Automation India

Enabling Global Competitiveness

Issue 11 – December 2007 A newsletter of the Automation Industry Association of India

President's Message

Dear Friends,

With AIA membership growing, our newsletters now represent a wider cross-section of product and application possibilities. You would have also noticed our new launch — of theme based, Guest Editors, since the last issue. This issue, dedicated to the AUTOMOTIVE INDUSTRY, has Mr VV Paranjape as our Guest Editor. Mr Paranjape, Director, Member Managing Board, Siemens Limited, is a person of acknowledged pre-eminence in the automation community, having been an integral part of the automation evolution, since the '70s. His selection of topics for this issue demonstrates a vision of global leadership that blends well with both the current as well as emerging needs of the our Automotive Industry.

In organizing "Automotive Tech 2007" the AIA steering group has chosen three areas for deliberation — Digital Manufacturing, Plant Safety & Reliability and Manufacturing Execution Systems. Each topic is backed by a set of eminent speakers from companies regarded as global leaders. We believe the event will offer lasting value to the participants from the user community, the automation service providers and policy influencers.

2007 has been a year of consolidation for AIA. We expanded our membership to over 45 members, organized Automation Tech 2007 — a world class, televised event featuring Top Managements of major corporates, held our first ever all-member AIA annual day and put in place the foundation of some exciting innovations which we hope to roll out early in 2008.

On my personal behalf and on behalf of my colleagues in AIA Executive Council, I'd like to convey our best wishes for a happy and fulfilling 2008 to all our members and readers.

JP SINGH
Hon. President, AIA

PS: *All our previous newsletters are up on the AIA website and articles of your choice can be electronically searched. So our new readers never miss anything!*

From the Guest Editor

Dear Readers,

These are exciting times, as India integrates with the World & the Indian Industry is putting its rightful claims as an emerging Global Economy.

The manufacturing sector such as Automotive has an immense bearing on the growth in economy & GDP. Particularly stressing on Automotive, the fast growth in this sector is evident by a spurt in demand for vehicles over the last few years. As per industrial sources, Indian Automotive Industry is expected to grow at CAGR of 14% in next 5 years, which will develop India as a "Global Manufacturing Hub". Even our Auto Components Industry is growing rapidly with a CAGR of 24%. International Market has shown increasing acceptance of the ability of Indian Auto Component Industry, which resulted in 17% growth in their exports.

To maintain this high rate of growth and to retain the attractiveness, it's very important for the Industry to be "Innovative and offer Complete Value Proposition". This encompasses several KPI's including Productivity, Quality, Delivery, Efficiency and Cost.

Keeping in mind its primary mission of enhancing knowledge & awareness on latest innovations and helping Indian Automotive Industry leverage cutting edge Automation Technology to increase competitiveness, AIA is organizing "Automotive Tech 2007". This is part of an important initiative of AIA of organizing "Industry Specific" seminars.

Through this issue of our Newsletter we are covering few innovations through Automation for the Automotive Industry. These case studies are presented keeping in mind the needs of the industry on Life Cycle Management, Quality, Flexible Manufacturing, Identification and Inspection.

At AIA we are very optimistic and enthusiastic to meet the challenges of the Automotive Industry and look forward to meet and interact with you during the summit. We hope it will help both of us to widen our vision and positively influence our goals.

VIJAY V PARANJAPE
Member, Executive Council, AIA

ANDON SOLUTIONS

Harnessing Actionable Information for Automotive Manufacturing

A robust Automation Andon solution acquires, displays and reports machine and production status in real-time.

In today's increasingly competitive, technologically advancing marketplace, your most significant differentiator is your ability to manage data throughout your enterprise and turn it into actionable information.

Making the large amount of data on your plant floor usable is a challenge, but an effective Andon Solution can convert equipment faults, block and starved bottlenecks, pull cords, or other inputs into actionable information based on your individual manufacturing and business rules. This is accomplished due to a unique automated "Rule Matrix" (see visual blocks on next page) which choreographs both manufacturing and business rules into real-time manufacturing directives. Many short-term benefits can be gained from report generation and early warning which can prevent downtime, financially justifying the project.

However, an even greater ROI comes from the long-term impact of harnessing actionable information from your manufacturing process. This results in more proactive problem resolution, getting the reports you need in real-time and having your manufacturing processes work in unison.

SAVINGS CALCULATOR
(for Short-Term ROI)

Hours used to generate production reports per year	_____
Labor rate per hour	x _____
Savings for report generation	= Rs _____
Loss of production in hours per year attributable to:	
• Blocks starved bottlenecks	_____
• Running out of parts at the cell	_____
• Upline quality issues	_____
Profit per hour	x _____
Saving for production loss	= Rs _____
Downtime in hours per year attributable to:	
• Failure analysis	_____
• Timely notification of failures	_____
• Improper problem escalation	_____
Profit per hour	x _____
Savings in downtime	= Rs _____
Potential Savings (add the 3 amounts above)	= Rs _____

The key to an effective Andon solution is the flexibility and versatility to collect data (from the plant floor), filter it (through the rule matrix) and create actionable information for your manufacturing process. It can be applied to annunciate production problems so you can:

