INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Finished Goods Inventory, Production Control, Cost Analysis, Budget Reporting, Order Processing
Type of Industry	Metals Fabrication
Name of User	Standard Pressed Steel Co. Jenkintown, Pa.

Equipment Used	Honeywell 1200 Computer System Honeywell 200 Computer System

Synopsis

Standard Pressed Steel Company (SPS), with corporate headquarters located in Jenkintown, Pennsylvania, was founded in 1903 as a manufacturer of steel shaft hangers. Today, SPS is one of the nation's leading industrial corporations. Products manufactured by SPS range from screws and bolts for commercial, industrial and aviation use into the sophisticated and specialized parts used in space technology and a complete line of office furniture, shop equipment, shelving and vocational/technical school laboratory furniture. The company employs over 9,000 persons in 28 plants and supply centers located in 11 countries and on six continents. Product units manufactured by SPS are numbered in billions, annually. Maintenance of inventories of finished goods, raw materials, tools, gauges, purchased parts and work-in-process are all critical needs in the operation of the company. At the company's largest and most diversified plant, located in Jenkintown, 95% of the orders for standard items (more than 12,000) are shipped within 24 hours from an inventory of over 190 million pieces.

BACKGROUND TO EDP

In 1958, SPS corporate management established a data processing research group to investigate available computer systems to supplant its growing complex of unit record equipment. This group was asked to recommend equipment and systems applications which would satisfy the needs of the Jenkintown manufacturing organizations and the corporate staff for a minimum of five years. The group completed its initial investigation a year later, and chose a Honeywell 800 computer system.

Among the initial applications taken over by this first computer was the finished goods inventory of standard threaded parts, a shop order system to record shop operations, operator and departmental performance and incentive operator earnings for all work-in-process and a tool inventory encompassing 35,000 to 40,000 tools manufactured or purchased for Jenkintown plant use.

A year later, with the increased demands of new systems in production and check-out, an H-400 computer was installed so that the H-800 could be operated in a tape-handling-only mode. All input devices and operations (card reading, card punching and printing) were delegated to the H-400 system.

Eventually, the SPS Jenkintown computer center was operating with a three-shift workload. An H-200 computer system was installed replacing the H-400 as an input/output processor, increasing throughput at a lower cost. At this time, SPS began its data processing standardization program throughout the corporation which resulted in the installation of Honeywell Series 200 computers in all data centers.

This step by step upgrading of computers at Jenkintown was accomplished over a period of about seven years. Most recently, an H-1200 computer with 65K characters of core storage was installed at the Jenkintown data center, which needed greater processing power. That data center serves two divisions and corporate headquarters. It is equipped with an H-800 and an H-1200 central processor, each with seven tape drives and an H-200 computer equipped with 16K characters of core storage, four tape drives, card reader, card punch and two high speed printers. The H-200 system still handles all of the input/output functions required to support the two large tape-handling systems.

THE DATA PROCESSING STRUCTURE

At SPS, the direction of corporate-wide data processing activity is a function of the corporate controller. Reporting to him is the corporate systems services staff whose responsibilities include the development of systems for corporate-wide use, assisting, advising and providing consulting services to corporate, division and plant management in all facets of data processing.

Techniques used in systems analysis and design, programing, equipment operation, input output control and documentation have been standardized across corporate lines. Company divisions using similar configurations of Series 200 hardware and software have implemented similar concepts of a basic integrated system with local variations in program content to suit the needs of the manufacturing and marketing environment.

In all, H-200 Series computers are utilized by four divisions and the corporate management staff. Each data center is operated under the control of division management with the corporate systems services staff having responsibility for establishing standards, training technical and non-technical personnel, the application and use of communications and data handling systems and approval authority for equipment additions, modifications, upgrading

and releases throughout the corporation. SPS data centers are strategically located to provide services to one or more divisions, and/or plants, dependent on the needs of the computer operating division. Each data center is operated as a cost-center with expenses apportioned to SPS user organizations.

