

Robotic Automation Can Cut Costs

Investment in automation can enable US manufacturers to increase productivity and defeat offshore competition

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North American manufacturers are facing very aggressive offshore competition. Just use the words "global competition" and people automatically think of outsourcing.

A new paradigm today says: My company can't compete with manufacturers located in low-labor-cost countries such as China. However, the prevailing belief that North American companies can improve their competitiveness only by relocating manufacturing operations to low-cost labor areas is based on incomplete information and analysis. While it may make sense for some companies to move manufacturing overseas, many organizations fail to look at other options that can lead to greater profitability while keeping their manufacturing operations in North America.

Companies need to understand that they have choices when it comes to manufacturing, and that the chips are not always necessarily stacked in favor of low-cost labor markets. Our company has launched an initiative called *Save Your Factory* that is dedicated to encouraging US manufacturers to fully and objectively analyze the advantages of technology, process improvements, lean manufacturing and quality-enhancing techniques, robotic automation, and the total costs of offshore manufacturing before deciding whether to source overseas.

Take a closer look at global competition. North American manufacturers have weathered decades of competition, but today's global competitors are different. In China, there are dozens of manufacturers battling for domestic market share, which keeps everyone lean. As John Engler, president of NAM (National Association of Manufacturers; Washington, DC) said earlier this year, fierce global competition is here to stay, and America's businesses and workers have no choice but to meet that competition head on.

He went on to say that even with tough competitive challenges, America is still the world's largest exporter, and nearly three-fourths of all US exports are manufactured goods. Offshore competition threatens to weaken this strong position, and action must be taken now to offset the threat.



So how can we argue against the new paradigm that the chips are stacked in favor of low-cost labor markets when it comes to manufacturing?



A variety of issues that have increased the costs of manufacturing in this country have made other countries such as India and China look appealing.

Consider the high costs of labor, health care, retirement, tort, tax rates, and environmental regulations in the US; all of these items weigh heavily on a company's bottom line.

The news is filled with stories of manufacturing jobs being outsourced to low-wage countries. Many companies are lured by tales of low labor costs and decide to transition their products to China, only to find the initially estimated savings were never realized. Before making a move, manufacturers should consider the tangible and intangible factors including transportation bottlenecks, counterfeiting of intellectual property, trade barriers, currency devaluation, and human resource issues.

Take, for example, the entire shipping process. From land shipping in China, through unload and land ship in the US, it can take four to six weeks for a product to reach its destination. Unexpected delays, such as the West Coast dock strike of 2002, can increase this time considerably. Issues around homeland security affect shipping schedules, and these costs continue to unfold. Another important issue that many manufacturers encounter is discovering too late that the product, once it is on the ocean, has to be reworked. It's very difficult, if not impossible, to ship products back. In addition, a number of fees are required upon leaving and entering ports, depending on the port of origin and arrival.

The manufacturing quality of your product is an issue that requires constant vigilance. China's low labor rates exist because there is a plentiful supply of unskilled workers from rural areas who are trying to make a better life for themselves. Since payment is often based on the number of units completed, any unit finished is a "good" unit.

Combine quality and shipping issues with lengthy travel time for representatives of North American companies, time zone differences causing communication difficulties, the cost of exporting raw materials



not available overseas from the US to the point of manufacturing, and the threat of shipping accidents, and the thought of offshoring becomes a much more serious financial risk.

According to a 2004 study done by Nicholas Dewhurst of Boothroyd Dewhurst Inc. (Wakefield, RI) and David Meeker, Noeoteric Product Development (Acton, MA), which was discussed in some detail in the article "Going Offshore's Easy, Right?" (ME, December 2004), these tangible and intangible costs often sum to approximately 24% of total product cost.

We arrived at this number based on our experiences with various suppliers and product development companies. This is a conservative estimate because we did not want to argue over particular intangible costs relevant to a particular product or firm. However, even when we take into account the pitfalls of offshore manufacturing, we're often still not at a level playing field.

How do we get to that level playing field? We must implement state-of-the-art technologies including lean manufacturing, robots and automation, and other quality-enhancing techniques. We can do so by taking advantage of the fact that we have recognized the crisis, and have public and private organizations dedicated to the betterment of manufacturing. It also helps that we are familiar with our markets, culture, laws, and standards.

Innovation impacts productivity. The facts show that manufacturing will go to the countries whose companies win the race to automate and use lean manufacturing processes which, in turn, helps reduce production costs while improving quality.

Let's look at some interesting statistics. We have often heard that offshore competitors such as China are stealing jobs from the US, but the statistics tell a different story. China actually lost 15 million manufacturing jobs between 1995 and 2002, whereas the US lost two million jobs for the same period. In fact, the world lost 22 million manufacturing jobs from 1995 to 2002. Where did all of these jobs go? They were eliminated by successful automation and other types of productivity-enhancing technologies, and initiatives such as lean manufacturing.

