INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Inventory and Production Control
Type of Industry	Heavy Machinery Manufacturer
Name of User	Cameron Machine Company Dover, New Jersey

Equipment Used	Univac 1005 III Magnetic Tape System
	Univac 1001 Card Controller
	3M "2000" Processor Camera
	3M 200 Reader-Printer
	Unit Record Equipment

Synopsis

Cameron Machine Co.'s data processing equipment is used primarily for production and inventory control applications. As many as 3,000 parts may be required for a single machine which the company builds. Ensuring that these parts are readily available where and when they are needed is the main function of the system. This process involves scheduling of parts production, parts ordering and inventory control.

Supplementing the data processing installation is a microfilm system which Cameron uses to automatically retrieve and reproduce the engineering drawings required in parts production and machine assembly. The microfilm system employs aperture cards which are sorted by automated equipment.

BACKGROUND

Cameron Machine moved into data processing in 1960 with an integrated system that was designed to solve many problems the company faced. The system did not perform up to expectations and the results were far from encouraging.

Despite the early set-back, Cameron's management realized that a great deal of value could be gained from the proper implementation of EDP. Cameron subsequently installed a Univac 1004 card processor in 1964, and has since moved to a Univac 1005 III Magnetic Tape System with a Univac 1001 Card Controller as a satellite.

In addition, Cameron has installed a 3M microfilm system tied into the EDP facilities. This combination has enabled Cameron to establish tighter controls in the manufacturing process.

> Cameron Machine Company of Dover, N.J. manufactures systems for processing flexible material in rolls or sheets for the metal, paper, fabric, plastics and printing industries. Most of Cameron's machinery is custom designed to fit unique applications. Founded in Brooklyn, N.Y., in 1906, the company employs approximately 350 persons and has annual sales in excess of $10 million. Cameron operates manufacturing facilities in South Windham, Connecticut; Ghlin, Belgium and maintains manufacturing license agreements in Japan, Finland, Brazil and Argentina.

At the present time Cameron is running more than 150 programs. Most important of these, according to the company's Controller, Herbert V. Restmeyer, are the ones that control inventory and production. Approximately 79 percent of all computer time is allocated to the production area.

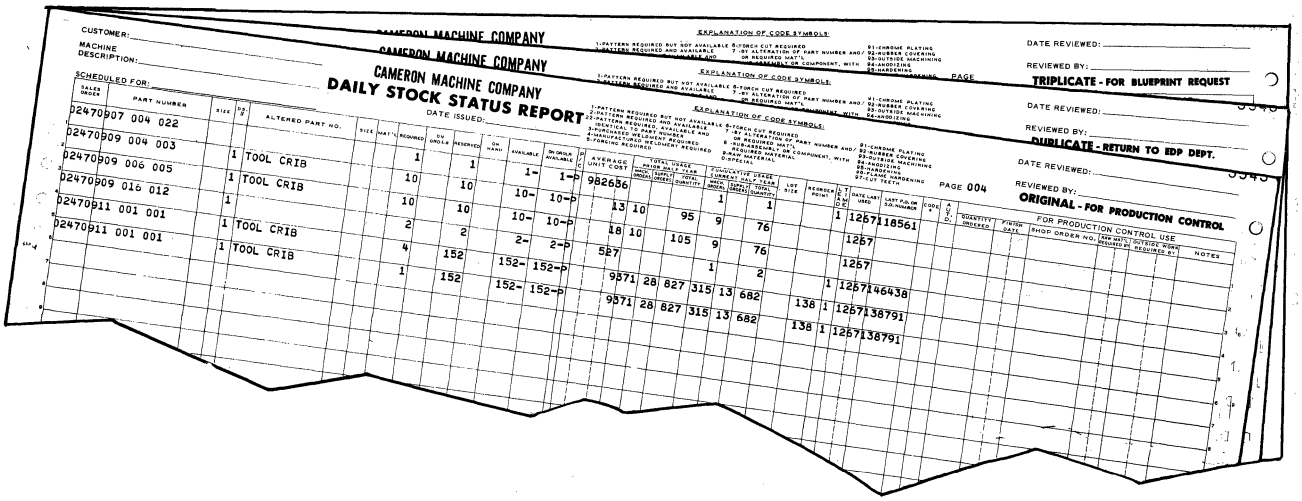
"There are times when one machine part can be bigger than the sum of the entire machine we're building," Restmeyer said. "This is the part that is out of stock, delayed in shipment, incorrectly cost estimated or somehow hexed in the production process. This one part can complicate the activities of virtually every department. The sales department worries about delivery. Production control revises machine loading schedules. Accounting is concerned with the cost. This production interrupt--as it is called--can bite into profits. It's a problem faced by many manufacturers, but I believe we have it well under control here."