THE BASIC INFORMATION SYSTEM

The philosophy used in the design of SPS data processing systems is that their prime function is to serve and provide for the information needs of manufacturing management. Under this concept, the accounting and financial information required for management of the company is designed to be a by-product of the manufacturing information systems.

The corporate-wide basic information system is comprised of four subsystems:

(1) Cost Book - Creates and maintains a file of production methods with standard costs assigned to each operation for all standard products. It is used to produce shop documentation and provide the basis for evaluating finished goods inventory.

(2) Work-in-Process - Maintains an up-to-date financially reliable record of the status of the work-in-process inventory, providing production control and order progress reports on an exception basis, daily labor information, control over variations from standards, shop-load data and cost information for cost center and budget analysis.

(3) Finished Goods-Order Control - Provides a financially reliable record of finished goods inventory, inventory management control information, a record of customer orders, automatic billing to customers for goods shipped and information for basic customer order analyses.

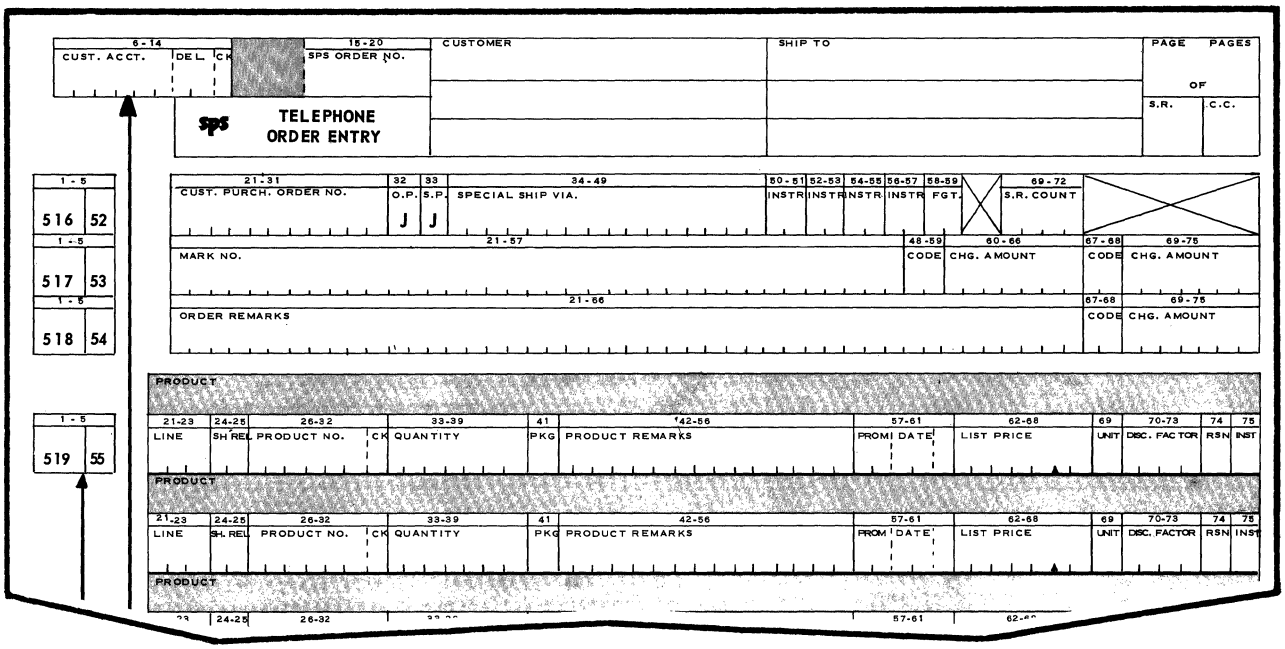
(4) Cost Center - Maintains a single record of all production cost and financial information. It is used to provide management control and budget performance reports.

