

Autoliv: Know Why as Well as Know How

Patricia Panchak

When a plant wins a prestigious award, plant managers from all over suddenly start calling — they'd like to tour, benchmark, and discover its secrets. Managers at the award-winning facility are asked for interviews or to write articles for the industry press and to speak at conferences. Readers and attendees clamor for answers: What's the secret? What's the formula, the magic bullet that will pierce through the mumbo jumbo and get to the heart of what it takes to be a world-class production facility?

When several plants from the same company achieve world-class status, interest reaches a fever pitch. Not only must the company have discovered the secret, but learned how to translate it in multiple locations — even in multiple countries across daunting language barriers and cultural differences. Surely its leaders will be able to communicate their strategy to others.

In Brief

Autoliv plants regularly win Shingo Prizes hands down. The reason is that they create lean by emphasizing its intent, developing all people to see and solve problems. They sustain the system by using policy deployment to constantly reinforce it as a way of thinking and working. Results follow. This is almost the reverse of what most lean companies do.

Such is what happened to Autoliv North America (ANA) when several of its Utah plants won the Shingo Prize in rapid succession (Brigham City and Ogden in 2003, Tremonton in 2005, Promontory in 2006, and Queretaro in Mexico in 2007). One Utah plant hosted 96 tours in 2006. Tour demand became so great that the company created a consulting division and started charging a fee. But although Autoliv openly shares the company's philosophy, strategy, and tactics, using detailed anecdotes and examples, few managers who study the company's practices lead any plants to world-class status. Fewer still are able to implement lean throughout a multinational corporation's far-flung facilities. They can have a world-class plant in one location, but struggle to transplant that success to other locations.

Autoliv managers say that this experience reminds them of the Big Three studying the Toyota Production System (TPS) in the early 80s. They were stunned, so the story goes, that Toyota would allow its primary competitors inside to study its system. However, Toyota continues to outpace GM, Ford, and Chrysler. Most companies launch new initiatives, achieve a few improvements; then stagnate or revert to previous practices.

What did the wannabes miss? "They deployed what they saw, but they weren't that successful in getting the utility out of it

because they didn't understand *why* Toyota had created what they created," says Tim Ambrey, director of Autoliv Production System (APS), Autoliv North America (ANA).

"Know Why" is as important as "Know How"

"Know why" is the secret to Autoliv's success, though Ambrey doesn't call it a secret. Citing numerous books about lean manufacturing, he insists there is no secret to a successful lean implementation. But clearly Autoliv is on to something: Success is less from implementing lean tools than by creating lean understanding in every associate of the company through constant practice.

"The key to why Autoliv succeeds is that we have come to understand not just what to do, but why you want to do it; the true intent behind it," Ambrey declares. "We're good at taking the intent of the TPS and turning it into our own APS, and then using those tools to their ultimate intended result, rather than just copying the tools. The mistake that a lot of people make is that they copy the tools without making the work self-diagnostic."

Ambrey concludes that 'know why' is as important as 'know how.'

So how did Autoliv learn the "true intent" of lean manufacturing; then convey that true intent to all associates throughout multiple facilities spanning the globe? How has it sustained that effort through the years? Clearly, Autoliv has done something different.

First, understanding the intent didn't happen in a blinding flash. They had guidance from a master. Autoliv's formal introduction to lean came through its association with Toyota from 1998 to 2001. That's when Mr. Takashi Harada from Toyota's operational management consulting division lived and worked in Utah to educate managers at plants there. For three years, over a dozen managers spent four hours a week with Harada to understand TPS and to learn how to create their own system, APS. Significantly, "He never told us what

to do," says Charles Leishman, project manager for APS ANA. "Harada just taught us the correct principles, the concept, and watched to see how we applied it."

Since then, Ambrey says, Autoliv has been trying to disseminate what those managers learned from Harada to all its manufacturing facilities. He notes that the European component had similar experiences, but worked six or seven years with a different consulting group, headed by another longtime Toyota manager.

It also helps to have top management backing. After seeing the successes of the three Utah plants, "Management really jumped on board," Ambrey says. "That's when we started receiving direction from corporate to set rigorous goals, to standardize ourselves, and to understand how we fit into that." At Autoliv, "The COO is the No. 1 proponent of the APS within the corporation," he continues. "I've never been in a meeting with him, regardless of the audience, where he has not reiterated that top management must be on board with APS and will be held accountable for it."

