Plant automation in IBM: a Preface

IBM's manufacturing plants offer a valuable test ground for studying plant automation techniques. In looking for ways to improve production processes manufacturing engineers in the company's plants have experimented with many approaches to the structure and design of plant-floor computer systems. The structural solutions have ranged from dedicated stand-alone controllers scattered throughout a plant to large hierarchical networks of general-purpose computers serving an entire factory site. The implementations have included combinations of standard and modified commercially available products as well as completely "homemade" devices and software.

Progress to date suggests an increasing agreement among IBM's manufacturing engineers that a particular systems organization offers them the best vehicle for continuing experimentation while simultaneously satisfying current production needs. This organization is one in which a number of small computers are arranged as "satellites" of a remote, general-purpose "central" computer. The satellite computers control the operation of devices dedicated to specific production tasks. The central computer supplies the satellites with process control and testing programs, does on-line and off-line data analysis and, quite importantly, serves as a resource for a variety of plant management computing needs.

Several papers in this issue treat aspects of a satellite network developed especially for use in IBM plants. Stuehler discusses the IBM manufacturing environment and the evolution of a design solution intended to satisfy the diversity of needs within this particular environment. A companion paper by Thoburn describes an experimental transmission control unit which provides the means for high-speed transfer of data between the central and satellite computers. Another companion piece, this one by Calva, reports one solution to the problem of making a central computer respond in "real-time" to satellite requests for service. This is accomplished by an operating system called PCOS, which is a process control extension of OS/360. Two other papers in the series give some representative applications of the system. Fischer et al. show how it is being used in the testing of magnetic-tape read-write heads and Radio et al. describe a machine they devised to make precise measurements of part dimensions automatically.

Although the range of IBM's manufacturing requirements encompasses only one segment of the broad scope of production situations found in industry, systems elements have been discerned that point toward generalized solutions. Two development engineers, Kinberg and Landeck, have drawn on the experience available within the company as well as elsewhere to produce a comprehensive analysis of the architectural considerations that must be faced by anyone who contemplates installing a plant automation system. In their paper considerable attention is paid to the problem of how to plan a system structure that permits an orderly growth from a modest beginning to a fully automated plant. This problem is also the theme of a paper by Harrison et al. They describe a specific implementation—that of the recently announced IBM System/7—whose features satisfy the basic plant automation requirements analyzed by Kinberg and Landeck.

Perhaps the most important conclusion to be drawn from this collection of papers is that plant automation has matured from experimentation to practical economic applications. The specific hardware and software solutions represented by the transmission control unit and the Process Control Operating System, as well as other manufacturing engineering accomplishments not recorded in this issue, can be regarded as pioneering efforts that have produced many of the insights needed for the development of IBM's commercially available products. The IBM System/7 and the Real Time Monitor extension of OS/360 are two current examples of products in which these insights have been applied. Although more systems engineering work remains to be done, a solid foundation now exists for developing an increased sophistication about the ways in which computers can contribute to more effective factory operation.

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