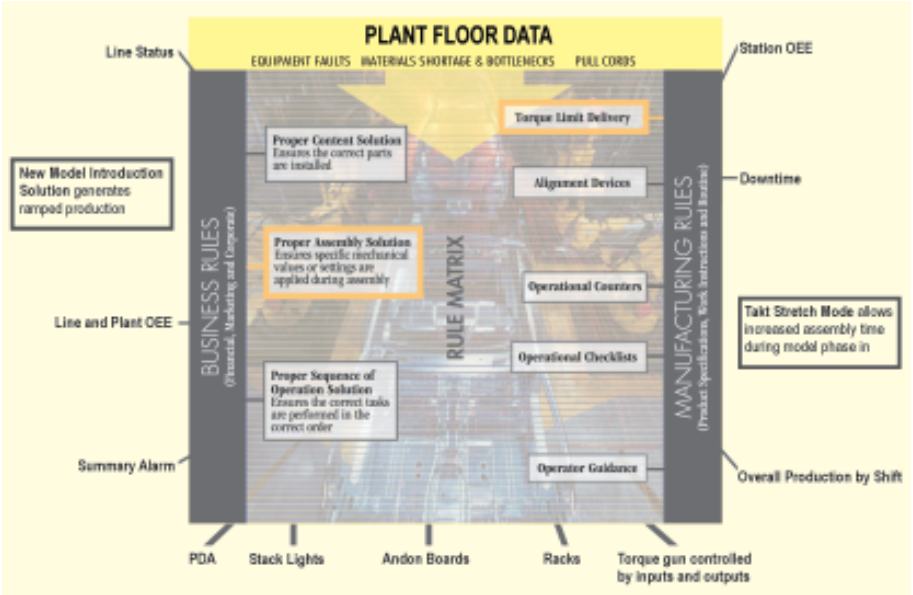
- Respond and repair immediately
- Evaluate line performance versus goals
- Drive towards continuous improvement
- Avoid passing quality problems to another area of your production floor

Once you enter parameters (buisness/manufacturing rules) based on the way you do business, alarms and notices can be displayed via:

- PDAs
- Andon Boards
- Stack Lights
- Pagers

These solutions can be used with existing controls which are often available in prepackaged starter kits, and are designed for future expansion.

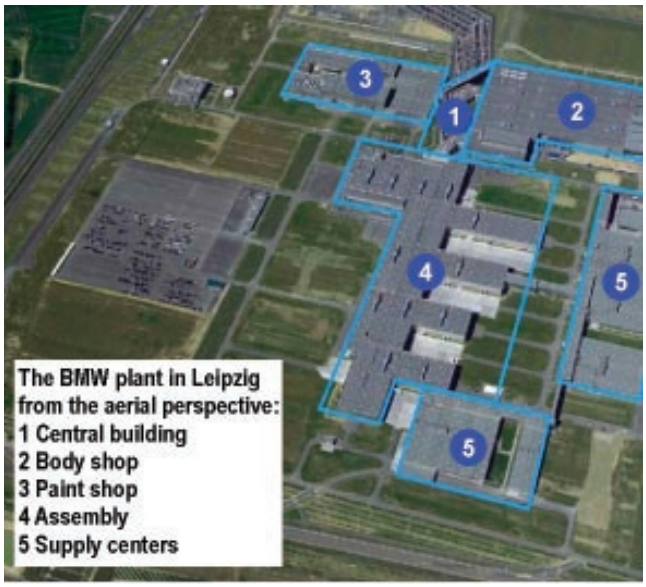
Ashoktaru Choudhury



Automotive Plant — Full Speed Ahead

Since the beginning of series production in March of 2005, over 100,000 BMW 3 series sedans have come off the line at the Bavarian car manufacturer's new Leipzig plant. BMW was even able to step-up production volume ahead of schedule. Automation technology contributed to this success not only by executing a smooth commissioning of the building services, but also by working round the clock to ensure reliable plant operation.

The body shop, paint shop, and assembly facilities are housed in an architecturally modern and awardwinning ensemble of buildings on 208 hectares (514 acres) of land. The plant complex forms a star shape around a central management, communication, and service building, which minimizes distances between any two points.



The BMW plant in Leipzig from the aerial perspective:
1 Central building
2 Body shop
3 Paint shop
4 Assembly
5 Supply centers

Much thought was also put into planning for future changes to production needs: The existing production buildings that make up the points of the star can be easily extended. Land has also been designated for adding new buildings in the future. The building arrangement enables smooth transitions between production steps and optimal material flow using modern logistics concepts such as Just-in-Time and Just-in-Sequence. To ensure that production can run uninterrupted and that the workers can enjoy the best possible working conditions, not only logistics, but also building automation and building services technology must meet rigorous demands.