ORDER PROCESSING FOR STANDARD PRODUCTS

SPS products are sold through a network of industrial distributors, sales representatives and dealers with orders coming by mail, telephone and teletype. All incoming orders are reviewed and are checked for accuracy and completeness by the sales department. The incoming order, which triggers the system, is sent to the order processing department where it is coded with a six-digit customer number, a four-digit product class, a six-digit product number and a required shipping date for each line item. If special pricing is necessary to override the price-per-hundred maintained in the computer magnetic tape file, the overriding price is applied at this time. A control report is forwarded to sales management each day, listing all orders to which overriding prices were applied.

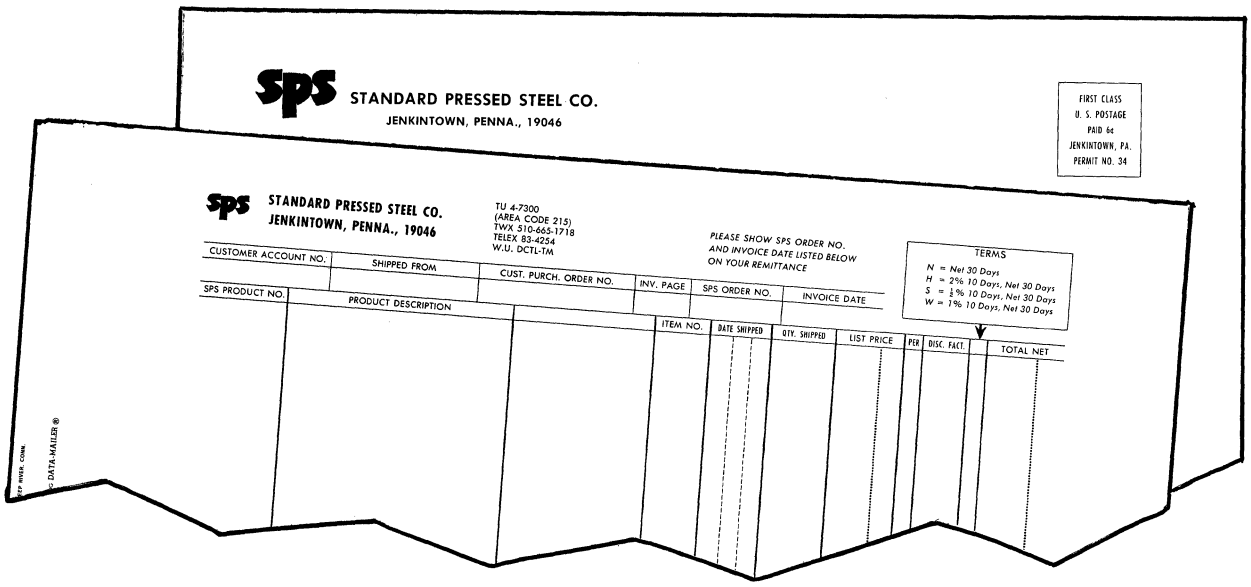
When all of the added information has been applied, the orders are then sent to the data center, in batches throughout the day. Here, using the coded information added to the incoming orders, each line item is recorded on punched cards or on magnetic tape via Mohawk 1101 data recorders. The prepared input is then run into the computer order processing programs where all codes are edited for validity and the inventory quantity of each item is checked to ensure availability.

The shipping document for each order, containing line items in warehouse shelf location sequence, is sent to the warehouse for picking and packing of the order. One copy of the shipping papers is sent to the customer with the goods and one copy is mailed to the customer as an acknowledgment. The third copy (after the order has been packed for shipment), is returned to the Data Center.



