INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Material, Inventory and Production Control
Type of Industry	Sheet Metal Fabricator
Name of User	Morton Manufacturing Company Chicago, Illinois

Equipment Used	McBee 360 Keysort System

Synopsis

Morton Manufacturing Company, a sheet metal fabricator, located in Chicago, and Libertyville, Ill., is currently using a McBee 360 Keysort System for controlling material, production and inventory.

The system at Morton Manufacturing uses the McBee 360 tab punch/reader, five data punch machines and a batch groover (which notches large groups of cards).

With this system, Morton Manufacturing, in addition to controlling production, obtains information relating to cost and scheduling and integrates many of the manufacturing operations into one system.

The Morton Manufacturing Company is a typical small manufacturer with big manufacturer's problems. Meeting customer delivery dates is only one of these problems. Morton's products originally consisted generally of only a few parts required to produce a finished product. With experience acquired over the years, it was relatively easy to coordinate various phases of manufacturing which enabled Morton to maintain customer delivery schedules with a minimum amount of paper work or formal procedures.

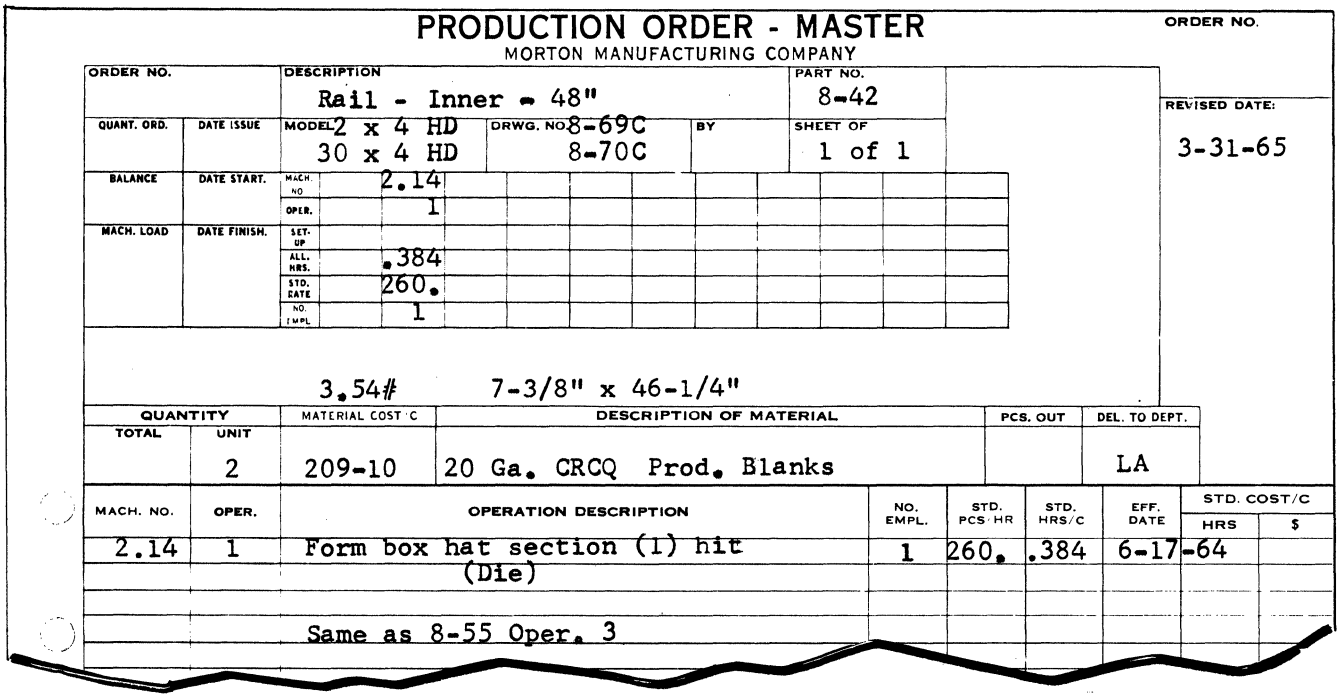
In recent years the product mix changed considerably and a large percentage of the work consisted of products with many models and sub-assemblies. Previous methods of controlling production did not work.

