

building




smart

BY PETER HAAPANIEMI

Michigan companies are pursuing advanced manufacturing technologies on many fronts — and helping to drive the evolution of the industry.

For decades, work on assembly lines typically involved moving parts down a line, with one assembly step following another in a serial fashion. But Comau Inc. in Southfield, MI, thinks it has a better way.

The company has created SmartCell, a system that essentially enables “parallel processing” in assembly operations, as opposed to the traditional serial approach, says Ted Brown, Comau’s vice president and general manager, Powertrain Systems. With SmartCell, components for powertrain products can be assembled using just one assembly station, versus the usual 10 or more stations. >>



>> “It’s basically having one machine do many operations, versus a whole bunch of machines doing single operations,” Brown says. The result: Greater flexibility in manufacturing. For example, re-tooling a traditional assembly line to handle new products can take months. But, Brown says, “we’re hoping that we can get that down to a maximum of a couple days, and perhaps a couple of hours.”

According to Brown, this flexibility makes it easier to change production to stay in step with changing market demand; reduces the time and cost of retooling; and has the potential to significantly reduce power consumption. In addition, manufacturers can easily scale up from one station to several, so that they can

he says, the computerized control of plant machinery “revolutionized the machining industry, and we’re hoping that this is the same type of revolution for the assembly industry.”

Comau is not the only company in Michigan with a view to manufacturing’s future, and the SmartCell system is just one aspect of a growing focus on “advanced manufacturing” in the state. Definitions of advanced manufacturing vary, but the concept essentially involves the application of sophisticated technologies and skills to bring greater efficiency, flexibility, quality and productivity to manufacturing.

“Advanced manufacturing is matching up manufacturers with technology and continuous development and innovations in material processing, new ways of developing products, and manufacturing processes,” says Rick Jarman, president and CEO of the National Center for Manufacturing Sciences (NCMS), an Ann Arbor, MI-based collaborative R&D consortium. “It’s a merging of the knowledge economy and manufacturing.” And today, many observers say, Michigan is in position to take advantage of this trend.

AN INDUSTRY EVOLUTION

Advanced manufacturing is hardly new to Michigan, but statistics show that it is playing an increasingly important role as industries evolve. “One of the trends that we’ve seen within the automotive manufacturing sector is that as the number of automotive industry jobs in Michigan has declined, the average wage within that industry has been going up pretty significantly,” says Scott Watkins, senior consultant at the Anderson Economic Group in Lansing, MI. That change, he says, “really does signal a shift toward advanced manufacturing. So we see this as retention and probably some creation of these more advanced manufacturing jobs.”

Several recent high-profile events have underscored this trend. Earlier this fall, two energy companies — Xtreme Power of Austin, TX, and Clairvoyant Energy of Santa Barbara, CA — announced plans to purchase a shuttered Ford Motor Co. assembly plant in Wixom, MI, and transform it into an alternative energy manu-

Comau’s SmartCell system features “parallel processing” for optimum flexibility in manufacturing.



purchase capacity as they go, rather than making one large, upfront investment.

Comau, which is part of the Fiat Group, has been developing the SmartCell system in Southfield for two years. It recently brought the system to market, making its first sale to Perkins Engine in the United Kingdom. Looking ahead, Brown expects the system to have a significant impact on the industry, because it addresses a range of factors that are critical for manufacturers working in ever-more competitive markets. Years ago,

facturing park. According to a report from the Michigan Economic Development Corporation (MEDC), the companies plan to invest some \$856 million in the facility — which encompasses 4.7 million square feet of building space on a 320-acre site — and use it to manufacture solar panels.

Similarly, General Electric announced plans in June to build a \$100 million manufacturing technology center in Van Buren Township, MI, southwest of Detroit. This Advanced Manufacturing and Software Technology Center will develop manufacturing technologies for GE's renewable energy products, aircraft engines and gas turbines, and will eventually employ 1,200. "We'll be making high-tech parts, wind turbines and aviation-related equipment," Jeff Immelt, GE's CEO and chairman, said at the time. "I think Michigan has a tremendous workforce. We think we can step right in and get up to speed quickly."

