INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Vendor Quality Ratings
Type of Industry	Data Processing Equipment Manufacturer
Name of User	Monroe International, Inc. Div. of Litton Industries Orange, N. J.

Equipment Used	Monrobot XI Data Processing System Synchro-Monroe Punch Tape Adding Machine IBM 026 Keypunch

Synopsis

The often tedious job of calculating vendor quality ratings is no longer a manual task at Monroe International, Inc. Instead, this leading data processing equipment manufacturing firm uses one of its own Monrobot XI desksize computers. A new system is used every month to provide a complete checkout of the machine under actual working conditions as well as to meet the needs of Monroe's quality control department.

Computer input is in the form of punched transaction cards. These are either produced directly on an IBM 026 keypunch, converted from punched paper tape or data are transferred from manually completed inspection forms. At the end of each month, these cards are merged into a master deck with a master card for each component handled. Processing of this deck by the Monrobot XI results in a VQR (Vendor Quality Rating) report which is distributed to department heads. It shows the status of each vendor, including those which are newly disqualified under the rating system. As a by-product, master cards are also produced for preparation of input for next month's report.

Several hundred Monrobot XI desksize computers are now on the air in the U. S. and overseas. They bring EDP's efficiency and vast processing capabilities to enterprises that do not require a costly, complex system or to procedures for which a small computer is most applicable. Appropriately, they also find extensive use in their birthplace - the Orange, N. J. plant of Monroe International, Inc., a division of Litton Industries. Among their most important applications is the maintenance of a comprehensive vendor quality rating program. Their use proves that manufacturers of data processing equipment remain among the organizations best able to take advantage of built-in capabilities for the streamlined handling of voluminous quantities of supplier information.

Quality Control at Monroe

Every month, a brand new Monrobot XI system (see Fig. 1) is selected from the production floor by Monroe's incoming inspection department. For the following 30 days, it will be used to prepare vendor quality ratings (VQR) for approximately 2, 500 components, from about 300 suppliers, used in Monroe's line of computers and other data processing equipment. This procedure has the secondary advantage of providing an additional product test under actual working conditions. In addition, computer flexibility permits special studies on purchased or fabricated parts, analysis and correlation of service reports, and component failure investigations.

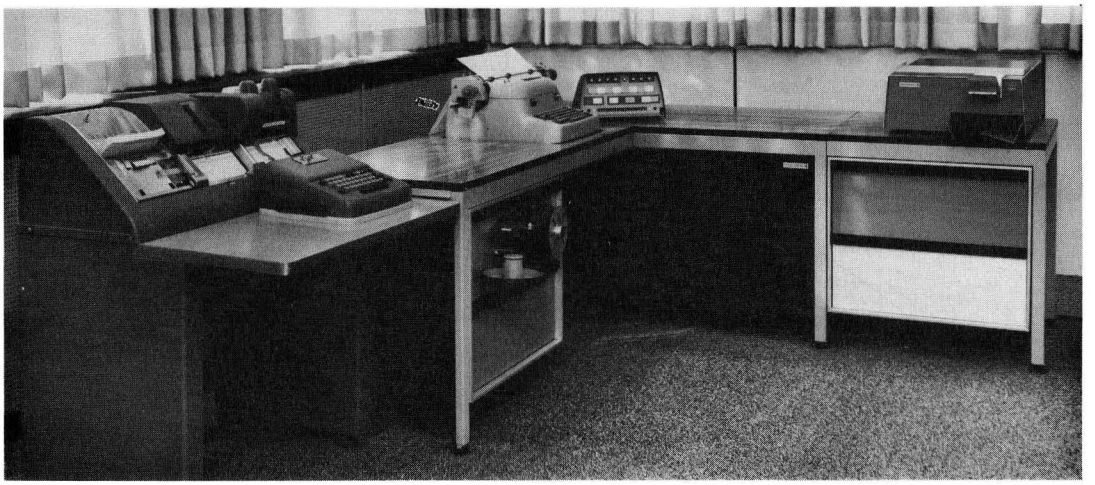

Fig. 1. - MONROBOT XI in its vendor quality rating configuration uses punched card input prepared on IBM 026 keypunch (shown at left). Monro-Card Processor is on top surface right.

Monroe's VQRs serve as guides for selecting the best among several suppliers, for adding new ones and for discontinuing the services of some. They provide a signaling system to alert quality control personnel when unusual difficulties exist and investigations should begin. In addition, the VQR of a specific vendor determines the sample size and acceptance number to be used for inspecting his subsequent material lots.

The VQR system generates ratings on everyone who manufactures, fabricates or modifies any component having a Monroe part number, except certain hardware items. Even internal production departments are considered "vendors" and earn VQRs in the same manner as do outside suppliers. Since more than one vendor or manufacturing department services certain parts, it is possible to have several VQRs on specific items. Although, incoming and processing inspections are conducted by separate groups, the handling of data is identical for rating purposes.

VQR Determination

Vendors are assigned 100 points for each lot received by Monroe. Points are then deducted for the percentage of defective units in the lot and for the percentage of rejected lots previously received.

Initially, a vendor rating is automatically computed by the following equation:

$$VQR = 100 \times Q \times S \sqrt{\frac{L}{L+1}}$$

where: VQR = Vendor Quality Rating

Q = number of units accepted ÷ number of units inspected

S = number of lots accepted ÷ number of lots received

L = number of lots received

Subsequent VQRs are automatically computed by adding the existing rating to the newest rating and dividing by 2.

