

HIGHLIGHTS OF THE FIFTY-FIFTH ADVANCED MANUFACTURING FORUM APRIL 1-2, 2004

SUPPLY CHAIN OPERATIONS EXCELLENCE

Shail Godambe

*Senior Vice President And
General Manager of the Supply Chain Operations Group, Commercial, Government, and Industrial Solutions Sector (CGISS)
Motorola*

Shail Godambe started with Motorola in 1974 as an operations research analyst. Over his 30+ years at the company, Motorola has grown into a \$27B corporation. Mr. Godambe's CGISS unit is responsible for approximately \$13-14B of that business. It is Motorola's history of innovation in communications that is a major driver for the company: half of their business is in the cellular business. Their communications division made the heavy walkie-talkie radios used in WWII in 1940, the first pager in 1964, and the first portable cellular phone in 1983. In 1995 totally integrated wireless, data and messaging units were developed, and today we see the small consumer two-way radios as well as smaller, faster phones and boxes in use on cable TVs.

Godambe pointed to three factors driving today's economy that were different twenty years ago:

- Communication issues
- Integrated supply chain issues
- Responsiveness to customers needs and wants

These processes must be continuously optimized to some benchmark performance. The level of competition is so great that you cannot be an average company anymore, Godambe said. There is too much pressure to survive. And so there are other factors that are also important:

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COMMUNICATION IS THE FOUNDATION FOR ACHIEVING EXCELLENCE IN LEAN MANUFACTURING

Chris Heinrich

*Plant Manager
Guelph Products, Collins & Aikman*

Chris Heinrich has been employed at Guelph Products since 1987. He began his employment as the plant's Human Resource Manager and presently is the Plant Manager. Guelph Products was established in 1986 as a Division of American Motors and currently employs 563 hourly employees, 35 temporary part time and 80 salaried employees. Some of the company's current products include seats made for the Jeep Liberty, Dodge Magnum, Chrysler 300C, Dodge Viper, Dodge Caravan, and Dodge Ram pickups. Recent accomplishments are many and include achieving the Lean "Serious Practitioner" status. In this presentation Mr. Heinrich describes the process of achieving this status.

Guelph Products began its continuous improvement journey in 1993 by identifying issues through an employee opinion survey. Results of the survey indicated a

(Guelph Products continued on page 4)

TURNING ENVIRONMENTAL VISION INTO REALITY

Edward deJong

*Principal Engineer
Xerox Corporation*

Edward deJong, Principal Engineer for Xerox, has a background in Systems Engineering and Environmental Design Disciplines. Mr. deJong has been instrumental in developing machines at Xerox that are completely recyclable.

A videotaped testimonial to the Document Management Center, designed by Xerox, set the stage for the presentation. Remarks by engineers and designers reinforced the concept of zero landfill, and described how Xerox has been a leader in dealing with manufacturing for the environment.

The initial step in changing Xerox's design culture involved the training of employees. The key point in the development of this process required the engineering and manufacturing systems to join together with the distribution systems and look at how to design for the environment. The first area to be addressed was Xerox's internal environment. Employees were asked to attend training that instilled them with the idea of environmental awareness. The training was the start of a workplace culture that would drive the process. An image that showed the connection of energy, water, environment, and future generations was developed that allowed employees to visualize how everything in nature is connected.

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TRADITIONAL LEAN TOOLS AND TRADITIONAL INDUSTRIAL ENGINEERING TECHNIQUES

Dave Hotler
Manufacturing Engineer
Dynamic Corporation

Dave Hotler is the Production Manager for Dynamic Corporation in Lafayette, IN. Dynamic Corporation supplies high power braking resistors to the locomotive industry. The mid-1990's brought a period of growth to Dynamic that presented challenges of quadrupling its capacity while reducing costs in response to rising labor and material costs, and increasing domestic and foreign competition. In this presentation Mr. Hotler describes the mix of lean manufacturing tools utilized by Dynamic Corporation to meet these challenges, and how these tools are similar to the goal of industrial engineering, which is to totally eliminate waste in the work environment.

There are numerous lean tools available, but those tools Dynamic Corporation found most useful were Kanban, Visual Management, and Quick Change. Kanban is a visual sign that indicates a replacement need to another department upstream in the assembly process. This sign can be a tag, card, rack, light, or empty space on the floor. One example of Kanban used by Dynamic is a card that indicates part #, description and lead-time. Empty carts indicating a need to build parts was also utilized, and all carts were put on wheels eliminating forklifts and two-wheeled carts.

Visual Management is a "user friendly" tool that quickly allows employees to determine what is happening in the work environment. Examples of Visual Management include graphs, charts, boards, shadow forms, and lights. These tools are utilized in a variety of ways such as color-coded tags, carts that identify different products, and the display of work assignments on a display board. Along with Visual Management, tool performance methods are also tracked and posted, and reviewed weekly at department meetings. Performance methods tracked include safety as measured by the number of reported injuries, delivery times as measured by the recording of on-time shipments, cost and labor utilization numbers, continuous improvement projects, and quality as measured by customer complaints.

