

# Report from the AutoMan front line

Manufacturing executives from vehicle makers and component suppliers gathered to discuss the challenges and solutions in today's automaking world and some of their conclusions were surprising writes **Alisa Priddle**

**H**eld over two days of conference and debate, plus a visit to the Ford Rouge Truck plant on the preceding day, AutoMan 2004 was lauded by speakers and delegates alike as a great success. Organized by *Automotive Manufacturing Solutions*, the first comprehensive global auto manufacturing forum took place right in the heart of the Motor City – Dearborn – birthplace of the mass-production automobile.

Following the first day of conference an exclusive gala dinner was held at the Ritz-Carlton Hotel. The main speaker for the evening was the Mayor of Dearborn, Michael A Guido. He spoke of the vital role of the industry in Dearborn's development but also recognized that every technology and manufacturing center has to adapt with the times, to continue to educate its young and improve the way of life for all its residents.

Manufacturing is arguably today's competitive battleground. With incentives on the hoods of an increasing number of new vehicles, there is an overwhelming need to reduce structural cost and increase productivity to return to positive price retention; the game can be won, or lost, on the factory floor.

It was against this stark backdrop that automakers and suppliers alike gathered at the inaugural AutoMan global conference. They were enticed by panels of speakers drawn to debate everything from automation, joining technologies, press shop and metalforming solutions, to the power of the integrators. Along the way, they visited the issues of safety, flexibility and lean manufacturing.

Automation continues its relentless onslaught in today's assembly plants, but workers are still very much in control, said Charles Wu, director of manufacturing and vehicle design with Ford Research and Advanced Engineering, who started the conference by outlining Ford's role in designing the work cells. With 500 work cells in trim and final assembly in a typical vehicle assembly plant, there are many line balancing, work distribution, and work cell design decisions to be made.

Minimizing non-value-added operations boosts productivity and goes straight to the bottom line. Wu cited examples where Ford saved 3m (10ft). per operator or 1.6km (1 mile) less per day, by careful work cell design.



**Mayor Guido of Dearborn, Michigan talked of the importance of the auto business to Dearborn and the role the city has played in the growth of auto making around the world**

## Plug and play

It becomes trickier as automakers put multiple models, sometimes from different architectures, on a single line.

Fortunately, machinery has evolved to meet the need to build cars faster today, said Sundar Balu, director of global industry marketing at Woodhead Industries. Gone are the days of bulldozing a plant and retooling for a new product. Today's tooling is soft and programmable, reusable, plug-and-play where possible.

The goal is a vehicle that is easier and faster to assemble, with less wiring and installation costs. The original Chrysler minivan, launched in Windsor, Ontario, Canada, in the fall of 1983, had about 27,000m (90,000ft) of wiring. Within five years that figure was reduced by more than 3,000m (10,000ft), Balu said. Today's vehicles are increasingly microprocessor based, with proprietary hardware, bus networks and intelligent controls assuming more



functions. It's not just to improve the product, but also the cost of manufacturing it, Balu said. "It makes sense to reduce wiring time by 50 percent."

Balu doesn't agree that there is a trend of vehicle makers scaling back the degree of electronics in new vehicles, arguing every segment has at least one vehicle with telematics such as Bluetooth wireless capability.

Al Hufstetler takes it a step further. The vice president of digital manufacturing, at UGS PLM Solutions, describes the plant as the process and the end result.

## What ails US automaking?

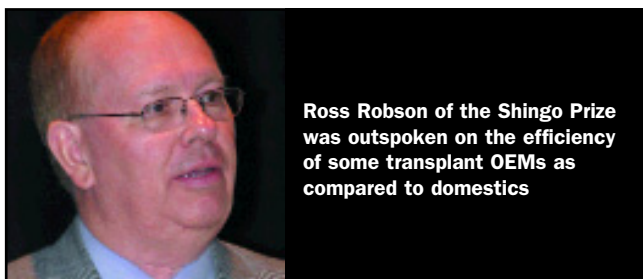
Playing devil's advocate, Ross E Robson, associate dean of business relations at Utah State University and executive director of the Shingo Prize, threw out the bait: "Technology is not the solution to what ails North American auto manufacturing."

Robson sees three competing paradigms when it comes to manufacturing: mass production, quality/Six Sigma, and, finally, the Toyota Production System – the grandfather of lean manufacturing.

Mass production is passé, he attested, as evidenced by the number of companies abandoning it for lean and flexible means of assembly. Robson cited Delphi for transitioning from mass to lean manufacturing "faster than any major company in the world."

Quality programs such as Six Sigma are excellent tools, "but shouldn't be an umbrella," Robson said.