Lean Intent

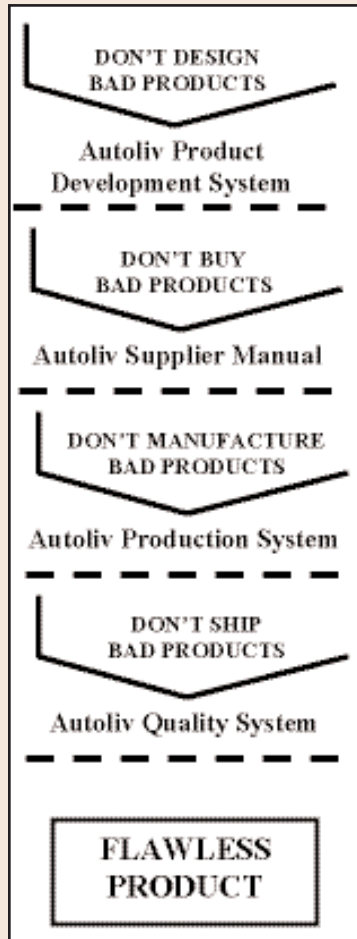
On the surface, Autoliv's creation of lean might not seem much different from dozens of other lean companies. What sets Autoliv apart is how the company uses policy deployment to promulgate the intent of lean in detail all the way to the work level:

Visual Management: First, and most obvious, Autoliv makes policy deployment of lean visual. Each plant features an "APS Wall" situated in a high-traffic location — the employee entrance to the plant floor or the lunch room. On this wall, standardized policy deployment documents are posted along with charts and graphs that track progress toward achieving the goals. In addition, each month associates' jidoka (or stop-and-fix) accomplishments are celebrated and APS Workshop (kaizen) success story boards are posted.

Autoliv refers to a plant as an *Autonomous Manufacturing Operation* or AMO. The plant manager and the AMO team establish objectives for the work site

About Autoliv

Our Path to "Zero Defects"



With headquarters in Stockholm, Sweden, Autoliv, Inc. maintains manufacturing and technology facilities in all major markets worldwide. Autoliv Inc. serves every major car manufacturer in the world from its network of 80 facilities in 30 car-producing countries. Autoliv develops, markets, and manufactures integrated safety systems including airbags, seat belts, safety electronics, steering wheels anti-whiplash systems, seat components, and child seats.

During 2006, Autoliv received a number of awards from customers, among them the Supplier Award for Achievement in Project Management from Toyota. In the entire world, over 90 percent of Autoliv's facilities are certified by ISO/TS 16949 (lean certification in the global auto industry). That's about 96 percent of total production. Autoliv can't get to 100 percent by this measure; they are constantly opening new plants.

The Autoliv Production System (APS), the focus of this article, is only one of Autoliv's systems which makes the company what it is. Other systems are shown at the left. Since Autoliv is in the automotive safety business, any product must work as intended any time it is needed. Product operational defects are extremely rare. Most defects are for something like a crooked label, and even then, Autoliv's customers will not tolerate a defect rate above 10 ppm for any cause.

All employees must understand their critical responsibility for zero defect safety products.

Adapted in part from the 2006 Autoliv Annual Report.

in order to attain the goals for the corporation. These goals and objectives cascade through the organization to the cell operator: the Autonomous Manufacturing Center (AMC), led by the operations manager, sets strategies to meet plant objectives. Autonomous Management Groups (AMG), headed by area supervisors, create action plans that describe how the group will carry out the center's strategies. Then the Autonomous Management Teams (AMT), led by team leaders, carry out the action plans. (See Figure 1.)

On the plant floor, close to where spe-

cific work is done, each AMC, AMG, and AMT also maintains smaller APS Walls dedicated to making visual the center, group, and team goals and progress. Reporting is specific to the unit's goals with a frequency that contributes to helping the unit achieve its goals. The smaller the group, the more frequent the reporting.

Most important, visual reporting is designed to expose problems to all associates, so they can be solved or escalated to the next management level for help in solving. For example, work at the cells is managed by team members using a rail-card



Within Autoliv, goal deployment has two purposes:

1. Communicate goals throughout the organization
2. Get everyone involved in kaizen.

Figure 1.

system, which makes visual the workload (which has been leveled based on two-weeks of orders). If the cell is behind and needs help, the team leader can go to another cell to recruit help; if they're ahead, the associates help other cells or spend time working on an APS workshop. The rail-card system also alerts both cell associates and managers whether Saturday overtime will be needed. Also, managers can

see at a glance whether the cell is working to plan and offer to help when needed.