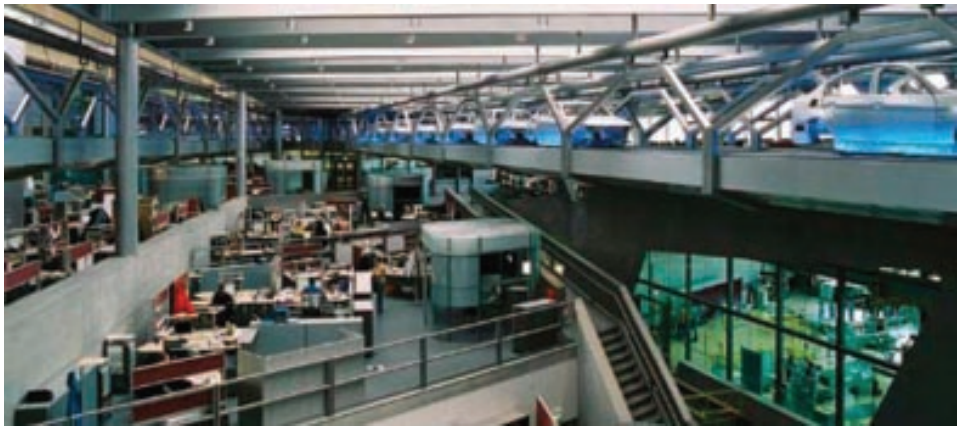
Breaking new ground in building services technology

BMW's goal for its new building services technology is to create an efficient, reliable, and safe system to monitor, control, and drive the technical systems in its Leipzig plant. In the process, the company broke new ground by selecting uniform technology to be used consistently throughout the entire facilities. The challenging task facing the control technology was no less comprehensive: It would have to handle a facility-wide network of more than 53,000 real data points — from sources such as sensors, actuators, and measurement systems — and more than 70,000 virtual data points — such as data from the PLC s. In addition to heating, ventilating, and air conditioning offices and production halls, the system would have to use collected information to distribute power, turn lighting on and off according to a time controlled and energy saving schedule, and provide media necessary for production such as water and air pressure at the right locations and in the right quantities. Due to the complexity of the task it was clear from the beginning that powerful and sophisticated control technology in combination with reliable automation systems would be needed to achieve these ambitious goals.

The evaluation process was based on technical features, modularity, the available software function blocks, price/ performance ratio, deliverability, stock-keeping, and degree to which switching cabinet manufacturers were familiar with the supplier. In addition, the supplier was asked to provide necessary training for the automation systems.

Time-tested and modern

BMW was confident that they had chosen a reliable automation technology. Configuring and preparing the systems in Leipzig proved to be a simple process, since BMW was already familiar with the necessary hardware



and drivers. Automation systems' users profit from state-of-the-art technology that has proven itself over time. They can also reduce the number of critical factors as well as the complexity of the entire project. The robustness of automation technology has contributed to the fact that BMW has not recorded a single failure or disturbance since commissioning of the approximately 300 controllers responsible for measuring and controlling the heating, ventilation, and air conditioning systems.

This high reliability is partially a result of the use of technology that has already seen widespread success in the area of system and machine manufacturing. The high-speed controller hardware and software functions of PLC's have proven themselves a thousand times over and drive control circuits with cycle times of a few microseconds.

Fast software development included

The software team has placed the specific control functions for heating, cooling, and ventilation systems into a special software block library. This library is an integral standard component of the automation specialist's engineering software. This is an important advantage for BMW, since the application software can be developed quickly and cost effectively with the help of the engineering environment and the technology blocks.

Every programmer involved in the project can access all technology blocks and control functions. Future expansion of the system or addition of new programmers will therefore not affect the uniformity of the programming structure. This ensures that the project will remain clear and easy to understand.

A strong technology — for years to come

Although non-production control technology usually does not require refurbishment until after 20 to 25 years of operation, BMW can profit from innovative advances at any time. The auto manufacturer takes the updates that automation technology offers and implements them quickly into projects that, as seen in the case shown here, can serve as a benchmark for the entire industry.

Through an emphasis on continuous innovation, and with the help of automation control technology, BMW is able to ensure the efficient, energy — saving, and cost-effective operation of its facilities.

PV Sivaram

Authentic Inspection — User Case Studies

Software Brings Certainty to Inspection Process

One of North America's largest stamping plants uses inspection software to track defects on automotive components, including full-body underframes, car roofs, doors and side panels. More than 400 parts are produced at this plant alone. Inspection software has replaced paper concern sheets that were used to record defects and then filed away for future reference.

Now inspectors use a stylus to touch a line drawing of a part on a touch screen to indicate the area of the defect and the severity of the ranking. Defects are ranked on a scale of 0.1 to 1.0. If any defect is listed as a 0.5 or higher,

the software immediately sends an e-mail to the appropriate managers.

Manufacturing representatives meet weekly to review color-coded concern reports ranking defects by severity. Data is compiled to determine where the problem areas are and what can be done to remedy them. These areas are then tracked to be sure that the improvements implemented are working.

"Instead of intuitively knowing where problems are, we now have data. Now we know," says the plant's continuous improvement supervisor. "We used to say, 'I think that this is probably what the problem is. Now we can say for certain.'"

Online Part Status Eliminates Incorrect Builds

An international heavy truck manufacturer needed to track customer-requested options to be installed on otherwise identical models of trucks. Because these options were tracked with paper route sheets, which could be easily lost or destroyed, assembly processes couldn't be determined and trucks awaiting optional parts had to be moved off-line to a staging area.

When parts arrived, assemblers had to walk from truck to truck in the staging area to match optional parts to truck chassis. In addition, inspection reports and warranty data were being documented by paper and pencil and keyed into separate databases for analysis and reporting.

Inspection software provided the solution. Because that uses a single database to generate reports from an internet browser, assemblers now can set the status for each part number online. External systems can query the software database to determine the exact status of a particular vehicle, including missing parts, operations and rework times. Assemblers and quality managers can send e-mails and text messages to the material handling team for immediate action.

