Lean and Mean

Raytheon Missile Systems' Louisville facility brings some serious fire power to their Shingo Award-winning Lean Six Sigma approach.

By Jeff Reinke

It's a select few that are offered the opportunity to get up each morning and go to work with the knowledge that everything they do makes a difference in the lives of countless people. And while it's a demanding position to accept, a sense of pride and duty plays an overwhelming role in the work done at the Raytheon Missile Systems Louisville facility. "Would you bet your life on the job you did today? Our Warfighters do!" This is the motto that can be seen throughout a plant where customer success is far and away the first priority, and, admittedly, everything else is secondary.

As part of the Raytheon Missile Systems Naval Weapon Systems division, the 2007 Shingo Prize-winning (see page 14 for more information on the award) location in Louisville provides new manufacture, upgrades and overhauls for the Phalanx Close-In Weapon System. Their customers, for which success is the only option, include the U.S. Department of Defense and 22 allied nations. With over 550 systems deployed around the world, these seven-ton weapons' primary objective is to defend ships from cruise missile attacks, as well as threats from surface craft. To help understand the impact of the work done at the 300,000 square-foot facility, one need look no further than the tragedy of the USS Cole, which fell victim to such an assault, and lost 17 brave soldiers in the process.

As one would expect, the combination of this incident and recent military operations have produced an up-spike in demand. Prior to the 2000 attack, Raytheon performed 15 to 20 overhauls a year. This year, 60 of the units will pass through the Louisville plant. Greater demand and the essential nature of the products in question caused Raytheon to re-examine the production methodology that was in place, as these increases would need to be handled without physically expanding

the facility. This put the onus on John Packwood and David Mattingly to get things flowing more efficiently.

The Battle Within

One of the key parameters in working on such an important weapons system is that scheduled overhauls need to hit their deadlines, without exception. This is driven by the simple fact that the Phalanx can only be accessed and re-installed when its parent ship is in port. In looking to handle additional timelines from more units moving through their facility, Packwood and Mattingly began their lean journey in June of 2003. “We explored everything involved with lean manufacturing principles,” states Packwood. “The first thing we knew we needed to do was benchmark ourselves against other companies. So we visited a number of other plants to look at their operations, and get a feel for where we stood. Almost all of them offered some good ideas.”

There are constant reminders at the Raytheon Louisville facility as to whom the company’s products serve.

This includes Raytheon’s larger Tucson facility, where the Phalanx new manufacturing work was handled up until 1998. These Arizona-based plants produce an estimated 80 percent of all missile munitions in the world. The Tucson facility also won the Shingo Prize for Manufacturing Excellence in 2004.

“The most difficult thing to get past was the transition of our workforce from government to private sector employee. There are business requirements that

didn't exist before that folks had to adjust to," states Packwood. These differences, initially, offered significant challenges.

"So, first we went around the plant and established that we were serious about implementing change, and gathered input from the employees on things that they felt could be better," recalls Packwood. "To be honest, it was tough, and there were days that we thought about quitting, but there was just no way we could ramp up production without changing our workflow and streamlining the entire operation. Not only would meeting our timelines have been very difficult, but you can't become complacent. We knew we needed to improve, or potentially risk losing the business."

In the end, two main themes played a key role in getting employees on-board with the leaner approach. In going through the experience of essentially changing jobs two years prior, no one wanted to repeat those types of disruptions. More importantly, however, is the underlying sense of pride and patriotism that Raytheon employees are able to experience in everything they do at the plant. "People wanted to succeed because of who they work for and what they build," states Packwood.

Right On Target

The results of Raytheon Louisville's Lean implementation not only produced the 2007 Shingo Prize, but also contributed to:

- Achieving ISO 9001 and AS9100 certifications.
- A 15 percent improvement in operational efficiency over the last two years.
- An estimated $14 million in costs savings that should be realized over the next five years.
- A 100 percent on-time delivery rate.
- A 26 percent reduction in lead times.
- A reduction in worker compensation costs by 95 percent over the last three years, with consistent safety records that show over 1 million hours worked without a lost-time injury or illness.
- A 90 percent reduction in the use of HFC 134a – a greenhouse gas.

Additionally, 20 site processes were selected as Best Practices by the Best Manufacturing Practices Center of Excellence. Driving these improvements are a couple of key initiatives that, following with the traditions of their military customers, can be summed up with three acronyms: MEM, RPM and IPT.

