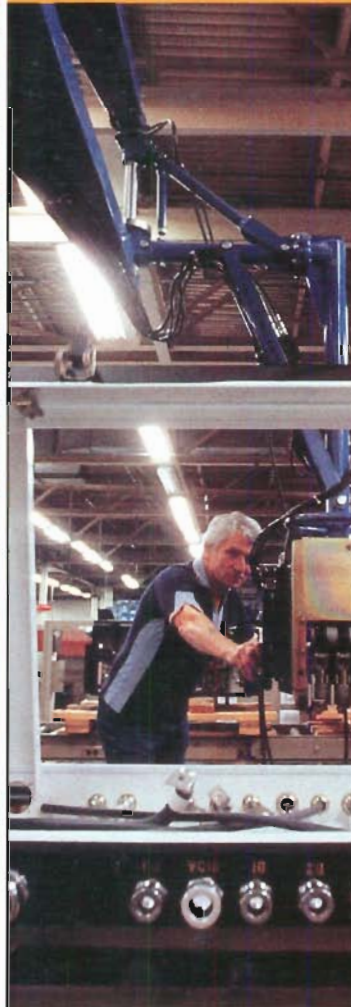# Computer Advances

July/August 1985

Manufacturing Productivity for Real

These companies are taking the lead — with the help of computer systems from Hewlett-Packard — in making manufacturing productivity improvements a reality.

AXIA INCORPORATED
On-time shipments improved by more than 40 percent

WESTINGHOUSE ELECTRIC
Build cycle cut by 83 percent

BURKE INDUSTRIES
Machine productivity increased by as much as 30 percent

HEWLETT-PACKARD COMPANY
Product yields pushed to 85 percent

HEWLETT PACKARD

HP Computer Museum
www.hpmuseum.net

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Manufacturing Productivity *for Real*

I t's a rare manufacturing manager who's not under constant pressure to improve quality and productivity. Cost pressures, product quality, shipment schedules, asset management, and production line efficiencies represent challenges to every company and institution that is committed to survival in an increasingly competitive environment.

Hewlett-Packard not only shares the same commitment but also is dedicated to helping each of our customers gain a greater competitive edge through improved productivity. HP offers these companies effective manufacturing applications that improve product quality and customer service, while reducing operating expenses.

At HP, we use our own manufacturing systems to manage our factories. As both a maker and user of manufacturing systems, we have long experience in evaluating what works *and what doesn't*. Because we are manufacturers ourselves, we have the experience and dedication necessary to design and manufacture the highest-quality products possible. Making high-quality products in the most productive and profitable manner is a key element of HP's corporate culture.

HP's emphasis on "practical technology" has resulted in a strong partnership with manufacturing companies. Many of our customers started years ago with a single HP instrument or computer. Over the years, we've helped a number of them build plant-wide manufacturing networks a step at a time. While they have different environments—and diverse requirements and goals—most have achieved significant results. Their decisions to innovate required tremendous vision, and a certain toughness.

The following stories are about four US companies committed to quality. With the help of HP computer systems, they are making manufacturing productivity improvements a profitable *reality*.

AXIA Incorporated: New manufacturing system improves on-time shipments by more than 40%

AXIA Incorporated's Faultless Division, a manufacturer of high-quality furniture and industrial casters, has been able to cut inventory by $700,000, reduce customer response times, and improve on-time customer shipments by 40-50 percent by implementing a new manufacturing system from HP.

Faultless manufactures approximately 400,000 casters per week and fabricates most of the caster components such as rubber wheels, stems, horns, and sockets. When the company's batch-manufacturing information system proved unreliable, management looked for an automated system to improve control over inventories and manufacturing processes.

Based on price/performance and reference contacts, Faultless chose HP Materials Management/3000 (MM/3000) software for materials requirements planning (MRP) and HP Production Management/3000 (PM/3000) software for shop-floor control — both running on an HP 3000 Series 68 computer system.

Improved stockroom accuracy

"Using MM/3000 and PM/3000 we have significantly improved stockroom accuracy for purchased and fabricated parts," explained operations manager Joe Adkins. "For example, cycle counts formerly averaged a 14 percent deviation from the quantity on the stockroom records," Adkins added. "Today, the average is a 2 percent deviation. Another example is the increased availability of components at work-order release date. We used to experience 40 percent availability of required material; we are now up to an average of 75 percent material availability."