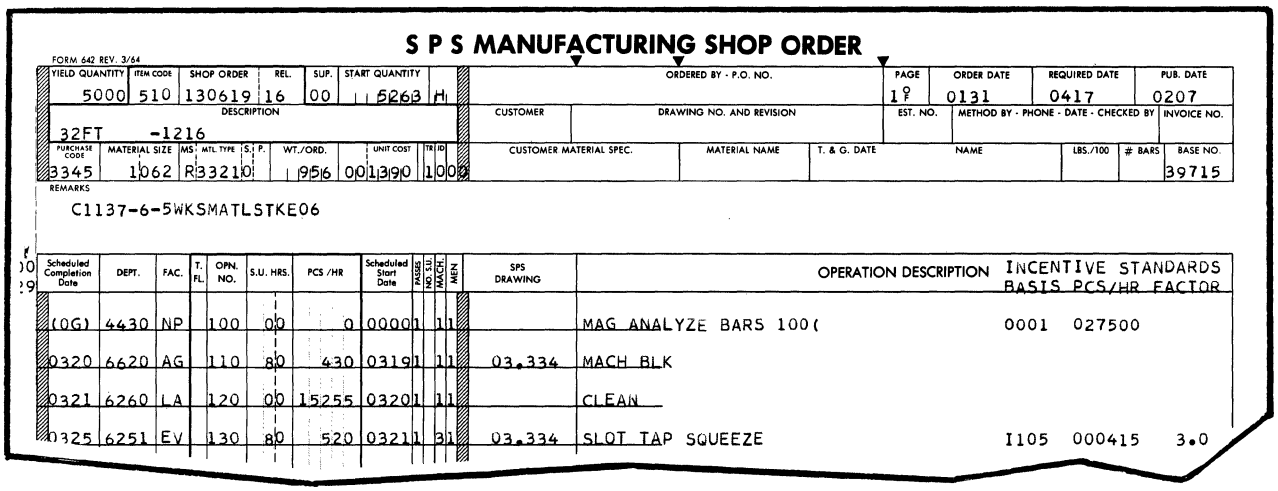
INCOMING TELEPHONE ORDER FORM. IT IS ARRANGED FOR KEYPUNCHING EASE.

For each order shipped, a punched card or magnetic tape record is generated. This data is then run into the computer order processing system for the preparation of customer invoices. If the order is complete, the program will automatically close the order on the computer file and produce the necessary input to the accounts receivable and sales analysis systems.



BACK ORDERS

The standard product order processing system will not produce a shipping document line for any item if there is insufficient inventory on hand to fill the order. The order processing system will generate a manufacturing work order if the non-fillable item is not already in the manufacturing process to meet a former demand. The manufacturing work order includes the product number and description, catalog number, drawing number, an operation sequence number and the cost center responsible for each operation needed to produce the item. Also shown is the facility (type of machine to be used for each operation), a start and completion date and a description of each manufacturing operation required to produce the finished parts. In essence, the manufacturing work order shows each step in the production of the item with the standard hours (calculated by the computer) for each operation required to accomplish the job.



S P S MANUFACTURING SHOP ORDER

FORM 642 REV. 3/64

YIELD QUANTITY	ITEM CODE	SHOP ORDER	REL.	SUP.	START QUANTITY	ORDERED BY - P.O. NO.	PAGE	ORDER DATE	REQUIRED DATE	PUB. DATE
5000	510	130619	16	00	5263 H		1	0131	0417	0207

DESCRIPTION	CUSTOMER	DRAWING NO. AND REVISION	EST. NO.	METHOD BY - PHONE - DATE - CHECKED BY	INVOICE NO.
32FT -1216					

PURCHASE CODE	MATERIAL SIZE	MS	MTL TYPE	S. P.	WT./ORD.	UNIT COST	TR	ID	CUSTOMER MATERIAL SPEC.	MATERIAL NAME	T. & G. DATE	NAME	LBS./100	# BARS	BASE NO.
3345	1062	R	33210		956	001390	10	02							39715

