Leveraging

How two manufacturers resisted a wave of plant closings and turned around their businesses.

BY ALAN S. BROWN

In 2000, two manufacturers, Drew Greenblatt and Jim Griffith, faced an uncertain future.

Greenblatt was an entrepreneur. Two years earlier, he had sold his security company and bought Marlin Steel Wire Products, the world's largest manufacturer of baskets used in making bagels. The Baltimore-based business grossed about $800,000 annually. Some of its equipment dated back to World War II. Greenblatt hoped to boost profits by investing in new technology.

His timing could not have been worse. "There were two things I didn't see coming," he recalled. "First, the Chinese began exporting bagel baskets cheaper than I could buy the steel to

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TIMKEN CO.

Timken prospered by going beyond bearings Here, Timken workers bore seamless tubes for oil and gas drilling.

Knowledge

make them. Their government was subsidizing steel production, and when they chromed something, they dumped the wastes into the Yangtze River.

"Then there was the Atkins diet craze, where people gave up eating carbs. The last place you wanted to be was to be the world's biggest manufacturer of bagel baskets. I was toast. I either had to throw in the towel or transform into something else. I was hemorrhaging major cash."

Meanwhile, in Canton, Ohio, Griffith had just been named president of Timken Co. after leading the company's automotive business for three years. Timken owned 30 to 40 percent of the market for tapered roller bearings and was the leading U.S. producer of alloy steel (which it used for bearings and also sold).

Yet Timken was hurting. "From 1980 to 2000, we had made only a 6 percent pretax return on invested capital," Griffith said. It was not enough to repay the interest on its debt. "We were gradually liquidating the company over a 20-year period."

Griffith knew those numbers by heart. In 1997, top management had asked Griffith and other younger managers to assess Timken's strategic position. The picture was not pretty. "Three of us had independently begun to question whether this was a company where we wanted to spend the rest of our career," he recalled.

Throughout the 1990s, Timken had undertaken massive manufacturing productivity programs and invested in making cleaner, more durable steel. Yet Timken did not make money in its largest market, automobiles. Instead, it made money in more customized industrial applications and in the aftermarket for replacement bearings.

The problem was that Timken's new alloy steels had extended bearing life by an order of magnitude. "That meant that a bearing that lasted 100,000 miles in 1980 now lasted 1 million miles," Griffith said. This killed the aftermarket. Meanwhile, bearings themselves had become commoditized, and offshore producers were bringing in cheaper substitutes. If Timken wanted to survive, it needed to change.

Both Griffith and Greenblatt stepped up, and today their businesses are thriving. Not every manufacturer did, and many paid the price.

Massive Change

Since 2001, 56,190 U.S. factories—roughly one in every seven—have closed their doors, according to the Bureau of Labor Statistics. Over the same 10 years, more than 5 million U.S. manufacturing jobs disappeared.

Such numbers lead many to say, "America doesn't make anything anymore." They are wrong.

Between 2001 and 2010—while tens of thousands of factories closed and millions of workers lost their jobs—the value added by U.S. manufacturing rose 28 percent, to $1.7 trillion, according to the U.S. Department of Commerce's Bureau of Economic Analysis.

"If you look at global manufacturing's value added, the United States accounts for about 20 percent of it, the same as 20 to 30 years ago," Doug Woods, president of the Association for Manufacturing Technology, said.

While the U.S. economy is still in the doldrums, manufacturing has done better than most sectors. Output has bounced back to more than 90 percent of its 2007 high, and exports of manufactured goods are at their highest levels in 20 years.

There is only one way to explain such contradictions: U.S. manufacturing is undergoing a massive change.

Marlin invested in robots to boost productivity and speed.

According to Tom Runiewicz, an economist at IHS Global Insight, U.S. manufacturers have been retooling their factories for 20 years. Back in the early 1990s, American business realized it could not compete with such emerging countries as China, India, and Brazil, where wages were much lower and regulations nonexistent.

That forced industrialists back to their drawing boards. Although U.S. workers were far more capable than their offshore counterparts, the difference in wages was too steep to surmount in labor-intensive assembly jobs. That work began to go offshore.

"The way we could compete was through recapitalization, investing in new technology so it takes a lot fewer employees to produce the same amount of product," Runiewicz said. "We became one of the world leaders in productivity growth."

In the past two recessions, the pace of those investments picked up. "There was a big squeeze on companies," Runiewicz added. "They had to do more with what they had. Automation saves in the short term and makes them more competitive in the long term."