Electronic checklists help to determine if a particular VIN was assembled correctly by providing a series of questions for the inspector. The software compares these answers to the options for a particular vehicle and determines if the correct options were installed. The manufacturer has now experienced 18 consecutive months without a single incorrect build.

Visual Inspection Confirms Repair Status

A large defense contractor is an active partner in the program to refurbish and return Bradley Fighting Vehicles to active service in the Middle East. The contractor is responsible for inspecting, repairing and certifying over 100 different wiring harnesses for each vehicle. Challenges in the program include:

- Eliminating communications breakdown on the factory floor
- Accounting for and reconciling reassigned parts
- Accurately identifying parts that need repair
- Tracking repair information

To meet these data-intensive challenges, the contractor selected a field-proven software package. "Our vendor provides a major improvement in communication," said the company's Quality Engineer. "There is no question about what needs to be done."

Incoming harnesses are scanned and a visual record is created in the inspection system. The inspector uses this visual record to identify locations of needed repairs. The red markup flags on the visual record indicate the repair needed at a specific location.

Totes of inspected harnesses are routed to the desired station, and each cable is pulled from its tote and scanned to display the visual record. The team member makes the needed repair and notes the completion of the repair with a green flag.

Using simple visual graphics, inspection software has proved to be a superior communication tool. It not only aids with recording the incoming and final inspection, but also allows repair personnel to confirm a specific repair is complete.

Sanjay Mittal

Digital Manufacturing and Innovation

The vision to enable a world where organizations and their partners collaborate to develop and deliver world-class products and services, allowing them to deal swiftly with emerging risks and opportunities, is based on the creation of Global Innovation Networks. PLM, or product lifecycle management, is an essential element in effectively creating and utilizing Global Innovation Networks.

PLM is when organizations digitally manage a product's complete lifecycle all the way from its concept to its retirement — and gain higher business value from that product as a result. It's a powerful value proposition helping companies transform their process of innovation in order to:

- Deliver products to market in shorter time period
- Reduce manufacturing costs
- Increase the number of successful product introductions
- Continue to increase margins annually

Automotive OEM

This technology supports the Automotive OEM industry with an open and modular suite of solutions for all aspects of the OEM's manufacturing operations and information. These solutions address the design and execution of Body-in-White, Assembly, Machining, Paint and Quality processes within the OEM enterprise and across the OEM's network of suppliers. Many of the world's leading automakers rely on this expertise and technology to transform their manufacturing operations.

Global competition is the strongest it's ever been, driving automotive OEMs to provide wider, high quality, content rich product ranges, without increasing price points. Over-capacity and increasing costs have forced automotive manufacturers to begin creating common and flexible manufacturing systems. Rapidly designing, reusing and validating manufacturing processes before implementing has proven critical to automotive OEM success. Engineering industry expertise and software solutions enable automotive manufacturers to plan, develop, manufacture and launch innovative vehicles, profitably, by addressing elements critical to success. Chief among these is manufacturing excellence.

Automotive Powertrain

Solutions for Automotive Powertrain applications improve competitiveness by:

- Reducing preplanning time from as much as 4 weeks to as little as 1 week
- Reducing line design time from 12 to as few as 9 months
- Reducing ramp-up time by about 13%
- Increasing throughput by up to 30%
- Increasing reusability by as much 15%
- Increasing quality of output by up to 15%

Planning a Machining Line

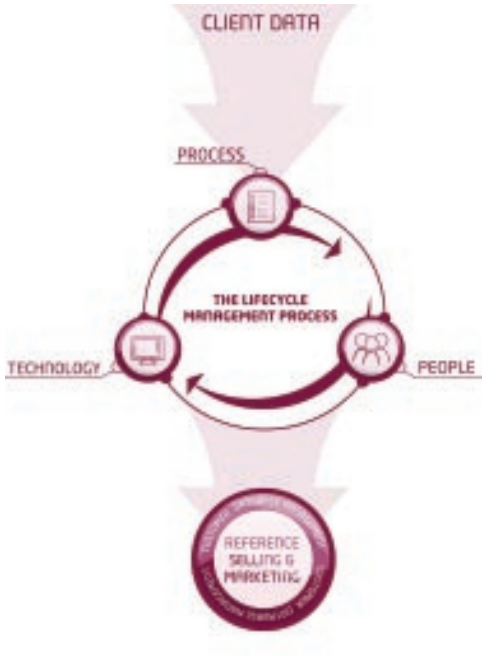
These solutions for Automotive Powertrain applications enables you to plan a complete powertrain line while considering all available and existing machine and line components. Using 3D CAD data, the system automatically defines the part's machining features and their hierarchy. Manual definition of features is also possible in the absence of 3D data. The system automatically selects suitable operations and tools from the system's library of knowledge and best practice operations.

Standard solutions for Automotive Powertrain generate cost estimates of selected operations, considering the machining time, cutting tools and cost of material removed. You can compare and analyze line proposals and their performance, including machining line throughput, resource utilization, work-in-progress, buffer utilization and bottlenecks.

Engineering and Optimizing the Process

Solutions for Automotive Powertrain also allows you to design efficient and balanced machining lines by allocating operations according to machine specifications. The software generates NC tool paths and calculates machining cycle times for each set of features and their operations. By running a 3D simulation of the NC path you can detect collisions between the part and the machine or fixtures, analyze material removal and optimize cycle times. The optimized program can then be automatically downloaded to machines in NC program format (G-code).

