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**A Computerized Management
Report System for Monitoring
Manpower and Cost**

V. R. Bullington
R. L. Stephenson
R. G. Cardwell

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UNION-CARBIDE CORPORATION
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DEPARTMENT OF ENERGY

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METALS AND CERAMICS DIVISION

**A COMPUTERIZED MANAGEMENT REPORT SYSTEM FOR
MONITORING MANPOWER AND COST**

V. R. Bullington, R. L. Stephenson, and R. G. Cardwell

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A COMPUTERIZED MANAGEMENT REPORT SYSTEM FOR MONITORING MANPOWER AND COST

V. R. Bullington, R. L. Stephenson,* and R. G. Cardwell†

ABSTRACT

Although most cost systems offer complete detail and traceability, not all provide timely detail in a concise form useful to senior management. This system was developed for a multifunction research organization funded from many sources. It extracts cost and manpower data from the general cost systems, summarizes it, compares it by program with previous cost periods, and presents it with minimum detail yet with maximum overview.

The system monitors the basic manpower distribution of effort at the source, that is, the division time-card input. Cost data is taken from the central computer ahead of the print-out and report-distribution steps, making the summary information available several days ahead of the detailed reports. This procedure has been regularly used for several months and has proven to be a valuable tool in management action and planning.

INTRODUCTION

Many cost systems offer reliable data in detail. However, not all offer timely data in a form useful to senior management. It is important and often imperative that management receive, as quickly as possible at the end of each accounting period, an accurate summary of all costs. Such a report should provide sufficient information to make general decisions yet not contain unnecessary burdensome detail and should contain sufficient data to flag any problem areas that may be occurring.

This system was developed for a multifunction research facility funded from many sources and managed by matrix organization. The Metals and Ceramics Division of Oak Ridge National Laboratory, one of four

*Computer Science Division.

†Finance and Materials Division.

plants within the Nuclear Division of Union Carbide Corporation, has approximately 300 scientists, engineers, and technicians in 25 functional groups supported by over 50 programs, originating mostly from the Department of Energy (DOE) and the Nuclear Regulatory Commission. Division management is responsible for accomplishing the stated milestones of effort within allotted funds.

Union Carbide Nuclear Division (UCND) provides and operates a comprehensive four-plant cost system that offers complete detail with 100% traceability. Because this system is so detailed, it is neither timely nor summatic enough to provide senior division management with the type of information needed. In recent years a considerable amount of time has been spent abstracting summary information each month and preparing it by hand in suitable form. We have used this information to develop a computer abstracted and prepared report that provides more timely information. With this method the only manual effort is the limited use of a computer terminal to update financial plan changes.

Figure 1 is a flow chart illustrating the sources and steps in collecting and reporting this monthly cost and manpower data. The Management Report shown is called from the main company computer by a special side program that is run just after the computation sequence but before the general report preparation, print out, and distribution. Because of the extensive logistics of the general reports, the Management Report is prepared and given to Division management from five to seven work days before the general reports are distributed.

Two basic inputs create the Management Report: "cost data," taken from the Central Accounting (four-plant) computer computations, and "manpower data," taken from the Division Labor Report. The cost data is a collection of all the dollar costs incurred during the month from all sources. The manpower data, however, is generated and controlled within each division and has been accumulated in a special way before its use as input to both the Management Report and the general company system.

DIVISION LABOR REPORT (MPRFILE)

The company is currently operating on a four-plant cost system that collects all basic departmental costs in a departmental account called a "cost center." The total costs are then distributed to supporting programs and activities based on department labor. An "internal time distribution card," Fig. 2(a), is prepared for each individual in the department at the end of each month, accounting for the total number of work hours. The work time is broken into the number of hours the individual has applied on each program and is posted to the proper program account.

Normally, these cards from each department are assembled and sent directly to the company keypunch section for preparation of a master deck of internal time distributions for the four plants. However, in the Metals and Ceramics Division the cards are intercepted and are separately keypunched into a special deck used to create a Labor Report for the Division. The program includes a check of program charge numbers against the company master list and a computer marking of incorrect ("bad") charges with an asterisk (*). The Labor Report is both illustrated with use of abstracts and briefly described in Figs. 2(b) and 3.

