBRINE CFM 3X 9HPRD CFM /IH )      OUTPC32S
      WRITE (6,8020)(I,WV(I),WS(I+1),WP(I+1),TV(I+1),TS(I), TS(I+1),SMT(      OUTPC33C
      I),SMT2(I ),CFMWV(I),CFMWZ(I),I#I,NTOTAL)      OUTPC33S      45
8020 FORMAT(I4,3E16.8,5F8.2, 2E14.6)      OUTPC34C
      IF(DECALC.EQ.1.0) GO TO 105      OUTPC34S
      I#NTOTAL+1      OUTPC35C
      WRITE (6,8025)I,WV(I),WP(I+1),TV(I+1),SMT(I),SMT2(I)      OUTPC35S      64
8025 FORMAT(I4,E16.8,16X,E16.8,F8.2,16X, 2F8.2)      OUTPC36C
      VVEV(I)#0.0      OUTPC36S
      TRAYFL(I)#0.0      OUTPC37C
      TRAYWD(I)#0.0      OUTPC37S
      RESIDT(I)#0.0      OUTPC38C
      DELP(I)#0.0      OUTPC38S
      DPREQ(I)#0.0      OUTPC39C
      A(I)#0.0      OUTPC39S
      105 DO 110 I#I,NTOTI      OUTPC40C
      110 ALPHA(I)#TS(I+1)-TV(I+1)      OUTPC40S
      ALPHA(NTOTI)#0.0      OUTPC41C
      WRITE (6,8045)( TITLE(I),I#I,12)      OUTPC41S      88
      WRITE (6,8030)(I,VVEV(I),TRAYFL(I),TRAYWD(I),RESIDT(I), PV(I),DELO      OUTPC42C
      IP(I),DPREQ(I),A(I),ALPHA(I),DTPDPS(I),I#I,NTOTI )      OUTPC42S      95
8030 FORMAT(24H0ONE LEVEL OF ONE MODULE /7X 10HVAPOR VEL 2X 9HTRA      OUTPC43C
      1Y FLOW 3X 10PTRAY WIDTH 3X 8HRES TIME16X 4HDELP 8X 4HDELP/      OUTPC43S
      2 6H STAGE 3X 6HFT/3      OUTPC44C
      3EC 6X 8HLB/HR FT 6X 2HFT 7X 3HSEC 10X 2HPV 6X 9HAVAILABLE 4X      OUTPC44S
      48HREQUIRED 8X 1HA 8X 5HALPHA 2X 4HDTD      OUTPC45C
      5 /IH /(I4,F12.6,E14.6,2F11.6,4E12.5,F8.3,F5.2))      OUTPC45S
      WRITE (6,8045)( TITLE(I),I#I,12)      OUTPC46C      111
      WRITE (6,8040)      OUTPC46S      118
      WRITE (6,8035)(I,AREADM(I),DPTDM(I),CTDM(I), CPROD(I),WI      OUTPC47C
      ICDM(I),I#I,NTOTI )      OUTPC47S      119
8035 FORMAT(I6,5E16.8)      OUTPC48C
8040 FORMAT(6H0STAGE 5X 7HAREA DM 12X 5HDPTDM 12X 4HDTDM 12X      OUTPC48S
      1 5HCPRD 12X 5HWIDDM )      OUTPC49C
      WRITE (6,8045)( TITLE(I),I#I,12)      OUTPC49S      130
8045 FORMAT(1H1 12A6)      OUTPC50C
      WRITE (6,8050)DOE,TRNOE,VNCE,HNGE,XSCD,VBLE,HBLE,BWE      OUTPC50S      137
8050 FORMAT(1H0 35H TUBE BUNDLE IN EVAPORATOR SECTION /      OUTPC51C
      1IH 4X 16HTUBE OD, INCHES 2X E13.6,4X 18HNO OF TUBES/BNCLE E13.6/      OUTPC51S
      2 IH 4X 9HVERT ROWS 9X E13.6, 4X 11HHCRIZ RCWS 7X E13.6,      OUTPC52C
      3 4X 10HS/D RATIO 8X E13.6/ IH 4X 14HBUNDLE HT, FT 4X E13.6,      OUTPC52S
      4 4X 18HBUNDLE WIDTH, FT E13.6, 4X 18HBUNDLE WIDTH + 3 E13.6)      OUTPC53C
      WRITE (6,8055)DOR, TBNOR, VNOR, HNOR, XSOD, VBLR, FBLR, BWR      OUTPC53S      138
8055 FORMAT(1H0 30HTUBE PUNDLE IN REJECT SECTION /      OUTPC54C
      1IH 4X 16HTUBE OD, INCHES 2X E13.6,4X 18HNO OF TUBES/BNCLE E13.6/      OUTPC54S
      2 IH 4X 9HVERT ROWS 9X E13.6, 4X 11HHCRIZ ROWS 7X E13.6,      OUTPC55C
      3 4X 10HS/D RATIO 8X E13.6/ IH 4X 14HBUNDLE HT, FT 4X E13.6,      OUTPC55S

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FIGURE 6 (Continued)