VQRs thus achieved form the basis of vendor analysis. Evaluations of vendor performance are based on the history of the specific supplier. A vendor is automatically disqualified if one of the following conditions occurs:

- The number of lots received is less than six, and
  3 consecutive VQRs are less than 17.
- The number of lots received is between six and 10 inclusive, and
  3 consecutive VQRs are less than 24, or
  5 consecutive VQRs are less than 35.
- The number of lots received is more than 10, and
  3 consecutive VQRs are less than 24, or
  5 consecutive VQRs are less than 35, or
  8 consecutive VQRs are less than 70.

The Vendor Rating System

Computer input data for the vendor rating system are generated by each of Monroe's quality control inspectors. Each has access to an IBM 026 keypunch, a Synchro-Monroe punch tape adding machine, or a daily inspection report form, depending on his volume of work. The 026 keypunch prepares transaction cards, which indicate part numbers, operation numbers, vendor or department codes, dates and the lot sizes with the quantities inspected and rejected. These cards serve as direct input to the Monrobot XI.

The Synchro-Monroe produces a punched tape, whose data, must be entered into a converter for transfer to punched transaction cards. Information from the manually completed inspection forms must similarly be punched into cards.

At the end of a month, the transaction cards are automatically sorted and collated with a master deck, which includes a card for each part on which VQR has been previously computed. Transaction cards which do not have a corresponding master card are automatically ejected.

Information from the merged deck is then entered into the Monrobot XI system for processing and generation of VQR data on the output typewriter. Simultaneously, an updated file of master cards is prepared to be used for the next month's report.

Copies of the VQR report are distributed to the quality control, purchasing, engineering and production departments. Besides summarizing data from transaction cards and indicating the present and previous VQRs, the report contains comments which indicate each vendor's status, such as "preferred", "temporarily suspended", and "disqualified".

A new vendor may sometimes be "preferred" over other suppliers for reasons not bearing on the rating schedule, such as better price, delivery, or tighter specifications than required at no extra cost. In such cases his VQR is determined in the regular manner. His preferred status, however, is indicated on the report. Usually, this consideration is extended to a vendor only for the time covering receipt of three lots of components.

PART NUMBER	OPERATION NUMBER	DESCRIPTION	VENDOR	TOTAL QUANTITY RECEIVED	TOTAL LOTS RECEIVED	PREVIOUS RATE	NEW RATE
100339		SHAFT AND HUB ASSY		8	2		48.9
100470	20	TERMINAL BOARD		207	5	85.4	88.2
200141		P.C. BOARD		311	4	52.3	
200394	10	INSERT		22,800	2	76.1	
500201-0	10	SHIM		625	2		76.1
500201-1	20	SHIM		269	2	76.1	
500201-1	40	SHIM		247	2		76.1
500202		SUPPORT CAM		282	2	76.1	
500204	10.	P.P. ASSY SCREW		1,003	2	17.2	
500205	10	P.P. MTG BRACKET		404	2	76.1	
500209	10	CROWN PULLEY		68	4	38.4	
500210-0	10	BASEPLATE		773	9	71.0	81.5
500210-1	10	BASEPLATE		243	6	73.4	
500210-1		BASEPLATE		65	2	76.1	
500210-1		BASEPLATE		115	3	37.6	
500213	10	BRACKET		192	2	76.1	
500213	20	BRACKET		189	2	76.1	
500217	10	BAND		9,800	3	81.3	
500220-1	10	BRACKET		315	2	76.1	
500220-1	20	BRACKET		710	3	81.3	

Temporary suspension usually occurs when the quality of component supplied by a vendor declines for reasons for which he may not be primarily responsible. For instance, a component may not perform as expected if it is used for other than its original purpose. A "suspended" vendor is treated as a new vendor for shipments received during the suspension period. His lots, for example, are subject to larger samples. Meanwhile, an investigation is begun to determine the cause of component failures and to bring about corrective action. When the suspension ends, usually after receipt of three successive lots, the supplier is reinstated or disqualified.

Disqualifications are caused by poor performance, part obsolescence, or no procurement during the past year. Actually, only the part having a poor rating is disqualified. Any other component supplied by the same vendor stands or falls on its own merits. Monroe's experience has shown that disqualification is normally a reflection of only one of a vendor's particular process capabilities, not of all of his processes.

Results

Originated in 1962, Monroe's VQR system has been in operation over a sufficiently long period to enable the company to specify the distinct benefits which it has brought.

Inspection costs have been sharply reduced. Since sample sizes are determined by the VQR, inspection time has been cut for vendors whose quality of material has been consistently high. At the same time, product quality has been improved as inferior suppliers and processes were quickly weeded out.

Similarly, quality costs have been generally lowered. The ratio of total employes to quality control personnel is now 20:1. The continuity of the rating system from incoming inspection through process inspection rapidly pinpoints the cause of quality problems.

The use of computers is now helping Monroe to eliminate the task of manually calculating vendor quality ratings. To quality engineers, technicians or clerks assigned to the job, this could become dull, monotonous drudgery. Thus, they often felt that their time should be diverted to work of greater productivity and personal interest. Now, as this task is being eliminated, computer processing is providing Monroe with rapid, accurate and economical results.