The advantages of this intercept report are twofold. First, the "first run" of the report is distributed immediately to Program Managers for correction of errors or improper distributions. These are resolved with the Section Heads or Group Leaders, and the hand-corrected copies are returned to the Division finance office for machine correction. This step is particularly important since the critical monthly reporting time imposed on the company by DOE will not permit any reruns to correct errors (except in very significant cases), and the costs are reflected incorrectly until the following month when adjustments are made. Second, a detailed cumulative record of monthly and up-to-date labor activity is retained in five types of summary formats for Division review and historical information. This has on several occasions proven to be a valuable tool in manpower planning not otherwise available.

3470-0001 A 3470-0001 1-1-79 001 80 3 1000

3470-0405	92
3470-0526	20
3470-0548	172
184	

INTERNAL TIME DISTRIBUTION CARD

REPORT NO.	CHARGE NO.	GRIND	W/IN	HAUGL	NAME	MATERIALS	IND CERAMICS	ACC JUST	SUMMARY	CURRENT HOURS	TOTAL HOURS	CURRENT PER PES
34700001	020									40		0.217
34700001	020									40		
34700005	020									72		0.061
34700005	020									144		
34700010	020									120		
34700030	020									110		1.315
34700030	020									92		
34700030	020									202		0.243
34700030	020									84		
34700042	020									84		
34700042	020									110		1.200
34700042	020									92		
34700042	020									222		0.091
34700047	020									184		
34700047	020									110		
34700047	020									92		
34700047	020									222		
34700048	020									184		
34700048	020									110		
34700048	020									92		
34700048	020									222		
34700049	020									184		
34700049	020									110		
34700049	020									92		
34700049	020									222		

JOHN DOE

Fig. 2. Input from the (a) Internal Time Distribution Cards is Printed Out in the (b) Account Summary, Which Reports All Labor Charges by Group, Individual, and Program Account.

ORNL-DWG 80-7804

REPORT NO. EM025

METALS AND CERAMICS ACCOUNT SUMMARY

CHARGE NO.	GROUP	P/R	EDGE	NAME	CURRENT HOURS	TOTAL HOURS	CURRENT MAN MOS
34700548	002				10		
34700548	002				6		
34700548	002				10		
34700548	002					24	0.130
34700548	028				82		
34700548	028			JOHN DOE	72		
34700548	028				6	164	0.891
34700548	092					6	0.032
34700548	092					194	1.054
34700548							

(a)

Fig. 3. Continuation of Manpower Effort Processing. The (a) EM025 Report accumulates total hours and man months (MM) by program charge and computes the total MM per program, which is shown on the (b) Management Report RPTPAGE printout abstracted here. (An example of a full-page RPTPAGE printout is shown in Fig. 5.) Note that 1.054 has been rounded to 1.0 on the RPTPAGE.