The system generates discrete-event simulation models, providing a dynamic perspective of the balanced



production line. You can analyze throughput, work-in-progress, resource utilization and buffer sizes.

Body-Paint and Assembly

Automotive Body-in-White solutions enhance competitiveness by:

- Accelerating project time by as much as 25%
- Reducing project investment by 5% or more
- Shortening ramp-up time by upto10%
- Increasing throughput as much as 10%
- Cutting Engineering Change Orders (ECOs) by as much as 20%
- Reducing tooling and related cost by upto 10%

Planning a Body-In-White Process

Automotive Body-in-White environment facilitates multi-user and multi-site planning and engineering, and enables you to create hierarchical representations of body-in-white manufacturing processes which make up the Bill of Process (BOP). The BOP captures process logic and flow, and defines the relationships between operations, manufacturing resources and product parts.

With such tools as standard robots, fixtures and welding or painting guns from the system's libraries, you can quickly plan a spot-welding or painting layout in a 2D sketching environment. Process planners can define welding points and allocate them to welding operations. Automatic tools associate the most suitable combination of welding guns, controllers and transformers according to process parameters, such as sheet metal thickness and combination. This allows early evaluation of manufacturing times, costs and project investments, as well as assembly line performance, throughput and resource utilization.

Solutions for Automotive Body-in-White also tracks and manages product design changes and verifies their effect on the manufacturing process.

Designing, Optimizing and Off-Line Programming

The Engineering applications for Automotive Body-in-White engineering applications enable detailed design of robotic and manual operations in a spot-welding line and cell. Automatic robot placement ensures that the robots can reach their target without colliding with their environment.

Guns are automatically selected from the system's libraries, and verified using the sections feature, which lets you view the gun's fit and reach from all angles.

3D simulations of the generated robot paths let you detect collisions, check reachability and optimize cycle time. Discrete-event process simulation allows analysis of line performance, including throughput, resource utilization, bottleneck detection and buffer sizes.

Solutions for Automotive Body-in-White automatically generates robot and programmable logic control (PLC) programs (off-line programming), as well as work instructions for shop-floor workers and suppliers that can be published and distributed in either hard copy format or as electronic work instructions over the Internet.

Plant Design & Optimization

Producing and selling more units does not necessarily lead to more profit. If plant layout and material flow is not optimized, building more products forces you to spend more money to get the output you desire. Even as revenues go up, profits can actually go down. Good product design certainly improves revenues, but it is the factory that determines how much of that revenue will become profit.

Digitally operated Plant Design & Optimization enables the modeling and simulation of production systems and processes to ensure, in advance of the start of production, that they operate at peak efficiency. By enabling engineers to see the outcome of plans in virtual plants, organizations avoid wasting resources fixing problems in real plants.

Using solutions for Plant Design & Optimization, you can optimize material flow, resource utilization and logistics for all levels of plant planning from global production networks, through local plants, to specific lines.

This ensures that plant design problems and waste are discovered before your company ramps up for production.

- Material is where it should be, when needed
- The right amount of material is stored on the plant floor
- Sufficient material handling equipment exists
- Machines and equipment are in the right place
- Product handling is kept to a minimum to avoid damage
- Workers can safely and productively complete tasks.

Thus, the above concept ensures that all major five **M**'s (i.e Man, Machine, Material, Method and Morale) are balanced towards plant optimization and its Overall Equipment Efficiency (OEE).

Atul Dalvi

System Integration can do that!

Delphi Automotive customizes its Injection Molding with Support from System Integrators.

Benefits: Advanced Diagnostics, Better Quality, Low Cost

When Delphi Automotive Products, Michigan, needed closed loop process control for its full-sized pickup truck line presses, it decided to combine a low-cost process control hardware platform with a high-end graphical user interface. Could this be done with standard products from automation vendors? This is where innovative thinking came in.

A low cost Injection Molding Control hardware platform was available, but it did not have a high-end Human-Machine Interface. Delphi wanted to modify the system to utilize a PC-based operator interface and alongwith the automation vendor, organized a cross-functional team that got the job done.

A Systems Integrator in Grandville, Michigan, delivered machine-specific customization and installation services while the hardware vendor provided system training. A software Partner did Visual Basic customer training and worked with Delphi to develop a VB-based program for displaying injection molding parameters.

Delphi makes automotive components, systems, and modules in about 200 factories all over the world. The firm's 10 injection molding plants are equipped with 590 large presses that consume about 180 million pounds (81 million kilograms) of resin each year.

The Adrian facility makes interior components for General Motors. Some of these parts are exceedingly complex, like instrument panels and dashboards.

Any Way You Want

There were "months of investigation" while Delphi looked at all the options. Then they specified a PLC based Injection Molding Machine Control System adapted for the plastics industry. It provides complete control capabilities for injection molding machine injection, clamp, and ejection. Its standard HMI is used to enter and display speed and pressure set points, temperatures, and other molding parameters.

This packaged product is an "awesome" machine, and comes with open architecture so it can be customized easily. But as one cannot anticipate every possible customer need, it is engineered to let customers make parts any way they want to and not be restricted by the control algorithms.

