Trends in Productivity

The competitive global marketplace demands that manufacturers be the low-cost producer to survive. Improvements in productivity, driven by the latest in automation and management policies, can provide the leverage managers are looking for.

By Nancy Syverson, Managing Editor

Productivity is the critical measure that determines plant efficiency. And because plant efficiency supports a company's competitiveness, many plant managers track its progress with diligence, turning to a variety of technological and managerial remedies should those numbers falter. Some of the most significant trends in productivity growth today involve increased use of automation, metrics, and "mechatronics," which combines electronic and mechanical components with modern controls and microprocessors.

But even the most advanced technological innovation cannot succeed without the cooperation of its employees. Company culture and "the human element" can be either a company's best asset or worst hindrance to productivity. World-class companies, and those who aspire to be, have found that investments in culture-building programs that train and reward employees and encourage communication are monies well spent.

The results of these trends are in the numbers. Measured in terms of product output per unit of labor, productivity numbers are published by the Bureau of Labor Statistics (BLS) quarterly and annually. They show that, despite offshore outsourcing and the huge losses in manufacturing jobs, the productivity of many U.S. manufacturing sectors is on the rise. Since 1987, for example, most manufacturing industries have had 3% to 5% compounded annual productivity improvements. From 1990 to 1998, labor productivity increased in 93% of the manufacturing industries. Output rose in 87% of industries, while hours rose in 47%. According to the most recent BLS statistics, fourth-quarter 2004 manufacturing productivity grew 5.6%. And on an annual average basis, output per hour in the manufacturing sector posted a 4.9% increase in 2004.

Leading the pack in productivity are the computer, electronics and communications equipment industries, with double-digit gains at an average annual rate of 10% to 25% since 1987. Dell, Inc., founded by Michael Dell in 1984, and based in Austin,

TX, is the only computer manufacturer left in the U.S. Jim Wynalek, vice president of engineering and quality for Dell America's manufacturing, says the company's focus on productivity is the reason why. "The electronics industry is under constant pressure," he says. "There has been a continual decline in price increase and consumer value per dollar spent." Because of intense competition, companies like Dell have been forced to be the low-cost producer to remain in the marketplace and stay competitive. And, according to Wynalek, high levels of productivity allow the company to provide continual value per dollar to customers.

The engine of the productivity success that Dell has achieved is its fulfillment model. "Every computer system that is produced is for an individual order," says Wynalek. "The result is a unique manufacturing process. We don't carry inventory, so we don't have warehouses. We receive materials from our suppliers as demand requires, so unusable parts are never on hand."

The factory floor of the Dell manufacturing facility in Austin is designed to reflect this "batch-of-one" concept. The parts for each computer order are individually kitted, and assembled in discrete work cells rather than in production lines.

"We focus on velocity through our manufacturing process to reduce any inherent delay," says Wynalek. "Because we're focused on velocity, we get the product on the truck and delivered to our customer more quickly."

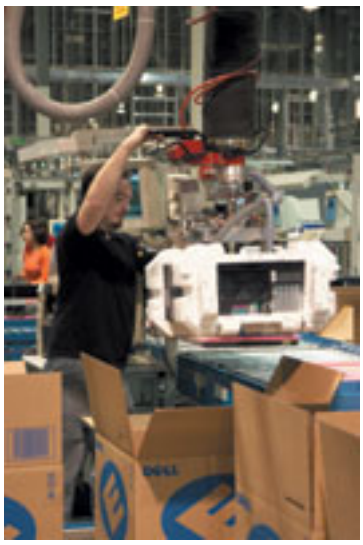
The company chooses to outsource any and all non-core, non-assembly processes, so as not to slow the manufacturing process. "We have supplier partners who provide printed circuit boards, chassis, hard drives and optical devices," says Wynalek. "We choose not to go into those areas because that is not our core skill. Our relationship with our suppliers works for us so we can concentrate on what we do best, which is assembly, and they can focus on what they do best."