These improvements were realized because Faultless Division manage-

At AXIA's Faultless Division, a new inventory control plan uses HP's materials management software to dramatically improve stockroom accuracy.

ment was committed to improving inventory accuracy and the new MM/3000 system provided the tools to make it happen. Inventory transactions are typed into a computer terminal right in the stockroom and the data base is updated instantly.

Planned lead times synchronized with actual cycle times

Manufacturing lead times have been reduced by cutting planned queue times at many workstations. Original MRP lead times were based upon the limitations of the old system, which could only schedule in weekly time intervals. As a result, planning lead times were often significantly longer than actual cycle times. PM/3000 provides accurate feedback on actual lead times for each manufactured part. This information is used to update the planning lead times used in the MRP system for scheduling fabricated and purchased parts and promising customer deliveries.

The production control department no longer releases work to the shop ahead of schedule. Work is released on the scheduled release date (or afterward when problems arise). Timely release keeps work-in-process inventory to a minimum and reduces the chance of the shop working on a job ahead of schedule at the expense of a late or high-priority order.

"All of these factors, plus better operational visibility and control, have enabled us to significantly improve our customer response times," concluded Adkins. "Using MM/3000 and PM/3000, we do more planning and less reacting. MRP and workstation load reports allow us to anticipate major changes in shop load. Accordingly, we have smoothed out fluctuations in shop load and stabilized our workforce — reducing the frequency and magnitude of layoffs and callbacks, and reducing the amount of overtime needed."

Westinghouse Electric: Streamlined operations shorten product build cycle by 83%

Westinghouse Electric has been a world leader in propulsion for transit systems since 1888, when it powered the first railway car with electricity. Since then, its Transportation Division has become a premier source for modern transit systems with showcase rail systems in major cities like Rio de Janeiro and San Francisco.

The transportation industry is a tough competitive environment with numerous major corporations from around the globe bidding on major transit contracts. To stay on top, the Transportation Division undertook an extensive program to modernize facilities, change manufacturing concepts, and replace aging computerized systems with an integrated network of engineering, manufacturing, and administrative support computer systems.

Hundreds of HP 150 Touchscreen Personal Computers and HP terminals are connected to a network that provides access to any of the division's local computer systems or remote time-shared systems — from five different major computer vendors.

The computer systems include four HP 3000s for engineering and manufacturing data bases and office automation functions, and HP 1000s for automated factory test. HP laser printing systems are taking over much of the division's printing — integrating text, graphics, and forms.

Early results show a remarkable compression of the build cycle — from three months to less than two weeks. Factory productivity and quality also have been dramatically improved. Computer tools are being used extensively by all functions of the business. Almost every desk has a terminal or personal computer workstation. And the factory doesn't look much like a factory; sub-assemblies are built in lots of one in carpeted workstations.

An integrated network of computer systems—including HP 1000s and 3000s—streamlines the production process at Westinghouse Electric's Transportation Division.

Burke Industries: Real-time information increases competitive edge

Burke Industries produces more than 6,000 different types of molded and fabricated rubber products — from giant O-rings used in the space program to resilient floor tiles for commercial buildings.

In 1979, Burke began planning for a computer system to provide floor supervisors and department managers real-time information for quality control and productivity management. Burke needed a reliable system that could link to programmable logic controllers (PLCs) that control rubber mixing machines and presses. Major requirements included ease-of-use, and upward expandability.

After careful comparison of several systems, the HP 1000 A-Series real-time computer was chosen. "In addition to meeting our established requirements, Hewlett-Packard provided a comprehensive solution for our manufacturing environment," says Mike Burke, control systems engineer with Burke Industries. "For example, the graphics were a plus that we hadn't counted on. It's much easier to display certain types of information graphically.

"The computer has increased our machine productivity anywhere from 10 to 30 percent, and enabled us to use software from our previous computer on the new system, which helped make the transition easier for employees," says Burke. "Because the system is so easy to use, employees are not afraid of the system. In fact, they like it so much, they keep dreaming up new applications."