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The objective of Quick Changeover is to reduce setup times to promote smaller run sizes. The result of using this tool is having the last good part of the last run as good as the first piece of the next run. An example Mr. Hotler used was the review of the seam welder's process. This machine was a bottleneck resulting in a stop in the production process. Employees were asking for more equipment, but by combining operations, and having extra parts available the company was able to save 763 hours a year at zero additional cost.

Industrial engineering tools such as facility layout, standard work instructions, ergonomics, and time and motion studies are similar to lean tools and can be interchanged. Both industrial engineering and lean tools are interested in saving resources, time, and money.

Dynamic Corporation again looked at the seam welding process and revised standardized methods, revised machine cycles, and measured operations for the first time. By review of this process the company was able to employ one operator for two seam welders rather than one operator for one seam welder. Packaging was also changed and by placing packaging at the point of use the operator no longer had to shut down his operation to package products. Other industrial engineering tools utilized were ergonomics where the assembly fixture and table were adjusted to the operator. Also, Dynamic Corporation became a paperless factory with work instructions and forms available online and latest versions were always available.

The use of industrial engineering tools and lean tools resulted in an increase of sales by 35%, increase in employee wages by 79%, and decrease in customer prices by 13% since 1995. Work in progress was reduced from days to hours, and setup times and space requirements were also reduced.

Challenges presented by the use of these tools included increased reliance on worker skills, excess "human inventory", employees not having the desire to be empowered, and the need for support systems such as maintenance and human resources to be in place. Cross-training your employees also carries the risk that they will take their skills and go elsewhere to work.

There have been many lessons learned in this process, but the one thing Mr. Hotler says is not to give up and don't be afraid to make mistakes. ■

MOTOROLA (continued from page 1)

- Cost
- Quality
- Delivery
- New product introduction

Godambe believes that these factors were important 50 years ago and will be as important for the next 50 years too. What will change is what the customer wants, and that will change what you do. As part of the Motorola supply chain vision, their goal is to optimize and manage the supply chain as a *system* to achieve significant improvements in customer service, cost, quality and new products introduction. The process Motorola developed, Schedule Sharing[®], electronically manages the information that controls the supplier and manufacturing segments of their supply chain. It is a form of "Vendor Managed Inventory". Customers are provided with a web-based tool and commit to a blanket purchase agreement with the supplier. The supplier manages the inventory levels and production and delivery plans to keep the customer's inventory levels within prescribed windows – a dynamic process that responds to the needs of the customer. Customers provide daily or weekly forecasts, and performance feedback to the supplier. Payment to the supplier (electronic) is made upon receipt of the goods.

Motorola has 12 distribution centers, 50 factories, over 1600 suppliers, and over 60,000 parts in its worldwide network. Godambe said Motorola had gained ground compared to where the company was 20 years ago and compared to its competitors today in these areas:

- Purchasing – all points of the operation are connected electronically (distribution, manufacturing, suppliers). Suppliers see the demand every day. They used to use purchase orders, a time-consuming activity when it came to making changes. They could lose 12-13 weeks of lead-time when it came to forecasting. At the end of that time frame, demand would

have changed anyway. Schedule Sharing[®] has proven to be a win-win proposition for them.

- Design – using Motorola's mobile police radio as an example, its design for manufacturing reduced components by almost 40%. This made a huge difference for them. Sub-assembly reductions totaled over 60%, for a rolled yield improvement of +6 points. But the outside appearance of the radio looks pretty much the same as it did ten years ago, which turned out to be an important factor for their customers.
- Distribution and Inventory Optimization – the issue was how to improve customer on-time delivery while keeping inventory in control, given all the forecast/demand variances and supply variances. A model was developed from raw data collected on a variety of historical order levels that was manipulated in light of demand variances and forecast accuracy, inventory replenishment, and supplier SKU performance. The result was a model that allows Motorola to consider investment strategies under a variety of scenarios: cost-based, flat SKU-based, commodity-based, or a mix of these.

Godambe commented on manufacturing in China. He felt that there were four fundamental factors that one must consider:

- Labor costs – they are rock bottom in China.
- Transportation - it has been optimized tremendously due to carriers such as Fedex and UPS, etc. Per pound costs are very small. Even heavy items that must go by surface are still cheap.
- The continuous improvement model – China has learned it very, very well.

- Suppliers – Motorola has 140 suppliers in China. China has a strong supply base, especially in electronics. It is ahead of other developing countries, India for example. Depending on what the customer demands are, you have to adjust your supply chain model.

There are two ways to start doing business in China: do a joint venture with a Chinese partner (this gives you a quick start); or, start as an independent company in China. You have to decide how much you will export there and how much you will keep "inside".

The biggest problem is communication. "Any family of our size has a communication problem," Godambe said. "Try changing the language, and then go down three or four layers. You have to have strong people who can speak Chinese."