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      OUTP1      - EFN      SOURCE STATEMENT - IFN(S) -
4 4X 18HBUNDLE WIDTH, FT E13.6, 4X 18HBUNDLE WIDTH + 3 E13.6) . OUTP0560
  IF(IDEMST.EQ.1) GO TO 115 OUTP0565
  WRITE (6,8060)(I,DPINIT(I),DTINIT(I),DPCLR(I),DTCLR(I), DTCND(I),I OUTP0570
  I#1,NTOTI ) OUTP0575
8060 FORMAT(3H I 5X 6HDPINIT 10X 6HDTINIT 10X6HDPCLR 10X 6HDTCLR OUTP0580
  1 10X 6HDTEND / OUTP0585
  2 (15,5E16.8)) OUTP0590
  GO TO 120 OUTP0595
  115 WRITE (6,8065)(I,DPINIT(I),DTINIT(I),DPCLR(I),DTCLR(I), DTCND(I), OUTP0600
  ISUBA(I),I#1,NTOTI) OUTP0605
8065 FORMAT(3H I 5X 6HDPINIT 10X 6HDTINIT 10X6HDPCLR 10X 6HDTCLR OUTP0610
  1 10X 6HDTEND 10X 4HSUB / OUTP0615
  2 (15,6E16.8)) OUTP0620
120 RETURN OUTP0625
      END OUTP0630

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FIGURE 6 (Continued)

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\$ORIGIN COSTLY,REW
\$IBFTC CSTVP DECK

CSTV0000
CSTV0005

FIGURE 6 (Continued)

CSTVP - EFN SOURCE STATEMENT - IFN(S) -

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C	SUBROUTINE COSTVC(D,B,PR,VS,AUNIT,TSE,SMAP,QIN,TS,	CSTVC010		
C	IWS,WS3,POTOT,AS,AD,PMSTMC,CAPF,WSI,GVTE,VSUC,HPVC,	CSTVC015		
C	2TBOUT2,WB2,WF2,WP2,GMSF,LENS,LEND,SMALLE,SITE,CAP11,	CSTVC020		
C	3WSTEAM,VOLDIS,TC2,TC1,PRIMWT,REAPC,ETP,EFFCYC)	CSTVC025		
C	COMMON /DPI/ SMAPPP,HR,SMAPPH,HE,UNARAR,UNARAE,A4,AJ	CSTVC030		
C	COMMON/ECON/SMALLE,SMALLD,SMALLB,SMALLP,RATEIN,WPL,CAPF,THERM,	CSTVC035		
C	IPMSTMC	CSTVC040		
C	REAL LEND,LENS	CSTVC045		
C	GTOT#GMSF+GVTE	CSTVC050		
C		CSTVC055		
C	BWR REACTOR CALCULATIONS (MARCH 13,1967)	CSTVC060		
C		CSTVC065		
C	FUEL COST	CSTVC070		
C	FUEL#8.81 +26.7 *RATEIN	CSTVC075		
C		CSTVC080		
C	FIXED CHARGES	CSTVC085		
C	FIXC#87.20*SMAP/((PRIMWT/1000.))**.244)	CSTVC090		
C		CSTVC095		
C		CSTVC100		
C	OPERATING AND MAINT	CSTVC105	2	
C	XOPER#4.35 *SMAP**.231 /((PRIMWT/1000.))**.314)	CSTVC110	3	4
C	PMSTMC#(FUEL+FIXC+XOPER)/100.	CSTVC115		
C		CSTVC120		
C	COLLINS REPORT	CSTVC125		
C	SMALLC#D	CSTVC130		
C	SMALLB#B	CSTVC135		
C		CSTVC140		
C	COMPRESSOR COST	CSTVC145		
C		CSTVC150		
C	MOYERS COMPRESSOR COST CORRELATION	CSTVC155		
C	CC#(1.02E5+(1392.*((HPVC/(AUNIT*1.E3))**.855)*VSUC**.746)/PR**	CSTVC160		
C	10.177)*AUNIT*AJ	CSTVC165	5	6 7
C	CCY#CC*SMAP	CSTVC170		
C	COMUNT#CC/AUNIT	CSTVC175		
C		CSTVC180		
C	FOUNDATION FOR COMPRESSOR	CSTVC185		
C		CSTVC190		
C	COFOUN#0.12856*HPVC*AJ	CSTVC195		
C	COFOY#COFOUN*SMAP	CSTVC200		
C		CSTVC205		
C		CSTVC210		
C	TURBINE COST	CSTVC215		
C		CSTVC220		
C	AMWT#(TBOUT2+POTOT)*.746/2.546E6	CSTVC225		
C	TURBK#-.85E-4 *TS+.3265	CSTVC230		
C	TURBN#.18E-4*TS+.6614	CSTVC235		
C	TPOW#AMWT/AUNIT	CSTVC240		
C	TUR#(TURBK*(TPOW**TURBN)-14.444*((TPCW/1000.))**.7882))*1.E6*AUNIT*	CSTVC245		
C	I AJ	CSTVC250	8	9
C	TURCST#TUR*SMAP	CSTVC255		
C	TURUNT#TUR/AUNIT	CSTVC260		
C	TCSTP#TUR*WS3/WS	CSTVC265		
C	TCSTC#TUR-TCSTP	CSTVC270		
C		CSTVC275		
C	GENERATOR COST	CSTVC280		