Ford has embraced Six Sigma with dogmatic rigor, describing itself as the only OEM to deploy the data-driven initiative



through all its operations globally, an initiative it credits with saving more than \$1.4 billion worldwide over about 18 months.

"If Ford spent as much money on lean [manufacturing processes] as on Six Sigma, it would be 10 percent better down the road today," Robson said following his speech.

He applauds Six Sigma and black belt teams for their ability to ferret out quality problems in plants, using training in statistical and problem-solving disciplines. Improved quality

saves money through reduced waste and warranty costs. But in the case of Ford, Robson sees evidence of overkill.

"Overall, Ford trained too many people. It was too detailed and too costly and too statistical."

In Robson's mind, the clear winner is manufacturing based on the Toyota system, deemed best-in-class. The result is a company with greater market value than GM and Ford combined, he notes.

"When will the rest of the companies wake up and follow their example?" Robson asked, apologizing to the partisan domestic industry crowd.

Key to Toyota's success is its ability to duplicate its system anywhere in the world. "Toyota does it the same way in Thailand, the US, UK, China, wherever they go," Robson said, with seemingly little trouble instilling its culture. Toyota has proven successful, despite being behind its competitors in technology such as IT flow and intranet use, he adds.

Regionally speaking, Mexico is a shining star in Robson's opinion, attributable largely to culture and attitude. "They tend not to think they are part of the industrial world, so they don't suffer from the problem of arrogance," said the associate dean. "The US suffers from knowing it is rich and powerful, so it sees no need to change." But the need to embrace change was exactly the theme for the panel on joining technologies.

## All change at GM

At GM, something as seemingly simple as buying new conveyors is being done differently. GM expects to reach its stretch target of a 30 percent cost reduction in future conveyor business by buying systems for its plants in bulk as part of its drive for commonality and volume purchasing.

The automaker is changing how it buys, integrates and installs conveyors, said Phillip Disch, GM executive director-controls, conveyor, robotics and welding.

Disch oversees the group that covers machines, controls, systems, robots, welding and conveyor functions in GM North America metal fabrication and assembly plants. The group's involvement stretches from planning through launch, until targeted line rates are reached.

The job of the team is to drive "common" across GM, with open standards and using volume to leverage cost. "I think we will get 30 percent savings initially," Disch said, noting the year got off to a good start with a 42 percent savings on a conveyor contract.

## Heated debates

The drive for common processes had led to heated engineering debates over the years, such as a round vs square connectors, or the decision in the late 1980s between 120-volt and 480-volt control circuits to run plant machinery.

In the case of conveyor systems GM wants a three-year contract with a potential two-year extension, and with a single conveyor supplier per technology type, to meet its needs for all plants worldwide.

Once the systems are bought in bulk, GM will tap regional integrators to adapt them to specific plant needs and regional installation and validation services.

Historically, GM went to integrators who went to contractors who went to subcontractors and back up the line again, Disch



**Phillip Disch of GM spoke of the cost pressures on the manufacturing process and how rationalization in equipment buying is the watchword at GM**

explained. Now, the automaker is bundling components to supply them directly to the integrator.

"We will source early, in volume," he said. Instead of buying 100-200 power roll beds for a plant, for example, GM will buy 1,925. It will buy 3,350 skids, 742 eccentric lift tables, 96 vertical belt lifts and 150 accumulating conveyors.

"So we save cost and [the equipment] is identical in all plants," Disch said. "It covers GM in all regions, including expansion in China."

It makes for more work up front, but common hardware and software make it possible to copy work already completed. "Eighty percent of designs are auto-generated so we're not doing it anymore, we're using legacy work already done in designing equipment," Disch said.

It dovetails with the overwhelming need to reduce structural cost and increase productivity during a period of negative price retention in the industry.

OEMs need low-cost, reliable equipment that is easy to recover, maintain, operate, upgrade and integrate, Disch said. Confronted with the additional challenges of legacy costs and the relentless march of technology, GM must leverage its strengths – such as its ability to pay about \$20,000 less, per robot, than some of its competitors because of its size.

Huge savings in up-front costs make it possible for GM to put \$3,000-\$4,000 in incentives on the hood of its new vehicles.

"It's free enterprise at its best," Disch said.

## **Lasers – an unnatural resistance**

The session was then dominated by the great laser weld technology debate. Spot welds are king of the North American body shop but in Europe laser welding is fast becoming the technology of choice.

Laser applications are widely used in all aspects of manufacturing, for joining, cutting and drilling, said Mariana G. Forrest, Chrysler Group senior manager of advanced vehicle engineering, applied materials and manufacturing technologies.