However, Delphi needed an HMI that showed quality parameters that were to be rapidly processed and displayed. They wanted to read five sensors with a rate of 20 Hz, which amounts to about 5K for each 50 second molding cycle. Dedicated hardware-based solutions typically use high-speed analog to digital converter cards to buffer this data. The challenge was how to handle this on a conventional PC running Windows NT®?

Working together, Delphi and the Software Partner blocked off a 5K memory area in the PLC to collect data during the cycle. At the end of each cycle, a Visual Basic program running on the PC reads the data without requiring any proprietary hardware. This program uses a variety of ActiveX controls as Dynamic Data Exchange (DDE) clients, to read the PLC data.

A key advantage of the new software, named Injection Profiler, is that it can be configured easily because it is software rather than hardware based. The user can click a button to change from monitoring hydraulic pressure, cavity pressure, or screw velocity. Development costs were low because the program was based on off-the-shelf products.

Having established the design criteria for Injection Profiler, the System Integrator developed the PLC programming to do the necessary data gathering and wrote the other VB-based applications that were needed to round out the operator interface. The overall application can track all operator initiated changes to the process.

Going the Extra Mile

The Injection Molding Control system automatically tunes the hydraulic system of an injection molding machine to eliminate error. "The screen shows what pressures should be through a cycle," says the System Integrator. "If the pressures are OK, the part is OK and there's no inspection sampling. If the pressures are wrong in some way, you get a bad part," he continues. "The part is rejected and then you figure out what happened. One possibility is plant temperature or humidity-an outside variable that can influence the way an injection molding machine functions. If there's a problem with the injection molding process, you know about it in real time. The control system compensates automatically to get the process back on track. If the problem is too large for it to handle, you get an alarm. Probably it's a mechanical or hydraulic problem, so the machine shuts down."

Modern PLC architecture provides excellent value in process control and can be extremely flexible. Its design allowed Delphi's modification to go smoothly. The leadership of the Systems Integrator and his close association with the Software Partner were crucial to the project's success.

Debasish Ghosh

Machine vision in the automotive industry

Increased complexity in today's automobiles brings the potential for greater production errors, but automobile manufacturers can ill afford such errors in a highly competitive market. To achieve the quality that customers demand, manufacturers and their suppliers are increasingly relying on a highly effective approach to preventing defects at multiple stages of production. That approach utilises machine vision.

In the automotive industry, machine vision (MV) is used in a range of applications primarily involving inspections and robotic guidance. Using embedded vision sensors to find objects in 2 or 3-dimensional space and adjust paths for the positions of the objects, robots utilize machine vision for far greater accuracy in critical activities, including auto racking (picking parts out of racks), bin picking and the positioning of parts (such as doors and panels) for assembly.

MV systems also efficiently perform various types of inspections, determining essentially whether the sundry items comprising an automobile pass muster and rejecting those that do not. This includes surface inspection for cosmetic flaws (such as dings, dents and wrinkles in body panels) as well as detection of functional flaws (such as irregularities on the bearing surfaces of automotive rocker arms or the correct spacing and size of mounting holes on disk brake pads). Machine vision systems also verify the presence (or absence) of parts and the correctness of their shapes (such as in the case of gears, which can have missing or malformed teeth). Finally, machine vision inspections for assembly verification insure error-free assembly (such as with closure panels that include doors, hoods, lift gates and tail gates).

MV systems also perform parts recognition . For example, they can read treads of different makes and types of tires and direct their correct routing by conveyor belt to designated vehicles. MV systems can also perform parts recognition via OCR functions where printed labels have been attached to parts.

Machine vision moreover enables dimensional gauging of precision machined components (such as fasteners, transmissions and other sub-assemblies). In so doing, MV systems insure that only parts falling within the correct tolerances find their way to into vehicles departing the assembly line.

Sudhir Bachloo

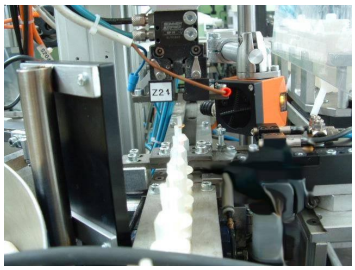
Vision at sensor prices

Object sensors check anything from car parts to broken biscuits

Available now from industrial sensing technology is a new smart, object sensor. Sorting, inspection and error-proofing tasks that used to need a complex system can now be done with a sensor half the price (or less) of others on the market.

Say you need to check for the presence of a known object, but its position isn't exact — Smart object sensors will do that. Or you need to know that the object is facing in the right direction — Smart object sensors will tell you. Smart object sensors will tell you if the object is complete. The list goes on. Normally, to achieve these tasks takes an array of sensors or something expensive and complicated. Smart object sensors are simple and inexpensive. They provide camera performance at sensor prices. They are not only easy to use but built for the job, coming in a stand-alone unit with integrated lighting and constructed in a rugged diecast housing with IP67 for use over a temperature range of –10 to + 60 °C

The detection algorithm is one of the most advanced, industrial evaluation algorithms currently available. Contour detection and verification is not only robust, but at up to 20Hz its pretty fast. Smart object sensors itself will store many different settings in its own internal memory, and the choice of functions available on the outputs is unrivalled. The operating concept is simple, too: the menu-driven PC setting via Ethernet makes it a quick task to set up the application. With error image memory and stored evaluation data the interface also provides a useful diagnostic resource.