FIGURE 6 (Continued)

CSTVP - EFN SOURCE STATEMENT - IFN(S) -

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C	POGEN#POTOT*.746/(AUNIT*1000.*2545.)	CSTV0285	
	GEN#(14.444*(POGEN/1000.)*.7882)*1.E6*AUNIT*AJ	CSTV0290	
	GENCST#GEN*SMAP	CSTV0295	10
	GENUNT#GEN/AUNIT	CSTV0300	
C		CSTV0305	
C	COST OF EVAPORATORS	CSTV0310	
C		CSTV0315	
C		CSTV0320	
C	ASSUME TUBE LIFE#15 YEARS AND PLANT LIFE 30 YEARS	CSTV0325	
C		CSTV0330	
	SMAPP#.03211	CSTV0335	
C	TUBING PURCHASE PRICE	CSTV0340	
	A1#2.37	CSTV0345	
C	COST OF INSTALLATION AND RETURNING	CSTV0350	
	A2#3.05	CSTV0355	
	EVC#(AS+AD)*A2*AJ	CSTV0360	
	EVCST#(AS+AD)*SMAP*A2*AJ+(AS+AD)*SMAPP*AJ	CSTV0365	
C	SHELL COST	CSTV0370	
C		CSTV0375	
	SHELL#0.794*(AD+AS)*AJ	CSTV0380	
	SHELLY#SHELL*SMAP	CSTV0385	
C		CSTV0390	
C	COMPRESSOR DUCTING COST	CSTV0395	
C		CSTV0400	
	DUCT#.051599*VS*AJ	CSTV0405	
	DUCTY#DUCT*SMAP	CSTV0410	
C		CSTV0415	
C	VTE BRINE PUMPS	CSTV0420	
C		CSTV0425	
	PUMP#3.693E6*(WB2/386.6E6)**C.*AJ	CSTV0430	
	PUMPY#PUMP*SMAP	CSTV0435	11
C		CSTV0440	
C		CSTV0445	
C	VALVES AND PIPING	CSTV0450	
C	FEED MSF TO VTE	CSTV0455	
C		CSTV0460	
	PIPEF#1.257E6*WF2/513.5E6*AJ	CSTV0465	
	PIPEFY#PIPEF*SMAP	CSTV0470	
C		CSTV0475	
C	BLOWDOWN VALVES AND PIPING	CSTV0480	
C		CSTV0485	
	PIPEB#1.130E6*WB2/386.6E6*AJ	CSTV0490	
	PIPEBY#PIPEB*SMAP	CSTV0495	
C		CSTV0500	
C	PRODUCT VALVES AND PIPING	CSTV0505	
C		CSTV0510	
	PIPEP#1.442E6*WP2/126.8E6*AJ	CSTV0515	
	PIPEPY#PIPEP*SMAP	CSTV0520	
C		CSTV0525	
C	VAPOR COMP DISCH PIPING	CSTV0530	
C		CSTV0535	
	PIPV#1.60392E6*VOLDIS/15.283E6*AJ	CSTV0540	
	PIPVY#PIPV*SMAP	CSTV0545	
C		CSTV0550	
C	TURB EXHAUST STEAM TO BRINE HTR PIPING	CSTV0555	
		CSTV0560	

FIGURE 6 (Continued)