"We use lasers in powertrain and tailor-weld blanks, but not enough in stamping and body-in-white," Forrest said. North America has a reluctance to employ laser welding in its body shops, while automakers in Europe are embracing the technology, with Volkswagen in the forefront utilizing it in 10 different vehicles.

The technology is prominent in the bodies of the new BMW 5-Series and Audi A3, the engine hood of the Opel Vectra, and Volvo Cars pioneered roof laser welding on the V70 and S70.

A relative newcomer is laser brazing, Forrest said, which provides a Class A surface with no additional sealing necessary, making it possible to have an exposed laser brazed joint, as is

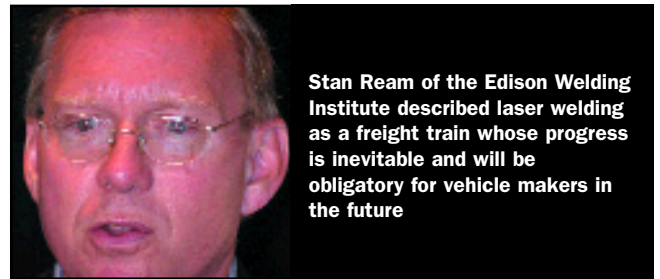
the case on the new VW Golf V.

It's not that the US is a newcomer to laser technology, Forrest said. The CO<sub>2</sub> laser was invented in the US in 1964, and the use of tailor-welded blanks continues to grow. But in Europe, some of the innovations include the growing use of robotic scanners, and there is a Kuka robot in operation with a fiber laser to perform welds from greater distances.

Remote laser welding is coming, Forrest said. Comau Progressive Tool & Industries (PICO) has developed the Agilaser, capable of 128 stitches in 96 seconds or 0.75 seconds per weld, with a flexible head enabling it to do its work from a greater distance and from different angles. It has been in volume production at the Fiat Auto SpA plant in Mirafiori, Italy, on a door line for six months said Neil Willetts of Comau. "The system can cut and weld with great flexibility and speed," he said. With the potential to perform 200 welds per minute, it can reduce by 35 percent the number of resistance welds.

It all begs the question: "Is Europe too aggressive or the US too short-sighted?" Forrest asked.

It is a complex cost/risk/benefit analysis, said Stanley Ream,



**Stan Ream of the Edison Welding Institute described laser welding as a freight train whose progress is inevitable and will be obligatory for vehicle makers in the future**

laser technology leader at the Edison Welding Institute.

The figure bandied about is that it costs five cents per weld to do resistance spot welding. US plants do 90 billion welds per year, using thousands of robots. "It's welding technology that's been around forever: simple, well-known, re-configurable assets that can be used over and over," Ream said.

There is a resistance to laser welds because it involves new, complicated, big equipment perceived to be risky investment. Ream said. North American manufacturers have accepted the technology outside body-in-white, but there is a reluctance to take laser welding into the body shop. Forrest suggests some of the reluctance stems from higher use of galvanized steel in the US, but she said new solutions are coming to better weld coated steel.

In addition, North American plants use adhesives in the body shop, while European facilities apply adhesives in the paint shop.

But Forrest suspects the biggest obstacle is the economic justification. Investment costs are high initially, which tends to discourage American OEMs, but Forrest said a full cost/benefit analysis over the long term shows its potential for body applications continues to grow. Cost may not come down, said Forrest, but productivity and the range of uses should continue to expand.

She wondered what it will take in the US to make the business case and jumpstart deployment of laser applications here.

The productivity equation is compelling. In terms of cost

differences, if a 25mm (1in) laser weld is the equivalent of one spot weld, and factoring the speed of each (lasers are faster and have short cycle times), eight spot welders would be needed to do the work of one laser welder, working all the time, Ream calculated. VW is achieving the 8:1 ratio, he said, while others have only seen a 6:1 ratio.

The result is the need for fewer robots, as well as the people and cost of maintaining them. And reducing a robot population by one-eighth means less space required in the body shop.

To realize full savings, the laser needs to be used all the time. VW uses two robots, flipping the laser beam between them, instantaneously, so the laser is virtually welding all the time, but requires two robots to do so.

These robots will live longer because they are lighter and have a smoother operation with fewer starts and stops, Ream said. However, it does introduce more tooling complexity, there are training issues and the unknown is always daunting.

The laser weld is considered superior, but the process requires removing zinc. A known technique is to provide a gap between the sheets to be welded, much like dimples in stamping to help stack them. Forrest also has developed a system of channels to funnel the zinc out, Ream said.

Body stiffness is one of the biggest advantages to laser welding, Forrest said. The Golf V improved static torsional stiffness 80 percent compared with the Golf IV.

There also are styling benefits, allowing an automaker to reduce the amount of trim and add-on pieces, which reduces overall weight.