REMARKS

C1137-6-5WKSMATLSTKE06

Scheduled Completion Date	DEPT.	FAC.	T. FL.	OPN. NO.	S.U. HRS.	PCS /HR	Scheduled Start Date	PASSES	NO. SU	MACH.	MEN	SPS DRAWING	OPERATION DESCRIPTION	INCENTIVE STANDARDS BASIS	PCS/HR	FACTOR
(0G)	4430	NP		100	00	0	00001			1	1		MAG ANALYZE BARS 100(	0001	027500	
0320	6620	AG		110	80	430	03191			1	1	03.334	MACH BLK			
0321	6260	LA		120	00	15255	03201			1	1		CLEAN			
0325	6251	EV		130	80	520	03211			3	1	03.334	SLOT TAP SQUEEZE	I105	000415	3.0

The single-copy manufacturing work order produced by the computer is photocopied for the use of each department (cost center) involved in the manufacturing specified on the order. Standard product drawings, with the necessary specifications, are maintained in the manufacturing departments. Using the manufacturing work order, the shop foremen regulate their man-machine assignments, obtain the necessary tools and raw materials and control movement of parts to the next required operation area.

WORK IN PROCESS

Every machine operator and packer records his production for each operation performed. The data is collected at the end of each shift and is forwarded to the data center for key recording and updating of the work-in-process file. At the start of his shift on the following day, each shop foreman is supplied with a daily performance report listing his prior shift production showing employe clock number, date, shift, machine number, shop order number, operation number, number of pieces produced and an indicator for direct or indirect labor charges. With this report the foreman can compare actual production performance versus standards. Variances above and below norm are highlighted for each operation and a summary of departmental performance is included.

When all operations to produce an order have been completed the parts are packed, at which time a packing report is forwarded to the Data Center for keyed recording and entry into

the work-in-process computer system. The W.I.P. files are updated to reflect order completion, capturing cost information on the job, and the packed quantity is moved to the finished goods inventory file record for the item.

Daily, the open back order records are run against the finished goods inventory, and if the parts are in stock, shipping papers are automatically produced and the normal shipping cycle is triggered.

DPS-1 DAILY PERFORMANCE SYSTEM DATE 0210
COST CENTER WORKED REPORT COST CENTER 6313 SHIFT 2

CLK#	MACH #	SO-REL	#	OPN #	MISC	QTY PROD	INCENTIVE STANDARD	INC HOUR	STDMN HOURS	D/L MNHRS	ACT M/M	ACT MCHRS	STD M/M	STANDARD RATE	SETUP STDMN	SETUP ACTMN	IND HOURS	ACC #	FAC	I F
	0A87	138508-14	110			4200			.9	3.5	1 1	2.9	3.5	3 1	1440.00				30	AS	
	6313	000000-00	000								1 1							6.5	260	ZZ	
	TOT AVAIL HRS			10.0	STD/AVAIL	.90			.9	3.5		2.9	3.5					6.5			
	0B13	682568-01	100	FR510J							2 1			2 1	11200.00		.1		131	GA	
	0B10	234164-16	100	CA525K		155500			3.1	4.0	2 1	6.2	8.0	2 1	24750.00				30	GA	
	0B13	682568-01	100	FR510J		195				4.8	2 1		9.7	2 1	11200.00				30	GA	
	0B10	765004-01	110	HG963B		155			.9	.8	2 1	1.9	1.7	2 1	79.00				30	GA	
	TOT AVAIL HRS			9.8	STD/AVAIL	.418			4.1	9.7		8.2	19.4				.1				
	0A15	138837-02	110	JA454G		450			.6	1.0	2 1	1.2	2.0	0 1	365.00				30	AG	
	0A18	109973-14	110	HG426G		400			.6	.7	2 1	1.2	1.5	2 1	330.00				30	AJ	
	0A18	109973-14	110								2 1							.2	137	AJ	
	TOT AVAIL HRS			2.0	STD/AVAIL	.600			1.2	1.7		2.4	3.5					.2			
	0A16	108519-39	110			880			.6	1.0	2 1	1.3	2.0	2 1	650.00				30	AG	
	0A17	120444-12	110			550			.5	1.0	2 1	1.0	2.0	2 1	515.00				30	AG	
	6313	000000-00	000								1 1							5.0	214	ZZ	
	TOT AVAIL HRS			7.0	STD/AVAIL				1.2	2.0		2.4	4.0					5.0			
																			30		

