



### **63<sup>rd</sup> Advanced Manufacturing Forum**

*Held on April 11, 2008 at Penn Stater Conference Center*

**Sponsored by**

**The Center for the Management of Technological and Organizational Change**

**Gerald I. Susman, Director**

**Russell Barton, Associate Director**

### **Continuous Improvement “A Way of Life”**

**Michael Kochis, Plant Manager**

**Doug Wilson, Engineering Manager**

**Heilman Center Electro-Manufacturing Operations**

**MEDRAD, Inc.**

**Indianola, Pennsylvania**

MEDRAD technology helps to create over 30 million enhanced medical images annually and MEDRAD is a worldwide market leader in medical devices and related sterile disposables. With government reimbursement rates for medical procedures declining, MEDRAD was under pressure from its medical customers and its competition to reduce pricing. At the same time, double-digit company growth demanded a continuous increase in production capacity to support global sales, all while maintaining margins and quality, and without significant reductions in needed capital improvements. MEDRAD's answer was to implement both a Lean program and a Continuous Improvement program that won the Malcolm Baldrige National Quality Award on the fifth try in 2003. Both programs together yielded an Industry Week Best Plant Award in 2007 and significant savings.

Founded in 1964 by Dr. M. Stephen Heilman, and headquartered in Pittsburgh, Pennsylvania, MEDRAD has a market presence in 15 countries on four continents and over 1,900 worldwide employees. MEDRAD produces medical devices used with magnetic resonance imaging (MR), computed tomography (CT), cardiovascular (CV) medical systems, electromechanical/fluid delivery products, and syringe/disposable products.

Most manufacturing is done at the Heilman Center in O'Hara Township outside of Pittsburgh, PA. Opened in August 2002 and consisting of 155,000 ft<sup>2</sup> on 16 acres, and approximately 300 employees, and the new facility consolidated three locations into one. The new plant was needed to accommodate MEDRAD's high growth rate and includes manufacturing, offices, field service, and a multi-vendor service department where MEDRAD also repairs other vendor's equipment.

MEDRAD started benchmarking companies manufacturing health care equipment, found a company that was doing very well in manufacturing and found that they were using Lean manufacturing techniques. So, in 2001 MEDRAD decided to start its own Lean journey at the Heilman Center. MEDRAD's Lean goals focused on reducing labor costs through improved productivity while increasing production capacity, reducing material costs, and reducing the value of inventory carried.

MEDRAD decided not to use outside consultants, but instead brought in a team of industrial engineer's (recent college graduates) and key Production Team Members to establish its "MedFlow Project". The team was to implement Lean manufacturing techniques, and determine how to make its high mix-low volume products profitable to manufacture. The team was trained, set-up the plant, production lines, and materials storage, and took the initiative to start Lean manufacturing at MEDRAD.

While this approach gave MEDRAD a good start to Lean, it quickly became apparent that there is no Lean "silver bullet". It cannot be started up in a week – it's a process and the models of Lean used needs to be tailored to the specific business configuration. Some models of Lean are easy to adapt and can yield big returns. MEDRAD started with process mapping, 5S, and establishing manufacturing's core competencies.

MEDRAD manufacturing established their core competencies as: integration of new products on to the manufacturing floor, equipment assembly and test (including test software development), documentation, and packaging/warehousing. Determining core competencies help to determine what to do in-house and what is best to outsource, which lead to MEDRAD's decision to outsource its printed circuit board operation as well as cabling.

In 2002, MEDRAD created an employee incentive program, implemented Lean production scheduling, inventory DOS metrics, initial Lean training for the production team, and a two-bin Kanban system. With the Kanban system, MEDRAD dedicated a materials handling team. An empty bin signals replenishment while using the materials from the second bin. Bins are labeled on both sides, kept in the same cell, and refilled from the back. Cards are used for larger materials.

MEDRAD uses an employee-focused team culture approach to Lean including a Continuous Improvement System, a Value Improvement Program, Operations All-Star Program, a Monthly Incentive Program, Summer Flex-Hours, Annual Team Money, and Annual Gain-Share. When administering these programs, it is important to evaluate both the individual teams and the team's affect on production together as a whole, so that team victories contribute to a win for the entire department.

The *Continuous Improvement System* consists of an Access database on the company intranet where employees can submit a suggestion, idea, or project, which will go to the Engineering Group to review. The Engineering Group may come back to the employee for more information or involve the employee(s) in the solution. All ideas will receive feedback in the database even if it is not implemented. MEDRAD receives about 300

suggestions per year with an 80% completion rate. They are careful not to make it an engineering work-order system – some ideas are not feasible. A continuous improvement program is also utilized with customers and seeks customer input early and often in the product lifecycle.

The *Value Improvement Program* is used for teams or employees who are working on projects with savings, which is matched against the larger manufacturing number. Last year they achieved \$23 million in savings and \$10 million in cost avoidance. But the true savings in this program is in the employee participation. Last year 335 employees out of approximately 600 employees participated in the program.

The *Operations All-Star Program* is an employee-to-employee recognition program where an employee will fill out a thank you to another employee, either via the intranet or on paper, which gets released to a database. The results print out each morning and participants receive a hash-mark for each thank you, which has a value (i.e., 10 equals an Operations All-Star t-shirt, 20 for a coffee mug) up to 150 maximum. This program has no management interaction.