Raytheon Missile Systems Manufacturing Excellence Model. MEM assesses 20 functional areas on a 1 to 5 scale, with 5 being world class effectiveness. Categories include things like customer satisfaction, workplace organization, open communication and quality improvements. Each of these rankings is then compiled and an average is obtained.
The first evaluation was done by employees from the Tucson plant in setting a benchmark score of 1.9. Since receiving that initial mark, the company gradually improved to a 2.6 the following year, then 3.4 and most recently registered a 3.9.

"What we've found," states Packwood, is that this approach helps to focus our efforts on areas that will improve our overall score. It's not always about those processes that are the most broken. Sometimes it's about targeting the low-hanging fruit in getting better results more quickly, and making the overall organization stronger."

Raytheon Principles of Manufacturing. RPM is a 45-step process that Mattingly and Packwood use to drive the implementation of leaner practices. "The journey is never over," states Mattingly. "RPM feeds MEM in that goals are set and a 100 percent is needed before establishing a new goal for that particular area of focus. This reinforces the fact that improvement is continuous and on-going."

Kanban systems like this feed improved part replenishment and visual factory initiatives.

Integrated Product Teams. IPTs are focused on improving communication amongst team members and keeping them up to speed on their area of concern, while also fostering a sense of responsibility for a given function or step in the Phalanx overhaul process. These teams are located adjacent to their production areas and reside in an open room to foster close interaction.

This structure creates an atmosphere where each employee is within arms' reach, and everyone hears what's being discussed at every stage in their area of responsibility. IPTs are broken down into four tiers that are integrated, but independent with a customer support leader, production program leader, design engineering leader and value stream leader that keep things flowing smoothly and with all of those facets in mind.

The Visual Factory/Workplace Organization. This encompasses the use of ergonomic work stations and the implementation of paperless workflow. The latter is facilitated via monitors throughout the facility that display instructions at each workstation, information displays on the work being done at a given cell and shadow boards for tool and equipment storage. Essentially, everything has its place and there's a place for everything that everybody can easily understand. The use of a Kanban replenishment system also feeds these initiatives.
"Our Six Sigma training was really focused on waste elimination," states Packwood. "One example was the de-trashing of the shop floor. Un-wrapping parts was wasting time and cluttering the production areas, so we moved that up-stream. It turned out to be a small part of what basically became a re-organization of our entire shop floor."

Monitors and shadow boards for tools are additional visual factory assets that help eliminate waste and keep the shop floor better organized.

This project not only adjusted work cell locations, but called for the purchase of several cranes and overhead lifts to save floor space and accommodate quicker transport from cell to cell. Mattingly also cites the creation and implementation of Parts Presentation Vehicles for helping to make each work cell more accommodating.

"By providing a customized PPV for a work cell, we're speeding up the transition from station to station in the overhaul process. The Phalanx has 35,000 parts, and we touch about 5,000 of them. These PPVs allow us to ensure quality component handling at all stages, which should translate to a better end product." Waste can also be reflected in time. So with this in mind, one of the operational focuses that fed the floor re-organization was a need to improve part picking times.

"We had inventory scattered throughout the building, so our pick lists were scattered," explains Packwood. "Now all parts for a pick are grouped together and placed closer to the work area. In coming up with this strategy we implemented a 7S approach. So in addition to sort, shine, straighten, standardize and sustain, we added security and safety. The end result was reducing some picks that took six days to four hours."

The Phalanx weapon system, ready for action.

Packwood and Mattingly also realized that a greater focus on quality should translate to a need for less inspection time at each phase in the process. "The nature of the work we do in overhauling the Phalanx means we're not really adding parts, just replacing them, so by focusing on better performance of the task at hand, we don't have to spend as much time with inspections," explains Packwood. He does, however, go on to state that each unit undergoes 400 hours of testing before they're sent out, including 50 straight hours without failure.

Perhaps more encouraging than all of the statistics and program implementations is

how employees have bought into the changes. Over 60 percent are certified specialists, having gone through a week of voluntary classes, and nearly 90 percent have had some sort of lean manufacturing/Six Sigma training.

The underlying theme for Raytheon during this whole process was “A Race Towards Lean.” Not only does this mesh with the area’s horseracing legacy, but it seems most appropriate when you consider that a race can only have one winner. This is a principle that the company’s customers on battleships around the world know all too well. And now their suppliers in Louisville are better prepared to offer more winning situations for a team where losses simply are not an option.

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