Past concerns such as risk, downtime and reliability no longer are valid, Forrest said. VW's experience shows the lasers perform well. Nor is training workers on the sophisticated equipment difficult. VW successfully trained 500 workers who were not familiar with the technology.

Asian automakers are also embracing the technology in body shops. Hyundai Motor is laser welding about 300 side panels daily at its Ulsan plant in South Korea.

"We'll probably continue to see people nickel and dime their way around it (in North America)," Ream concluded. But he sees it as "obligatory in the future."

Meanwhile, the proliferation of advanced, high-strength steels, with more carbon, poses a problem for spot welds, tailor blanks and laser welds, Ream cautioned.

"It's coming. It's a freight train."

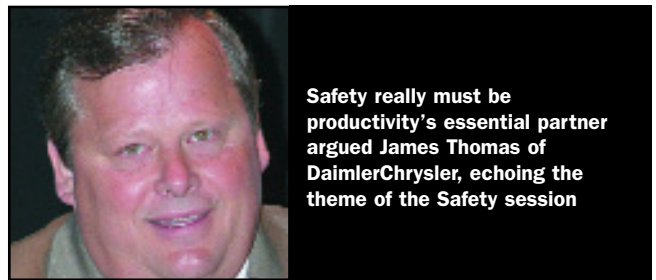
## Safety – not negotiable

One train upon which all industry players are on board, is safety. The numbers are going in the right direction, said James E Thomas, Chrysler director-health, safety and medical operations.

There were 9,000 fewer injuries in 2003 vs 1999; the automaker has 2,500 fewer lost work cases annually and ergonomic injuries have been reduced by 30 percent each year. Incident-related injuries are down more than 60 percent.

The next stage is encouraging workers to be safety conscious out of work as well. Not only does it protect workers, an OEM's most precious asset, but there is a financial incentive. Chrysler spends more on health care than on rubber and steel combined, Thomas said. A safe workplace also has better throughput, higher product quality and better morale.

"The ultimate objective is that safety is woven into the fabric



**Safety really must be productivity's essential partner argued James Thomas of DaimlerChrysler, echoing the theme of the Safety session**

of the business and even transcends work walls," Thomas said.

At GM, which benchmarks companies such as Dupont, Allied Signal, Alcoa Inc. and Boeing Aerospace when it comes to safety, the No.1 lesson learned was: "If we could do it all over again, we would certainly involve our unions at the beginning, rather than waiting," said Mike White, GM assistant director of occupational health and safety.

GM started working with the United Auto Workers union in 1993 on the necessary cultural change to make GM a safety leader and believe that an injury-free workplace is an achievable goal.

It didn't happen overnight, said Harold Shelton, UAW coordinator of health and safety activities at GM. The membership needed to overcome the perception that management cares more about productivity than safety.

But the proof is in the results. The injury rate was 4.5/100 employees in 1993. Last year it was 0.27/100 employees – a 94 percent improvement. Benchmark Alcoa is at 0.14.

Adding a dose of realism, Thomas Pilz, CEO of Pilz Automation Safety, said, "Everything will go wrong eventually and we will have accidents, regardless of best efforts."

As a result, workplaces need to perform risk assessments, and



**Harold Shelton of the UAW and Mike White of GM discussed involving all parties, including the unions, in the early stages of workplace safety planning**

perhaps employ the services of safety integrators such as Pilz Automation.

Unions can help identify the line that separates acceptable risk from unacceptable, a starting point to determine the safety measures that need to be put in place in a given work cell – but not to the extent that plant flexibility is hampered. It is well

worth the prevention, Pilz said. "The costs of safety after the fact are exorbitant. They are reasonable early in the process."

Early planning is key when there are multiple players. Case in point: the Dundee global engine plant in Michigan is a joint venture between Chrysler, Mitsubishi Motors and Hyundai, notes Joseph J Lazzara, president and CEO of Scientific Technologies Inc. (STI).

The three automakers have spent a lot of time thrashing out the safety standards each requires for the plant currently under construction that will supply a family of 4-cylinder motors.

## Integrating production solutions

In addition to safety integrators, there are manufacturing integrators, such as Liberty Precision Industries, which started as a tool and die shop and now is a turnkey solutions provider, said Mark Wiktorski, corporate development manager.

Liberty has positioned itself as a one-stop provider of everything from material removal to customized equipment. It can purchase, modify, design or customize equipment. The integrator specializes in sourcing parts, integrating the system, testing it and delivering it to the plant floor.

Liberty also helps Tier 1 suppliers make the transition to high-volume production and better utilize their capacity. It offers imbedded service and support inside a customer's plant for greater uptime. Wiktorski said Liberty can work with customers expanding globally, into China and other emerging markets, and can provide equipment and maintenance there as well.