The numbers bear him out. U.S. manufacturing technology orders totaled $607 million in September 2011, according to a report compiled by Woods's Association for Manufacturing Technology and the American Machine Tool Distributors' Association. That is up 50 percent from one year earlier. In fact, orders through the first nine

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months of 2011 were nearly twice as high as in 2010 (which was also a strong year).

Of course, "manufacturing technology" is an umbrella term that covers almost any capital investment in a factory. Its components range from machinery to robots, sensors, and software. Yet today, even old-school mills and stamps feature sophisticated automation and data systems that connect to larger networks.

Those networked devices make today's technology totally unlike the automated filling lines and CNC machines of the past, Woods said.

Marlin upgraded its workforce to handle its automated equipment.

"At some point, you invest in automation not just to replace a cheap person, but because it is an enormous source of data," he explained. "That data gives you enough information about a process to find ways to improve quality, speed, and cost. If a human's doing it, there's no data on torque, angle, speed. There is no way to optimize your plant. That model's changed."

Marlin and Timken show how those changes play out in the field.

Robots and Engineers

Marlin was a profitable company that had made bagel baskets for 30 years. Yet to Greenblatt, the factory looked like something out of a Charles Dickens novel. "The newest piece of equipment was from 1955," he said. "We had welders from World War II that had welded tanks and airplanes on Long Island. Everything had multiple manual operations. Workers would carry in straight rods, hand bend them on a fixture, and hand weld them together."

When the new owner drove into the parking lot, his was the only car there. "Everyone was minimum wage, no health insurance. I was the only guy who owned a car," he said.

Greenblatt attacked on many fronts. For starters, he began hiring what he called "A-plus people" rather than make do with his existing workforce. He was going to need them, because it was already clear that Marlin needed to become more efficient and productive.

His first major investment was a pair of robots, one to bend wire into frames and the second to weld them. The results were dramatic.

"Before, a guy would hand bend 300 wires per hour. The new robot did 400 frames, each with at least four bends, per hour. That's 1,200 bends with variance of plus or minus one-thirty-second inch versus one-third to one-half inch for the human.

"Next to the bender, we had another guy who would do 250 butt welds per hour to close the frame. He made less than 100 frames per hour. Now, with one robot bending and the second robot welding, we were making 400 frames in an hour."

That required a different type of workforce. "We couldn't use a $6 guy to set up the robot," Greenblatt said. "We have to have a real smart guy. He's still going to have grease under his fingernails, but I can pay him more because he's more productive and I can afford it."

The investment in workers and technology made Marlin "viable, but not viable enough," Greenblatt said.

Then fate stepped in. Greenblatt was still pondering how to transform his factory to survive when a Boeing engineer called. "He needed a basket and asked if I could deliver it quickly," he recounted. "I said to myself, 'This a pain. They only ordered a handful, so I'll have to charge them twice as much.' "

The engineer agreed to the higher price immediately. Then the light went on for Greenblatt. "I realized that I had been fixating on bagel shops, and there was no future there. What I needed was to get into a business where people appreciate quality, fast delivery, and engineering."

Greenblatt began to transform the factory. He already had two robots, but if he wanted to get into the market for customized fixtures, he needed to change the old-school design side of his operations.

In the past, customers had bought baskets from Marlin's catalog or sent the company an existing basket to copy. To make custom fixtures, Greenblatt had to go digital so he could exchange design information with customers. He invested in a 2-D CAD station and hired a draftsman who developed products from customers' specifications or sketches. "Now we have six seats of 3-D AutoCAD at $8,000 per throw," he said.

He continued to invest in hardware and software. He bought a $400,000 20-ton punch that bends steel sheet into louvers and hinges, and software to optimize those designs to produce as little scrap as possible. Then came a press brake with 10-micrometer accuracy. He purchased finite element analysis software to estimate product strength against customers' specifications.

He added a two-robot cell, and then another. In each, one robot would make three-dimensional bends and the second would pick up the workpiece and perform secondary operations, like punching holes or adding a screw.

Managing the new computerized equipment demanded a lot, even from Marlin's "A-plus" workforce. Talking about his new press brake, he said, "The operator has to be able to read a blueprint, download the right computer program, modify it in some cases, load the material, make sure the dies are just right, run off a few samples, compare them to

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the blueprint—and do all this while doing the same thing on three other machines. This guy is the foundation of American manufacturing."

Greenblatt also knows how to motivate his workforce. He sets very achievable goals for safety and productivity, and gives bonuses when workers reach them. "People are motivated by bonuses, and I write a big check every two weeks," he said. "Last period, I gave $7,800 in bonuses to people."

In return, Marlin's workers manage themselves. They have a singular focus on productivity and will not let any coworker slack off. "They only want the best guys on their crew," he said. "You can have the best. It's not unobtainable."