ACCOUNT NUMBER	PROGRAM DESCRIPTION	MM	MM
34700520	NOG MGT	1.3	0.3
34700521	SLDG INSULAT	1.2	15.0
34700522	ALT FUELS	1.2	12.1
34700523	INSUL EVALUA	0.4	4.4
34700524	GAT ANALYSIS	0.4	3.9
34700525	NOG TIMES	0.0	0.0
34700526	INSUL C ANAL	0.0	17.7
34700527	CONSERVATION	4.0	34.1
34700531	JTFC MTH STU	0.3	0.1
34700532	OTFC	0.1	0.1
34700541	PROG MGT	0.0	0.0
34700542	PROG VE 5PL	2.7	10.0
34700543	FAIL ANALYSIS	0.5	0.5
34700544	EMISSION CHG	1.0	11.5
34700545	INSPECT TECH	1.0	12.0
34700546	FLUID MDS	0.0	1.2
34700547	POS ENER MTL	1.4	0.4
34700548	CLOSAD	0.0	0.0
34700549	CETP	1.0	5.7
34700550	APRC MTH PLT	0.0	0.0
34700551	CHAL	0.0	02.9
34700552	TMT REL PFI	1.1	0.6
34700553	PROD SPEC	2.0	1.3
34700554	HTGM DEV	2.0	10.6
34700561	STRUCT MAT	10.7	115.3
34700562	DEP MECA	4.0	30.4
34700563	MHY PROD	13.4	92.4
34700564	440 EFFLCT	15.2	111.2
34700565	CLOSAD	0.0	0.3
34700566	ENG MAT STU	0.4	3.7
34700567	FUNDAMENTAL	13.4	102.3
34700570	PROG MGT	1.3	3.1
34700571	RSD DAMAGE	10.7	31.4
34700572	COMP STUJEL	1.0	10.4
34700573	SURFACT STUJ	1.0	10.4
34700574	ORNAK	1.4	15.2
34700575	GAT'L ENGI	1.0	5.7
34700576	POULTRON ENGI	17.4	130.4
34700580	GRAPH DESJAT	1.0	5.1
34700581	FUEL GRAPHITE	3.0	25.0
34700582	KFA GRAPHITE	0.0	0.1
34700583	STRUCT MAT'L	3.7	47.4
34700584	MLT SUP-C MNT	0.0	2.2
34700585	TAPM 443	0.7	0.2
34700586	PCR MAT DEV	2.4	12.7
34700587	STO MAT DELJ	0.0	5.4
34700588	STO MAT COM4	0.3	1.7
34700589	EC PL RAD	10.3	45.3
34700590	CLOSAD	0.0	0.0

(b)

As the "first run" is printed the computer also punches a card deck containing all the reported information in a format that matches the aforementioned company "master deck" of the monthly internal time. On receipt of the Program Manager's corrections, the Labor Report is updated by withdrawing the cards containing improper input and substituting new, corrected cards punched on site. The corrected deck is then delivered to the company computer center, where it is first used to rerun a corrected Labor Report. It then becomes a part of the four-plant "master deck" used to generate the general monthly cost reports.

This special intercept handling of the Metals and Ceramics Division labor distribution has been in successful operation for two years and is now being considered by other divisions as a means of better, more accurate cost control.

MANAGEMENT REPORT

Program Description

An understanding of the flow of information into and out of the program is essential in understanding the program's use. Figure 4 illustrates schematically the flow of information to and from the program. Control of the various functions that the program performs is provided by commands, which the user enters through cards in the system input file, SYSIN.

As previously described, manpower distributions to each account are supplied as card output from the Division Labor Report. Upon the appropriate user command, these cards are ready by the program from MPRFILE. Although the Central Accounting program contains both the cost and manpower data, the Management Report data is taken from the Division Labor Report file (MPRFILE) because it is computed more accurately for the small programs. The cost distributions to each account are supplied by the Central Accounting program and are read from CSTFILE upon command. Finally, for determination of total and remaining funds available, the financial plan for each account is input from a card deck that is updated before each monthly run of the Management Report.

ORNL-DWG 80-7996

Fig. 4. Type and Flow of Input and Resulting Output Through the Management Reports Computer Program. Files include: SYSIN - system input, MPRFILE - Division Labor Report, CSTFILE - cost distributions, BGTFILE - total and remaining funds, SYSPRINT - standard output, RPTPAGE - body of report with details of individual accounts, CVRPAGE - cover page with subtotals and grandtotals, LASTRPT - input tape for succeeding month, and RPTFILE - output tape.

The final product of the program's execution is the printed report. The report is actually printed on two output files so that summary information can be separated from detail information. A cover page containing subtotals and grand totals is printed on file CVRPAGE. The body of the report is written on file RPTPAGE and contains the status of individual accounts as well as subtotals and grand totals. The commands along with any error messages are printed on the standard output file, SYSPRINT.