THE EDP SYSTEM

The machines built by Cameron range in price from $10,000 to $400,000 and require anywhere from 500 to 3,000 parts. Therefore, it is important that Cameron's system be able to determine the availability of every one of the more than 35,000 parts that are either in inventory or on order.

Inventory information is updated three times weekly, with information on shop orders, purchase orders, parts finished, parts required and reserved for orders on hand, and average unit costs. Most of this information required for updating of files is entered manually on the computer-printed stock status reports when they are received by the various departments. Manually written information is then key-punched and fed into the system. Thus the stock status report is, in effect, a turnaround document.

Punched card input is run through the Univac 1001 card controller for collating, editing, sorting and card proving.


CAMERON MACHINE COMPANY

DAILY STOCK STATUS REPORT

CUSTOMER:

MACHINE DESCRIPTION:

SCHEDULED FOR:

DATE ISSUED:

PAGE 004

TRIPLICATE - FOR BLUEPRINT REQUEST

DUPLICATE - RETURN TO EDP DEPT.

ORIGINAL - FOR PRODUCTION CONTROL

SALES ORDER	PART NUMBER	SIZE	QTY	ALTERED PART NO.	SIZE (MAT'L)	REQUIRED	ON ORDER	RECEIVED	ON HAND	AVAILABLE	REORDER AVAILABLE	AVERAGE UNIT COST	TOTAL USAGE PRIOR HALF YEAR	CUMULATIVE USAGE CURRENT HALF YEAR	LOT SIZE	REORDER POINT	L/T (DAYS)	DATE LAST USED	LAST P.O. OR S.O. NUMBER	CODE	A/C	QUANTITY ORDERED	FY/QTR DATE	FOR PRODUCTION CONTROL USE SHOP ORDER NO.	SEQ. NO.	OUTSIDE ORDER REQUIRED	OUTSIDE ORDER REQUIRED BY	NOTES
	02470907 004 022		1	TOOL CRIB		1		1	1-	1-P		982636			1		1	1267118561										
	02470909 004 003		1	TOOL CRIB		10		10	10-	10-P			13	10	95	9	76		1267										
	02470909 006 005		1	TOOL CRIB		10		10	10-	10-P			18	10	105	9	76		1267										
	02470909 016 012		1			2		2	2-	2-P			527			1	2		1267146438										
	02470911 001 001		1	TOOL CRIB		4		152	152-	152-P			9571	28	827	315	13	682	136	1	1267138791								
	02470911 001 001		1	TOOL CRIB		1		152	152-	152-P			9571	28	827	315	13	682	138	1	1267138791								

THE STOCK STATUS REPORT IS PRODUCED THREE TIMES EACH WEEK. IN ADDITION TO "EXCEPTION" INFORMATION ABOUT PARTS WHICH HAVE REACHED REORDERING LEVELS, THE REPORT INCLUDES DATA ABOUT PARTS USAGE IN THE CURRENT AND PREVIOUS SIX MONTH PERIODS. COLUMNS ON THE RIGHT SIDE OF THE FORM ARE USED BY PRODUCTION CONTROL PERSONNEL TO UPDATE INFORMATION ON THE PRINT-OUT; THIS MANUALLY WRITTEN INFORMATION IS THEN PUNCHED INTO CARDS AND FED INTO THE COMPUTER.

These cards are then processed through the Univac 1005 III which stores the information on magnetic tape and produces a printout known as the "Stock Status Report."

