INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Bill of Material Processing, Engineering Design and Specifications
Type of Industry	Electrical Equipment Manufacturer
Name of User	I-T-E Circuit Breaker Co. Philadelphia, Pa.

Equipment Used	IBM System/360, Models 30 and 40
	IBM 1013 Card Transmission Terminal
	Data-Phone Data Set
	IBM 1440 Computer
	IBM 1978 Print-Read Terminals (2)
	IBM 1403 Line Printer

Synopsis

I-T-E Circuit Breaker Co. in Philadelphia, Pa., is using an IBM System 360/40, 360/30 and a 360/20 for processing bills of materials including parts, assemblies and subassemblies for items manufactured in the company's Power Group.

In addition to these functions, I-T-E's suburban Philadelphia EDP center is responsible for the more routine administrative computer applications such as payroll, accounting and sales.

The center is currently serving three plants in Philadelphia as well as supplying data to remote plants in Greensburg, Pa., and Los Angeles, Calif., with an IBM 1013 card transmission terminal on a Data-Phone data set hook-up, using WATS and leased voice grade lines at night. The IBM 1013 will be replaced by the 360/20 using the same communications services.

The system is being developed over a five-year period and eventually will cover almost every aspect of I-T-E's business, effectively controlling operational data from the time of proposal to the day of delivery.

BACKGROUND TO EDP

I-T-E Circuit Breaker moved into data processing cautiously with the installation of an IBM 1401 system to handle routine jobs like payroll, accounting and sales reports. Prior to that, unit record equipment was in use for many years.

The overall system design began when IBM, anxious to prove that a computer could generate the design of complex equipment, such as I-T-E transformers, joined I-T-E in the design and development of such a system. It was the first step toward I-T-E's present ADE (Automated Design Engineering) program.

The ADE System, which has been switched over from the original IBM 1401 system to the present system/360, is the conversion of customer mechanical and electrical requirements into top assembly bill of material requirements by means of product engineering logic. It tells the engineer the assemblies needed, gives specifications and tolerances and indicates the type of wiring necessary to do the job. Thus, the proper data fed into the computer from a pre-printed edit sheet gives the engineer all the information he needs to design a large transformer or switchboard.

As good as ADE was, I-T-E's management wanted more. Top management put this question to the data processing department: "If we can accomplish this in the engineering function, why can't we extend the use of this approach to manufacturing, production control and accounting?"

The answer was that it was possible, but a considerable amount of work would have to be done to determine what areas could best be automated, how soon, and how expensive or economical it would be. Gordon Dolfie, I-T-E's manager of data processing, was hired to answer those questions and find a means of implementing a system.

Initial studies showed that a separate system for each of I-T-E's manufacturing divisions would be economically impractical. But Dolfie determined that a standard company-wide system would be both practical and economical because some of the divisions have overlapping product lines and manufacturing needs. It was felt that a common data base could effectively serve all divisions with only minor changes necessary in programs and format for the presentation of material in printed-out reports.

Dolfie began by making a systems study that lasted six months. His objectives were three-fold:

- To automate all elements of customer order processing.
- To free personnel from routine recurring tasks, thus providing time for creative work.
- To impact fixed costs.

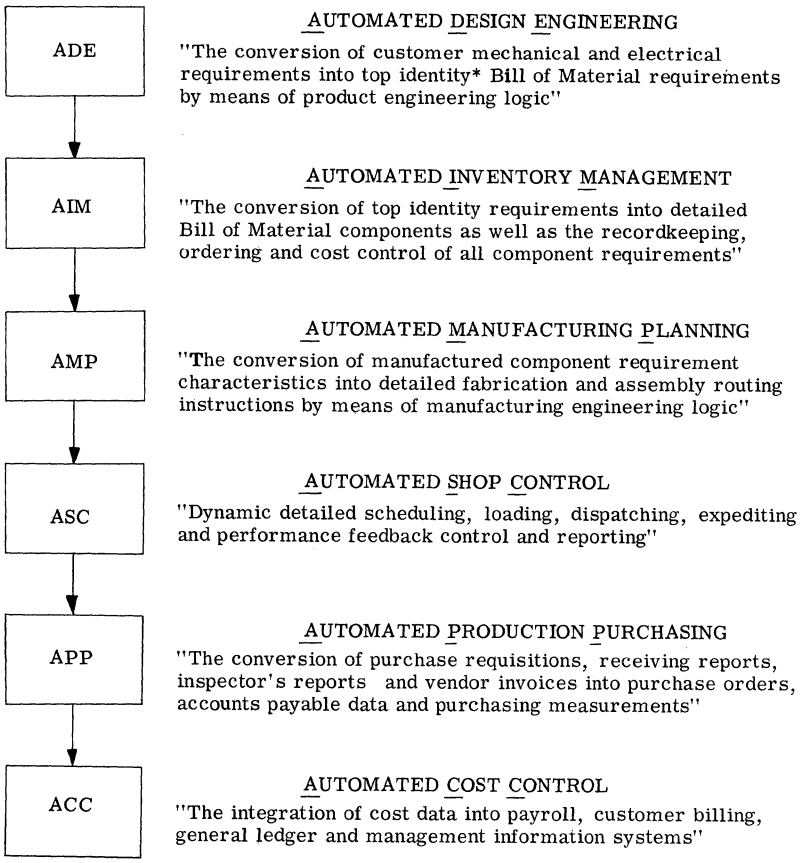
In addition to soliciting remarks of the people that were, or eventually would be, involved in the added emphasis on EDP, Dolfie also set out to build up confidence in the EDP approach to I-T-E's problems. The final presentation for top management was two months in the preparation with the important systems areas delineated and justified. The company's Power Group -- the five divisions that initially pioneered the ADE system -- began to gear up for the new program. All but one of the Power Group's division s are now involved in the program.