An example of the details report RPTPAGE can be seen in Fig. 5, while Fig. 6 shows a sample summary cover page CVRPAGE. Examination of any line from Fig. 5 is a good way to visualize the information maintained for each account. A record is stored for each account, which contains the following:

Account number — an eight-character key between "00000000" and "99999999" to identify the record.

Name — a twelve-character mnemonic for convenience.

Monthly manpower charge — the manpower charge to each account is stored for each month of the fiscal year in man months (MM) (only the last three months are printed in the report).

Monthly cost — the costs charged to each account are stored for each month of the fiscal year in thousands of dollars (\$K) (again only the last three months are printed).

Straight line rate — the allowable monthly rate of spending for the remainder of the fiscal year.

Cumulative man years — the total number of man years (MY) charged to the account in the current fiscal year to date.

Budget — the financial plan for the account in thousands of dollars.

Percent spent — the percent of the financial plan spent to date.

Average cost per man year — the cumulative cost is divided by the cumulative man years to compute the cost per man year for the account in thousands of dollars per man year.

ACCOUNT NUMBER	PROGRAM DESCRIPTION	APR. MM	APR. SK	MAR. MM	MAR. SK	FEB. MM	FEB. SK	STRAIGHT LINE RATE \$K/MONTH	SCALE. MY	YR TO DATE \$K	FISCAL YR P.000T \$K	% SPENT	AVERAGE TO DATE \$K/MY
34700320	ROG MGT	1.2	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700321	SLDG INSULAT	1.2	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700322	ALT FUELS	1.2	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700323	INSUL EVALUA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700324	MAT ANALYSIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700325	MGT TIMES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700326	INSUL C ANAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700327	CONSERVATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700331	OTEC MTR STU	0.3	0.1	1.1	5.5	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
34700340	OTEC	0.3	0.1	1.1	5.5	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
34700341	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700342	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700343	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700344	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700345	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700346	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700347	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700348	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700349	PROG MGT	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700351	TR1 REL PTF	1.1	0.0	1.0	5.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700352	PROC SPEC	2.0	0.0	1.0	10.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700353	MTGR DEV	2.0	0.0	1.0	10.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700354	STRUCT MAT	19.3	15.3	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4
34700355	DEF MECH	15.0	15.0	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4
34700356	PHY PROP	13.5	13.5	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4
34700357	AD EFFECTS	11.2	11.2	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4	10.2	10.4
34700358	CLOSED	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700359	ENG MAT STU	33.0	33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700360	FUNDAMENTAL	33.0	33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700370	PROG MGT	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34700371	RAD DAMAGE	10.7	10.7	1.0	10.7	1.0	10.7	10.7	10.7	10.7	10.7	10.7	10.7
34700372	COMP STUDIES	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700373	SURFACE STU	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700374	ORMAK	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700375	MAT'L ENGR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700376	FUSION ENERGY	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700377	GRAPH OXIDAT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700378	FUEL GRAPHITE	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700379	STRUCT MAT'L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700380	MUS SUR-CONT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700381	RAPH MAT DEV	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700382	PCR MAT DEV	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700383	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700384	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700385	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700386	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700387	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700388	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34700389	STR MAT CON	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

'18. 5. Sample Report Detail (RPTPAGE) Output of the Management Report. Note that the subtotals of this report are the line totals of the CVPAGE (Fig. 6) output.