Standardized Work: Each Autoliv plant uses a similar very detailed, documented process for policy deployment, execution and follow-up. Foremost, each plant uses standard documents to describe and track progress toward reaching corporate goals. Most of the items posted on the APS Walls use standard document formats used

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are funda-
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APS.
"Without
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dards there
are no stan-
dards."
Kurt Hallesy,
Plant
Manager,
Brigham City
Facility**

throughout Autoliv. Examples are the design of the document that lists the unit's goals, the board tracking associates' kaizen suggestions, and the workshop Success Story Boards.

Each day begins with a series of meetings. AMT meetings are first at the start of the shift. They escalate in succession to the AMO meeting. Each meeting follows a standard agenda to be sure that all important issues are addressed regularly — each shift, daily, weekly, monthly, and quarterly. Nothing slips. All meetings are on the plant floor, standing up next to the relevant APS Wall, so all the information to be discussed is readily available. Because of the standard agendas, meetings are brief and can identify problems or exceptions to plan that need to be addressed. These standardized formats assure that by 8:30 a.m. every associate and every manager has reinforced his or her commitment to lean, reviewed a lean concept, tracked progress toward goals, identified problems, reported the solutions to previous problems, and escalated any problems that require managers' assistance. This emphasis daily reinforces APS itself.

During each meeting, the meeting leader fills out a standard report form, listing issues that attendees agreed needed attention. At the end of the meeting, the form is photocopied and sent to attendees as a reminder that assignments made at the meeting will be followed up at the next one. Nobody has to take the time to write up meeting minutes.

Also, each day APS coordinators conduct audits throughout the plant, at predetermined times and intervals (which vary by the product being made, customer requests, etc.).

In each cell, every step in the production process is standardized in job breakdown sheets, right down to the actual movements. "Not just "fold the bag," but, "grab the right top corner with left hand and pull left . . ." *Both the changes to work methods and the documentation of the new job breakdown standard are performed by the associates who do the work.*

"We really have good standards," says Yoana Avila, an AMT leader in Molding at the Airbag Module Facility in Ogden. "I've worked at three different plants, and it's the same for everything — they have the same steps, the same paperwork. Even if I haven't done, say, a 5S audit at Brigham City, I could do one there."

Even plant management works from a standardized work plan. Each manager prints and works each day from a standardized daily things-to-do document. The document lists daily and monthly follow-up items, such as "Conduct AMG one-on-one," "Go-and-see each AMG," and "Update Standard Work Audits." The manager's standardized work document also includes areas for meeting notes, work-cell audit comments, and daily cell notes. Each cell's goals and progress status are also conveniently printed on the document for reference.

For global best practice sharing, the difficulty is "how do we make standards known and accessible," Leishman says. In addition to quarterly regional APS Forums, Autoliv maintains an intranet site where users can "click on any topic to find the corporate-approved standard." He notes also that transfers between plants in Utah facilities and even within North America are "perhaps more than you would see in other plants." Because some Autoliv plants supply others, managers somewhat regularly move from a supplier facility to a customer facility, which promotes sharing of best practices.

Continuous Improvement: Some variation exists, however, as new practices are tested and new standards are agreed upon. Kurt Hallesy, plant manager of the Brigham City Facility notes, "In spite of the near-regimentation of the plant activities, you won't see everything done the same exact way," he insists. "You see the same philosophy."

Fred Wasden, director of APS Consulting, ANA adds: "Change is part of the culture. Change is expected. If you're not changing, we get uncomfortable." What sets Autoliv apart is that the managers understand the tension between standardization and change. "How can you stan-

dardize without strangling flexibility and innovation?" Wasden says. "It's at the core of understanding lean."

At the global level, too, variations are inevitable, says Leishman: "When you standardize on a global basis, it's harder to make changes to it, it takes longer to come to a consensus." Autoliv's process for coordinating global standards also sets it apart from most lean companies.

Plan, Do, Check, Act (PDCA): Perhaps most notable is Autoliv's PDCA approach to policy deployment that keeps everyone on track. Reviewing progress toward goals and action plans — the usually forgotten "Check" part of the cycle — is critical. "Where Autoliv is stronger, or has some positive processes, is a rigorous system for management follow-up," Wasden explains.

"We have one-on-ones every week. The plant manager meets with his staff for a weekly gemba shop floor review, where we discuss issues that are coming from the shop floor and what things we need to support proactively," he explains. "This one-on-one review cascades: managers have one-on-ones with supervisors and supervisors with the team leaders every week."