The hub of the Burke system is an HP A-Series computer running powerful application software such as Graphics/1000 for easy-to-read operator updates, IMAGE/1000 data base management and, of course, the Programmable Controller Interface (PCIF/1000) software that controls the PLCs. Six computer terminals are located just off the manufacturing floor in the offices of floor supervisors. The computer controls six Allen Bradley PLCs and six Allen Bradley mini-PLCs connected to mixing machines, presses, and various workstations on the floor.

"While many vendors claim computers that will control PLCs, I feel that Hewlett-Packard provides the best control, as well as the simplicity that is required for easy use on the manufacturing floor," says Burke. "The PCIF software is well documented and easy to use, and has increased our ability to program the PLCs."

Streamlining the production process

When a part goes into production, it is listed on a daily production schedule which is used by the Document Control Department to check specifications. To do this, a worker types the part number on a computer terminal keyboard, and the "run" specifications appear on the terminal's screen. These specifications tell how long a part has to be processed, the temperature at which it must run, cure time, the standard for how long the process should take, and other appropriate control information.

The computer sends this control information to the PLCs, and the part begins its run. As the product goes through the various workstations and production stages, actual run conditions are transmitted back to the computer via the PLCs.

Competitive edge from on-line information

To find out time and temperature records on any part, a supervisor simply types in the name of the report needed and the information appears on the computer terminal's screen. The part number, the machine that the part was made on, cure time, temperature, and time of day are all provided. "Because so many of our customers require this information for their own quality-control procedures, we have actually won contracts because of our ability to provide this kind of production data on an accurate, real-time basis," says Burke.
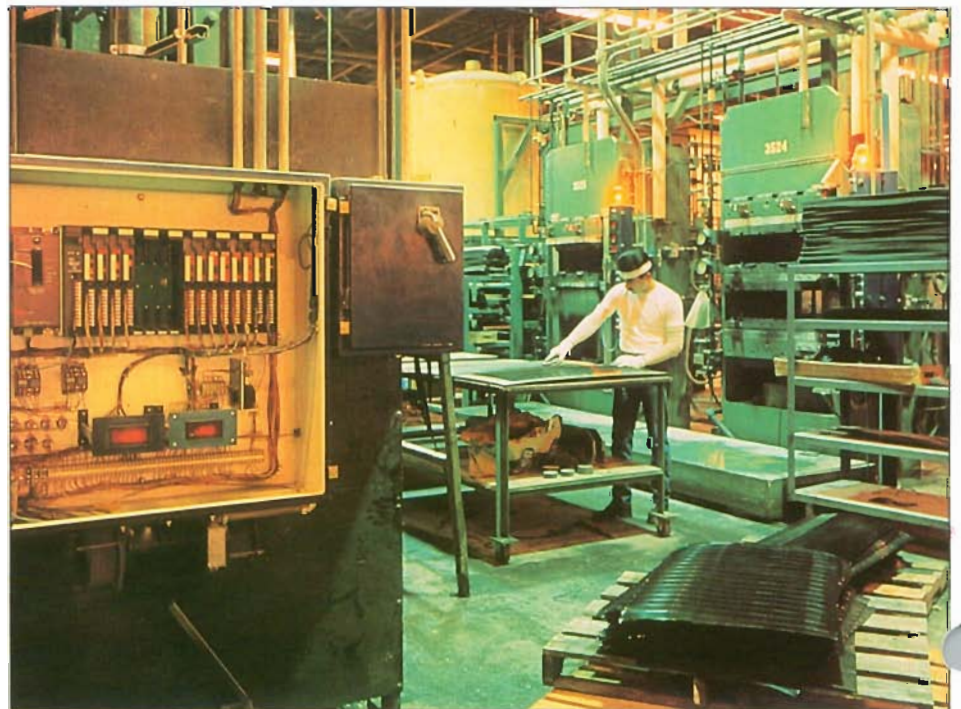
At Burke Industries, a control panel on the factory floor links to programmable logic controllers (PLCs) which send real-time information to an HP A-Series computer.

Another benefit of a real-time system is its ability to shut down the production process if production parameters are out of specification. "For example, if the temperature is out of spec by more than two or three degrees, the computer simply instructs the PLC to shut the machine down until the temperature is corrected. The operator can't make another part. This saves money in the long run. We don't have to throw away faulty parts because we never produce more than one," says Burke.