The 1005 III, which has a storage capacity of 4K, is capable of reading 615 cards a minute and printing at a rate of 600 lines per minute. Core access time for the machine is 6.5 microseconds.

The stock status report reflects complete data for parts in inventory by the "exception" principle. When the supply of a particular part reaches pre-established replenishing points, data for that part is automatically printed out on the status report. With this information, management can anticipate potential trouble spots and move to correct them before they become critical.

It also accumulates the usage of parts that have been needed throughout the prior half-year, and the cumulative totals for the current half year. This listing for the previous six-months is used as a tool in the ordering procedure; it enables the purchasing agent to see at a glance how the current request compares to the total previously ordered.

When an order is received, a bill of materials is drawn up by the engineering department. Each component of the unit to be built is coded to the bill of materials and punched into a deck of requirement cards which in turn is run through the 1005 to produce the stock status report.

The subtraction of the newly needed parts from stock changes the availability of inventory on hand; so the bill of materials requirement deck is combined with other inventory transactions, for comparison with the inventory stored on magnetic tape, to update the status of parts affected, and to produce a printout that becomes the basis for ordering from suppliers and scheduling production. Part numbers, sales order numbers, type of material used, unit costs and other significant factors provide further "required reading" for production control.

CAMERON MACHINE CO.
BILL OF MATERIALS

FORM NO. _____ _____
SHEET NO. _____
CUSTOMER _____
SALES ORDER NO. _____ SIZE _____ TYPE 680 SERIAL NO. _____

ASSEMBLY SUB. ASSY

ITEM NO.	PART NUMBER	MACH. SIZE	IBM CODE	D.S.	DESCRIPTION	QUANTITY REQUIRED	ENG. CHG'S. DATE	BY	STK RM.
1									
2									
3	30-49-03451		MA	4	Hyd. Valve Support	1			
4	01-71-01844		MA	1	Bar	1			
5	01-36-06001		MA	1	U Bolt Clamp (Hyd. Valves)	8			
6	01-61-45050		MA	1	U Bolt Clamp Block	8			
7									
8	915-002-119		MA	1	Hose (65" Long) (1") Two Each Motor	4			
9	915-002-100		MA	1	Hose (50" Long) (3/4")	2			
10	915-002-153		MA	1	Hose (61" Long)	2			

Hydraulic ... etc.

BILL OF MATERIALS REQUIREMENTS ARE TYPED IN THE ENGINEERING DEPARTMENT AND FORWARDED TO DATA PROCESSING, WHERE EACH MACHINE PART IS COSTED OUT AND THE AVAILABILITY OF PARTS IS DETERMINED. THE BILL OF MATERIALS REQUIREMENTS LIST IS ALSO USED TO UPDATE INVENTORY.

DATE CAMERON MACHINE CO. COSTED BOM

SO NO.	PAGE #	ITEM #	CODE	PART NUMBER & SIZE	QUANTITY	AVERAGE UNIT COST	TOTAL MATL COST	TOTAL TIME	TOTAL INV VALUE
68400	19 8	02	A	30 17 10001	0006	1.36	1.14	.6	8.16
68400	19 8	03	A	05 31 00422	0001	13.74	2.00	1.7	13.74
68400	19 8	04	A	31 42 56002	0002	4.88	1.02	1.2	9.76
68400	19 8	05	A	14 15 18061	0001	39.21	9.11	4.3	39.21
68400	19 8	06	A	B 213 006	0001	15.16	15.16		15.16
68400	19 8	07	A	911 001 001	0001	.09	.09		.09
68400	19 8	10	A	23 31 22072	0001	.92	.18	.1	.92
68400	19 8	11	A	05 31 00421	0001	11.30	2.20	1.3	11.30
68400	19 8	12	A	31 42 56002	0001	4.88	.51	.6	4.88
68400	19 8	13	A	B 213 006	0001	15.16	15.16		15.16
68400	19 8	14	A	23 31 22072	0001	.92	.18	.1	.92
					*	107.62	46.75	9.9	119.30
68400	20	03	A	23 01 99006	0002	2.05	2.18	.2	4.10
68400	20	04	A	934 001 100	0002	15.91	31.82		31.82
68400	20	05	A	BW 103	0004	3.78	15.12		15.12
68400	20	09	A	23 01 99007	0004	3.44	3.52	1.6	13.76
68400	20	11	A	911 001 001	0004	.09	.36		.36
68400	20	12	A	NI 127	0006	4.10	24.60		24.60
68400	20	13	A	31 51 75004	0002	2.28	2.70	.2	4.56
	20	14	A	30 23 81406	0002	7.76	3.86	1.6	15.52
		15	A	30 23 91402		30.44			121.76