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C	PIPTUR#.38356E6*WSTEAM/.102245E8*AJ	CSTVC565	
	PIPTRY#PIPTUR*SMAF	CSTVC570	
	PIPT#PIPEF+PIPEB+PIPEP+PIPVC+PIPTUR	CSTVC575	
	PIPTY#PIPEFY+PIPEBY+PIPEPY+PIPVGY+PIPTRY	CSTVC580	
C		CSTVC585	
C	SITE WORK	CSTVC590	
C		CSTVC595	
	SITEW#SITE*GVTE/GMSF *AJ	CSTVC600	
	SITEY#SITEW*SMAF	CSTVC605	
C		CSTVC610	
C	ELECTRICAL EQUIPMENT	CSTVC615	
C		CSTVC620	
	POVTE#3.7677E-10*WB2*(LENS+LEND+20.)/SMALLE	CSTVC625	
	EECVTE#.0326E6*POVTE *AJ	CSTVC630	
	EECVTY#EECVTE*SMAF	CSTVC635	
C	CRANES AND BLDG, INSTRU	CSTVC640	
C		CSTVC645	
	COSINS#317000.*(WP2/126.8E6)**C.6*AJ	CSTVC650	
	COSINY#COSINS*SMAF	CSTVC655	12
C		CSTVC660	
C	OPERATING COST, \$/YEAR	CSTVC665	
C		CSTVC670	
	OPERY#C.1104E6*((GVTE+GMSF)*1.E-6)**0.3238+7500.	CSTVC675	
C		CSTVC680	
	CAPTOT#CC+TUR+GEN+EVC+COFOUN+ SHELL+PUMP	CSTVC685	13
	I+PIPT +SITEW+EECVTE+COSINS+DUCT	CSTVC690	
C		CSTVC695	
C	MAINT AND SUPPLIES	CSTVC700	
C		CSTVC705	
	COSMAY#.006*(CAPTOT+CAPII)	CSTVC710	
C	COST OF STEAM TO BRINE HEATER	CSTVC715	
C		CSTVC720	
	SMALLB#PMSTMC*((1.-EFFCYC/ETP)/(1.-EFFCYC)-((.101*AJ*SMAF	CSTVC725	
	I*(1.-ETP)*EFFCYC)/(ETP*CAPF))	CSTVC730	
C		CSTVC735	
C	COST OF ON-SITE POWER	CSTVC740	
C		CSTVC745	
	ELSTM#PMSTMC*QIN*1.E-6*WS3/WS*EFFCYC/ETP	CSTVC750	
	I*8760.*CAPF	CSTVC755	
	CONCST#3.0217E3*(POTOT*.746/(1000.*2545.))*(1.-ETP)/ETP	CSTVC760	
	I*SMAF	CSTVC765	
	ELCST#ELSTM+CONCST+GENCST+TCSTP*SMAF	CSTVC770	
	SMALLD#ELCST/(8.76E6*CAPF*POTOT*.746/(1000.*2545.))	CSTVC775	
	HTCST2#PMSTMC*QIN*1.E-6 *8760.*CAPF	CSTVC780	
	FACTOR#2.739726/(CAPF*(GVTE+GMSF))	CSTVC785	
	HTCS<G#HTCST2*FACTOR	CSTVC790	
	CCKG#CCY*FACTOR	CSTVC795	
	TUR<G#TURCST*FACTOR	CSTVC800	
	EVC<G#EVCST*FACTOR	CSTVC805	
	ELC<G#ELCST*FACTOR	CSTVC810	
	GEN<G#GENCST*FACTOR	CSTVC815	
	DUCTK<G#DUCTY*FACTOR	CSTVC820	
	COFOK<G#COFOY*FACTOR	CSTVC825	
	SHELLK<G#SHELLY*FACTOR	CSTVC830	
	PUMPK<G#PUMPY*FACTOR	CSTVC835	
		CSTVC840	

FIGURE 6 (Continued)

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CSTVP - EFN SOURCE STATEMENT - IFN(S) -