Dell teams also participate in kaizen events, looking for productivity opportunities to eliminate waste and gain speed and efficiency. A recent work-cell kaizen, for example, resulted in the cell being re-engineered for motion efficiency. The changes will be implemented as a pilot program before being replicated.

Outgrowths of the Toyota Production System (TPS), kaizen events and lean manufacturing techniques have become standard practice at efficient companies. "Any company using a TPS-based system can get higher productivity because it focuses on waste in the process," says Jim Thomas president of Lean Masters Consulting Group, Inc., Lawrenceburg, KY. Thomas defines productivity in terms of more valued-added work and less non-value-added work. "If you can reduce the non-valued added work then you can use that time to do more value-added work," he says. The Dell system is the perfect example of a manufacturing process that has all but eliminated non-value added work, such as that related to defects, scrap or rework, inventories, over-production, and product alterations that the customer doesn't care about.

"Productivity lowers your cost to manufacture a product," says Thomas. "That will result in greater profits, which you can then convert into bigger market share, to grow your business."

Because of the productivity/low-cost-producer link, Dell's Wynalek says his company is obsessive about factory performance, and monitors it hourly. Productivity reports are sent to management-team pagers hourly, and at any given moment, productivity and throughput numbers can be accessed via computer-generated, line-by-line floor plans.



On the factory floor itself, “selective automation,” is what Wynalek claims is the Dell engine for driving productivity. He cites, for example, burn-rack imaging, the process during which the software load is customized to the individual buyer requirement. It was once an arduous, manual process: Machines were transported on wheeled carts into a center rack where they were wired by hand. A new infrastructure has been developed where the computers are automatically transported through the software load and test, then automatically extracted and moved on to the boxing and shipping area. Another example of Dell’s use of advancing technology is its selective use of robotics, says Wynalek. “We use selective robotics predominantly to pick up and load heavy computer chassis into key process elements.” In addition to improving productivity, robotics improve worker ergonomics and safety.

“If there is something that has a higher level of quality and will run faster and takes less manpower hours, I am going to want to know about it,” says Paul Parker, plant manager at Church and Dwight’s Green River, WY, plant. Located near the world’s largest known trona deposits (used to make sodium bicarbonate for soaps, baking soda, and laundry detergent), the Green River plant manufactures a range of process products from laundry detergent to cat litter. A 20-year Church and Dwight veteran, Parker has seen and implemented a range of innovations that have boosted plant productivity. For example, when he started at the company, palletizing was done manually. At least two workers lifted and stacked cases onto a pallet, while a third employee on a forklift would pick up the pallet, take it to get hand stretch-wrapped, then put it on a truck. Today, cases are sent directly to an automatic palletizer, which palletizes according to any pre-programmed pattern. They are then moved to another area and automatically shrink-wrapped.
“Now we have one person who can handle four packaging lines from the forklift standpoint, and put it on to trucks to be loaded to our customers,” says Parker. “We have gone from a scenario where you may have had six, eight or more people on a daily basis out there manually palletizing, stretch-wrapping and putting product away.” Thanks to the automatic palletizer, Church and Dwight now completes the same process with one or two employees.
Church and Dwight has also modernized and automated production. A computer system monitors pressures, temperatures and flows. It watches the plant continuously and controls inside specifications without need for an operator. Alarms

will sound if the system senses a problem, informing the operator to return to the control room to diagnose the problem and fix it before it shuts the facility down. Parker believes computerization has drastically changed how plants are operated. “We’ve reduced labor because a computer can now monitor the process and make adjustments,” he says. “And because the machine can sense very small changes in the process, we improved raw-material conversions. The computer keeps the plant running at near-optimal operating conditions,” says Parker.