Besides top management, all Power Group managers were brought in for an eight-hour briefing on exactly what the integrated data processing system would do for them. The presentation was broken down into the four major facets of the project:

Systems scope

- Equipment and organization necessary for the job
- Economic feasibility
- Implementation and scheduling

I-T-E AUTOMATED ORDER CONTROL SYSTEM (AOCS)



*Top Identity - The Bill of Material component level at which all lower level components are retrievable without requiring further logical determination (a standard explosion).

Then I-T-E started to assemble a staff. An engineering systems coordinator, a production control systems coordinator and an administrative systems coordinator were assigned to handle the three major subdivisions of the total system implementation. They, their staffs and the manager of data processing operations report to the manager of data processing.

I-T-E set its five-year plan into motion in 1965. The first 360, a Model 40, was delivered in November of that year. The plan runs through 1970 when the company expects to have its Automated Order Control System (AOCS) fully operational.

THE SYSTEM

The ADE system is well established and has been operational for several years. The most important single aspect of I-T-E's Automated Order Control System is a subsystem called AIM -- automated inventory management.

AIM provides the data base for the entire Automated Order Control System program. Basically a product structure master file, it eventually will include bills of material for every I-T-E product, as well as a master component file record for each unique raw material, part or assembly.

Included in the product structure master file are component part numbers, parent assembly numbers and standard quantities required. The master components file, on the other hand, contains information such as component part and assembly numbers, raw material numbers (if necessary), description, type of record code, a make or buy code, a stock or non-stock code and an inventory status code.

AIM also contains a manufacturing routing file with detailed operational instructions and time standards and a purchasing file with detailed specifications on items to be bought from vendors.

Each division using the AIM system is responsible for the data to be used in building its own product structure, master components, manufacturing routing and purchasing files. This information is keypunched by the division, forwarded to the EDP center and fed into the computer, thus building mechanized master files. The results of the computerized master files are sent back to the divisions in the form of printouts for editing and review.

All this information -- product structure, master components, manufacturing routing and purchasing -- is stored in the 360's discs and tapes, giving the entire system an extensive memory capability.

AIM Output

The importance of the AIM data base can be measured by the amount of output available to the appropriate levels of I-T-E management. The 360 system produces bills of material and component reports, basic scheduling, order batching, inventory posting, and parts and shop order inquiries. In addition the computer helps expedite re-orders, processes inventory feedback and produces historical usage reports.

Engineers can make quick decisions on costs and interchangeability of parts with the AIM subsystem by using either an implosion or explosion technique.

Information is exchanged from the three Philadelphia plants to the Philadelphia computer center by messenger seven times daily. Night WATS lines or leased voice-grade lines and an IBM 1013 card transmission terminal (to be replaced by a 360/20) using a Data-Phone data set hook-up, connect the EDP center with the Greensburg, Pa., factory and the Los Angeles plant. These remote factory locations are equipped with IBM 1978 print/read/punch terminals. Greensburg also has an IBM 1440 disc system for administrative work.

Plant hardware will eventually be converted to 360 computers, Model 20s and 30s with peripheral gear.

AIM Subsystems

Branching out from the AIM system are three subsystems that will eventually reach into every I-T-E division -- Automated Shop Control (ASC), Automated Production Purchasing (APP) and Automated Cost Control (ACC). AIM, ASC, APP and ACC, when they are all operational, are designed to fit into an overall package approach with division selected options based on need. Optional for all I-T-E's divisions are ADE and AMP.

AMP

By definition, AMP, Automated Manufacturing Planning, is the conversion of manufactured component requirement characteristics into detailed fabrication and assembly routing instructions

by means of manufacturing engineering logic. An AMP prototype system including numerical control punched paper tape output is implemented in the Switchgear Division in Philadelphia.