THE DAILY PERFORMANCE REPORT

SPECIAL ORDERS

In addition to standard products, SPS also manufactures custom made parts to the specifications of its customers. These orders usually require special engineering and the performance of operations to demanding tolerances. It is the responsibility of the sales department to determine if the requested product has been manufactured before by SPS, or if special engineering must be done, and so indicate on the order. The order is then sent to engineering for the preparation of specifications and operations required for manufacturing. The engineering dept. then forwards the order with its working papers to the estimating department for costing. Sales then gets the information, quotes the selling price to the customer and if the item price is accepted, generates an order for the parts. The method of manufacture is key recorded from the engineering method sheet developed for the special product. This data is fed into the computer cost book and work-in-process systems and is used to generate the necessary manufacturing work order. At this point, the work-flow becomes the same as that for standard products.

FINISHED GOODS SYSTEM

In the design of the SPS finished goods system, mathematical techniques to control finished goods inventory quantities have been used. Based on manufacturing experience and customer demands the shelf quantities, safety stock, economic order quantities, etc., are self adjusting. To comply with certain conditions, these calculated quantities may be manually adjusted via punched card entries. The major output of the system is a series of daily exception reports used by production control and sales personnel. Tape inputs to the system are generated daily from the order processing and work-in-process systems and transactions from production control. Periodic customer and product analyses reports are prepared for use by sales and manufacturing management.

PFD FG-5 DAILY ITEMS TO MANUFACTURE DATE 02-11-69 PAGE 6

I/C DAYS	DESCRIPTION PCD SIZE	C TYPE	AWK	JENK-OH LB/MPC	WHS-OH YIELD	SCHED STARTQTY	OFF-1 MT-SQ	UNF-ALL =BARS	CR-FUT YDF	SHOPN SC	SHTRN SP	PC/W R.O.P.	LT E.O.Q.	USYTD PROD	USLTY =-RE	OR/MO RMCOST	ORYR	ORLY TC
L17	1-8 X 6	E		13				240				2	3	10	60	.4	2	2
				.	227	231			98	3					135185			6
017	1 1/4-7 X 4 1/2	B	5	1304	202	326						170	7	1719	5294	13.7	16	154
	4101 001250	43400		2750.00	1520	1600	4400		95	2		1870		1400	104857	1	.3700	6
017	1 1/2-6 X 4 1/2	B	2	206	66							31	7	477	2058	5.6	8	75
	4101 001562	43400		5044.60	480	500	2522		95	2		341		500	115919	1	.1775	6
817	1 3/4 X 8	MS	C 4	93								22	5	191	1110	2.1	3	32
	4101 001875	43400		1026.42	780	800	821		98	2		110		800	123110		.1780	6
018	HANDLE	02	E 12	25								2	5		355	.2		3
				.	72	80			90	3		100			100491	6		0
	HANDLE	04	E 4									2	5		515	.2		
																11		

DAILY ITEMS TO MANUFACTURE IS AN EXCEPTION REPORT, LISTING INVENTORY THAT IS DROPPING TO BELOW SAFE QUANTITIES.

COST CENTER SYSTEM

The SPS cost center system has been designed to furnish management with the essential information it needs to control costs and measure performance at each level of the organization. The system basically summarizes into a single file the production and financially-oriented transactions produced by other systems. Reports are produced in both detail and summary forms and are distributed to various management levels, from the shop foreman to plant and division activity managers and executives.