METALS AND CERAMICS DIVISION MANAGEMENT REPORT

ACCOUNT NUMBER	PROGRAM DESCRIPTION	APR.		MAR.		FEB.		STRAIGHT LINE RATE YR/MONTH	FISCAL YR TO DATE		FISCAL YR BUDGET \$K	Σ SPENT	AVERAGE TO DATE \$K/MY
		MM	\$K	MM	\$K	MM	\$K		MY	\$K			
CONSERVATION		4.9	35.1	3.8	38.0	3.6	30.5	62.4	2.27	212.9	515.0	41.3	93.9
CTEC		0.3	0.1	1.1	5.5	0.0	0.2	-0.1	0.44	30.8	30.0	101.6	69.7
COAL		9.0	62.9	8.3	62.4	8.2	23.8	86.8	5.05	370.1	804.0	46.0	73.1
HTGR DEV		2.0	1.4	1.8	10.1	1.4	8.1	17.9	3.44	28.6	98.0	29.2	64.7
FUNDAMENTAL		53.6	342.9	56.0	344.2	51.2	363.9	392.0	73.33	2659.1	4618.0	57.6	79.8
FUSIGN ENERGY		17.8	139.9	17.6	156.9	19.0	170.0	145.1	10.22	594.3	1724.0	57.9	97.7
HTGR		23.6	170.1	18.2	197.8	17.5	113.2	173.0	15.91	1010.0	1875.0	53.9	92.6
TH U		22.6	187.6	18.7	120.0	19.0	140.0	229.3	13.06	1108.5	2255.0	49.2	84.9
TECH & APPLIC (NRA)		26.5	215.6	23.0	213.6	23.0	140.4	177.9	13.88	1337.1	2221.0	60.0	96.0
TH FC CST		1.0	5.1	1.0	5.9	1.0	5.0	12.7	0.25	16.6	80.0	20.8	66.3
WASTE MGT		2.0	10.1	2.2	16.8	2.4	15.8	10.6	1.02	103.1	196.0	52.6	109.6
LMFR		27.8	204.4	27.5	253.0	24.6	296.9	293.8	15.51	1766.9	3176.0	53.7	110.1
HT DESIGN		1.5	12.4	1.0	9.2	1.3	12.3	11.9	0.74	90.6	150.0	60.4	105.1
ADV. FUEL		5.4	30.3	6.1	31.3	4.4	42.7	22.8	2.60	161.7	275.0	88.6	61.9
TOTAL DOE		194.5	1428.0	186.2	1444.7	181.3	1334.0	1637.9	109.81	9827.3	18617.0	54.5	89.5
PROGRAM 23		0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.00	0.0	25.0	0.0	0.0
PROGRAM 30		1.1	4.7	0.9	5.2	2.4	11.1	27.6	0.76	44.1	182.0	24.3	58.0
PROGRAM 40		21.1	178.2	22.7	231.2	22.1	176.7	226.8	11.85	1117.7	2750.0	49.7	94.4
TOTAL NSC OPERATION		236.7	1610.9	209.8	1721.1	207.7	1522.3	1896.9	122.42	10989.2	20474.0	53.7	89.6
SERVICE		23.5	0.0	23.4	0.0	22.6	0.0	0.0	13.12	0.0	0.0	100.0	0.0
DIV. ADMINISTRATION		31.3	0.0	29.9	0.0	31.0	0.0	0.0	18.70	0.0	0.0	100.0	0.0
LOANEE'S OUT		7.0	0.0	4.0	0.0	6.0	0.0	0.0	3.03	0.0	0.0	100.0	0.0
LAB O.M.		22.5	0.0	24.5	0.0	23.1	0.0	0.0	14.24	0.0	0.0	130.0	0.0
GRAND TOTAL		305.1	1610.9	293.6	1721.1	290.1	1522.3	1896.9	172.33	10989.2	20474.0	53.7	89.6

Fig. 6. Sample CVRPAGE Output of the Management Report.

Program Use

The program provides the user with a command language. This enables the user to control the program's functions and adapt the output to his specific needs. The following is a list of the commands and their meanings:

START -- this command is used to initialize the program for the first month of the fiscal year.

RESTART -- this command must be the first card in the SYSIN deck for all months after the first month of the fiscal year. It must be accompanied by the month number justified right in columns 24 and 25 of the same card. This causes the program to read the history through the previous month from tape so it can be updated with the current month's information. The number of the month is written on each tape, and the program will check to see if the number of the current month (entered on the RESTART card) is one greater than the number on the tape for the previous month to avoid losing information from overwriting the wrong tape.

MANPOWER -- this command causes the program to read the manpower charges from MPRFILE.

COST -- the COST command instructs the program to read the costs from CSTFILE.