Mounting of a washer of the fuel tank float, being checked using the principle of colour separation

The automation industry is committed to working closely with customers to develop products which precisely match their needs for position and process control, complemented by a huge selection of connection possibilities, from connecting cable to AS-interface systems, and provide expert, readily accessible technical support to help users maximise the benefits from these smart, yet affordable products.

Bipin Jirge

Best-Fit is the Best Practice! Quality Down to the Last Detail

German automobiles stand worldwide for high quality down to the smallest detail. "There is no second chance for a first impression" - that is the motto of the engineers and designers - and in fact, perceived quality is a big factor in the decision to purchase a vehicle. The precise fit of body parts, such as doors, with the smallest and above all most uniform gaps possible, plays a decisive role. That makes the requirements of automotive manufacturers for their production processes all the higher. In automobile construction, attached components are assembled predominantly using conventional methods with gauges, which keep the attached components in a constant, rigid position for installation. This means that sometimes substantial rework has to be invested during production for manual adjustment. Uniform distribution of gap dimensions, as required today by both designers and quality engineers is hardly possible using these conventional methods except through correspondingly high levels of expensive labor. This was recognized by the engineers at EDAG, the world's largest independent development partner of the mobility industry. The company worked with a leading Vision Technology company to develop an intelligent sensor for use with their image processing systems and other applications. In the first step, a pilot system was implemented in Fulda,Germany, in collaboration with GM/ Opel.

Best-Fit: Sensor-controlled assembly

The system known as "Best-Fit" is a highly intelligent sensor -based assembly process, which makes custom-tailored, highly precise assembly of attached parts in automotive production possible. For example, for door installation, sensors first determine the dimensions of the gap and transition for each manufactured door along with the cut-out in the sidewall of each corresponding vehicle; then calculate the optimal position of installation of that door with that car body; and finally use robots to target this position precisely.

The joining robot then installs the door so that it meets the requirements for a high-quality vehicle, despite the unavoidable geometric variations due to production tolerances. A particular feature of the Best-Fit system is that it learns and thus independently controls placement behavior in the joining process. Beyond that, a final quality inspection step is carried out and documented, so that downstream measurement stations can be eliminated. Depending on the design of the attached part, 6 to 11 sensors are installed on the gripper of the robot. In addition to electronic control and monitoring systems, the intelligent sensor consists of a laser source and a digital camera. With the aid of these sensors, the components, e.g. door and side wall, are measured with each other. The Best-Fit system detects the current status quo of the

alignment along with the width and distribution of the gap dimensions and calculates the optimal position for installation. The software ensures not only the most parallel possible gap dimensions, but also uniform distribution of the gap dimensions at all measurement positions.

Optimal choice for multi-camera operation

For the Best-Fit process, EDAG depended on digital cameras with a resolution of 1.4 Megapixels, that permit precise gap measurements. For better integration in the intelligent sensor, the housing of the standard camera was removed and the board-level version was selected.. In addition, the cameras are equipped with a digital interface (FireWire IEEE 1394a). This interface can be used to activate all the cameras of the EDAG Best-Fit system via a broadcast trigger. Thanks to the internal memory and the deferred mode, the Best-Fit system can flexibly call up the images of each camera for analysis.The deferred mode of the cameras and the industrial suitability of the FireWire interface was important to the design team in selecting the best camera for the Best-Fit application.

Practical use: Milestone for assembly quality in automobile construction

The Best-Fit process is a milestone for assembly quality in automotive production. For each manufactured component and each manufactured body, the system calculates the optimal position for assembly — for a consistently uniform and high-quality appearance of the overall vehicle. But in addition to the quality advantage of perfect distribution of the gap dimensions, the Best-Fit system also achieves economic advantages: The costs of manual re-adjustment are reduced drastically, as the implemented projects have shown clearly. Assembly is now being done at two European locations with the Best-Fit system, for instance, for all the attached parts of the Mercedes Benz S-Class and the doors of the Opel Corsa. In addition, the Best-Fit system is also being used for other applications, such as precise positioning of robot tools, e.g. for punching, stamping, or riveting in automobile production.

The above article is an extract from AVT Best Practice monograph, and published under authorization from Allied Vision Technologies.

Anand P Chinnaswamy

Bridging the Information Gap — RFID

It is today's most buzzing and upcoming technology that manufacturers see, called Radio Identification (RFID) tags. This is a small, inexpensive computer chip. RFID enables users to collect and track information about product, place, times or transactions quickly and easily. Invented in 1969, but only now becoming commercially and technologically viable, RFID technology is growing by leaps and bounds. RFID tags will soon be built into everything, allowing each individual item to be tracked and traced. RFID allows greater innovation in product manufacturing and distribution and supply chain.

RFID can address numerous manufacturing challenges, including security, quality control, production execution and asset management. When implementing the technology in a manufacturing environment, however, the key is not the tag, the reader or the part identification. Rather, it is the data that can be obtained. The objective to use RFID is to become a data-enabled enterprise. A manufacturer obtains timely data and can use the information to further its competitive edge.

RFID can bridge the information gap between Manufacturing Execution Systems (MES), Enterprise Resource Planning (ERP) systems and the production floor. It transfers data accurately, on-time and in detail as compared to other alternatives. It can be used to monitor and control various areas like operator stations, security checkpoints, and task completions as a means of controlling quality and safety.