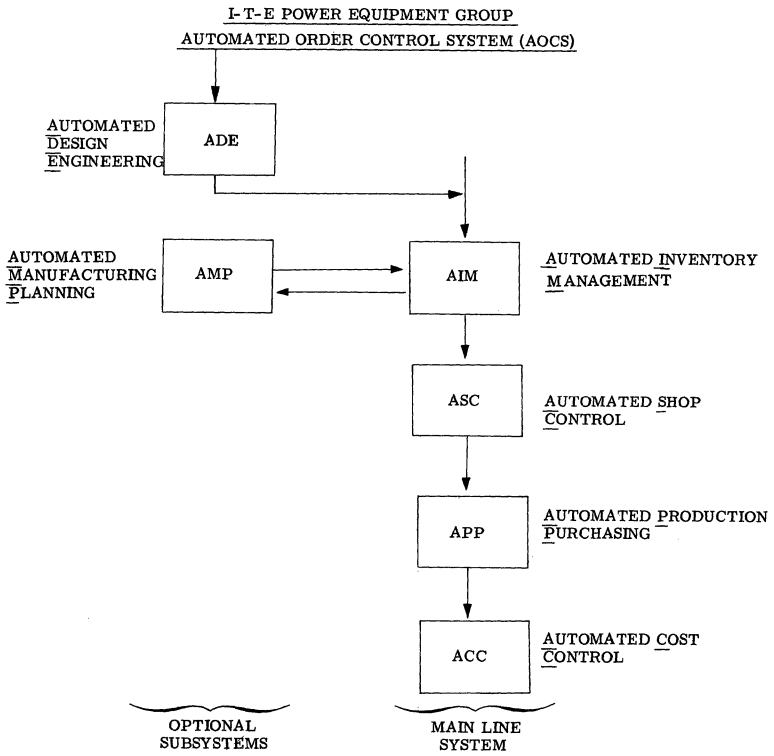
AMP, like ADE, is division and product oriented, with programing, input and output based almost entirely on the needs of the division as they relate to the product and the manufacturing process.

Presently, the systems are being implemented sequentially with the final subsystem ACC culminating the effort. By 1970, when ACC is fully operational, I-T-E's management believes that the company will have a data processing system that will encompass virtually every area of the company's business. ACC will tie all the other subsystems together by integrating all cost data into payroll, customer billing and general ledgers and provide a well-rounded general information system.

MANAGEMENTS' VIEWS TOWARD AUTOMATION

The primary responsibility for all but the ADE and AMP subsystems falls to the corporate data processing staff. In addition, this staff provides systems and programing expertise and is responsible for the administration of the entire AOCS program. Each division has its own AOCS team headed by a division AOCS team coordinator, responsible for making system design recommendations to corporate EDP and implementing programs on the division level. Each division team is responsible for its own ADE and AMP program. The AOCS teams work closely with corporate level personnel to assure continuity from subsystem to subsystem. The training of division personnel in decision table documentation -- FORTRAN and other EDP techniques -- is provided by the corporate staff. I-T-E's management stresses the singular responsibility of the division AOCS teams for the validity of input and output.

An important aspect of all data processing activities at I-T-E is communications. Meetings and briefings are held at every step to update all concerned on systems status, short and long range objectives and detailed scheduling commitments.



THE AUTOMATED INVENTORY CONTROL MANAGEMENT SYSTEM (AIM) PROVIDES THE DATA BASE UPON WHICH RESTS ASC, APP AND ACC. BOTH AID AND AMP ARE OPTIONAL SYSTEMS BASED ON THE NEEDS OF THE DIVISIONS.

PROBLEMS

Since 1962, I-T-E has learned a lot about data processing -- some of it the hard way. Conversion from the IBM 1400 series to the IBM System/360 was not without its share of headaches. One of the biggest problems any company faces, according to Dolfie, is finding experienced 360 personnel. Normal problems, in FORTRAN and other software systems, common with early System/360 users, also slowed down the initial conversion and expansion of AOCS. Other contributing complications were manufacturer's software slippages and some hardware problems caused by environmental deficiencies at the former data processing center in the downtown Philadelphia plant complex. "We discovered that System/360 is extremely sensitive to environmental conditions. Thus, we were faced with a great deal of down time due to breakdowns," Dolfie says. This was solved by moving the corporate computer center into newly-built quarters with a controlled environment.

RESULTS AND FUTURE PLANS

The various setbacks originally put I-T-E's five-year plan back about a year. However, company management is optimistic about completion before the 1970 target date, because hardware and software development are now exceeding original expectations.

Although only about midway in implementation, I-T-E's AOCS program has already proven to be invaluable. Complete, accurate and timely bill of material processing has meant a great deal to the company. "In a data processing operations sense, we expect that the divisions will perform most of the daily high-volume operations associated with the AOCS system. The corporate data processing unit will provide significant direct access storage and computing capability which will be readily accessible to the divisions," Dolfie said.

Ralph Guthrie, corporate controller - financial planning, is pleased with I-T-E's EDP progress.

"As the data bases are completed and the skills of our data processing personnel grow, increased emphasis can be placed on simulating and optimizing applications," he says.

He adds that further concentration on data communications and teleprocessing will play a significant role in future I-T-E planning.