Realizing that a control of material, production and inventory was needed, Morton examined the equipment available and decided to use the McBee Keysort system and adapt it to its specific problems.

Morton Manufacturing is a small privately owned company with two plants in the Chicago area; one in Libertyville, Ill., and the other in Chicago. A job shop sheet metal fabricator, its customers include railroads, as well as retail stores. Manufacturing processes include shear work, press and brake work as well as most types of welding. Morton has a complete metal finishing department and does various types of mechanical assembly work.

In conjunction with McBee, it was determined what sort of information was needed and how it was to be obtained. Labor cards were designed for the shop in addition to inventory control cards, material control cards, cost cards and several unique forms to suit Morton's purposes. Above all, Morton personnel did not want to engulf themselves with paperwork.

A production order master was developed. This is a spirit duplicating master. Information on this form originates in the industrial engineering department. Information pertinent to all other forms and functions appears on the top.



PRODUCTION ORDER - MASTER

MORTON MANUFACTURING COMPANY

ORDER NO.

ORDER NO.

DESCRIPTION: Rail - Inner - 48"

PART NO.: 8-42

QUANT. ORD. | DATE ISSUE | MODEL: 2 x 4 HD, 30 x 4 HD | DRWG. NO: 8-69C, 8-70C | BY | SHEET OF: 1 of 1

REVISED DATE: 3-31-65

BALANCE | DATE START. | MACH. NO: 2.14 | OPER.: 1 | SET-UP | ALL. HRS.: .384 | STD. RATE: 260. | NO. EMPL.: 1

MACH. LOAD | DATE FINISH.

3.54# 7-3/8" x 46-1/4"

QUANTITY TOTAL	QUANTITY UNIT	MATERIAL COST C	DESCRIPTION OF MATERIAL	PCS. OUT	DEL. TO DEPT.
	2	209-10	20 Ga. CRCQ Prod. Blanks		LA

MACH. NO.	OPER.	OPERATION DESCRIPTION	NO. EMPL.	STD. PCS/HR	STD. HRS/C	EFF. DATE	STD. COST/C HRS	STD. COST/C $
2.14	1	Form box hat section (1) hit (Die)	1	260.	.384	6-17-64		
		Same as 8-55 Oper. 3						

INDUSTRIAL ENGINEERING DEPT. PREPARES PRODUCTION ORDER MASTER WHICH IS CAPABLE OF GENERATING ALL INFORMATION FOR MATERIAL, INVENTORY AND PRODUCTION CONTROL IN ADDITION TO COST AND PAYROLL.

A large portion of the labor card is an exact duplicate of the production order master. Space is provided, on the right-hand side of the card, for the operator to punch in and out on the job. On the bottom of the card the total pieces produced is recorded.

Other forms include a variable master - which is a duplicate of the upper left portion of the production order master - and a master order record. The top part of the master order record is similar to the production order master while the bottom half is used for production control purposes.

In addition, forms have been developed for material requisition, a shop traveler and inspection report and a material stores requisition.

One form — the production order master — is capable of generating all the information for material, inventory and production control, cost and payroll. In additon, a complete sortable bill of material is obtained.

Five persons are required to operate the system. These include one production control supervisor, two production schedulers and clerks, one payroll clerk and one combination machine loader and cost clerk.