Nothelfer Inc. expanded its expertise as an integrator with its role in developing the all-new BMW X3 cross/utility vehicle.

Nothelfer, a subsidiary of ThyssenKrupp Technologies, was a system partner with BMW, providing body engineering including tools and dies, body-in-white from stamping to welds, prototype construction and matching of the entire body for the vehicle built by Magna Steyr Fahrzeugtechnik AG & Co. KG in Graz, Austria.

The X3 was a record contract for Nothelfer, said Erich Kibler, vice president- Engineering. Development took 34 months, with work starting in November 2000. Production began in September 2003. Kibler said Nothelfer provided BMW and Magna with a means to keep costs down, reduce lead time and provide quality.

## Lean approaches cut lead times

Everyone is on a quest to reduce lead time. Delphi is no different, said Dave Logozzo, director of manufacturing operations. He outlined the road the supplier has taken since 1996 to implement a quality network, with synchronous manufacturing and health and safety initiatives.

Priorities are getting products faster to market, and to a market that is more diverse. Getting there requires combining a business philosophy with key tools and techniques, Logozzo said. It means abandoning batch and queue for smaller lots and high frequency for shorter lead times.

Delphi used "change agents" in its plants as part of its reorganization and development of a production system that is standardized, reusable, and designed to eliminate waste. The sweet spot of lean manufacturing is just short of

overcapacity, but not so much that demand cannot be met, according to Logozzo.

Flexible manufacturing is a company-wide commitment, agrees James Ricci of Harbour Consulting, known for its annual Harbour Report which ranks the productivity of automakers.

Flexibility is increasingly necessary in a world where sales and shifts in market share can be unpredictable. The Big Three, for example, had 65.2 percent of the 19.8 million North America sales in 2000, with Japanese OEMs garnering 25.3 percent and European car makers 6.9 percent. Three years later, the Big Three had fallen to 59.4 percent of 19.2 million sales, with the Japanese up to 28.9 percent, Europeans at 7.9 percent and South Koreans capturing 3.8 percent of sales. Harbour projects, in 2008, the Big Three will have 52 percent of sales while Asia combined will have 37 percent and Europeans 11 percent.

In terms of capacity utilization, Honda's six plants had an average utilization rate of 97 percent in 2003, followed by Toyota at 94 percent for the same number of plants. Leading the Big Three is GM at 90 percent utilization (30 plants), then Ford at 87 percent (22 plants) and Chrysler at 84 percent (14 plants). Rounding out the top six is Nissan Motor Co. Ltd. at only 76 percent for its five plants.

Capacity can be better utilized in a plant with the ability to adapt quickly, easily and cost-effectively to change – in terms of physical plant, operations and culture, Ricci said. Those ahead of the game have commonized architectures, standards and processes, with welding, paint and assembly systems with high reusability. They also minimize late engineering changes and have common operating systems with interchangeable managers and workers.

Those who will succeed will have multiple products and variations in a single plant with flexible tooling, generic capacity and high reusability. It requires high short-term investment, but costs will be lower in the long run. Poor launches are expensive, Ricci added.

## Stamping out waste

To set the groundwork for such flexibility, Chrysler has made a conscious effort to modernize its stamping operations. In 1990,

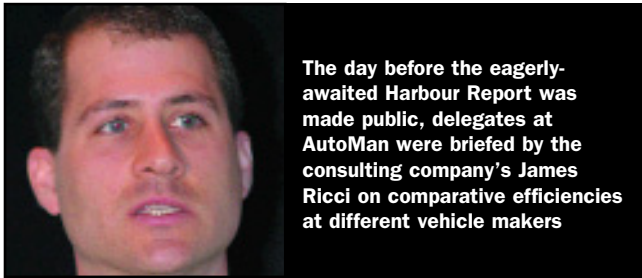


the average age of its presses was 25.2 years and, if time had run its course, Chrysler's presses today would be closing in on 40 with most of the units 25 years old or greater. Instead, Chrysler launched a capital-intensive revitalization plan in 1994 that has cut stamping costs.

The auto maker has reduced the average age to 12 years and overall number of presses by some 36 percent since 1990, with specific concentration on cutting the number of small-piece presses from 32 percent to 21 percent of the total press mix, said

Dean Hendrickson, manager of Chrysler's Sterling Heights, MI, stamping plant.