## Hewlett-Packard: Manufacturing productivity begins at home

At HP, we use our own manufacturing organizations as working laboratories for advanced manufacturing technologies, frequently with extraordinary results.

For example, at the beginning of this decade, HP's Disc Memory Division, in Boise, Idaho, looked for ways to improve process yields and reduce costs in the manufacture of its media modules.

Because the manufacturing process for these units is so complex, there was no easy way to correlate design and process parameters with data on product defects. And testing was impractical because of the unusually high number of test variables.

In 1981, the division developed an in-house factory data-base system — subsequently marketed as the HP 1000 Quality Decision Management system — to automate collection, validation, correlation, storage, and retrieval of information from every step of the manufacturing process.

The system gives division engineers access to accurate, chronologically-organized test data. They can select historical reports, control charts, or graphs for any portion of the process. They can also analyze trends and answer numerous "what-if" questions. Now, instead of spending three
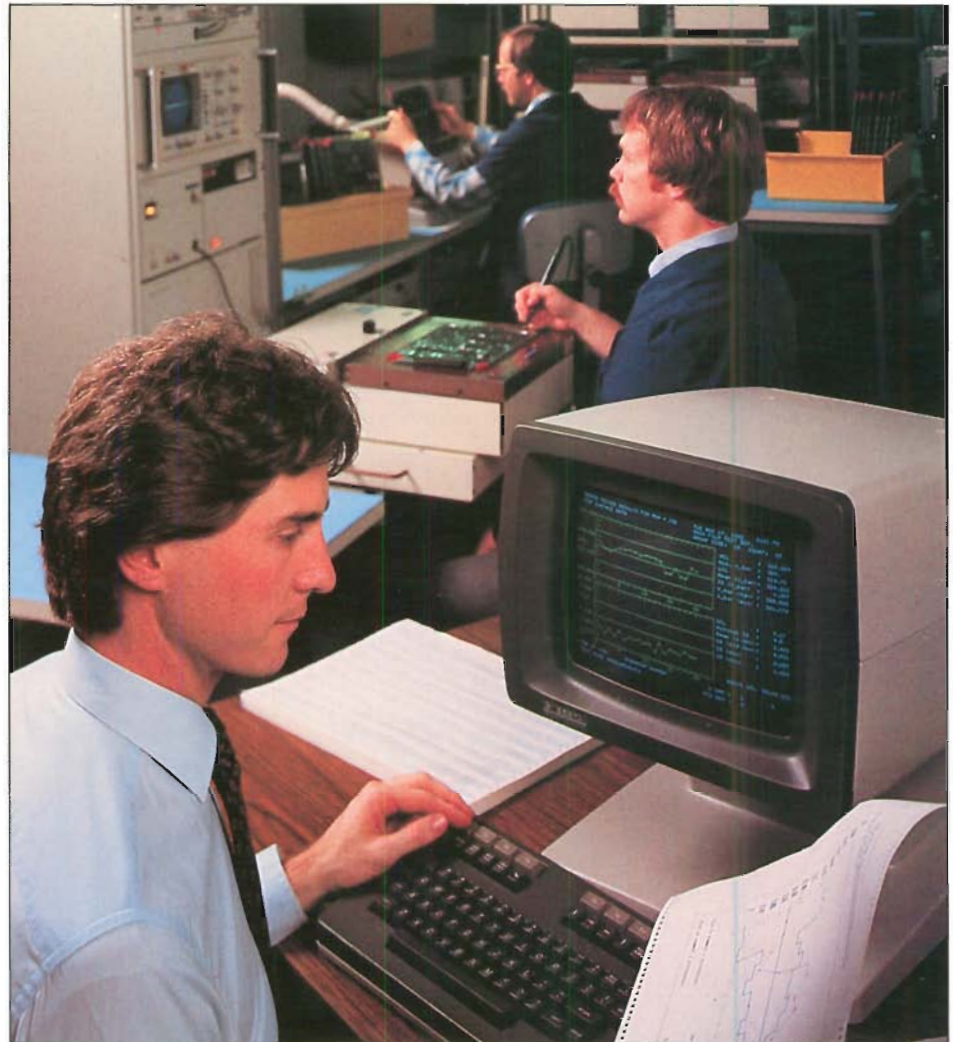
HP's manufacturing organizations are working laboratories where new manufacturing technologies often produce significant productivity breakthroughs.

weeks to evaluate and solve in-process problems, engineers typically spend less than two days. What's more, overall product yields are up to 85 percent.