CAT. NO. DESC. NO. ITEM NO.
PART NUMBER
B91597X

ORDER NO.	DESCRIPTION	PART NO.	MASTER ORDER RECORD MORTON MFG. CO.
45746	Rail - Inner - 48"	8-42	

QUANT. ORD.	DATE ISSUE	MODEL	DRAWING NO.	BY	SHEET OF
11,500	10/4	2 x 4 HD 30 x 4 HD	8-69C 8-70C		1 of 1

BALANCE	DATE START	MACH. LOAD	DATE FINISH

WK. CTR.		2, 14							
OPER.		1							
SET-UP									
ALL. HRS.		.384							
STD. RATE		260							
DEPT.		1							

MAT'L	.2708
LABOR	.0149
TOTAL	

QUANTITY TOTAL	QUANTITY UNIT	MATERIAL NO.	DESCRIPTION OF MATERIAL	PCS. OUT	DEL. TO
		3.54#	7-3/8" x 46-1/4"		
	2	209-10	20 Ga. CRCQ Prod. Blanks		LA

	1	2	3	4	5	6	7	8	9	10	11	12	TOTALS
DATE FINISHED	10/12												
PIECES FINISHED	11,500												11,500
ACTUAL HOURS								62.5 x 2.75					62.5
ALLOWED HOURS	.0765 x 3.54# = 2708							11,500					
STANDARD													
VARIANCE													
TOTAL													

PARTIAL COMPLETIONS

DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY
10/6	300	10/11	2650								
10/7	2700	10/12	750								
10/8	2700										
10/10	2400										

MODEL NUMBER

MORTON'S MASTER ORDER RECORD. (NOTE NOTCHES ON TOP WHICH MAKE CARD SORTABLE BY PART NUMBER, AND NUMBERED HOLES ON LEFT-HAND SIDE WHICH DESIGNATE THE MODEL.) TOP PORTION IS SIMILAR TO PRODUCTION ORDER MASTER.

THE SYSTEM

The process begins with the receipt of an order.

Working from drawings, engineering bills of material and labor estimates, the industrial engineering department prepares a production order master for each part required to complete a product.

This preparation includes masters for all sub-assemblies, purchased parts and raw material.

When all the masters are prepared, they are individually run through a spirit duplicating machine producing one master order record. This is used for a bill of material and for copies of the shop traveler which is distributed to the departments involved. They are then filed in the industrial engineering department as part of their history development of the origination of standards.

The master order records are turned over to the production control department in order to prepare a bill of material. The top portion of the master order record has several notches in it which make the card sortable by part number using a six-digit part numbering system.

On the left-hand side of the card are numbered holes which designate the model. The production control department assigns each model of a particular group one of these numbers and then notches the corresponding model numbers where the part is used. As the usage per model may vary, this information is penciled in next to the notch.

The "Material No." which describes the material is notched into the lower portion of the card. On the top left-hand side of the card the process is notched - (1) welding, (2) finishing, (4) final assembly. There is no notch for fabricating.

All cards are prepared in a similar manner for each product. These cards can then be sorted by part number, material type, and model and are filed in the production control department.

As nearly 85 percent of Morton's business is repeat, the first two steps need be done only once.

A typical order has notations by the production control department which identify the customer's model number with Morton's number. The quantities required by the customer appear on the left side of the order.

These quantities are transferred to an order work sheet, with the order number. At this point the process is ready to requisition materials and have the order for production prepared. The order work sheet and a copy of the order are turned over to a production control clerk, who then obtains the master bill of materials from the file. These cards are filed by part number and by process. By visually observing the top left-hand side of the deck, the cards requiring raw material are separated. As lead times for raw material can be extended, Morton selects this as its starting point in the preparation of an order. By needle sorting the left-hand side of the card - inserting a needle through the holes of the model numbers required on this order - the desired or required parts cards drop off the needle or out of the deck and only those parts which are required for this order are obtained. The first card is placed on the order work sheet. Notches on the left side of the card indicate the model used and, where a notch aligns with a quantity on the work sheet, the quantity required for this order can be calculated.