Simplified and condensed weekly operating reports are forwarded from the various divisions and/or locations to corporate headquarters for review. Each month, at the close of the accounting period, a series of condensed reports are forwarded to the manager of corporate accounts where the information is drawn together clerically to produce simplified reports on company-wide operations. The monthly reportings reflect order, shipment, inventories, personnel and payroll information, budget performance and similar data required for a summarized financial statement. This information is reviewed and evaluated by top management, providing the basis for operational and financial decisions in keeping with short and long-range company objectives.

SUPPORTING SYSTEMS

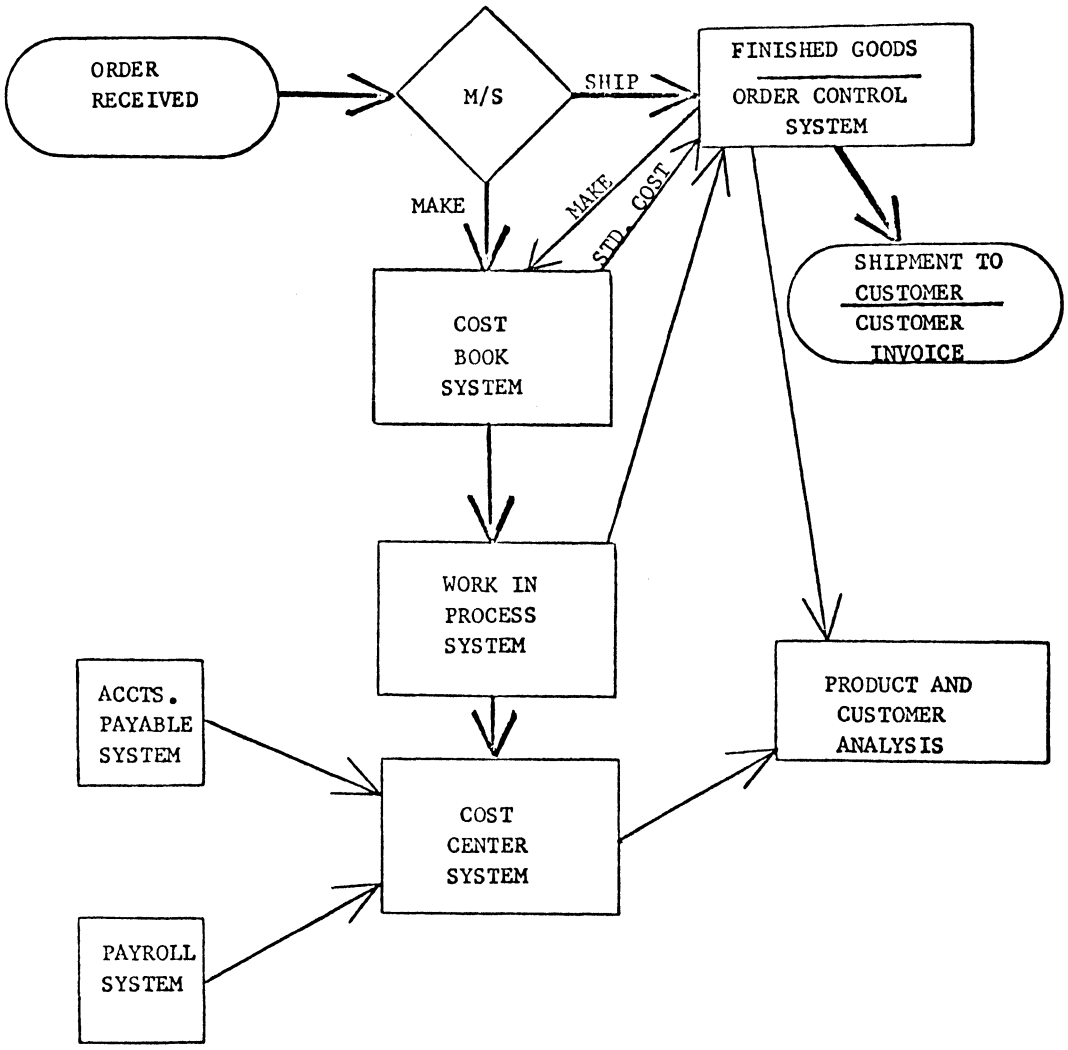
Supporting the SPS basic information system through the generation of magnetic tape inputs are allied financial and manufacturing systems including accounts payable, payroll, raw materials inventory and tool inventory. Each of these component systems have been designed to permit integration of data required to satisfy the information system and at the same time, serve the needs of the personnel charged with managing the individual functions within the company.