THE BILL OF MATERIALS INPUT FROM ENGINEERING PRODUCES A PRINTOUT THAT INCLUDES THE COST OF EACH PART REQUIRED FOR THE MACHINE CAMERON IS BUILDING.

For example, the company may be in the process of making five complete machines and filling 100 supply orders on a given day. Once an order for a machine is placed, the salesman needs a realistic delivery date and an approximate price. Within four hours, the inventory picture can be updated. Computer time on this job runs from 30 minutes to an hour, depending on volume. This speed has proven to be extremely valuable to Cameron. Often, advances in the customer's business, or changes in requirements, make it necessary to modify machines before they're delivered. Thus, Cameron is able to act quickly when these situations arise.

The rescheduling of new shop orders is normally done on a first-in-first-out basis. This "Machine Loading and Order Scheduling" report is run after the correlation of inventory and production control is completed. The program which was written for new orders is based on projected completion dates as they relate to previously scheduled load requirements, machine tool utilization and past performance.

INTEGRATING MICROFILM AND EDP

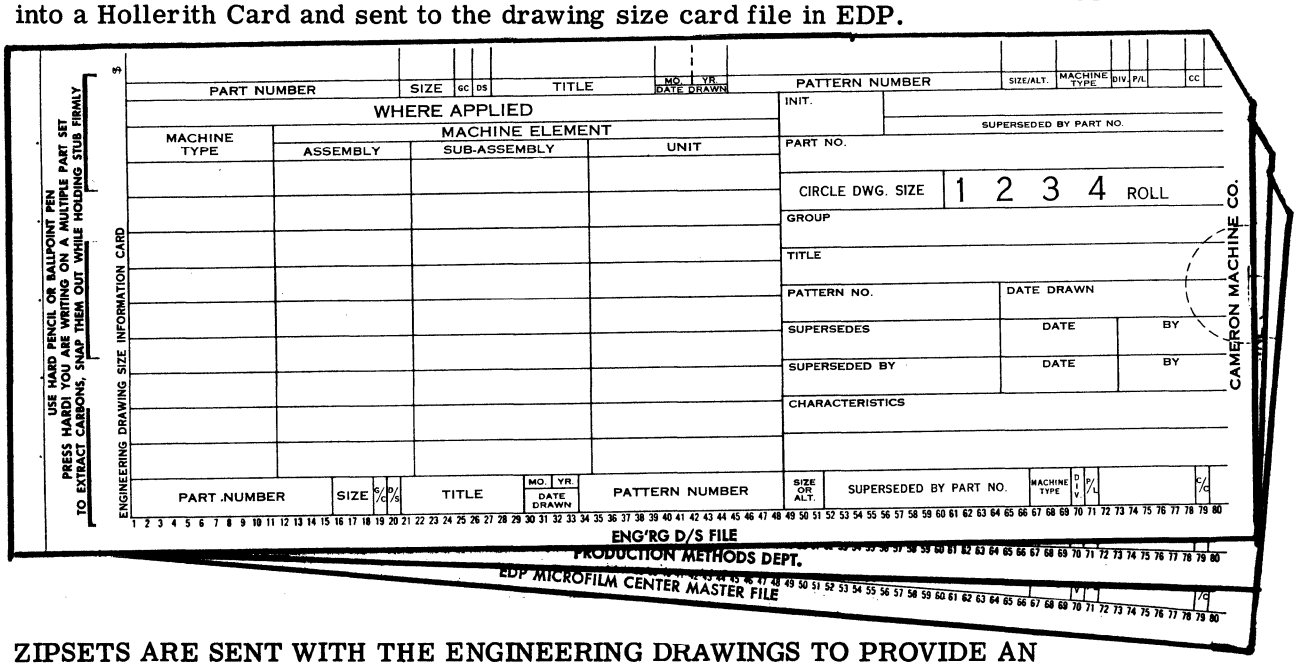
Complementing data processing equipment is a 3M unitized microfilm aperture card system. The microfilm area is adjacent to the computer and easily accessible to both engineering and production personnel.