With that, Immelt points to a key manufacturing resource in the state: a highly skilled workforce. Michigan has a long history in engineering-related businesses, including manufacturing, and today the state ranks third in the nation in numbers of engineering graduates. It also has the country's fourth-largest high-tech workforce. As Comau's Ted Brown says, "We're here because the talent is here."

Mike Pfeiffer, marketing manager for Canadian clean-diesel firm NxtGen Emission Controls Inc., agrees. The company is setting up a facility in Wixom to manufacture its patented syngas generator, which will be supplied to retrofit trucking fleets and original equipment trucking manufacturers. "We wanted close proximity to the automotive market in Southeast Michigan and access to the area's highly qualified engineers," Pfeiffer says. The facility will have the capacity to manufacture 25,000 to 40,000 units annually.

"Manufacturing is important and people in Michigan know how to do that. They know how to design things, they know how to make things," says the NCMS's Jarman. That workforce has gained widespread attention, he adds. He says that in talking to Toyota, which has an extensive R&D center in Ann Arbor, "they've told me that they are here because there is a great talent base here." >>

INDUSTRY INSIGHT:

Making a Manufacturing Renaissance

BY JIM KLETZIEN

If there's one thing Southeast Michigan has understood well, it is the importance of manufacturing. The history and growth of the automotive industry has spawned thousands of manufacturing businesses. As a result, it also created thousands of critically important, high-tech manufacturing support companies ranging from computer numerical control and automation providers, to makers of innovative sensors of all types, to tool & die producers, to world-renowned machine tool manufacturers.

The recent decline and subsequent restructuring of the U.S. automotive industry, and U.S. manufacturing in general, has forced the painful relocation and closure of many manufacturing businesses. The result has been the near-elimination of numerous U.S.-based high-tech manufacturing support industries.

Clearly, in Michigan for some time now and more recently across the nation, our elected officials have shown increased awareness of the importance of manufacturing. We now regularly see news about trade missions, business attraction incentives and re-education initiatives to promote manufacturing industries and jobs. But locating manufacturing businesses here underscores a point that is far too often missed. Building a strong manufacturing base for any industry is very difficult, if not impossible, without access to strong, high-tech manufacturing support companies.

By support, I am referring to the means of production: precise, innovative and highly productive machine tools, coupled with the tooling and automation to operate them optimally, as well as the know-how to keep them maintained and running efficiently. These high-tech means of production are the foundation of what produces the automotive parts, oil and gas exploration systems, aerospace components and complex defense systems that make our economy and nation strong.

This point is far from lost in countries like Germany, Japan, Korea and Taiwan, which have overtaken the U.S. to become world powers in developing and manufacturing machine tools and related technologies. Each population is keenly aware of its manufacturing support industries and their importance. Each country also exhibits strong cooperation among government, education and business sectors to train the high-tech workers of the future.

I am in the machine tool business. While our industry is not typically viewed as high-tech in comparison to Apple, Google or Microsoft, not only are we high-tech, we are critical to keeping our manufacturing industries globally competitive.

We can compete with anyone in the world in many sectors of manufacturing — especially since manufacturing technology has evolved to a point where the unskilled labor cost component of manufacturing is no longer much of a factor, and is often offset by the additional costs of procuring from lower labor cost countries.

However, we will need continued effort and increased cooperation among industry, all aspects of government and all levels of education, starting as early as elementary school, if we are to maintain our prominent role in manufacturing and manufacturing technology. We will also need strong manufacturing technology support companies and an ongoing source of interested top young talent to operate these companies. If we remain focused on attaining these goals, a manufacturing renaissance and retaining our position as a top global power is assured.

Jim Kletzien is a vice president with Toyoda Machinery USA Corp. He has a 25-year career in manufacturing, both as an end-user and a supplier of manufacturing technology.

Envisioning the Future

To a great extent, advanced manufacturing is focused on finding ways to work faster, better and more efficiently. For Dassault Systèmes, that means helping companies think ahead and set up the right manufacturing processes long before operations begin.

To do so, Dassault offers a range of software products to manufacturers. One of these is Delmia, which enables companies to simulate and optimize their manufacturing processes in a virtual environment. Dassault is based in Paris, France, but the Delmia brand is managed through the company's Auburn Hills, MI, office. "For Delmia, this is the world headquarters," says Peter Schmitt, vice president of sales, America Dassault Systèmes Delmia. "We have all the functions in this office, including R&D, support, sales and service."