PIPKG#PIPTY*FACTOR	CSTV0845	
OPERKG#OPERY*FACTOR	CSTV0850	
COSMKG#COSMAY*FACTOR	CSTV0855	
SITEKG#SITEY*FACTOR	CSTV0860	
ECVTKG#EECVTY*FACTOR	CSTV0865	
COSIKG#COSINY*FACTOR	CSTV0870	
VCTOT#HTCST2+CCY+TURCST+EVCST+CIY+GENCST	CSTV0875	
1+DUCTY+COFOY+SHELLY+PUMPY+PIPTY+OPERY+COSMAY +SITEY+EECVTY+COSINY	CSTV0880	
VCTOKG#HTCSKG+CCKG+TURKG+EVCCKG+CIYKG+GENKG	CSTV0885	
1+DUCTKG+COFOKG+SHELLKG+PUMPKG+PIPKG+OPERKG+COSMKG+ SITEKG+	CSTV0890	
2ECVTKG+COSIKG	CSTV0895	
TCST2#TC2+VCTOT	CSTV0900	
TCST1#TC1+VCTOKG	CSTV0905	
WRITE(6,8000) GVTE,GMSF,CAPF,SMAP,SMALLB,SMALLD,SMALLE,	CSTV0910	
1 AJ,VSUC,HPVC,PMSTMC,AMWT,TURBN,TURBK,POVTE,	CSTV0915	
2 ELSTM,ELCST,TCSTC,TCSTP,COMUNT,TURUNT,GENUNT,CCNCST,	CSTV0920	
3 HTCST2,COFOUN,SHELL,SITEW,PUMP,PIPEF,PIPEB,PIPEP,	CSTV0925	
4 PIPVC,PIPTUR,EECVTE,COSINS,DUCT,CAPTOT	CSTV0930	
8000 FORMAT(1H0,45X,30HCOST ITEMS CALCULATED IN CSTVP/	CSTV0935	
145X,30H-----/1H0,4HGVTE,E16.5,1X,	CSTV0940	
24HGMF,E16.5,1X,4HCAPF,E16.5,1X,4HSMAP,E16.5,1X,	CSTV0945	
36HSMALLB,E14.5,1X,6HSMALLD,E14.5/1H 6HSMALLE,E14.5,1X,	CSTV0950	
42HAJ,E18.5,1X,4HVSUC,E16.5,1X,4HHPVC,E16.5,1X,6HFMSTMC,	CSTV0955	
5E14.5,1X,4HAMWT,E16.5/1H 5HTURBN,E15.5,1X,5HTURBK,E15.5,	CSTV0960	
61X,5HPOVTE,E15.5,1X,5HELSTM,E15.5,1X,5HELCST,E15.5,1X,5HTCSTC,	CSTV0965	
7E15.5/1H 5HTCSTP,E15.5,1X,6HCOMUNT,E14.5,1X,6HTURUNT,E14.5,1X,	CSTV0970	
86HGENUNTE14.5,1X,6HCONCST,E14.5,1X,6HHTCST2,E14.5/1H ,	CSTV0975	
96HCOFOUN,E14.5,1X,5HSHELL,E15.5,1X,5HSITEW,E15.5,1X,	CSTV0980	
14HPUMP,E16.5,1X,5HPIPEF,E15.5,1X,5HPIPEB,E15.5/1H ,	CSTV0985	
25HPIPEP,E15.5,1X,5HPIPVC,E15.5,1X,6HPIPTUR,E14.5,1X,	CSTV0990	
36HEECVTE,E14.5,1X,6HCOSINS,E14.5,1X,4HDUCT, E16.5/1H 6HCAPTCT,	CSTV0995	
4E14.5)	CSTV1000	
WRITE(6,8005)ELCST,ELCKG,SMALLD,PMSTMC,SMALLB,	CSTV1005	
1 HTCST2,HTCSKG,CC,CCY,CCKG,COFOUN,COFOY,COFOKG,	CSTV1010	
2 DUCT,DUCTY,DUCTKG,TUR,TURCST,TURKG,GEN,	CSTV1015	
2 GENCST,GENKG,EVC,EVCST,EVCCKG,SHELL,SHELLY,SHELLKG,PUMP,PIUMPY,	CSTV1020	
3 PUMPKG	CSTV1025	
8005 FORMAT(1H1,64X,5HCOSTS/1H 64X,5H-----/	CSTV1030	
11H0,35X,9H\$,DTR+IND,9X,	CSTV1035	
16H\$/YEAR,11X,4H\$/KG,10X,7H\$/MMBTU,9X,7H\$/KW-HR/	CSTV1040	
21H 35X,9H-----,9X,6H-----,11X,4H-----,10X,7H-----,	CSTV1045	
37X,7H-----/1H0,8X,14HPOWER COST,30X,2E16.8,16X,E16.8/	CSTV1050	
41H 8X,16HPRIME STEAM COST,56X,2E16.8/	CSTV1055	
51H 8X,18HSTEAM TO BRINE HTR,54X,E16.8/	CSTV1060	
61H0,8X,9HHEAT COST,31X,2E16.8/	CSTV1065	
71H 8X,15HCOMPRESSOR COST, 2X,3E16.8/	CSTV1070	
31H 8X,15HCOMP FOUND COST,9X,3E16.8/1H 8X,14HCOMP DUCT CCST,10X,	CSTV1075	
43E16.8/	CSTV1080	
81H 8X,12HTURBINE COST,12X,3E16.8/	CSTV1085	
91H 8X,14HGENERATOR COST,10X,3E16.8/	CSTV1090	
11H 8X,15HEVAPORATOR COST, 2X,3E16.8/	CSTV1095	
4 1H 8X,10HSHELL COST,14X,3E16.8/1H08X,15HVTE BRINE PUMPS,	CSTV1100	
59X,3E16.8)	CSTV1105	
WRITE(6,8010)PIPT,PIPTY,PIPKG,	CSTV1110	
4 EECVTE,EECVTY,ECVTKG,COSINS,COSINY,COSIKG,	CSTV1115	
5 SITEW,SITEY,SITEKG,CAPTOT,OPERY,OPERKG,COSMAY,COSMKG,	CSTV1120	

FIGURE 6 (Continued)

CSTVP - EFN SOURCE STATEMENT - IFN(S) -

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6 VCTOT,VCTOKG,TCST2,TCST1
8010 FORMAT(1H,8X,
4      17HVALVES AND PIPING,7X,3E16.8/
51H 8X,18HELECTRIC EQUIPMENT,6X,3E16.8/ 1H 8X,
315HCRANES AND BLDG,9X,3E16.8/1H 8X,9HSITE WORK 15X,3E16.8/
31H 8X,16H-----,8X,16H-----/
41H ,8X,16HTOTAL VC CAPITAL, 8X,E16.8/
41H08X,19HOPERATING (VC+SEMS),21X,2E16.8/
51H 8X,21HMAINT+SUPPL (VC+SEMS),19X,2E16.8/
31H0,8X,13HVC WATER COST,27X,2E16.8/1H 8X,
426HTOTAL WATER COST (VC+SEMS),14X,2E16.8/1H1)
D#SMALLD
B#SMALLB
RETURN
END

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CSTV1125
CSTV1130
CSTV1135
CSTV1140
CSTV1145
CSTV1150
CSTV1155
CSTV1160
CSTV1165
CSTV1170
CSTV1175
CSTV1180
CSTV1185
CSTV1190
CSTV1195

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FIGURE 6 (Continued)

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\$DATA

FIGURE 6 (Continued)

IBL DR

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OVERLAY ORIGIN CARDS. AND ASSIGNED LINK NUMBERS

\$ORIGIN	COSTLY	IS LINK	1, PARENT LINK IS	0
\$ORIGIN	COSTLY	IS LINK	2, PARENT LINK IS	0
\$ORIGIN	COSTLY	IS LINK	3, PARENT LINK IS	0
\$ORIGIN	COSTLY,REW	IS LINK	4, PARENT LINK IS	0

