

A WINNING FORMULA

Autoliv's lean journey to becoming the leader in enterprise excellence.

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If ever there was a time and a place to leverage the power of lean, it's inside the facilities of Autoliv, the world's largest air bag manufacturer. From its global headquarters in Stockholm, Sweden, to its Ogden, Utah, facility, the company lives its motto, "Save more lives," each and every day, saving more than 30,000 lives and preventing 10 times as many severe injuries annually with its vehicle safety systems, including air bags, seat belts and steering wheels, as well as active safety solutions.

The business of saving lives, particularly within the automotive industry, has drawn intense scrutiny of late. The last few years have marked record-breaking automotive recalls, most notably an unprecedented air bag recall linked to faulty inflators manufactured by Takata. The recall underscores the

importance of the relationship between quality manufacturing practices and consumer safety.

"We ship approximately 700,000 air bags each week from the Ogden facility. We save lives, so we must do everything 100 percent correct every time," said Autoliv Lean Consulting and Autoliv Production System (APS) Manager Marie Turner.

In an unexpected move, several automotive manufacturers have asked Autoliv to supply replacement air bag inflators to their competitors' recalled vehicles — a testament to the company's reputation for quality. Over the next four years, the facility will grow by at least 9.4 million air bags. Yet, long before the news of defective air bags, Autoliv was honing its processes for a lean manufacturing approach that positively impacted its product safety, quality and efficiency.

Turner recently illustrated the importance of its work while hosting attendees of the 2016 AME Southwest Region lean manufacturing workshop at its Ogden facility in April.

"It takes 100 milliseconds to blink. It takes 20-30 milliseconds to deploy a car's curtain air bag and 40-50 milliseconds to deploy the front air bag. Autoliv's work, its success and ability to save lives must be precise," Turner said.

The publicly owned company currently has a 40 percent share of the air bag market. Autoliv Ogden Airbag had 20 production cells in 1995 prior to the start of its lean transformation. Today, with annual sales inching just past \$1 billion, it has 135 production cells and is making room for an additional 20-22 by the end of 2017.



Suggestion boards keep the lines of communication open between employees and management.

“Bottom line is that we are currently a \$1 billion plant and we will easily go to \$1.5 billion after the line expansion,” said Plant Manager Brian Hyde.

The company’s first quarter 2016 net sales of \$2.4 billion is an 11.8 percent increase over the same period in 2015. Sales of air bag products first quarter 2016 increased by 12.2 percent from the prior year.

“Our lean success didn’t happen overnight. We had pockets of success in the 1990s, but today, lean has allowed us to be less reactive and more proactive,” Turner said.

On solid ground

With 66,000 associates spread across 80 facilities in 27 countries, there’s no room for error. The company receives daily orders from 90 percent of its customers, and a single manufacturing sort for a customer error may cost the company as much as \$60,000.

As such, the company built the foundation for its lean model by studying the

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industry playbook — the Toyota Production System (TPS). In fact, between 1998 and 2001, Toyota sent Japanese production specialist Takashi Harada to work with Autoliv. That experience taught those who worked directly with Harada even more than Toyota’s recipe for lean.

Autoliv APS Coordinator Jim Bickerstaff recounted the time when Harada convinced him to try running his production cell using one-piece flow. Bickerstaff did not believe that one-piece flow was the most efficient way to run his cell, but agreed to try it for one week. His production cell had one machine that was notorious for breaking down on a daily basis when running one-piece flow, and thus he did not have the normal buildup of work in process after that station. This caused the entire cell to go down daily and caused the cell to have to work the weekend for the first time.

“The following morning, I told Mr. Harada that one-piece flow did not work because it caused me to work overtime,” Bickerstaff said. “Mr. Harada replied that ‘one-piece flow is the reason that your problem would never get fixed.’ His point was that if we are going to get better, we need to expose our problems and fix them.”

Hyde echoed Bickerstaff’s sentiments. “Harada never once told me what to do. But I was always busy because he was asking good questions. The solution I came up with was better than someone telling me what to do,” he said.

Tailoring Toyota’s lessons to its own needs, the company calls its lean approach the Autoliv Production System (APS), built on a foundation of five elements: teamwork, 5S, standards, muda (waste) elimination and total productive maintenance (TPM). Its foundation is

supported by three lean principles: just-in-time (JIT), quality first and employee involvement. The company refers to a plant as an autonomous manufacturing organization (AMO).

The Utah company — the only air bag manufacturer still operating in the U.S. — has implemented the principles of its APS model in all its AMOs, and has been recognized for its success. Autoliv has earned supplier awards from all the major vehicle manufacturers, as well as the coveted Shingo Prize for Excellence in Manufacturing at seven of its 12 manufacturing facilities in the U.S. and Mexico. Two of the seven facilities recertified in 2008.