With Delmia software, manufacturing engineers can create virtual production lines that encompass tooling, robots, safety devices and electrical, hydraulic and pneumatic systems, giving them an integrated view of how it all fits together. The software allows engineers to not only lay out the production line, but to simulate its behavior, as well. That means engineers can test various "what if" scenarios to understand, say, how the operation will be affected by an additional robot, a change in material flow or an unusually high number of absent workers. "You have the ability to drive multiple, alternative scenarios of what can happen in that plant, and validate each scenario against cost, space and time requirements to optimize," says Schmitt.

To further streamline the process, Delmia enables various engineering disciplines and departments to collaborate around the virtual model to find the best approaches to production.

In essence, Schmitt says, "you lay out the sequence of processes necessary to manufacture your product, you validate those processes through the simulation of assembly, robotics, numerical control, material flow, ergonomics — and then propagate that down to the shop floor for execution."

Delmia software is used widely by automotive, aerospace, defense and ship-building companies around the globe, and Dassault has recently been making inroads. "You can basically do a virtual start of production without having invested a dime in physical equipment," says Schmitt. And that, in turn, can help manufacturers cut time out of planning, increase efficiency, improve quality and shorten time-to-market — all key factors in an era of relentless global competition.

"As I travel throughout the state, I am continuously impressed that are out there — and with their ability to innovate and

>> The Anderson Economic Group's Watkins also cites Southeast Michigan's "connectedness" with the rest of the world, with its transportation capacity and worldwide travel links. That's a key asset, he says. "Today, you need to be able to be well-connected to the rest of the global manufacturing sector. You need to be able to get to other businesses and have those come to your site in a very ready fashion."

Not surprisingly, the State of Michigan has designated advanced manufacturing as one of its key target areas for economic development efforts. Overall, says Watkins, "the state has the workforce, we have the education and training assets and we have the infrastructure in terms of both facilities and capacity. The potential is great."

A GROWING VARIETY OF BUSINESSES

The automotive history has, of course, played a big part in building Michigan's strengths in advanced manufacturing technologies. Automakers have been pioneers in robotics and automation, and many suppliers in the industry have focused on helping to bring ever-greater sophistication to the industry's manufacturing processes.

But today, Michigan's advanced manufacturing businesses are involved not only in automotive manufacturing, but also in producing products in the medical, alternative energy and advanced battery fields, among others. In addition, says Jennifer Owens, vice president, Michigan Retention and Growth, at the MEDC, "we're really seeing a lot of traction recently on the defense side of advanced manufacturing." In suburban Detroit's Macomb County, she says,

this is driven largely by the U.S. Army TACOM Life Cycle Management Command and U.S. Army Tank Automotive Research, Development and Engineering Center. "That's really kind of a center of advanced manufacturing development for the defense industry."

In fact, there is now a great deal of variety in advanced manufacturing across the state. For example, Saline Electronics in Saline provides electronic circuit-board assembly services to companies involved in bio-medical devices, aerospace-related circuits, data communications, industrial controls, oil and gas drilling industry and other fields. And W Industries, a Detroit manufacturer of metal products, has branched out from its roots serving the auto industry to provide engineering and advanced manufacturing services to the aerospace, defense and energy industries.

In Ann Arbor, Accuri Cytometers has been manufacturing its products in the state since early 2008, and is currently expanding. "We've been ramping up manufacturing pretty dramatically over the last year, making new investments and growing our manufacturing base here, as we are expanding our sales worldwide," says CEO Jennifer Baird.

As the name suggests, Accuri makes cytometers — devices used in the life-sciences industry to measure and examine microscopic particles. Not surprisingly, says Baird, bringing this kind of instrument to market requires high levels of sophistication "every inch of the way." As a result, she says, "the manufacturing steps have lots of built-in checks and confirmations that the instruments are going together in an optimal way with the most robust characteristics, and to make sure that



with the capability of so many of the manufacturing companies their desire to do more.” — RICK JARMAN

the quality checks are there to lock it all down before shipping.”