FIGURE 6 (Continued)

* MEMORY MAP *

SYSTEM COCOO THRU 02717
 FILE BLOCK ORIGIN C2720
 FILES 1. UNIT06 (NC BUFF POOL ATTACHED)
 2. UNIT05 (NC BUFF POOL ATTACHED)
 PRE-EXECUTION INITIALIZATION 02750
 CALL ON OBJECT PROGRAM 02757
 OBJECT PROGRAM 02754 THRU 74031

LINK	DECK	ORIGIN	CONTROL SECTIONS (/NAME/#NON 0 LENGTH, (LOC)#DELETED, *NOT REFERENCED)					
0	VAPCOM	02764	/MAR22 / 02765 06637 *	/GEOME / 02766	/ECCN / 03000	/OP / 03011	/PHYS / 03301	
	MNIA	06651	/GEN / 06652 /FOULIN / 07062 /TCVL1 / 07313 /MAIN1 / 14601 /JAN31 / 14625 RPE 15257	/TEMPC / 06666 /PUMPH1 / 07073 /TCVL2 / 07365 /STG1 / 14603 /FEB4 / 14626	/GEOME / 02766 /AMISC / 07101 /PHYS / 03301 /JAN18 / 14607 /FEB8 / 14632	/ECON / 03000 /CATA1 / 07114 /OP1 / 03011 /JAN23 / 14610 MAIN 15130	/TUBING / 07043 /AZ1 / 07130 /STAGE1 / 11645 /JAN27 / 14617	
	BPRI	15173						
	TCVA	15277	/GEN / 06652 /FOULIN / 07062 /TCVL1 / 07313 /JAN18 / 14607 /OP1 / 03011	/TEMPC / 06666 /PUMPH1 / 07073 /TCVL2 / 07365 /JAN23 / 14610 TCVAL 17624	/GEOME / 02766 /AMISC / 07101 /TCVWSC / 15300 /JAN27 / 14617	/ECON / 03000 /CATA1 / 07114 /PHYS / 03301 /JAN31 / 14625	/TUBING / 07043 /AZ1 / 07130 /MAIN1 / 14601 /FEB4 / 14626	
	GSC1	17650	/GEN / 06652 /FOULIN / 07062 /TCVL1 / 07313 /JAN18 / 14607 /PHYS / 03301	/TEMPC / 06666 /PUMPH1 / 07073 /TCVL2 / 07365 /JAN23 / 14610 TTT 21553	/GEOME / 02766 /AMISC / 07101 /TCVWSC / 15300 /JAN27 / 14617	/ECON / 03000 /CATA1 / 07114 /PHYS / 03301 /OP1 / 03011	/TUBING / 07043 /AZ1 / 07130 /MAIN1 / 14601 GSC 21420	
	TT100	21436						
	CNDN	21574	/MAY15 / 21575 * /AZ1 / 07130 /STG2 / 22562 /CNDLNK / 24156	/GEOME / 02766 /TCVL2 / 07365 /CNDRI / 23723 CNDNSR 30236	/AMISC / 07101 /STAGE1 / 11645 /CEM1 / 23730	/CATA1 / 07114 /CONDI / 21576 /CEM3 / 24101	/TCVL1 / 07313 /STG1 / 14603 /STAGE2 / 24120	
	STAGE	30257	/GEN / 06652 /FOULIN / 07062 /TCVL1 / 07313 /MAIN1 / 14601 /DEMI / 23730	/TEMPC / 06666 /PUMPH1 / 07073 /TCVL2 / 07365 /STG1 / 14603 /STG2 / 30264	/GEOME / 02766 /AMISC / 07101 /STAGE1 / 11645 /STG2 / 22562 /STGCST / 30272	/ECON / 03000 /CATA1 / 07114 /STAGE2 / 24120 /CST / 30260 /FEB8 / 14632	/TUBING / 07043 /AZ1 / 07130 /PHYS / 03301 /CNDRI / 23723 STAGE3 33740	
	UBARI	33756	/GEN / 06652 /FOULIN / 07062 /TCVL1 / 07313 /STG1 / 14603	/TEMPC / 06666 /PUMPH1 / 07073 /TCVL2 / 07365 /STG2 / 22562	/GEOME / 02766 /AMISC / 07101 /STAGE1 / 11645 /FEB8 / 14632	/ECON / 03000 /CATA1 / 07114 /PHYS / 03301 UBARHM 35001	/TUBING / 07043 /AZ1 / 07130 /MAIN1 / 14601	
	WAT	35025	WATH 35164					
	RO100	35206	ROPR 35360					
	SU100	35400	/OP1 / 03011	SUBAJ 35565				
	CI100	35617	/PHYS / 03301	DINTPL 36310				
	TWO	36336	/BLOC / 36337	DOUBLE 37121				
	BLKDAT	37152	/BLOC / 36337					
	INPU	37152	/GEN / 06652 /FOULIN / 07062 /AZ1 / 07130	/TEMPC / 06666 /PUMPH1 / 07073 INPUT 40430	/GEOME / 02766 /AMISC / 07101	/ECON / 03000 /CATA1 / 07114	/TUBING / 07043 /NOV25 / 37153	
	CND	40446	/GEOME / 02766 /STAGE1 / 11645 /CNDRI / 23723 CNDNS 42671	/AMISC / 07101 /CONDI / 21576 /DEMI / 23730	/CATA1 / 07114 /STAGE2 / 24120 /CEM3 / 24101	/AZ1 / 07130 /STG1 / 14603 /CNDLNK / 24156	/TCVL2 / 07365 /STG2 / 22562 /OP1 / 03011	