Godambe concluded his presentation with remarks on CGISS' Baldrige award in 2003. Keys to Motorola's success are customer intimacy, operational excellence, and technological supremacy. He provided a "top ten" list of considerations:

1. Leadership commitment
2. Cross-functional teamwork and benefits
3. Consistent communications and information
4. Pride
5. Focus on what you do
6. Learning and leveraging best practices
7. Focus on linkages
8. Demonstrated results
9. Worldwide deployment
10. Constructive dissatisfaction and continuous improvement and...the journey continues....■

XEROX (Continued from page 1)

The next step of the process was to create environmental attributes by listening to the "voice of the customer". Examples of attributes included reducing package size, minimizing noise, using recycled paper, and recycling packaging. The vision was communicated to Xerox employees and changes in the workplace were initiated, such as having offices and labs built to allow for natural lighting, changing the dress code to casual, and distributing coffee mugs to eliminate waste in the environment.

Once the internal or workplace environment was changed and employees trained to support the vision, the next step involved changing design standards and business processes. Engineering guidelines were developed to enhance remanufacturing and materials recycling by placing environmental codes on every design drawing. Business processes were re-engineered by developing design reviews and assessments with focus on environmental requirements, noise, energy, and emissions compliance. Zero landfill goals were added in order to support the reuse and recycling of products. The final step involved in changing Xerox's supplier relationships to deliver waste-free products in waste-free factories to waste-free customer offices.

Future technology needed to be included in the vision in order to provide value for the customer and money for management. The idea of environmental friendly products was initially downplayed when marketing was not sure how to handle those products that were already available to the customer, but were not environmentally friendly. An independent study by a Carnegie graduate student was helpful with this dilemma when the study showed an increase of market share by 15% with the introduction of environmental products.

The development of a database that includes codes that describe whether or not the part is remanufacturable and recyclable, and whether or

(Xerox continued on page 5)

GUELPH PRODUCTS (Continued from page 1)

need for increased communication between management and the workforce, a desire for the workforce to be involved and to understand the business, and finally a lack of basic skills training and product knowledge.

To address the survey results, core training for the entire workforce was initiated with topics that included health and safety, corporate vision, problem solving, elements of lean production, teamwork, communications, an open forum with the plant manager, and plant-specific product and technology sessions. Within one year, numerous positive results were seen. Examples of these results included defects reduced by 77%, inventory reduced by 23%, 17, 200 sq. ft of floor space recovered, sales increased by 15%, cost reductions of \$540,000, and employee morale skyrocketed. A team environment had been established and the culture of the company began to change. Success of this core training resulted in the training of managers, union committee, and supervisors. Phase two training included the remaining salaried staff.

The two training sessions in which lean initiatives and continuous improvement were integral led to development of a workforce that understands and recognizes the importance of lean principles in a manufacturing environment. Phase two resulted in a restoration of the workplace and transformation of the "factory" into a "manufacturing facility". This was accomplished by allowing employees to design and paint a mural on the wall. Award presentations, pizza parties, baseball caps, etc. celebrated achievements. Also, work cells were established that gave employees the responsibility for scheduling and production in accordance to customer requirements. Employees began understanding the metrics by which Guelph Products measures its success, and the employees became an educated, knowledgeable workforce that was empowered to make continuous improvement through suggestions.

Examples of improved areas within the company included enhanced work instructions by providing a running video of how to do a specific job, thus allowing employees to train themselves or to reinforce previous training. Plexiglas improved vision boards, and a Heijunka Board provided information on the production schedule, thus allowing anybody who entered the plant to determine whether production was on schedule or behind.

Also presented was information on the 5S Process: 1. Segregate and Discard 2. Simplify (arrange and identify) 3. Scrub (clean daily) 4. Systemize (prevent recurrence) and 5. Standardize (motive to sustain). This process begins with cleaning and organizing one area at a time, and then extending the process through the remainder of the plant.

Other areas addressed included the color-coding of the manufacturing process from the start of the manufacturing process and continuing to the end of the manufacturing process. Workstations were developed that provided total production maintenance check sheets and basic supplies. Also, a communications center for production and maintenance was developed to allow for the recognition of problems before the problem affects production. Employee audits allow each area to determine if tools are put away properly and the area cleaned. Employees were cross-trained to compensate for absenteeism, bottlenecks in production were identified, and energy management was initiated.

Chris summarizes Lean as making systems work right and conserving cash. Lean is a journey to remove waste. ■

XEROX (Continued from page 4)

not the part contains hazardous material has been very helpful in accomplishing Xerox's vision of providing products that are environmentally safe. Eventually Xerox became 99% recyclable by part, and 99.996% recyclable by weight.

Mr. DeJong included in his presentation a review of regulatory compliances that will take effect in June 2006. Examples of new regulations include establishing techniques to meet ROHS standards for hazardous materials, and eliminating lead in solder. With this review of regulations, a point was made that companies cannot manufacture in a vacuum – design and manufacturing must work together with suppliers and distribution systems. Changes in manufacturing are coming and the environment is becoming important. Companies that are exporting to other countries must be aware of regulations in those areas as well as recycling acts in place within the U.S. It is important for companies to be looking at internal operations or you will end up out of business.

Xerox Corporation is willing to share with other companies what they have learned in the process of developing environmental-friendly products and is providing participants with copies of their parts database along with other helpful information. ■

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