A well-choreographed production

Inside the Ogden AMO, the sights and sounds of a successful lean practice are everywhere. Associates move about the facility with ease and precision, carrying out standard, repetitive work and changing jobs every 24 minutes for ergonomic purposes against the motorized hum of tugs moving inventory from one production cell to another at the same intervals.

According to Turner, a visual management system that contributes to that precision is key to the APS. Visual management tools fill each facility, including a swiveling, blue cube for each production cell, loaded with laminated and acrylic-covered charts and graphs with information that tracks the health of the cell at a glance and in detail, including cell goals, weekly communication sheets, job openings and even fun employee social opportunities, like the company’s popular egg hunt. Likewise, huge, color-coded monitors strategically hang above the floor to highlight abnormalities (something associates at all levels are trained to spot quickly), and mural-like images cling to the walls as APS reminders and

why it is important.

Virtually any process can be visually controlled, she said, whether it's cyclical or performed less frequently, including visuals for 5S and administrative tasks.

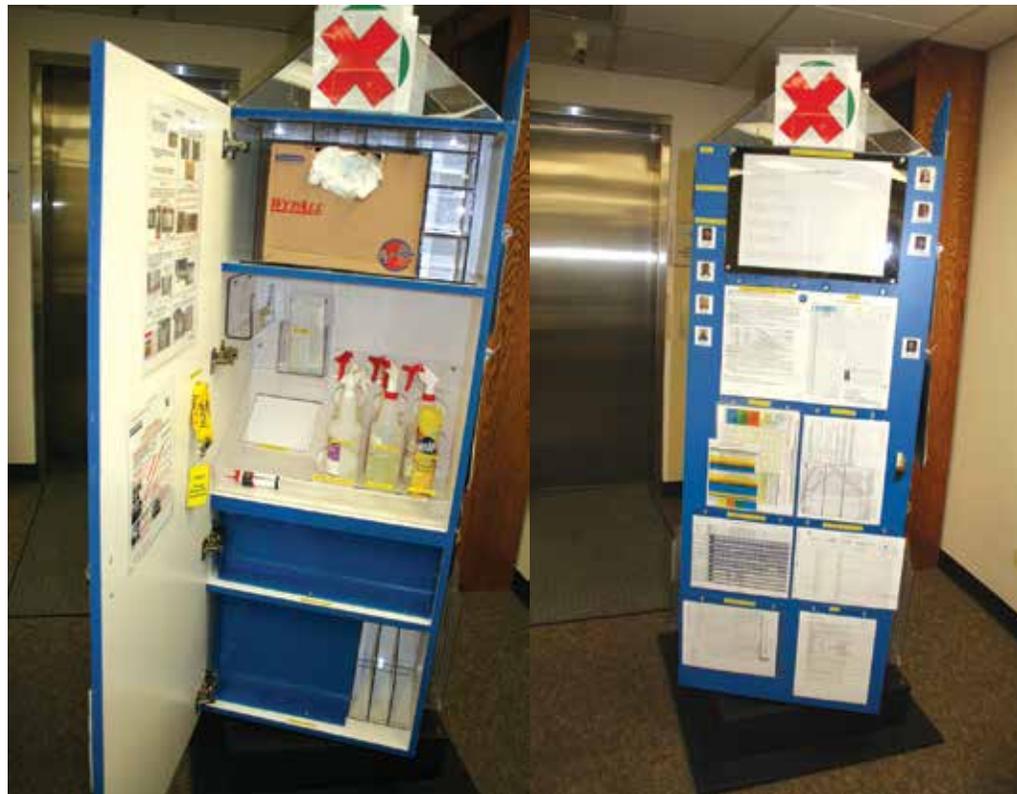
"Visual controls raise the level of accountability for all involved. At the same time, visuals push responsibility closer to those who actually do the work," Turner said. "The board gives the operator the information to be responsible for the tasks, and visible accountability for completing them. That's quite different from giving the same information to an auditor, thus making him or her responsible for it."

A winning formula

From the outset, the company created a culture of continuous improvement by creating the expectation, teaching all teams the principles of lean (APS), aligning organizational goals through policy deployment, regularly sharing company performance, encouraging suggestions, processing and implementing those suggestions quickly, following a visual management system and recognizing that all leaders are teachers.

"We constantly raise skillability by teaching everyone the principles of lean. That leads to permanently resolving process issues. When you teach, employees start questioning their processes more, do more problem solving and come up with more good ideas. We want everyone here to own his or her process. No one knows it better than the associates. This has been critical to our success," Turner said.

That success is apparent in a number of performance metrics. Tracking safety, quality, cost delivery and morale, the company has a 100 percent on-time delivery rate. Similarly, it has reduced its labor minutes per produced unit (LMPU) — the mother of all metrics — by approximately 6 percent every year over the last five-year period, outpacing its target of at least 5 percent annually.