Also, each month, the plants hold an Action-Plan Review with each department, an Action-Plan Wrap-up with plant leaders and a goal review with each manager. Everyone's performance, including that of all workers, also is reviewed quarterly.

Standard meeting agenda items and managers' daily work plan activities are designed to check whether work is completed according to APS, then to act to get it back on track, if needed. "We've all been in situations, where the plan is created, but there's no follow-up," Wasden says. Standard work for managers assures that as reality exposes itself, they change their actions. Also he points out that systemic management follow-up ensures that management doesn't "inflict standards unless they, themselves, commit to following them."

A key point added by Leishman is that Autoliv managers "check for understanding, not just compliance."

Employee Empowerment: Though it would seem that extensive standardized work and rigorous management follow-up would leave employees little ability to affect change, the opposite is true. Employees are more empowered. "All of the plants are deemed to be self-running or autonomous," Ambrey says. "They have everything they need to run their business as a sole business entity." Likewise, all AMCs, AMGs, and AMTs also run autonomously, befitting the name of each group.

Standardized work and standardized follow-up makes problems visual, so associates can solve them; it pushes problem identification and solving closer to where the work is being done, by the people doing the work.

At the cell, standardized work changes continually. "If this process hasn't changed, then we're not doing it right," Wasden says.

Policy deployment ensures that associates engage in process improvement. Corporate goals cascade to each cell. There the associates themselves create action plans that require a high level of involvement in lean practice and problem solving. Development goals for each associate include serving on a specified number of 8D workshop projects and suggesting a certain number of process changes.

Indeed, the strength of Autoliv's lean implementation is strengthening the employees' understanding of lean by "getting more and more people to see problems, and more and more people to solve them, and in involving everybody to make their processes better," says Wasden. "There's no way that the handful of managers can do as many improvements as hundreds of associates."

Go and See for Yourself: Still, says Ambrey, "there's a lot of guidance involved." Success centers on having managers on the plant floor. "Management on the shop floor is really consistent across all of our plants," says Todd Howell, APS facilitator, ANA. "A weaker facility is usually indicated by a lack of management on the shop floor."

Managers on the shop floor achieve many important policy deployment goals:

They are there to verify that associates are continuing to work according to a standardized work plan, to teach and encourage, as well as to better learn the work process first hand. Also, two-way communication is established: They ensure that what is learned at one cell is communicated to other similar cells at the plant and at other plants throughout the world, called "Yokoten." Often the floor managers' role in Yokoten is simply to remind the associates to tell other cells, or perhaps to suggest additional cells that might need to be made aware of a new practice.

"It's too easy for managers to think they know everything," Wasden says. We need to get away from what we call the "PA approach" to policy deployment, he adds, referring to announcing new initiatives over the public address system. "The manager needs to go to the source, the plant floor, the cell, to understand." Go-and-see and the managers' daily standardized work plans ensure that they do.

Continuous Learning: Policy deployment also promotes Autoliv's employee education. As the associates work toward achieving their goals, they must also study the basics and intent of specific lean tools. Employee development derives from Autoliv's perennial five categories of focus for each plant: quality, cost, safety, delivery, and employee morale. Autoliv calls these "the five missions of the work site."

Employee education begins with a three-day orientation on basics — learning the lean philosophy, terms, and tools, as well as spending some time building parts in a training cell. Throughout the world, each new employee is given a 40-page book that both describes and explains the intent of APS and its primary components. Translated into over a dozen languages and employing easy-to-understand graphics, this book ensures that all new Autoliv employees begin with the same understanding of APS and its importance to Autoliv's and the employee's future success.

Continuous learning is the heart of APS. It follows seamlessly from standardized work, on-the-job training, and consistent follow-up. Each meeting — indeed

most encounters between facility personnel whether management or associate — reinforces APS. All associates attend APS Forums for sharing knowledge. They participate in the APS workshops, which primarily create knowledge. When they describe their work in the Forums and in Monthly Wrap-up meetings, associates enrich their knowledge of APS. Following lean teaching philosophy, "students" describe, in their own words, what they've learned. Teaching not only demonstrates that you've learned, but deepens the learning.

In addition, all ANA facilities have "monthly topic-focused training," a review of a particular lean concept throughout the month. The goal is to study some aspect of every lean concept at least once per year. During that month every regular stand-up meeting will briefly review that concept. The newsletter features articles on the topic.