BUDGET -- this command causes the program to read the financial plans for any accounts included in BGTFILE. This command is always needed for the first month, but in subsequent months it is only needed when changes or additions are necessary.

REPORT -- this command causes the program to generate the report for the current month. It must be issued only after all other information for the current month has been entered. At this point the program uses this information to update all other information in the record for each account. It also records all information on the output tape, RPTFILE. This tape will become the input tape (LASTRFT) for the succeeding month.

RANGE TOTAL -- this command is used to form the sum of the individual costs of a range of program numbers. For example, in Fig. 6 the

line labeled CONSERVATION is the sum of the costs listed above it and was computed by using the command RANGE TOTAL 34700520 (through) 34700529. In this operation, not all accounts in the sequence need to be utilized. The program simply "skips" those numbers, and they are held in reserve for future use.

PRINT SUBTOTAL -- in general, this command prints the RANGE TOTAL on the CVRPAGE and RPTPAGE, making the RANGE TOTAL and SUBTOTAL synonymous. However, the program can sum two or more discontinuous ranges into a single total, as explained below.

ZERO SUBTOTAL -- this command clears all previous accumulations and starts the addition over at zero (0.00). The program does not automatically "zero" the totals as they are printed, and they must be cleared by command. This permits the summing of the discontinuous ranges described above simply by not inserting the ZERO SUBTOTAL command until you are ready to sum the discontinuous ranges.

PRINT GNDTOTAL -- as each subtotal is cleared or "zeroed," it is stored and accumulated with other subtotals in a second mode. On this command all subtotals are summed and printed out as the grand subtotal at that point. Unless the command ZERO GNDTOTAL follows, the mode will continue to store the previous subtotals and accumulate additional ones to their totals.

PAGE -- causes file RPTPAGE to be advanced to the top of the next printer page.

STOP -- stops execution of the program.

Card layouts for the commands are shown in Fig. 7. The relationship of the input commands that create the reports output is discussed in the next section.

Sample Input and Output

A sample input selected from a typical month in the Metals and Ceramics Division is shown in Fig. 8. The corresponding output is illustrated in Fig. 9 by using abstracts of previous figures. The input deck (SYSIN) begins with a RESTART command for month 3, followed by commands to read the manpower and cost decks (MPRFILE and CSTFILE). If

Fig. 7. Card Formats for Commands.

```

34700520 34700529
CONSERVATION
CONSERVATION
34700531 34700531
OTEC
OTEC
34700540 34700549
COAL
COAL
34700550 34700559
HTGR DEV
HTGR DEV
34700550 34700569
FUNDAMENTAL
FUNDAMENTAL
34700570 34700579
FUSION ENERGY
FUSION ENERGY
34700599 34700609
HTGR
HTGR
34700610 34700623
TH U
TH U
34700629 34700639
TECH & APPL'C (NRA)
TECH & APPL'C (NRA)
34700640 34700649
TH FC CST
TH FC CST
34700650 34700659
WASTE MGT
WASTE MGT
34700700 34700779
LMFBR
LMFBR
34700780 34700789
HT DESIGN
HT DESIGN
34700790 34700799
ADV. FUEL
ADV. FUEL
TOTAL DOE
TOTAL DOE
34700200 34700299
PROGRAM 20
PROGRAM 20
34700300 34700399
PROGRAM 30
PROGRAM 30
34700400 34700499
PROGRAM 40
PROGRAM 40
TOTAL M&C OPERATIONS
TOTAL M&C OPERATIONS
34700100 34700100
SERVICE
SERVICE
34700001 34700001
DIV. ADMINISTRATION
DIV. ADMINISTRATION
34700021 34700021
LOANEE'S OUT
LOANEE'S OUT
34700099 34700099
LAB O.M.
LAB O.M.
GRAND TOTAL
34700000 34700999
GRAND TOTAL

```

[illegible]

Fig. 8. Sample Input.