The new clarity of quality-control data also allows the division to correlate test and production data with that of its vendors. This cooperative effort makes it possible to resolve production problems in both shops quickly and economically. Now incoming parts can be accepted virtually without inspection. Other HP organizations have achieved similar productivity breakthroughs:

- $300 million annual savings on inventory carrying costs (that's a reduction of inventory as a percentage of sales from 20 to 15 percent),
- $180 million annual savings on accounts receivable costs (3 percent of sales),
- 70 percent reduction in order processing costs,
- improvements in already high customer service levels, even while volumes increased threefold.

Add to this across-the-board productivity gains in manufacturing-related functions. And a remarkable seven- to eight-day build cycle for multilevel PC boards — down from the three- to five-week industry average, with one-third the workhours per board. And last, but not least, a substantial cost reduction passed on to our customers in the form of price reductions.

New HP consulting services help your HP 3000 system keep pace with your growing business

As your business grows, you need to ask yourself two basic questions: What happens when the number of people actively using your company's computer system increases? and When should you trade in your current system for a larger one? Hewlett-Packard's Capacity Planning and Performance Analysis products, using new, sophisticated analytic modeling software, answer these types of questions, and more, for companies using HP 3000 computer systems.

Capacity Planning. The ideal time to do HP 3000 capacity planning is at the beginning of your budgeting cycle, when you forecast your business growth. HP's new consulting services can forecast how much computer power you will need and when you will need it.

Performance Analysis. To help you gain the most benefit from your investment in computer equipment, HP's new tools will analyze your current system and make specific recommendations for managing it most efficiently.

Long-range DP planning for your HP 3000 system

HP Caplan System Capacity Planning is a consulting service designed to

DP managers can use HP's new performance analysis and capacity planning services to manage system resources more effectively.

help your DP manager plan for business and system growth. HP Caplan forecasts the amount of computer power your business will need as your applications grow and change (see box).

Analyzing HP 3000 system performance

HP 3000 HP Trend System Performance Analysis is a year-long subscription service that provides your

system manager with information to aid in the ongoing, high-level management of overall system resources. It monitors system activity over time, allowing you to identify potential problems before they occur.

### Fine tuning for improved system performance

HP Snapshot System Performance Analysis is a consulting service designed to help you get the most out of your HP 3000 computer. HP Snapshot's in-depth analysis helps your system manager tune your HP 3000 system for improved performance of your current applications.

Customized performance consulting

If your business's concerns are exceptional and the standard performance products described above do not fully meet your needs, Custom Performance Consulting provides personalized assistance. This service includes many of the software tools used in the other services, but is customized to your unique application performance concerns.

For more information about HP Capacity Planning and Performance Analysis products, contact your local HP Sales Representative.

Performance Predictions
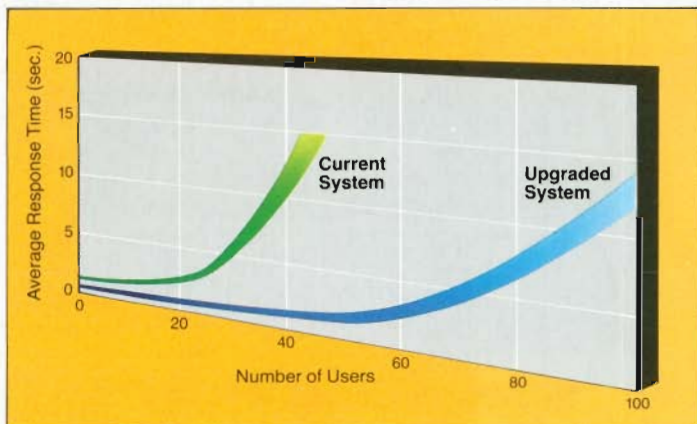
Response time projections based on actual HP Caplan analysis.

This chart, generated by software used in HP's new capacity planning service, HP Caplan, solves a common business problem: When should an expanding company upgrade its computer system?

The green curve shows the forecast of a current system's response time (the time it takes the computer to complete a given set of instructions) as the number of active users increases. The computer performs well as more users log on — with an average response time of less than five seconds — until a certain point where additional users slow it down.