The order number and the quantity required are transferred to the variable master which is then detached and clipped to the master order record. In the same manner, quantities for all parts required for the particular order are calculated. To determine raw material requirements, the following procedure is observed: After calculating the number of pieces required, the "pcs out" information on the card is referred to. Dividing the pieces required by the pieces out, the number of sheets of raw material specified on the card is obtained.

This information is placed in the upper right-hand portion of the work sheet - gage, type and quantity. In a similar manner, all the raw material requirements are determined. The total quantity of a particular type and size is then determined and this information, along with the order number, is transferred to a variable master and clipped to a master order card for the material.

These cards are then turned over to a clerk who secures the book containing the production order masters for this product. Using a spirit duplicating machine, the following copies are produced with the information on the variable master appearing on all the forms:

A. (1) copy of the master order record.
B. (2) copies of each requisition.
C. (1) copy of the shop traveler.
D. (2) copies of the material stores cards.
E. As many copies of the labor cards as can be determined necessary.
F. Extra copy of the labor card for each operation appearing on the master.

Labor Cards

The labor cards are notched for order number and part number and are delivered to the applicable department when the job is to be run. The supervisor circles the operation to be run and hands the card to the employe. The employe inserts his plate - a plate for the machine the job is to run on - and his card into a data punch machine. This machine notches the top of the card for machine number, department and clock number as well as printing the employe's clock number on the face of the card. The card is then inserted into a time clock and the time "in" is punched on the card. The employe performs the operation, records the amount completed and punches out. These cards are turned into the payroll department by the supervisor at the end of the day. The timekeeper computes the elapsed time and records this information on the card. The cards are needle sorted to arrange them by department and clock number, and then run through a tab punch machine which codes the number of hours spent on that part by that employe into the card. This code appears under the words "actual hours." The cards for one employe are then sub-totaled and this figure is compared to the total hours on his daily time card. If these figures match, all his hours worked and the hours on each card are correct. If not, the discrepancies are determined and corrected as required. These cards are then turned over to the production control department. The clerk records the production counts from the labor cards and files the labor cards by order number by part number.

Material Cards

Material cards are delivered to the fabricating department with the labor cards. They are issued to the shear operator who obtains the material specified on the card. When the job is finished, the operator records the number of sheets of steel or aluminum used on the back of the card. The card is then turned into the production control department, where deductions are made and the inventory maintained, and then filed by part number.

Master Order Record

The purpose of the master order record is to control work in process. Information is obtained from the labor cards and recorded. The back of the card is used for inventory purposes. This record is also used for cost purposes.

When the particular part is completely through a process, the finished parts total is transferred to the right-hand side of the card, which is then forwarded to the cost department. The cost clerk removes the labor and material cards for this part from the file. The labor cards are run through the tab punch machine to get a read out of the total hours spent on this part. These hours are recorded on the card. From payroll figures the average hourly rate, for the period of time this job was in process, is noted on the card. From these figures, the labor cost of the part is calculated and recorded on the upper right side of the card.

Next, the cost of the material used to produce the part is calculated. This information is obtained from the material cards. The number of sheets used,multiplied by the cost per sheet, divided by the number of finished good pieces, give the material cost per piece. The labor and material cards, being of no further use, are put in a dead letter file.

Cost information is punched into the master order card in the same manner as hours were punched into the labor cards. When this is completed each part comprising an order is costed in the same manner.

After the card or item is costed, the card is returned to the production control department as inventory deductions may still be required. When the order is finished, all the cards on the order are turned over to the cost department and run through the tab punch equipment. This provides a tape read out in dollars and cents.

Using the procedure described, Morton is able to cost items within minutes after receiving the cards which indicate completion. An order can be completely costed shortly after the last item is indicated as complete.

The cost department files the master order cards by part number, providing a permanent cost record.