ORNL-DWG 80-7005

ACCOUNT NUMBER				APR.		MAR.	
PROGRAM DESCRIPTION				MM	SK	MM	SK
34700520 ROG MGT				1.2	0.0	1.2	0.0
34700521 ALY FUELS				1.2	12.1	0.0	10.0
34700522 INSUL EVALUA				0.0	4.4	0.0	12.2
34700523 MAT ANALYSIS				0.0	3.0	0.0	8.0
34700524 LGT TIMES				0.0	0.0	0.0	6.0
34700525 INSUL C ANAL				0.0	30.2	0.0	0.0
CONSERVATION				4.0	34.1	3.0	38.0
34700531 OTEC MTH STU				0.3	0.1	1.1	5.5
OTEC				0.3	0.1	1.1	5.5
34700540 PROG MGT				0.0	0.0	0.0	0.0
34700541 PRES VESSEL				2.7	10.0	0.0	7.0
34700542 FAIL ANALYSIS				0.0	0.0	2.0	10.0
34700543 EMULSION CTR				1.0	11.0	1.1	17.5
34700544 INSPECT TECO				1.0	12.0	1.5	10.0
34700545 FLUID BEDS				0.0	1.2	0.2	1.7
34700546 POS SEMEN MEL				1.0	0.0	1.0	1.2
34700547 CLOSED				0.0	0.0	0.0	0.0
34700548 CERP				1.0	5.7	0.2	3.0
34700549 AFRC DEM PLY				0.0	0.0	0.0	0.0
COAL				9.0	62.0	8.3	42.0

ACCOUNT NUMBER				APR.		MAR.	
PROGRAM DESCRIPTION				MM	SK	MM	SK
CONSERVATION				4.0	35.1	3.0	38.0
OTEC				0.3	0.1	1.1	5.5
COAL				9.0	62.0	8.3	42.0

ABSTRACT FROM RPTPAGE

ABSTRACT FROM CVRPAGE

Fig. 9. Abstracts of Figs. 8, 5, and 6 Showing Relationships of Input Commands in Creating the Report Page (RPTPAGE) and the Summary Cover Page (CVRPAGE).

changes in financial plan were needed, the BUDGET command would have been included. After all input has been read, the REPORT command is entered to update the account records, and the commands for actually printing the report begin.

The RANGE TOTAL command is used to form the total of all accounts from 34700520 through 347009529. After the program processes this command, the total is stored in both the SUBTOTAL and GNDTOTAL records. (The program clears these totals when execution begins. Hence, it is not necessary to "zero" them before their first use.) The SUBTOTAL record is then printed with the title "CONSERVATION" on both CVRPAGE and RPTPAGE. The SUBTOTAL record only is cleared before the next RANGE TOTAL command is given. By repeating this process the user can print subtotals of specific groups of account numbers while accumulating the total of all accounts as a grand total. This has been done in Fig. 8 through the point where the total of accounts 34700700 through 34700779 has been accumulated. At this point the SUBTOTAL record has been printed with the title "LMFBR" while the GNDTOTAL record is printed with the title "TOTAL DOE." The GNDTOTAL record contains the total of all subtotals up to that point.

The GNDTOTAL record is allowed to continue accumulating the total of all accounts, while the SUBTOTAL record is "zeroed" after each RANGE TOTAL command. The GNDTOTAL record is printed again with the title "TOTAL M&C OPERATION" and near the end with the title "GRAND TOTAL" on RPTPAGE only. Before printing on CVRPAGE the GNDTOTAL record is zeroed and the total is recomputed by using the range of all allowable account numbers. By comparing this to the previous grand total, we can determine whether any accounts were omitted from the groups. As always the input deck should be terminated with a STOP command.

CONCLUSIONS

The Management Report along with the related Division Labor Report have been in service in the Metals and Ceramics Division for over two years. Comment from the Division staff indicates that the system is producing timely and accurate data in sufficient detail to be

informative but not burdensome. The special intercept handling of the hours distribution used an input for the Labor Report has resulted in more accurate labor costing with almost no errors. We recommend the system as a vital and useful tool in the management of either a matrix or nonmatrix organization.

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