With RFID, companies can track products through the entire production process from input material to completion and reporting data as required at critical stages. In addition, data enabled by RFID can meet Six Sigma or Kaizen real-time data requirements for statistical and root cause analysis. Going live with RFID needs systematic approach like understanding of business needs and potential using RFID system. It is necessary to outline manufacturing goals and data requirements before examining any RFID.

Rajesh Shirodkar

RFID tags are microchips, so tiny that they can be embedded in almost anything to give it a unique ID code.

An RFID tag acts as a transponder, responding to queries from a nearby transceiver by transmitting back its own unique 64-bit or 128-bit identifier.

This yields about 18 thousand trillion possible values, each virtually impossible to erase without destroying the tag. Some RFID tags are powered by batteries — but that makes them more bulky and expensive, limiting their applications. The most common RFID tags are passive circuits, powered directly by the received radio signal. RFID tags are designed to be read between a few inches and several feet away, depending on the size of the antenna and the power driving the tags. Today, prices are as low as a few hundred rupees a piece and are dropping as quantities increase.

Real-time data enables production execution

Manufacturers pursue lean manufacturing and just-in-time methodologies to obtain the benefits of reduced inventory. Some manufacturers, however, build up inventory to handle unforeseen circumstances, or because they do not have an accurate representation of WIP. Such technology can sustain inventory visibility and tracking within the manufacturing. Each event is recognized in real-time, and each event spurs other events to occur. Notification of a pending production run, for example, can prompt a supplier to schedule a replenishment delivery.

RFID can support users with the real-time data needed in production execution. Consider applications where it is critical to ensure that correct labour, machine, tool, materials and components are available and ready for deployment. The read-write capabilities of RFID can be used to control, modify and reconfigure production steps based on inbound materials and assemblies. For example, in flexible automobile assembly, cars can be assembled according to customer choice. Car parts can be read by operator or robot and follow the right steps, according to the data received.

Going live with RFID needs systematic approach like understanding of business needs and potential of using RFID system. It is necessary to outline manufacturing goals and data requirements before examining any RFID.

RFID systems should be conceived, designed and implemented using a systematic development process in which end-users and specialists design RFID systems based on an analysis of the organization's business requirements. Few generic guidelines that one can follow:

1) Clear Business objectives.
2) Establish goals to be achieved or problems to be solved.
3) Awareness and technology know-how.
4) Analyze the business case and establish the technology.
5) Identify and implement pilot project and cogitation results and ROI.
6) Roll out.
7) Keep analyzing and improving: Set up an ongoing process to monitor and adjust as changes occur in requirements or technology capabilities.

Harmeet Sodhi

Pneumatic automation in the automobile industry

Over the years, all the successful automobile manufacturers have reduced their supplier base for vehicle components from several thousand companies to just a few hundred companies. Where earlier automobile plants were designed to receive and process thousands of components, they are now supplied with complete door systems, interior fittings or braking systems.

This trend has impacted the way plants are being conceived and built. Production plants are generally built around the capabilities of special plant manufacturers, so-called line builders, who take responsibility for building the plant as quasi general contractors. The need to innovate task and value addition of all machinery systems and subsystems is now being felt by all concerned.

Automation technology is the heart around which mechanical equipment is given greater speed, safety, reliability and intelligence. Despite the role of advanced electronics and software based systems, pneumatic components and systems continue to reliably undertake major tasks in the Automotive industry, such as:

— Handling and transporting sheet metal parts in the press shop

— Component clamping and fixing, positioning welding tongs for the unpainted body shell

— Nozzle control in the paint area

— Assembling or feeding units in final assembly

Applications

- Holding and clamping of piston rods in any position during clamping, processing or handling tasks
- Clamping unit with compact design
- The piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure or leaks in the system.

In order to avoid downtime, components which must meet certain specified standards are being increasingly used in manufacturing plants so that maintenance personnel can replace defective components more quickly. Complete solutions and special services, are however needed to support the special or proprietary needs of automobile manufacturers and tier-1 suppliers throughout the world.

Intelligent systems

Contributory factors in plant productivity are preventive maintenance and time-optimised and controlled systems. Intelligent systems, for example, provide data regarding switching cycles which facilitates strategic and planned maintenance. Diagnostic aids provide maintenance staff with assistance in identifying defects. Controlled or user definable systems reduce the cycle time and optimise the process. Valve terminals and cylinders with diagnostic capabilities or intelligent systems for welding tongs are now available.

Pneumatics application in the unpainted body shell area when the welding tongs need to be transported, held, gripped and fed.

Benefits

The sturdiness, simplicity and reliability of pneumatics reduce maintenance and defect identification costs. Furthermore, pneumatic drives also provide additional supplementary functions such as guidance, adaptation and sensing options which come practically “free”. With pneumatics, “intelligent” and cost-effective systems can also be realised, as has been demonstrated with welding tong drives.

Manoj Dunung

AIA ANNUAL WORKSHOP

The first Annual Workshop of AIA was held on 8th Sept 2007 at the L&T training centre, Madh Island, Mumbai. Participants are seen interacting with AIA President JP Singh, and guest speakers, Mr Ashok Verma and G Suresh of EIL, during the session on System Integration standards.

For AIA membership enquiries, contact Anup Wadhwa, Director, AIA at aiateam@gmail.com

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