Today, Marlin is a $5 million business that knows what it does. "We're good at quick delivery. If you need 8 million baskets to hold socks at Wal-Mart in nine months, I'm the wrong guy. They can make those in China with guys that earn $2.50 per hour. I'm not viable there.

"But if SmithKline wants 10 baskets to hold vials in a certain way in two weeks, we can do it. We are blisteringly fast. We have the best quality in world, and we offer the engineering expertise to get it done. No one has one or two mechanical engineers. We have six ME's and also two designers," Greenblatt said.

Turning Knowhow Into Value

At Timken, Griffith was also grappling with tough competitors and narrow markets. Yet his strategic assessment led to a plan to transform the company. It involved translating Timken's vast knowledge of movement, friction, and materials into customer value. "It's not what we make, it's what we know that's important," Griffith said.

That meant making three fundamental changes. First, where the old Timken had sold bearings, the new company would sell friction solutions based on customer needs. Second, it would extend its product and service offerings to include anything involved in the transmission of mechanical power. Third, it would become a globally integrated manufacturer and supplier.

These strategies totally changed Timken's railroad business. "Our AP bearings were on the wheels of almost every railcar and locomotive in America, yet we lost 10 percent on every bearing sold because the big wheel makers played us off against our competitors," Griffith said.

Timken could not raise prices. Yet it noticed that its bearings lasted four times longer than railcar wheels. When companies changed wheels, they would recondition old bearings for $75 rather than spend $300 for new ones. Timken got into the service business by acquiring a reconditioning company. Services now account for half its railroad business income.

Equally important, services changed Timken's relationship with its customers. Timken was now inside the wheel shops, and had access to data on wheel mileage and use. In the past, it had tried to sell conservative railroads and their purchasing departments on high-efficiency bearings that could slash operating costs, but got nowhere. Now, Timken had the data and credibility to make its case to the wheel shop managers, who demanded the better bearings.

Timken took advantage of its size and wealth to make investments. It upgraded its steel plant to make alloys that sell for multiples of its previous prices. It acquired companies with specialized technology that could benefit from Timken's knowledge, and moved beyond bearings to gearboxes and to specialized oil and gas drilling equipment.

Timken also redoubled its efforts to sell bearings customized for industrial applications. This was a small-volume, high-margin business, and it meant the company had to realign its manufacturing capacity. Not every plant made it. Timken closed roughly 30 facilities over the past 12 years, including its first factory, across the street from Griffith's office.

Timken's Bucyrus, Ohio, plant was one that survived. Like many Timken plants, it was built for high-volume, low-cost production of automotive bearings. Its goal was to continuously shave additional tenths of a second off each discrete operation so it could make more parts in less time at lower per-unit costs.

Often, that came down to spark time, the amount of time Timken's grinding machines were being used to shape bearings. "If you're not creating sparks, you're not adding value to the piece," said Doug Smith, Timken's senior vice president, technology and quality.

Many factors went into spark time. Some were obvious, like the time needed to move parts between operations and set and center them in machines, as well as the grinding wheels, angles, and speeds. Others were less visible, like the alchemy of alloys, heat treatments, and working fluids that made grinding faster.

In pursuit of greater spark time, the plant grew more automated. Workers had once run grinding machines. By 2000, they were setting up grinding machines, which did the job automatically. Yet Timken's automotive bearings were over-designed. Automakers did not want to pay for bearings that would outlast their vehicles.

So Timken shifted markets. The plant now makes bearings for off-road trucks, high-end performance vehicles, and commercial trucks, and high-volume industrial products whose manufacturers are willing to pay for performance. "Where there's a high cost of failure or a high probability of failure, that's Timken's sweet spot," Smith said.

That meant the plant needed to profit with shorter product runs. It invested in additional automation. Today, smart mechatronics automatically load, center, and eject parts. Vision systems that never lose their concentration have replaced quality inspectors at the end of each line.