Hendrickson said the average age of Chrysler's presses now is the youngest of the Big Three and the total number of lines has been reduced 46 percent, from 123 to 67. Much of the age improvement comes from the addition of four new stamping satellites – Brampton, Ontario, Canada; Belvidere, Illinois; and Toluca and Saltillo in Mexico – each installed to support local



**The day before the eagerly-awaited Harbour Report was made public, delegates at AutoMan were briefed by the consulting company's James Ricci on comparative efficiencies at different vehicle makers**

assembly operations and, consequently, lower operating costs and commonize stamping operations in new facilities.

In addition, Chrysler modernized its stamping operations in Sterling Heights, Twinsburg, Ohio, and Warren in Michigan, mostly focusing on installing tandem (double action lead) press lines and adding automatic presses to produce smaller stampings.

Thanks to a bump in extra-large capacity presses from 7 percent of Chrysler's press mix to 33 percent over the past decade, the auto maker has been able to cut the number of stamping lines it needs, reducing complexity and maintenance costs, while minimizing future capital investment. It now only stamps smaller parts in-house when the pieces are needed in extraordinarily large volumes; otherwise small pieces are outsourced.

While Chrysler doesn't release its overall improvement in stamping costs, Hendrickson reveals that over the past four years alone the amount of scrap costs per piece has been reduced 30 percent, while pieces per hour have jumped 40 percent.

The fact that die changeover times have fallen 53 percent – to as low as 7 minutes in Mexico – contributes greatly to Chrysler's increased productivity in an area of the industry best described as a "necessary evil."

Now that the company has revitalized its presses, the next frontier is implementing lighter dies that enable more flexible changeovers and less-costly implementation.

The more flexible a die changeover operation becomes, the more likely a stamping line can accommodate lower-volume vehicle production. Hendrickson said Chrysler must be prepared for this as it implements its product strategy of populating fewer plants with more vehicles against devoting plants to single boom-or-bust products.

"High-volume days of a few vehicles are over," he said, going on to condemn the high costs for dies to the same fate. One of the highest single costs of a new vehicle program is investment in lightweight dies and, with younger, more technologically advanced presses, die investment is beginning to shrink.

"There is no glamor in stamping but it is an important part of the business," Hendrickson admitted. In fact, stamping

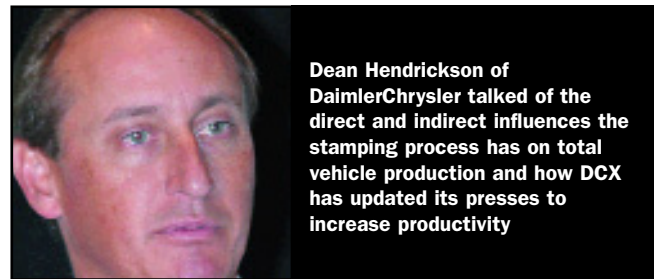
revitalization is credited in Chrysler's performance in the Harbour Report on manufacturing productivity. "Heavy investments in the stamping operations over the past few years are starting to pay off in the results seen in productivity for Chrysler Group," Harbour Consulting said in the 2002 report.

This year, Chrysler continued its improvement, posting a 7.8 percent productivity surge to 37.42 assembly hours per vehicle made, which is nearly 20 percent better than 1998 and better than Ford for the first time in 15 years. Harbour again credited stamping for making a contribution.

Cost-effective stamping operations also free capital to invest in product development.

"[Stamping] has a direct impact on Chrysler Group's core business (of) building great cars and trucks," Hendrickson said, especially on speed-to-market, quality, cost, design and safety of vehicles. Current vehicles, such as Stow 'n Go minivans and 300 Series sedans, are direct recipients of investment that would have gone into updating aged presses and fixing stamping-related quality glitches.

Ford also wants to revitalize its stamping operations, and tackle some of the issues Chrysler has addressed, but isn't there yet, said Paul Wollschlager Jr of Ford.



**Dean Hendrickson of DaimlerChrysler talked of the direct and indirect influences the stamping process has on total vehicle production and how DCX has updated its presses to increase productivity**

## The appliance of science at Ford

A more ambitious project is Ford's aim to migrate its North American body shop production schedules to a leaner, more precise science, a goal that will take time, said Joe Hinrichs, Ford director-North American manufacturing.

"Our strategy is to attempt to go to inline vehicle sequencing, which (enables us) to be able to broadcast out to the supply base in sequence what we are going to build and to do it in that sequence." But the move to sequencing doesn't happen overnight, he said, admitting that much of Ford's build sequences are "random" and the company is striving to introduce software and equipment in old plants that will introduce at least some level of "control of the build sequence in the body shop."

The drive to in-line vehicle sequencing is part of what suppliers refer to as Ford's "Enterprise Model" for manufacturing, which includes an order-to-delivery initiative designed to enable plants to reduce inventory and lead times.