FIGURE 6 (Continued)

DEMST	42717	/GEN / (06652)	/TEMPC / (06666)	/GEOME / (02766)	/ECON / (03000)	/TUBING / (07043)
		/FOULIN / (07062)	/PUMPH / (07073)	/AMISC / (07101)	/DATA1 / (07114)	/AZI / (07130)
		/TCVL1 / (07313)	/TCVL2 / (07365)	/STAGE1 / (11645)	/DMST1 / 42720	/COND1 / (21576)
		/STAGE2 / (24120)	/PHYS / (03301)	/MAIN1 / (14601)	/STG1 / (14603)	/STG2 / (22562)
		/CST1 / (30260)	/CNDR1 / (23723)	/CEM1 / (23730)	/CEM3 / (24101)	/DEA10 / 43704
		/STG21 / (30264)	DEMIST 47152			
DEARIV	47170	/GEN / (06652)	/TEMPC / (06666)	/GEOME / (02766)	/ECON / (03000)	/TUBING / (07043)
		/FOULIN / (07062)	/PUMPH / (07073)	/AMISC / (07101)	/DATA1 / (07114)	/AZI / (07130)
		/TCVL1 / (07313)	/TCVL2 / (07365)	/STAGE1 / (11645)	/DMST1 / 42720	/COND1 / (21576)
		/STAGE2 / (24120)	/PHYS / (03301)	/MAIN1 / (14601)	/STG1 / (14603)	/STG2 / (22562)
		/CST1 / (30260)	/CNDR1 / (23723)	/CEM1 / (23730)	/CEA10 / 43704	/STG21 / (30264)
		DEARI 50563				
.LINK	50601	/LDT / 50601	/LRECT / 50606	/LVEC / 50616		
.LXCEN	50644	.LXSTR 50644	.LXSTP 50647	.LXOUT 50715 *	.LXERR 50724	.LXCAL 50727
		.LXRTN 50727	IBEXIT 50727 *	.DBCLS 51111 *	.LXARG 51260 *	.LO 51360 *
		.CLSE 51366 *	.LFBL 51367 *	.LUNB 51370 *	.DFOUT 51371	
.LOVRY	51401	.LOVRY (51401)	.LDT (50601)	.LRECT (50606)	.LVEC (50616)	
.LXSL	52107	.LXSEL 52107	.LXSL1 52110	.LXTST 52113	.LXOVL 52153	.LXMOD 52215
		.LXIND 52241	.LXDIS 52244	.LXFLG 52245	.LTCH 52246	
.FPTRP	52254	.FFPT. 52254 *	.FPOUT 52403 *	.FPARG 52411 *	/COUNT/ 52413 *	OVFLOW 52457 *
.ERAS.	52464	E.1 52464	E.2 52465	E.3 52466	E.4 52467	
.XCC.	52470	CC.1 52470	CC.2 52471	CC.3 52472	CC.4 52473	
FXEM	52474	.FXEM. 52474	.FXOUT 53034 *	.FXARG 53042 *	/OPTW./ 53116 *	
FCNV	53127	.FCON. 53127	.FCNV. 53154	.ENDFS 53163	.CNVSW 53166	.FDX1 53172
		.FDX2 53173	.DRC 53175	.DBC10 53333	.DBC20 53361	.DDSW 53371
		.DDFIX 53400	.FIXSW 53406	.CDRC 53463	.DDRS1 53740	.DDRS2 53742 *
		.DI 53745	.D2 53747	.FERR2 54034 *	.ANPT 54070	.ONPT 54105
		.LNTP 54170	.AGUT 54237	.OOUT 54250	.LOUT 54277	.DFLT 54307
		.FLT 54554	.FXFL1 54705	.FXC 54711	.FXFL2 54714	.FXFL3 54720
		.INTG 54724	.TOPAC 54742	.WIDTH 54746	.FPACK 54753	.TEST 54754
		.KOUNT 55007	.LIST 55012	.DCNE 55020	.OUTBF 55511	.CHAR 55745
		.FBDBF 55762	.DDDFL 56014	.DCFLG 56015	.WORD 56016	.MQD 56017
		.PEX 56020	.FEXP 56021	.DIG 56022	.DEXPN 56023	
FIOH	56055	.KEEP. 56055	.FIOH. 56056	.FFIL. 56721	.FRTN. 56747	
FIOS.	57141	..FIOS 57141	..FIOC 57244	..FSEL 57263	..FBCK 57301 *	..FTCK 57303
		..FCHK 57426 *				
FRDD.	57633	..FRDD 57633				
FWRD.	57660	..FWRD 57660				
FBCD.	57706	..FBCD 57706	..FBCW 57710	..FBCB 57721		
UNIT06	57751	..UN06 57751				
UN05	57752	.UN05. 57752				
MOUNT.	57753	.MOUNT 57753				
FLOG	57764	ALOG10 57764	ALOG 57765			
FXPF	60170	EXP 60170				
FSQR	60311	SQRT 60311				
FXP2	60364	.XP2. 60364				
FXP3	60502	.XP3. 60502				
FSL00	60627	.FSL0. 60645	.FSD0. 60653 *			
FSL0	60664	.SLO. 60664	.SLO2. 60672	.SC0. 60677	.SD02. 60711	
UCALCM	60723	UCALC 61541				
CHKTBI	61564	/PHYS / (03301)	CHKTB 62066			
PSIAA	62131	PSIA 62352				
VAPTSS	62372	VAPTS 62567				
VAPTHH	62624	VAPTH 63007				
VAPVV	63045	VAPV 63326				