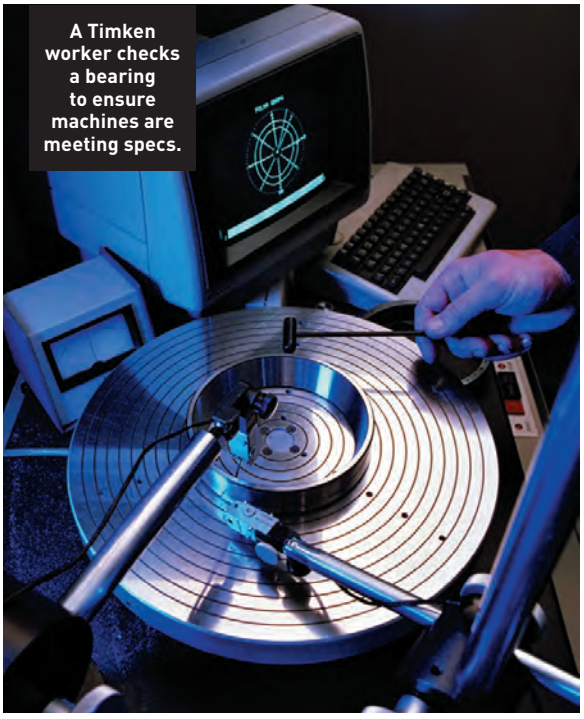
The plant employs just under 400 people, far fewer than in the past, but many have technical or associate degrees. Instead of making products, they set up manufacturing lines to switch between products, monitor equipment, and make the judgment calls on when to take machines down for maintenance.

Not every Timken bearing plant evolved like Bucyrus. The company also operated several smaller, more flexible facilities to make industrial bearings. These changed too.

One was its Asheboro plant in Randleman, N.C. It opened in September 1994. Since then, Timken has molded it so that it can produce a single custom bearing profitably.

That begins with engineering. "The real value in working with Timken is capitalizing on what we know as an organization," Smith said. "If you're trying to put a bearing into an application, our engineers have probably seen many similar types of challenges."

Timken, like Marlin, acts as a consultant for its customers. It designs the bearing, looking at everything from size, shape, and loading to operating temperature and lubrication. Its engineers build simulation models to show how the bearing will perform. If the application calls for a ball bearing—"previously a four-letter word at Timken," according to Smith—it will recommend another manufacturer.



A Timken worker checks a bearing to ensure machines are meeting specs.

Otherwise, the Timken engineer sends the now completed CAD model to the Asheboro factory. There, the company's manufacturing system will break down the specifications into manufacturing steps. The engineer can then step the bearing through the process, selecting the right heat treatment, and cutting, grinding, buffing, and assembly steps needed to make a final product. The system then picks the right combination of machinery to make the bearing most efficiently.

Like Bucyrus, Asheboro has an educated workforce. Unlike the larger plant, which focuses on manufacturing lines, Asheboro has a team-based culture where workers collaborate and cross-train to do multiple tasks. On any given day, a worker might move from buffing or grinding to superfinishing.

Yet neither Asheboro nor Bucyrus nor the products they manufacture are really the point for Timken today. It is not selling products but is instead leveraging knowledge.

"The reason we survived is because we use our knowledge to help other companies improve their performance," Smith said. "That's our big differentiator, reengineering their application so they can compete." Today, Timken is on its way to record sales and profits.

A New World

Both Timken and Marlin took their lumps. If Boeing had not called about a custom basket, perhaps Marlin would have gone under. Timken had to change its business model and rebuild its factories to respond profitably to more low-volume orders.

Along the way, both companies used technology to become more productive. They are not alone. As Michael Zinser, a partner with the Boston Consulting Group noted, America has led the industrial world in productivity growth since 1972. Today, each American worker makes 2.5 times more product than he or she did 40 years ago.

Manufacturing technology played an important role in this. Robots, for example, have become less expensive and easier to use. Even small companies, like Marlin, can use them to boost output and improve quality. When combined with a worker who understands what the final output should look like, robots are a very powerful way of advancing productivity.

Yet manufacturing technology is not just confined to the factory floor. Technology helps companies provide services: Marlin custom designs mission-critical baskets and fixtures; Timken creates friction products. Both create customized solutions. Both have built manufacturing systems flexible enough to adapt to the ever-changing needs of their customers.

Many companies have made similar investments. They have created systems that turn knowledge into products. They have added automation, improved quality, reduced inventory, standardized equipment so they could leverage best practices from plant to plant, and rationalized their assembly processes.

Rather than racing to the bottom to lower costs, many have found customers willing to pay for the best they can offer. Timken, for example, did not stop making million-mile bearings. Instead, it found applications where customers would pay for them and exited the commodity businesses where they would not. Marlin hardly makes bagel baskets any more.

As many analysts have pointed out, industries that rely largely on manual labor have generally shifted overseas. Those that are more capital-intensive have tended to stay and thrive.

In many ways, this explains the paradox of American manufacturing. Yes, factories have closed and jobs have disappeared. Those were generally labor-intensive facilities that could not close the cost gap by adopting automation.

Manufacturers who invested in technology, from robots to CAD software, have continued to thrive. They continue to make quality products profitably. In many cases, they have let go of factory workers. Yet in their place, they have hired other, more skilled technicians and engineers to keep their businesses running.

They are the reason the United States will continue to thrive as a manufacturer. ■

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