The accounts payable and payroll systems, in addition to providing paychecks, tax information, labor distribution data, expense checks, remittance advices and analytical reports, also furnish data for use in the cost center system. The integration of this data permits the distribution of labor and purchasing expense to the responsible organizational units.

With the need for raw materials ranging from simple lubricants to unusual metal alloys used in the manufacture of aerospace products, the SPS raw materials inventory system is a vital link in the manufacturing information flow. Records of all materials used by SPS are stored on tape. Files are updated daily producing reports of raw material status and creating input tapes for the basic information system. The status reports reflect the purchase code, type and size of the material, open purchase order numbers and quantities, materials allocated quantities, materials received and issued quantities and the on-hand-balance.

On receipt of material from steel manufacturers, an added identification, steel date, is appended to the inventory record. The various reports produced in the inventory system are well used by production control, purchasing and the warehousing or steel shed personnel responsible for raw material inventory control and maintenance. Transactions involving purchasing receipts and issuance of raw materials are sent to the data center each day for key recording and input to the computer system. When on-hand stocks fall below a safety level, material requisition records are generated. The purchasing department specialist responsible

STANDARD PRESSED STEEL BASIC INFORMATION FLOW



for the type material required then initiates a purchasing order, forwarding a copy to the Data Center for key recording and entry into the system. When the ordered material has been delivered from the vendor, a receiving report is prepared and forwarded to the Data Center for system entry to increase the on-hand balance, remove the open-order status and obligate the material to a specific manufacturing order if such is the requirement. As stock is withdrawn for the use of the manufacturing activities, an issue transaction is prepared for entry to the system to reduce the material-balance-on-hand.

The SPS tool inventory system is, in application, a business system within the basic information system. SPS manufactures a large percentage of the machine tools used throughout the company in their own tool room facilities. In addition, such SPS widely-used tools as thread roll dies are also marketed to other companies. The balance of SPS tools are purchased from vendors.

As with raw materials, an up-to-date record of tool status and availability is vital information needed in the manufacturing of customer products. The SPS tool inventory and control system design includes many of the features encompassed within the basic information system. There are tool manufacturing work orders, tool engineering method sheets, work-in-process reporting, finished tool inventory, purchasing actions, etc.. The tool making facilities operate as cost centers, being evaluated as to cost and performance through the use of the basic information system. Various tool transactions generated on a daily basis in the maintenance of the tool inventory and control system by the tool purchasing, tool manufacturing, tool crib and tool production control personnel provides the magnetic tape input to the basic information system. In the largest SPS manufacturing facility, the tool inventory and control system maintains the records for over 35,000 different machine tools.

RESULTS AND FUTURE PLANS

The top management of Standard Pressed Steel Company looks upon the computer as the nerve center for integration and control and acknowledge the contribution made by data processing systems to the more effective and efficient use of the company's resources. Short and long range plans include continuing the emphasis on system, equipment and operations standardization, further systems integration through data base concepts, the use of remote data communication devices in sending and receiving modes, and improving input handling capabilities through machine language source recording, computer usage, improving the scope of training of personnel in systems design and application and in continuing the program of constant study and evaluation of equipment, software and applications of the newest techniques in the field of systems and data processing.