But productivity gains that reduce the number of employees required to do a task can pose a job-security issue and undermine unity. “The biggest obstacle to productivity and implementing productivity measures is the culture of the people in an organization,” says consultant Thomas. “Productivity improvements are people-related, especially if you have to teach them a new production system. It’s more than redesigning equipment or automating processes.” Getting people to work in teams, replacing batch and queue operations with continuous flow, and cross-training programs that help retain jobs all must be viewed from the perspective of culture change. “It’s teaching your entire workforce from the CEO right down to the shop floor a new way to do business,” says Thomas.
For example, when the management at Aries Electronics, an electronic connector manufacturer in Frenchtown, NJ, planned to replace five employees with one employee and a newly designed $40,000 automated machine, “The first thing we did was get everyone involved,” says president William Sinclair. “The second thing we did was tell everyone they were not going to lose their job. You must have a no-layoff policy or productivity doesn’t work. No one is going to show you how to do their job, if they think they are going to lose their job, or even if they think a buddy is going to lose a job.”
Sinclair says he prefers to reduce headcount through attrition. “We tell our employees that if we are going to automate their job, we’ll reassign them. That’s what productivity is about: getting more output with less labor,” he says. “And we pay a bonus twice a year predicated on the profitability and productivity of the company.”

Employee incentives to motivate workers to produce more is not a new idea. However, Solvay Paperboard, a containerboard mini-mill located near Syracuse, NY, has taken the concept to the extreme, reworking the productivity equation in its company-culture value chain: employee first, productivity fourth.
“The fact that we emphasize other business areas like safety, breeds an appreciation in our employees that we care more about them, than running the

machines faster and faster," says James Porter, Solvay president. "We inspire our employees to be smarter and to be more knowledgeable about our processes which produces a better result over time." Meanwhile, the company relies on metrics continually tracking output per day, uptime efficiency, production per employee, production per dollar of capital invested, ft. per minute of speed, and other measures to help it fine-tune productivity.

Solvay's decentralized, mini-mill set-up has also had a positive effect on productivity. General manager Tom Stigers says the approach has reduced capital investment in an industry known for above-average capital expenses. Second, the mini-mill matches its capacity to demand. And finally, the mini-mill is usually on the outskirts of an urban location, so it is close to the rail, power plants, the fiber supply, and the customer. Again, proof is in the numbers: Built in 1994, the Solvay plant doubled its production in 1998 and again in 2002.

According to consultant John Zyrkowski, mini-mills can be more productive because they are easier to manage. Employees can respond to problems more quickly, and the facility is small enough that improvement efforts can often be drawn from employee inputs. He says the trend toward mini-mills has proven to be more conducive to increased productivity even in areas like steel. Whereas so many of the big steel mills have closed and gone bankrupt, the mini-mills, which recycle scrap, are more efficient given their smaller capacities. Like the paper mini-mills, steel mini-mills are producing smaller quantities, but under tighter control and closer to market demand. "World-class mini-mill outputs per day have risen by almost 50% over the last 10 years," says Zyrkowski.

Solvay president James Porter says his company also focuses on state-of-the-art manufacturing technology. New presses that remove more water from the paper have helped the company dramatically improve efficiency and throughput. According to Porter, 20 years ago paper machines could run 1,500 ft. of containerboard per minute. Today the best machines run at 3,000 ft. per minute. So, machine speeds have doubled. The result? A second linerboard machine was installed in 1999 after output doubled and a third corrugating medium machine was installed after output almost doubled again in 2002.

Clearly, the old sweatshop approach to manufacturing is practically nonexistent in the U.S. today. Modern companies train their workers to work smarter not faster. They also implement no lay-off policies and offer financial incentives and rewards. This approach, coupled with phenomenal advances in technology and automation, have kept productivity in industries such as computers, electronics, and paper and pulp on a steady upswing.

But the loss of 3.1 million U.S. manufacturing jobs over the past 2½ years is an eye-opening revelation that many employers have not been able to or have not attempted to take steps to improve their domestic productivity. Reasons for this vary, but as companies like Dell and Solvay have shown, it is not because outsourcing is the only path to productivity gains. In today's economy, the low-cost producer is the winner, whether here or offshore. And the best companies also know that price must be matched by quality. "There are two pieces to it," says consultant Zyrkowski. "You have to offer a product that will give you a price advantage. This can be a higher price than China," he says, "but the market is also looking for value. The product must be better. And if you can produce it at costs on par with Chinese costs, then you can compete in that marketplace. And that will basically be because

of productivity.”

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