A major problem in speeding up the process was finding a system that would improve the flow of blueprints needed by production control to review. It was necessary to design a system that would meet these requirements.

Like most manufacturers, Cameron had accumulated a sizable quantity of drawings--more than 150,000 in all, with some 35,000 on the active list. Some were for machines manufactured 40 or 50 years ago, still running, and still requiring replacement parts. Faced with fast-growing files, slow retrieval time, lack of file integrity and tight space requirements, Cameron turned to a marriage between microfilm and EDP for the answer.

Management took care to set up a standard operating procedure to provide fast service. Fulfilling requests and setting up jobs is performed in four steps:

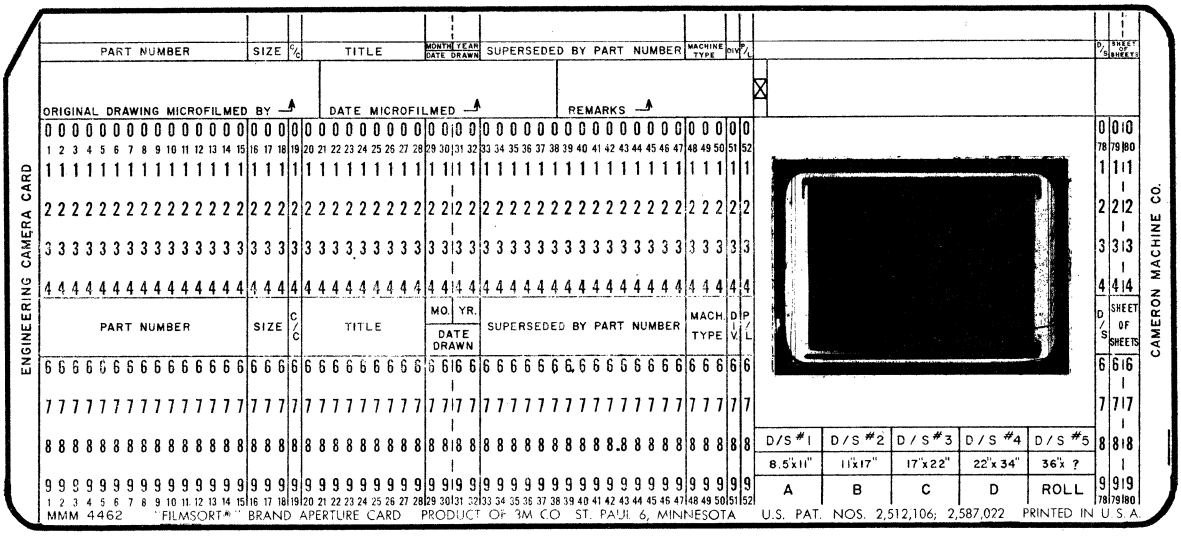
-- An original drawing accompanied by a drawing size Zipset is sent to the EDP-Microfilm Center from Engineering. Information on part one of the Zipset is keypunched into a Hollerith Card and sent to the drawing size card file in EDP.



ZIPSETS ARE SENT WITH THE ENGINEERING DRAWINGS TO PROVIDE AN ADDED CONTROL FACTOR AND NECESSARY INFORMATION.

-- A diazo blueprint is made and forwarded with part two of the Zipset to production methods, where a master operations sheet is made up. Information on part three of the Zipset is keypunch duplicated for pertinent information and filed with other master aperture cards in the EDP-Microfilm center. This card is then destroyed when a production master is received. This procedure gives the microfilm center a cross check for establishing receipt of the original drawing from engineering and subsequent transmittal to the production methods group.