Autoliv's visual management system includes items such as these swiveling, blue cubes highlighting important employee information.

Because the company's associates understand the importance of their work on consumer safety, they are trained to quickly and visually track anomalies. In return, the company verifies quality by leveraging Poka-Yokes (the Japanese term for error proofing) through cell line inspections, sensors and cameras.

Autoliv created five checkpoints to meet its high standards for quality and safety, including project planning, concept definition, product and process development, product and process validation and product launch.

Typically, it takes the Ogden manufacturer 18 months to launch a new product from start to finish, and allow for the time required to test and meet environmental standards. Each project uses an average of three to four machines, so reusing equipment gives way to considerable savings. To that end, Autoliv developed an equipment reuse database (ERD) to

look at what equipment the company can potentially reuse with a new project. It's become a valuable tool in bidding new projects because certain tooling cannot be reused, but control systems and ergo lifts can. It also helps forecast cell capacity. For example, one cell might only be used 40 percent of the time, so that would free it up to handle production of a new product. The ERD saves the company more than \$1 million annually.

Sharing lessons

The shift to lean manufacturing has been an outstanding success for Autoliv, so it's no surprise other companies are eager to learn the secret to that success. As a result, the company added a lean consulting division with a fee-based menu of consulting services to share its proven lean approach with others.

According to Turner, creating a sustainable lean transformation requires more



Nearly 700,000 air bags are shipped each week from Autoliv's Ogden facility.

than just using selected tools from the lean toolbox. It requires a complete management system makeover. The company provides lean tours, as well as on-site coaching to other companies. Turner said it's a powerful way to introduce these tools to employers of all types and sizes. The company addresses a broad spectrum of topics including lean management, worksite management, continuous improvement and simulated training.

Patricia Wardwell, director of continuous improvement Americas for Watts Water Technologies in Boston, attended the AME Southwest Region tour to learn the secrets to Autoliv's success.

"For many years, I had heard about its lean success and seen several presentations made by the company at various conferences," Wardwell said. "I wanted to go to their gemba to see for myself how it has implemented lean philosophies and methods, and how it has changed its culture."

In her role as a continuous improvement leader, Wardwell said it was a "critical next step" for her organization to "move to a more holistic approach to lean." Specifically, Wardwell was interested in strategies for driving improved behavior, standardized work, daily and visual man-

agement and problem solving.

"Seeing their methods will help me validate and improve some of the daily management work we are doing. Several of the presenters made it very clear that the boards used in their visual management system are important communication devices, getting everything out in the open, and surfacing potential problems very quickly,"

Wardwell said. "We have a tendency to rely on information stored on computers, and don't always share important issues or surface potential problems within our teams. I got many new ideas on how to make work more visual and how to manage visually from this visit."

Employee engagement

Autoliv is the largest manufacturing employer in Utah. Working at the plant is hard work, according to Human Resources Representative Hyrum Facer, but there's a certain staying power in return for how well employees are valued.

"Most of the time, when people leave Autoliv, the grass isn't necessarily greener on the other side," Facer said. "When you have great people working together in a safety environment, it's a unique kind of bond."

Like most companies making the lean transformation, there was some resistance early in the journey. But standardizing the work and a steadfast discipline to those standards helped ease the transition.

"It's not me pushing lean, it's them (the employees) pulling it," Hyde said. "We also realized early on that if we could implement our production associates'

ideas, we should just do it. We want everyone here to own his or her process. No one knows it better than our associates."

In fact, associates are expected and encouraged to submit three kaizens per month. Generally, Turner said if an employee submits a kaizen, it's a good idea, and if it's under \$1,000, management will likely do it. If it's more involved, it will require more consideration. While it could be rejected, Turner said that less than 1 percent of the kaizens are rejected.

Initial job training includes watching a video of testimonials from accident survivors whose lives were spared by air bags. It helps them understand that Autoliv isn't just an assembly plant, Bickerstaff said.

"We get one opportunity to save your life," Bickerstaff said. "That's why it's important that when we fold an airbag, we have a standard in place to get it right."

Incentives also help. The company keeps meticulous records on defects. Too much scrap signals an issue with either the machine or employee training. Conversely, the company is disciplined about its rules. For example, if an employee doesn't return from a break on time or doesn't do his or her required stretching exercises prior to the start of a pitch (or shift), it negatively impacts the line's ability to meet its goals, and prevents the entire team from earning three extra hours of goal-related PTO each month.

Ultimately, Turner said, the APS is not a means toward earning PTO. It's a means to keep consumers safe.

"Every four to five years, there's a new car on the road. We have to put a new bid on that business, while continuing to excel at quality and safety," Turner said. "Those aren't options, they're expectations. Drivers take that five-star rating seriously," Turner said. ●