For now, however, Ford will have to straddle the batch vs scheduled sequence fence because of the age of its facilities and the high cost of moving to sequenced builds.

"Let's take, for example, St Louis," Hinrichs said. "The body shop is a good body shop, but it's not a new one, so it does a random build. That won't change until we decide to change the body shop. To add on to what we have today in our current

system doesn't make economic sense, so we're evolving the [sequencing] strategy and executing it with our new body shops."

Both the Dearborn truck plant and the Chicago Freestyle cross/utility vehicle and Five Hundred sedan assembly plant have body shops employing such technology, said Harbour's Ricci. He agrees that the move to inline vehicle sequencing is expensive and will take time, and said Ford will have to abandon many of its current batch and/or purely random processes.

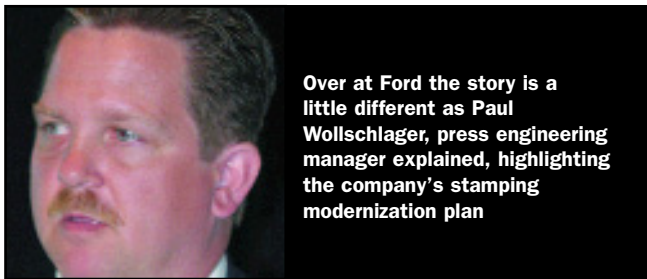
Ricci said Nissan, the top performer in the Harbour Report, is the only automaker building in the US wholly relying on sequenced builds. Others, such as GM and Toyota join Ford in operating a mixed bag of body shop sequencing strategies.

However, batch building is not dead. Honda Mfg. of America is a pure batch building operation, according to Ricci, and it shows no sign of converting to the Nissan way. "Honda's philosophy is predicated on their whole operating system, but most auto makers aren't like that," said Ricci.

He went on to say Nissan's system is extremely precise and allows it to cut the amount of time it takes to get the right product in the hands of customers.

"Nissan is going down a path that requires a lot of discipline and is focused on lead time reduction."

Ford has designed a bill of process that calls for the company



to have more control of the sequence of the build, but Hinrichs admitted, "It's still a work in process quite frankly."

While Hinrichs didn't provide details as to which plants will get the necessary equipment and software needed to move to scheduled sequences, it is likely that the company's new flexible plant planned for Hermosillo, Mexico, and proposed conversions of plants in Cuautitlan, Mexico, Atlanta and Oakville, Ontario, Canada, to flexible operations, will be tuned for in-line vehicle sequencing.

In addition, as vehicles get major model redesigns, Ford will be presented with an opportunity to better equip body shops for more of a planned production sequence, Ricci said.

## Bespoke builder seeks to broaden horizons

Looking to expand its vehicle assembly footprint is Magna Steyr. The supplier is aiming to establish a vehicle manufacturing presence in the US by 2008, which would function much like its operation in Graz, where it produces six vehicles for three different automakers.

In addition, Magna Steyr aims to launch similar operations in the Asia/Pacific region within the same timeframe, said Manfred Eibeck, director of production technologies.

Eibeck said 2008 is not so much a "target" etched in stone as it is the expected time for expanded operations. Currently the three year old Magna International Inc. offshoot is optimizing its

footprint and core competencies in Graz while consolidating operations elsewhere.

"We will [build a manufacturing campus] where we can make a business case," Eibeck insisted, adding: "There is no real project on the table."



He said a North American plant would not be located near existing assembly plants to give Magna Steyr a logistical advantage. "You should not be too close to your customers."

## Fresh footprints

Expansion may come sooner rather than later as Graz production is nearing its capacity of 260,000 units. With the addition of the BMW X3 line to its facility, Graz has reached production of 1,000 units per day and is expected to exceed 200,000 units this year and to top 2004 levels in 2005.

Eibeck said the company will need to establish a fresh footprint elsewhere because they don't want to expand in Graz. Magna Steyr's only opportunity for respite wouldn't come until 2006, when its contract with DaimlerChrysler to build Chrysler Voyager minivans is up for renewal.

Currently the supplier is studying Canada, Mexico and the US as possible entries into North America as a niche producer, but the company will not move forward in the region until it has a signed contract with at least one OEM to build cars here.

The company has not decided on a manufacturing locale in North America or elsewhere, Eibeck cautioned. "There are 25,000 possibilities so one or the other makes sense," he said, pointing out that none will make absolute sense until Magna has a customer handing it a product to build.

Eibeck said initially the supplier will likely set up operations to build a North American version of a foreign automaker's vehicle that needs "localization," similar to its deal with DaimlerChrysler in Graz. In addition to the Voyager, Magna Steyr builds European versions of the Jeep Grand Cherokee, and until recently did so for the Mercedes M-Class SUV and Chrysler PT Cruiser. They had to be configured for right-hand drive and other European specifications. For now, Magna Steyr will continue to outsource many of its smaller contracts to Eastern Europe, a region that continues to grow with low labor costs expected to continue until about 2020.