-- When a copy of the production methods master and the diazo blueprint is received at the microfilm center, it is placed on the copyboard of a modified 3M "2000D" processor-camera which produces a fully developed 35mm microfilm image in a frame of film mounted in the aperture card. The process takes less than a minute. Data contained on part three of the Zipset is then reproduced into the camera card and into two diazo duplicards.



APERTURE CARDS ARE MADE OF ALL ACTIVE DRAWINGS. THE EDP-MICROFILM INTERFACE HAS ELIMINATED LONG SEARCH TIMES AND CUT DOWN ON FILING SPACE REQUIREMENTS.

The 2000D processor camera has an output of approximately 60 microfilm records an hour. It is cartridge fed and shoots at two ratios -- 14-1/2 to 1 and 29 to 1. The machine has been modified because the blow-back of the microfilmed images into hardcopy didn't correspond to the original reduction ratios of 16 to 1 and 24 to 1. Reproductions are now in accordance with specifications: "A", "B", and "C" size drawings are reproduced full scale while "D" size drawings are blown-back half-scale.

-- The duplicards, complete with copies of the microfilmed images, are reproduced on a 3M Filmsort Uniprinter. The camera card is filed in the EDP-Microfilm center by part number and maintained in the master file.

One duplicard is sent to the security vault and the other to Engineering for inclusion in their departmental satellite file for rapid reference. Engineering is equipped with one 3M 200R reader-printer -- one reader is also contained in the Research and Development department. Additional duplicards are prepared, when necessary, for mailing to Cameron's facilities in Belgium, Connecticut and Japan.

At this point the microfilm process is married to the data processing system. On line to the 1005 III is a Univac 1001 Card Controller. This high speed alphanumeric collater with magnetic core storage, program logic and computing ability can collate 2,000 aperture cards a minute and sort 1,000 cards a minute.

Aperture cards are selected automatically from any run and in any sequence needed enabling Cameron to quickly retrieve the right drawings for each job. This process reduces search time considerably. Aperture cards are selected either simultaneously with printout of the production scheduling report or after the report is printed. After the required aperture cards have been selected, they are then batch processed through the 3M "333" Dry Silver Printer which handles 200 cards at a time and produces quality prints up to 18"x24" at a rate of up to eight copies a minute. These prints are manually collated with the computer printed Stock Status Reports and the aperture cards returned to the master file via the 1001 -- all within one hour. Production control receives a "complete package" in short order and the engineering drawing file retains its integrity. Lead time savings resulting from this system have eliminated previous paperwork delays running from three days to a week at a substantially reduced labor cost. Production control assigns and manually checks work to be done. When the

product is completed and ready for shipment -- or for addition to inventory -- that information is reported to data processing and the billing procedures begin.

MANAGEMENTS VIEW OF EDP

Cameron's initial EDP problems have set the pattern for growth since inception. The company's attitude is one of caution when developing programs.

Mr. Restmeyer said: "We don't believe anyone can come in and install a system that will be all things to all people. I think the fact that this was promoted and was not successful is proof enough."

"Our major emphasis has led toward developing bread and butter programs first. Once they are tested and proven, we move on to the next level -- step-by-step -- application by application. In this way we've been able to extract data required for the financial end of the business and still give the production people an efficient management information system custom designed to render exactly what is desired."

RESULTS AND FUTURE PLANS

Cameron estimates that annual savings of the two systems approaches $100,000. Approximately 70 percent of this in the inventory control and production areas. The ability to explode a bill of materials, along with pricing information, schedule machine time and tighten inventory control would not have been possible without the computer.

Reports like the Stock Status Report give management a clear-cut picture of the operating problems to be encountered in these major departments -- accounting, production and engineering.

Mr. Restmeyer said: "We can realistically measure time and costs now, and the purchasing department has a tighter control over ordering procedures. Production centers now operate on a maximum load base and the engineering department can function more efficiently without long blueprint searches. We believe that we're proving daily that the production interrupt is an unnecessary blight on sales, profits and management's nerves."

He believes that the present system will fulfill corporate requirements for the next several years. In the meantime, Cameron looks to expand its volume and correlate data processing activities in Dover with the Belgium and Connecticut plants.