According to a recent NAM report, 80% of manufacturing executives report a shortage of qualified workers, and 68% state that this negatively impacts productivity. What about the long-term picture? By 2018, there will be a gap of 30 million workers—70 million baby boomers will retire and there will be only 40 million new workers to enter the US workforce. Now, more than ever before, productivity and automation are critical factors if North American manufacturers are to be competitive in the world market.

The productivity-enhancing technologies that we see today, such as plant floor automation, are having as much impact on the economy as the farming technology that was implemented in the last century. In 1900, agricultural workers constituted more than 38% of US employment. Today, they represent about 2% of the work force; however, we produce more of the world's food than we have ever produced.

Because of the productivity-enhancing technologies used in farming, we not only produce more food than ever before in our history, but have become the world's largest producer of food.

A similar analogy can be drawn with the US steel industry. Over the last 20 years, the number of workers employed by the US steel industry dropped by 74% from 289,000 to 74,000. However, output increased by 36% from 75 million tons to 102 million tons during the same timeframe. Technical innovation and productivity-enhancing tools drove this growth.

Late last year, we decided that as the leader in the robotics industry we needed to take a stand and convince North American manufacturers that they can still compete with foreign competitors by optimizing their processes, and keeping themselves lean and fully automated with the latest and best technologies. Thus we created our Save Your Factory initiative. Our message is clear—there are alternatives to plant closings and moving offshore. With lean manufacturing, robotics, and automation, North American manufacturers can be profitable and competitive in today's global market.

Cost is a major factor in the decision to move a factory offshore. An example of how robotics can help companies stay competitive with offshore companies was provided by The Lincoln Electric Co. (Cleveland), a manufacturer and supplier of welding products, robotic welding systems, and plasma and oxyfuel cutting equipment. Lincoln's customer requested an analysis on the cost of weld wire—a consumable in welding. The customer indicated that they were considering moving their manufacturing operations to China unless they were able to reduce their consumables cost.

Lincoln Electric worked with the customer on a thorough cost analysis. The analysis showed that the cost of manual welding the part in the US was \$0.86 per part; the cost of manually welding the part in China was \$0.30 per part. When the consumable cost was eliminated, the cost of manual welding in the US was still high, at \$0.69 per part. This cost figure led the company to conclude that even if the weld-wire consumable was free, there was no way they were going to make enough of an impact on their overall costs to prevent them from moving to China.

That conclusion, in turn, led the customer and Lincoln Electric to do a thorough cost analysis using robotic arc welding. What they found is that with robotic arc welding, their costs went down to the equivalent of manufacturing in China: \$0.30 per part.

This US manufacturer found that what used to take 1.23 min of weld time became 0.61 min of weld time using robotic welding. Weld time decreased, throughput increased, and costs were substantially lowered.

They also found that what used to be 1.52 min of nonwelding, nonproductive activity was reduced to only 0.50 min of nonwelding activity. This change significantly reduced nonvalue-added/nonproductive time, and lowered costs substantially.

In addition, the customer found that robotic welding had a significant positive impact on higher quality, and improved process control.

The customer was not looking forward to the anticipated lead times that they were told to prepare for if they decided to manufacture in China. Coupled with the issues related to shipping back to the US, that factor convinced the company that investing in robotic arc welding automation and keeping their manufacturing in the US was the right decision.

In another example of a customer who was considering moving machining operations to China, we looked at the cost to manufacture a 5-lb aluminum automotive part. Our customer's finish-machining area ran two shifts and had a five-day operation (260 days per year). When we compared labor costs, the part was \$0.21 higher in the US versus China.



Once robotic automation was introduced, the cost dropped to just \$0.73 per part—\$0.03 less than the part costs to make in China, not to mention the additional costs associated with offshore manufacturing such as transportation, delays, duties, risks, etc.

In machining, several factors influence machine productivity, which means the number of parts that a given machine can produce on an annual basis. One factor is the amount of time that a machine can cut parts in an 8-hr shift. If we ignore the lunch break that operators (in any country) take, there is still a 15-min break in the morning and afternoon during which the machine is idle. Because a robot does not require breaks, this means that machines that are manually loaded are reduced to 7 1/2 hr of production, while a robot achieves a full 8 hr of production.

A second issue is the amount of time a machine waits for manual loading and unloading. Our studies show that a robot is faster than an operator, because a robot does not have to wait for a part or cutter to stop moving, or a door to open. Instead, a robot can access parts through the top of a machine, and unload parts immediately upon their completion. In the case that we examined, based on machine productivity, machines loaded by operators produced 445,000 parts annually, while robotically loaded machines produced 545,000 parts.

We encourage US manufacturers to fully and objectively analyze the advantages of robotic automation and the total costs of offshore manufacturing before deciding whether or not to source overseas. There are many tangible and intangible factors to consider, including transportation bottlenecks, counterfeiting of intellectual property, trade barriers, currency devaluation, and human resource issues.

After reviewing the options, the facts show that manufacturing will go to the countries whose companies are agile and innovative. North America is in the best position to win the competitive race, given the infrastructure that currently exists, because of automation technology and lean manufacturing.