To demonstrate the benefits of an upgrade, HP Caplan forecasts the new computer's performance. The blue curve shows that the upgraded system could accept many more active users and still maintain excellent response time.

Improve product quality at half the programming costs with new HP semiconductor memory tester

HP's new HP 9430 Memory Test System — a versatile tool for testing semiconductor memories — offers excellent accuracy, long-term stability and new standards in software productivity. An easy-to-use modular software structure shortens manufacturing start up and can cut programming costs by up to 50 percent.

An integral part of the HP 9430 is the HP 9000 Series 200 multiuser computer, running on HP-UX, HP's implementation of the UNIX™ operating system. Supporting HP peripherals and advanced software, this local high-level intelligence eliminates the need for an external host computer, making each test system an independent workstation that can be integrated into a larger network.

New modular software drastically reduces computer program complexity. This means a fast learning curve, quick test-program development, and easy program maintenance. The various tasks for developing a complete test are logically grouped in individual modules, with independent editors used for such tasks as pin assignment and pattern selection.

Cost-effective efficiency and excellent stability

Features such as hardware and pattern simulation and the unique softkey-driven operating environment boost engineering efficiency, giving test engineers the time to concentrate on more complex tasks.

The HP 9430 is designed for long-term stability without frequent calibration. With four minutes of calibration, performance stays within specifications for at least one year. The system also features excellent stability with temperature changes and requires no special environmental conditioning.

UNIX™ is a trademark of AT&T Bell Laboratories.

In Brief

- Texas Instruments' Equipment Group has awarded its "Supplier Quality Award" to HP as one of 20 vendors who delivered 100 percent defect-free material throughout 1984. "It shows our confidence in HP that they were ranked as our number one supplier in dollars in 1984," said Vern Raven, purchasing manager for the TI group. In previous years HP has twice received the group's award for delivering 98 percent defect-free material.

- John Young, HP president and CEO, was the keynote speaker at the dedication of Stanford University's Center for Integrated Systems, which will conduct research in semiconductor and systems technology. HP was one of 20 companies that each contributed $750,000 toward construction of the center, which also received federal support. Young commended the partnership of academia, government, and industry in the project as "our best chance of continuing the American tradition of innovation."

- Now HP Touchscreen computer users can view information from a variety of sources, including the HP 3000 data base system (IMAGE/3000) and personal computer data bases such as CONDOR and dBASE II™. Using the new HP Access interface products, users can draw information from several systems, which appear to operate as a single data base. According to Jan Lewis, senior analyst with InfoCorp, "This is the closest thing to a real distributed data processing system I've seen. With Access, HP has leapfrogged other OA [Office Automation] vendors."

dBase™ is a US trademark of Ashton-Tate.
CONDOR is a US trademark of Condor Computer Corporation.

HP's new HP 9430 Memory Test System provides a versatile and economical way to test all common semiconductor memories in manufacturing environments.

Innovative displays: new low-priced terminals from HP

Two new display terminals deliver increased flexibility in business, technical, and manufacturing environments at a 40 percent savings over previous models.

The HP 2393A graphics terminal displays full graphics and text, and provides a variety of input/output options, including touchscreen, mouse, digitizer tablet, and bar code reader. The HP 2393A works with the HP 3000, HP 9000, and HP 1000 computers. It also works with the DEC® VAX™ minicomputer and can emulate a Tektronix® graphics terminal.

With an optional port you can display information on a variety of printers and plotters. And because the terminal has a modular design, you can replace the monitor with other video de-

A design engineer creates a complex drawing using the new HP 2393A graphics terminal and a mouse.

vices such as film recorders or large-screen projectors.

The HP 2394A data-entry terminal is a high-performance alternative to the

HP 2392A, bringing screens up faster and reducing terminal response time. The new terminal offers an innovative approach to remote data-entry applications. It stores forms locally in terminal memory and provides extensive edit checks — if you make a mistake while entering data from a remote location, the terminal immediately notifies you of the error.

Both the HP 2393A and HP 2394A use advanced very-large-scale-integration (VLSI) technology which reduces the number of components required and lowers the cost to customers.

DEC® is a US registered trademark of Digital Equipment Corporation
VAX™ is a US registered trademark of Digital Equipment Corporation