The *Monthly Incentive Program* consists of two paid hours off per month on a specific Friday, which is awarded for meeting the monthly target(s) – such as device history record accuracy, and meeting production goals. The goal is achieved about seven times per year. Employees are disappointed when they miss the goal and work harder to achieve it the next month. *Summer Flex-Hours* is an option to work a 4x10 schedule (four ten-hour days) during the summer, while maintaining a five day per week operation, with individual scheduling decided among team employees.

*Team Money* of about \$70 per employee per year is awarded and each team decides how to spend the money. The money is mostly spent on summer team activities, such as going to a baseball game, a Gateway Clipper ride with spouses, t-shirts or food. This is a “use it or lose it” program and most of it needs to be consumed by October. The company-wide *Annual Gain Share* is based on meeting the five corporate objectives for the year. Last year’s per employee share was \$2,400, regardless of level in the company.

In 2003, MEDRAD followed up with Lean office training, implemented resource leader for raw materials, a safety committee and a 6S process (5S + Safety), which yielded quick results and gained employee confidence in Lean programs because it is visual. This is also the year MEDRAD was the recipient of the *Malcolm Baldrige National Quality Award*, which is a process similar to Lean.

In 2004, MEDRAD implemented cellular manufacturing, burn-in reduction, created order fulfillment metrics, and visual factory work instructions. The visual factory work instructions involved re-writing the traditional instruction manuals and blow-up diagrams, tailoring and simplifying for MEDRAD-specific processes with visual work instructions broken into sub-element drawings and illustrated with digital photographs of MEDRAD products and procedures with inspection points highlighted in purple. This resulted in a 35% reduction savings in the first year of implementation due to a reduction

in training time. It also created a more flexible workforce with more employees cross-trained and capable on multiple lines, which made MEDRAD better equipped to meet fluctuating customer demand. Other benefits included increased flexibility in production scheduling, increased employee satisfaction, employee contribution, efficiency, productivity, and a higher value, skilled workforce.

The cellular manufacturing layout was MEDRAD's solution to increasing manufacturing space for new product lines instead of building a new facility. Cellular layout increased internal cell workspace by 30-40 percent vs. a straight-line plant layout, optimized floor space (increased the work area 10-20 percent), and employees have been very happy with the new layout. Cellular is very flexible and sets-up quickly. For instance, last July 4<sup>th</sup> holiday, MEDRAD disassembled the entire 100,000 ft<sup>2</sup> of production space, resurfaced the entire floor, and reassembled in a total of 3 days. Cellular also allowed the addition of two new production lines without adding space, and positioned the facility for the next 3-5 years of growth.

The visual workplace included dedicated floor space for raw materials and WIP with production targets clearly visible, and resulted in reduced inventory. The operator benefits with a larger work area, enhanced communication, and increased teamwork and support. Shared resources are the key to reducing headcount and increasing productivity, without backfilling normal attrition on an annual basis.

This process took approximately six months to complete from design and testing to completion throughout the plant. MEDRAD did not lose production time due to the cellular conversion – they use scheduled downtime, which was already budgeted. The conversion process involved analysis and establishing the direction to take, getting the employee team involved which helps with buy-in, and overcoming objections as there is a constant “change management” aspect to these projects.

In 2005, MEDRAD implemented productivity through uptime, wireless materials tracking, continuous improvement, and set a safety record. In 2006, MEDRAD implemented Kaizen events, Andon lighting system, ODAT incoming inspection, plant-wide Lean refresher training, a supplier demand pull program, and introduced multi-product cells. This was also the year that MEDRAD won the *Pittsburgh Business Times 2006 Manufacturer of the Year*.

The demand pull system is an inventory replenishment method which allows the supplier to control the release and delivery of materials to MEDRAD by managing a min/max level. MEDRAD used SAP to provide real-time inventory to suppliers and allow suppliers to manage material flow. The signal can be sent twice daily or as the supplier prefers to allow the supplier to schedule deliveries. This served to reduce inventory levels (mostly raw, but also included WIP and finished goods) by \$2 million and also resulted in a labor savings.

MEDRAD implemented a multi-product cell concept to help reduce allocated overhead burden for low volume-high mix products. This concept maintains manufacturing floor

layout flexibility without increasing production floor space. The multi-product cell concept consists of portable carts and benches used to produce the products they don't make often. Employees will load up the carts with number of parts units needed for the month, and move cart to a dedicated multi-product cell area to assemble. Two to three of these cells are running on any given day. Carts can be restacked and put away when production is finished.

Shared resources help accommodate for fluctuations and variability in the manufacturing process – the more people know, the more can be accomplished with less. At any given time MEDRAD is staffed to run at 75% capacity and are not staffed to have all cells running at 100%. Instead cell/product scheduling fluctuates based on demand.

In 2007, MEDRAD implemented packaging/final quality control improvements, a level-loading production schedule, plant quality world-class benchmarking, expanded their plant quality team, implemented DHR error reduction, and was the *Industry Week Best Plant* award winner. While MEDRAD has made great strides with considerable accomplishments, MEDRAD feels they are nowhere near the end of their Lean journey.

In all, MEDRAD calculates their productivity cost savings from Lean manufacturing to be \$575k, which includes the improved floor space utilization, better assembler and production work areas, increased productivity from cross-training, Pitt RM DOS reduction, and Pitt FG DOS reduction, more manufacturing flexibility, and gained a general productivity increase from Lean activities.