VAPHH	63346	VAPH	64170					
VAPSS	64210	VAPS	65131					
2	SMAP1	60723	SMAP	61053				
	COS	61107	/MAR22	/(02765)	/GEN	/(06652)	/TEMPC	/(06666)
			/TUBING	/(07043)	/FOULIN	/(07062)	/PUMPH	/(07073)
			/AZI	/(07130)	/TCVL1	/(07313)	/TCVL2	/(07365)
			/COND1	/(21576)	/STAGE2	/(24120)	/PHYS	/(03301)
			/STG2	/(22562)	/CST1	/(30260)	/CNDRI	/(23723)
			/DEA10	/(43704)	/OP1	/(03011)	/NOV25	/(37153)
			/JAN31	/(14625)	COST	63632	/GEOME	/(02766)
	AREAY	63646	/GEN	/(06652)	/TEMPC	/(06666)	/ECON	/(03000)
			/FOULIN	/(07062)	/PUMPH	/(07073)	/DATA1	/(07114)
			/TCVL1	/(07313)	/TCVL2	/(07365)	/DMST1	/(42720)
			/STAGE2	/(24120)	/PHYS	/(03301)	/MAIN1	/(14601)
			/CST1	/(30260)	/CNDRI	/(23723)	/STG1	/(14603)
			/OP1	/(03011)	/NOV25	/(37153)	/DEM3	/(24101)
			AREA	65306	/CSTLK	/(61110)	/DEA10	/(43704)
	SHEL	65322	/GEN	/(06652)	/TEMPC	/(06666)	/CSTLK1	/(61123)
			/FOULIN	/(07062)	/PUMPH	/(07073)	/TUBING	/(07043)
			/TCVL1	/(07313)	/TCVL2	/(07365)	/AZI	/(07130)
			/STAGE2	/(24120)	/PHYS	/(03301)	/COND1	/(21576)
			/CST1	/(30260)	/CNDRI	/(23723)	/STG1	/(14603)
			/OP1	/(03011)	/NOV25	/(37153)	/STG2	/(22562)
			SHELL	72157	/CSTLK	/(61110)	/DEA10	/(43704)
	VAL	72175	/GEN	/(06652)	/TEMPC	/(06666)	/CSTLK1	/(61123)
			/FOULIN	/(07062)	/PUMPH	/(07073)	VALVE	74016
			/TCVL1	/(07313)	/TCVL2	/(07365)		
			/STAGE2	/(24120)	/PHYS	/(03301)		
			/CST1	/(30260)	/CNDRI	/(23723)		
			/OP1	/(03011)	/NOV25	/(37153)		
3	OUTP	60723	/GEN	/(06652)	/TEMPC	/(06666)	/GEOME	/(02766)
			/FOULIN	/(07062)	/PUMPH	/(07073)	/ECON	/(03000)
			/TCVL1	/(07313)	/TCVL2	/(07365)	/DATA1	/(07114)
			/STAGE2	/(24120)	/PHYS	/(03301)	/DMST1	/(42720)
			/CST1	/(30260)	/CNDRI	/(23723)	/STG1	/(14603)
			/OP1	/(03011)	/JAN18	/(14607)	/DEM3	/(24101)
	OUTP1	64114	/TEMPC	/(06666)	/JAN27	/(14617)	OUTPUT	64076
			/TCVL2	/(07365)	/SUBMAR	64115 *	/MARH20	64262 *
			/MAIN1	/(14601)	/DMST1	/(42720)	/COND1	/(21576)
			/CNDRI	/(23723)	/STG1	/(22562)	/STAGE2	/(24120)
			/OP1	/(03011)	/DEM1	/(23730)	/CST1	/(30260)
			OUTPUTX	65754	/DEM3	/(24101)	/AZI	/(07130)
4	CSTVP	60723	/OP1	/(03011)	/ECON	/(03000)	/DEA10	/(43704)
			CCSTVC	63407				

UNUSED CORE

74032 THRU 77014

FIGURE 6 (Concluded)

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