Accuri's manufacturing also has to handle growing volumes, Baird says. “This year, we have more than tripled what we're building over last year, and next year we are expecting to at least double again, and to continue to have really robust growth. This will continue to challenge us to do better and better in our manufacturing.” Having its manufacturing operations located at company headquarters in Ann Arbor is key to advanced manufacturing success, she adds. “We really do think that it has been important to have it here, close to the experts that were part of the design of the instrument.”

Accuri serves a global market, Baird says, “but most of our core suppliers are here in Michigan. These suppliers can do very sophisticated work, and it is really helpful to work closely with them and collaborate with them. So we see this as a great place to be building [our product].”


ENABLING THE TRANSFORMATION

With Michigan's focus on growing the advanced manufacturing center, there are a number of efforts that focus on helping the state's manufacturers expand beyond the traditional automotive base. The MEDC, for example, has managed a manufacturing diversity effort designed to help companies reach into new industries. “We help them create a road map [for moving into new markets] and then provide connections to the other industries that are looking for products,” says the MEDC's Owens. “We've been able to attract over \$300 million in new contracts in industries outside of the automotive industry.”

The NCMS also helps companies map their way forward to more diverse markets. One of those companies was Koops, a Holland-based manufacturer, which wanted to reach beyond its automotive-based business. “We spent time with them doing road mapping and looking at their capabilities and their processes, and we found that they had some excellent capabilities that matched the needs of the Defense Department,” says NCMS CEO Jarman.

The company used its expertise to create a robotic laser stripping system that will take the paint off helicopter blades — much more efficiently than the traditional manual process. “The Department of Defense is so ecstatic with [the system] that it's being installed at Cherry Point, NC, in the Marine facility down there,” says Jarman. If that project goes well, he adds, the DoD is likely to want more of the systems.

Such diversification efforts highlight a fundamental truth: The advanced manufacturing landscape is ever-changing, as markets, customer requirements and technologies continue to evolve. And companies need to change with it; simply maintaining the status quo won't be enough. As Accuri Cytometers' Baird says, “We're always asking, ‘How can we improve our quality, how can we improve our reliability, how can we improve our efficiency?’ Those things are a constant, constant focus.”

Jarman thinks the region's manufacturers are up to the challenge. “Quite frankly, I see an awful lot of innovation,” he says. “As I travel throughout the state, I am continuously impressed with the capability of so many of the manufacturing companies that are out there — and with their ability to innovate and their desire to do more.” 

Mass Transit Lean and Green

Several years ago, the U.S. Department of Energy sponsored the development of a new hybrid commercial bus design. Today, Fisher Coachworks is bringing that design to market.

Based in Oak Park, MI, the company has created the Fisher GTB-40 — an innovative, all-electric, plug-in hybrid mass transit vehicle. Unlike other hybrids that have essentially applied electric technology to existing vehicle architectures, the GTB-40 was designed from the ground up as a hybrid. The result: a stainless steel bus that weighs about half as much as a traditional bus and uses half (or less) of the energy used in existing hybrids, according to John Van Alstyne, vice president of marketing and sales at the company. “We get a big boost in energy consumption. And on the emissions side, our battery electric [model] is a zero-emissions vehicle,” he says.

In designing the GTB-40, Fisher considered not just how it would perform on the road, but also how it would come together in the manufacturing plant. For example, the stainless steel body means that Fisher does not have to set up a painting operation, which saves time and money. Overall, says Van Alstyne, “we have a flexible, cellular, lean manufacturing line that will be building the buses. The whole chassis and body architecture was designed for cost-effective manufacturing. The vehicle has been developed through CAD and CAE from the very get-go. A lot of analytic work was done very early to test the design principles — and that process continues all the way to the plant floor. So it's a very modern approach to developing and controlling the manufacture of the vehicle.”

Fisher Coachworks is now gearing up to produce these buses in larger volumes, and to do so, it will move to a larger facility. “Our plan is to be into production by early 2011,” says Van Alstyne. The company hasn't made a final site selection yet, he says, but the plan is to remain in Southeast Michigan: “The technical skills that we require to develop and manufacture the vehicle all reside here in Southeast Michigan. The supply base is well represented here. We believe that we are right in the sweet spot of where we should be.”