STRIVING FOR MANUFACTURING EXCELLENCE

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Intense competition in the global marketplace for the types of products and services offered by AT&T spurred it to review every aspect of its operations. As a result, the company's management renewed its commitment to manufacturing excellence, a significant element of any competitive strategy. The commitment has had demonstrable success. The papers in this issue describe the *improvement cycle* and its outcome at one of AT&T's manufacturing facilities, the Denver Works.

Introduction

United States manufacturers, at one time preeminent in the world, face daunting competition from abroad. The initial effects of the offshore challenges were felt in the 1970s by low-technology industries such as textiles and shoes. By the time international competition had spread to automobiles, machine tools, consumer electronics, and semiconductors, it was evident that U.S. manufacturers faced fundamental problems. In some cases, they abandoned markets; in others, moving production offshore appeared to be the only recourse.

The causes for the decline of U.S. competitiveness became the subject of much debate. Some people attributed the problems to low-cost offshore labor, while others pointed to the natural dispersion of the global technology base. Still another school traced the causes to U.S. macroeconomic policies that impeded innovation and investment. Finally, it was argued that lackadaisical management of technology and manufacturing was at fault.

Regardless of the reasons for the decline, managers of many U.S. enterprises moved to stabilize and rebuild their companies' economic bases during the 1980s. They rededicated themselves to managing their manufacturing processes effectively. Early in this renaissance, the response took the form of increased automation, with an emphasis on robotics. More recently, the focus has been on just-in-time (JIT) manufacturing, with emphasis on simplifying the manufacturing environment and introducing programs to improve the quality of all operations (i.e., TQC—Total Quality Control).

Recognition by the business community and government officials that manufacturing competence is critical to the U.S. economy has also led to the creation of federally sponsored ventures such as the National Center for Manufacturing Sciences, and Sematech. The consortia were formed by private businesses to pool their research and development (R&D) resources, leverage them through government support, then share the resulting knowledge base among industries that are critical to the United States' security and economic well-being. AT&T has played a leading role in establishing and supporting these consortia.

Manufacturing excellence—the ability to produce innovative products of high quality at competitive cost, and to deliver them in a timely manner—is an important element of AT&T's competitive strategy. Some of these products enter the heart of our network, investing it with capabilities not available initially to our competitors; some are attached to the network and stimulate its use; others, sold in intensely competitive markets, derive their advantage predominantly from manufacturing excellence.

By 1985, it had become clear to the company's management that a reaffirmation of manufacturing excellence would be needed to serve our customers better. This awareness sparked a renewed commitment within the company. During the two years that followed, AT&T factory managers launched programs to improve dramatically at least one of their manufacturing lines. The programs, usually based on the application of JIT/TQC techniques, led to shorter manufacturing intervals, higher product quality and lower cost.

Successful application of these techniques resulted in their widespread adoption by individual AT&T factories, as well as between the factories and their internal and external suppliers. In addition, plans called for the JIT/TQC processes to be used in AT&T's distribution chains. Only by applying these techniques throughout the product provisioning chain could our customers' expectations of price, quality, and service be ensured.

The Improvement Cycle

Experience has confirmed the wisdom of beginning the improvement cycle with reengineering. In the manufacturing environment, this consists of flow simplification, improved layouts, smaller transfer lot sizes, reduced set-up times, and increased process capabilities. When combined, these activities improve the predictability of the process and its flow—a goal of manufacturing excellence.

Wherever possible, improvements in the process should precede the introduction of information systems. In this way, information systems can remain simple, reflecting the underlying simplicity of the process they support. Moreover, the information systems' development costs are minimized and their effectiveness and impact maximized.

Except where it is essential to ensure manufacturability, development of new physical automation is the last step in the improvement cycle. When this approach has been followed, improvements have been most dramatic and the cost of moving toward manufacturing excellence has been effectively controlled. The overall methodology, which consists of process reengineering followed by information and physical automation, is the fundamental underpinning of the emerging field of Manufacturing Science.

The Denver Works as a Model. This issue of the *AT&T Technical Journal* describes the improvement cycle at one AT&T factory, the Denver Works.

Although examples from other company factories could have been used, the experience at Denver was chosen because of the relative complexity of the Works' processes for manufacturing private-branch exchanges (PBXs)— assemble-to-order products with numerous options. In addition, Denver introduced a modern materials-management system just before it launched an ambitious program to improve its shop and storeroom operations. Finally, the Denver Works' experience is particularly instructive because many of its improvements

resulted from a close collaboration by the Works' manufacturing engineers and operating people with R&D engineers and mathematicians. For more than two and a half years, many R&D members on the team spent most of their time at the Denver plant, working with their manufacturing partners at all levels of the hierarchy in a unique demonstration of knowledge exchange.

Partially as a result of this collaboration, the Denver plant has achieved an unusually high level of performance, particularly in its inventory turnover ratio. In addition, the company's R&D community now has a much better understanding of the needs of manufacturing, and is modifying the focus of its activities to serve its internal customers better.

In This Issue

The papers that follow trace the Denver Works' improvement cycle.

The first, by Carboy, et al., gives an overview of the three phases of the program. Subsequent papers provide detailed descriptions.

The paper by Kinney describes the first phase—the concepts of a materials-management program and the way it was implemented at Denver.

The second phase, covered by four papers, introduced JIT/TQC methods. Hendryx introduces JIT/TQC concepts in his paper. The three subsequent papers describe how these concepts were implemented on the shop floor (Albano, Friedman, and Hendryx; Albano, et al.), and in the storeroom (Burman, et al.).

The third phase consisted of a marriage of the *push* philosophy, embodied in the materials-management system, with the *pull* philosophy in the shop operations. The concepts behind this marriage appear in papers by Doshi and Krupka, and by Luss, Rosenwein and Wahls. Implementation of the concepts is treated in the final paper of this issue, by Kinney, Denning and Foo.

A Brief Evaluation

Can the Denver experience be considered a success? The answer is emphatically, "yes."

Is the program adequate to ensure long-term success? Here, the answer is not so easy.

One of the lessons learned at the Denver Works, as at all other AT&T plants, is that improvements must be endless. Although we may celebrate our past successes, we must continually demand from ourselves further improvement in our performance. That is why the theme for this issue of the *AT&T Technical Journal* is "*striving* for manufacturing excellence."

The Denver Works has attained a measurable, overall high level of manufacturing performance. True success, however, can only be assured through a partnership among all allied functions, including product design, process design, and marketing. Difficult as it is to attain, this goal is not only desirable; it is essential to *any* enterprise that intends to compete successfully in the global marketplace.

Biographies (continued)

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