## Building spirit

Magna Steyr considers itself a Tier 0.5 supplier because it offers production operations and capabilities beyond those of a typical Tier 1 supplier, including stamping, total vehicle quality control, purchasing, "deep manufacturing skills" and the ability to shepherd a vehicle throughout its lifecycle.

"[Building cars] is our heart, this is our spirit," Eibeck asserts,

saying the supplier plans to continue to outsource smaller projects to focus on large ones, such as the three vehicle launches Magna oversaw in 2003. It is currently working the kinks out of the Grand Cherokee changeover slated for the fall.

Still, Magna Steyr plans on remaining a supplier at its core – focusing on such things as all-wheel drive, safety, driving comfort and modular concepts – efficiencies it hopes to bring to its growing portfolio of vehicle production programs in Graz, which also includes the Mercedes-Benz E-Class and G-Class and Saab 9-3 convertible.

“We will never be an OEM. We don’t have a brand. We don’t have a sales and marketing department,” Eibeck said. Instead, the supplier will focus on offering OEMs significant cost savings via:

- Lower wage structures and longer and/or different production hours. The supplier may be able to offer a two-tier wage assembly workforce in addition to a unique bargaining position given its newcomer status in the sector.
- More flexibility. Eibeck points to Saab 9-3 convertible production as the benchmark of Magna Steyr’s flexibility. Because it has many different vehicle programs on one campus, the supplier can funnel more workers to the convertible line in the summer, when demand calls for as many as 120 vehicles per day, and slow the line in the winter when demand tapers off.
- Multi-platform expertise. At one time Magna Steyr ran the body-on-frame Mercedes M-Class down the same



**Magna Steyr is looking to the US as a possible new vehicle making base to complement its operations in Europe and to move closer to some of its clients’ markets said Manfred Eibeck, Director of production technologies**

assembly line as the unibody Jeep Grand Cherokee.

- Profitable low-volume production. Low-volume G-Class production, which requires “thousands of more parts” and a longer production window, benefits both from Magna Steyr’s off-road vehicle expertise and flexible workforce.
- A unique manufacturing system. “We don’t rely on our customer’s system; we need to bring the process internally,” Eibeck said. The company has its own logistics and training strategies, for example, and allows automakers to set many of the parameters within each of its systems, such as specifications of dies for stamping.
- Magna Steyr’s heightened equity in the automaker’s success. “If you plan something you have to live with later and make money on it, you probably will work at it a little harder,” Eibeck said.

## Labor and location

Additional manufacturing jobs in the US would be well received as employment in the sector fell by 2.8 million jobs from December 2000 to December 2003 in the US, 168,200 of



**The session panels were happy to debate automation, joining technologies, press shop, metalforming, safety, flexibility and lean manufacturing**

them lost in Michigan, said Armando Ojedo, executive director of the Michigan Hispanic Chamber of Commerce.

As a percentage of the US gross domestic product, manufacturing (in all industries, not just automotive) declined to 14 percent in 2001 from 17 percent in 1993. In Michigan, it fell 5 percent. That is coupled with lower prices not yielding greater consumption, as well as decreased demand for manufactured goods.

Capital investment has declined, export markets have been in recession and imports are cheaper, all of which mean lower demand for goods both domestically and in export markets. It all translates into lower demand for US manufactured goods, Ojedo said.

Some of that is attributable to an above-average increase in productivity: output per employee has increased 52 percent from 1992 to 2003, while the increase in manufacturing output only rose 31.5 percent in that period, thus requiring fewer workers. Some workers have left manufacturing for service-sector jobs.

However, some of the work has left as well, as more non-core functions are outsourced to sectors other than manufacturing, Ojedo said. These include such things as legal services, administrative and business support, and temporary help agencies. But, of the 2.8 million jobs lost from 2000-2003, only 12.5 percent were lost due to trade and global sourcing, Ojedo points out.

And the impact of offshore outsourcing has been more positive than negative for Michigan, Ojedo attests. It has been positive for total output, productivity, and competitiveness, new markets and innovation for US corporations. It has been neutral in terms of total employment, but negative for manufacturing jobs.

Essentially, for every dollar spent offshore, Michigan creates \$1.14, Ojedo said. That is from a combination of cost savings and value created from redeploying resources.

Meanwhile, the US – and Michigan in particular – must find a way to meet challenges posed by an aging workforce, a pending shortage of skilled labor and decreased research and development funding. ■