Requisition Form

One copy of the requisition is forwarded to purchasing; the second copy is filed by date needed. When a purchase order is received, the purchase order number and price information are recorded. When the material is received, this is indicated on the requisition which is then refiled in the order number file with the master order record in production control. If delivery dates pass without receipt of material, a weekly report with information from the card is forwarded to interested parties for expediting. When the order is completed, these cards are filed by part number as a permanent cost record of part purchases.

Machine Load Cards

For each operation one card is needed to complete a particular part or assembly. When these cards are produced on the duplicating machine, they are given to the production control clerk. A calculation is then made for each operation to determine the number of machine hours that will be required to complete the order quantity. The operation number on the card is circled and the number of hours required is punched into the card in the same manner as with the labor cards. These cards are then filed by work center in either of two places. If the material is to be ordered, the card is filed by work center under "material not received." If the material is a stock item, the card is filed under "material received."

The production control department then determines from forecasts and delivery requirements the starting date of the job. When a job is scheduled, the card is filed by work center under "work in process," and a priority through each work center is determined. Usually the "work in process" file is based on one month's work. At any time the cards can be pulled from the first two categories and run through the tab punch to determine future hours ahead of any work center. On the work in process, daily summaries by work center are prepared in the following manner: All the cards in this file are run through the machine to obtain the total hours of work immediately ahead of the particular center.

This total hours figure is punched negatively into a summary card for the work center. As the daily labor cards are received in the production control department, they are sorted by work center and run through the tab punch machine. The total number of hours of work in process produced that day through that work center is read out. This figure is punched positively into the summary card for the work center. The summary cards can be run through the tab punch daily by work center. By reading the negative totals and the positive daily total, a current machine load for each work center can be determined. When a job is completed, the load card is removed from the file and destroyed. With this procedure Morton can accurately determine:

1. The work ahead of a machine.
2. When a job can be completed.
3. If new priorities are determined, the sales department can be advised as to when it can expect the rescheduled jobs.
4. If particular work centers have to be operated overtime in order to meet schedules.
5. Manpower requirements one month ahead of time.

Shop Traveler

The shop traveler serves a dual purpose. Issued to the shop with the labor and material cards, the traveler is attached to the parts, as they proceed through the various operations, and identifies the work. Secondly, the inspection department uses the traveler in the following manner:

When the job is submitted to the inspection department, the traveler is stamped by the inspector when approval to run is given. When the job is completed, the inspector stamps the traveler on the right-hand side, indicating the parts are satisfactory and that it may proceed to the next operation.

Should operations change or deviations or rejections occur, this information is noted on the traveler. When the parts are used in the next process the traveler is pulled from the load. It is then returned to the production control department and then to industrial engineering. Here, any significant notations are transferred to the traveler in the industrial engineering file. Some changes may require a new production order master. The traveler is then routed to the inspection department where it is filed by part number. It then becomes a permanent record of the shop history for that job.

Indirect Labor Cards

Indirect labor cards are handled in an economical manner. By using pre-printed job cards for direct labor, the situation occurs where any cards run beyond the required number for a particular part on a particular order number are useless for reuse. Rather than destroy the excess cards, they are used for indirect labor in the following manner:

1. When the supervisor completes a job, he is asked to turn in any cards which are left over.
2. This card is then renotched in the upper left-hand corner in the spot marked "ind."
3. These cards are then issued to the supervisor as requested, and he notes the appropriate account number for the indirect labor across the card.
4. The cards are notched for clock number in the same manner as the labor cards and are therefore sortable by the payroll department.
5. Before the cards are turned over to production control, the payroll clerk sorts out the indirect labor cards by needle sort and files them by department by account number.
6. These cards are totaled monthly by department by account number by running them through the tab punch equipment. This produces a distribution of indirect labor hours by department by account number.

RESULTS

The system at Morton Manufacturing has achieved an adequate control over production and has enabled Morton to integrate as many of the manufacturing functions as possible into one system. In addition, information relating to costs and scheduling is rapidly obtained.

The McBee 360 Keysort system is also used to handle payroll and reporting.