Asked if the continual review gets boring for long-time associates, one associate says, no, because the associates' perspective on the topics changes. "You look at a different aspect of it as it relates to the problems at hand, and the problems are different each year."

Additional formal training also is delivered to smaller groups of associates through APS University (APSU). There associates who've been recommended by their supervisors attend a program that runs two hours, once a week for nine months. The coursework involves classroom instruction, reading assignments, games, and hands-on workshops — "make it stick" activities, says Howell, who started APSU. More important, APSU students learn to teach the concepts by "teaching back to the class" what they've learned. APSU thus solves the problem of having "a few people with lots of lean knowledge, and lots of people with a little knowledge," Howell says. Graduates of the program are important. They help teach others the monthly topic as well as the understanding of lean concepts.

Leishman notes that this is not training in the usual sense. It raises each person's level of understanding so they can

more fully utilize their creativity and resourcefulness through APS.

Dozens of Other Examples: APS execution across multiple plants across the globe has deeply embedded APS into Autoliv's corporate culture. It's impossible to recount all APS practices, let alone its benefits to each plant. Suffice it to say that the company practices dozens of lean principles that lean adherents would readily recognize, but emphasizing tools and practices — or even their benefits — would divert attention from the core reason for Autoliv's success, learning why as well as how-to.

After nearly a decade of learning, implementing, standardizing, and changing its lean implementation throughout the globe, Autoliv has attained a level of excellence that few other companies match. Still, the managers who oversee the company's lean efforts balance their pride in the company's accomplishments with the knowledge that more work remains.

Coordinating Global APS

Worldwide, Tim Ambrey, director of APS for North America, has peers in Europe, Asia-Pacific (except Japan), and Japan. All four report to the COO. They meet quarterly to share learning and best practices, and to facilitate the development of global standards.

Each of the four directors conducts a quarterly APS Forum in their region to regularly and consistently promote the exchange of ideas. All plant managers and APS coordinators from a region convene at a host plant, which demonstrates its progress in meeting the APS intent, and in following the APS manufacturing vision. All four directors attend each others' regional meetings, both to assess the host and to learn the best practices created there. Thus each new best practice is regularly translated into new global APS standards.

For example, the four directors agreed to promulgate a global standard for APS Workshops (kaizen events). Tim Ambrey defines a workshop as "a proactive approach to address a specific issue that

needs involvement of plant management through the workforce." Autoliv associates follow a standard approach conducting a Workshop: Planning starts with filling out a form: Why this workshop? What part of APS does it support? What is the target improvement? What training materials from the APS text or database will be employed? Determine the duration, identify participants, and choose the problem-solving tools to use. Then the workshop teams schedule "intensive days," targeted times when selected participants dedicate part or all of their day or days to work on the specifics of the process. Once the issue is addressed, the team presents the results in a standardized "Success Story Board" format at the monthly "Plant Action-Plan Wrap-up Meeting."

For the past four years, each plant selects its best workshop of the year and sends the team who conducted it to Autoliv's annual LIFE Expo (for Leading Improvement for Excellence). The winning workshop teams from each plant present their workshops to each other, as well as compete to be chosen the best in North America. These workshops epitomize Autoliv's approach to lean implementation; they focus on employee education, problem solving, innovation, teamwork, cross-functional cooperation, and idea sharing.

One example of a potential standard being considered by the directors is to establish a corporate scorecard, a report card by which every plant throughout the world would be evaluated. Another is to standardize the labor reporting metric, labor minutes per unit (LMPU), that all the plants use but calculate differently. The actual calculation of LMPU is "fairly open to interpretation as to where and when it incorporates support people," Ambrey explains. "One of the things we've been working on is figuring out how best to standardize the rules and equations that give you that number, so as to compare data from all the plants, knowing full well that it's been generated in the same fashion."

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What is Hoshin Kanri?

"Hoshin kanri means 'policy deployment.' It starts with high level objectives and then cascades these objectives down to every function in the organization . . . a give-and-take process of communicating between top to middle management and sometimes supervisors and team leaders. One of hoshin kanri's great strengths is its ability to translate high-level, executive-level goals into quantitative, achievable actions. Simply put, policy deployment is a system that encourages employees to analyze situations, create plans for improvement, conduct performance checks, and take appropriate action . . . Every policy deployment chart ends with measurable objectives, measures, and a point person responsible for achieving the results."

Excerpted from *The Toyota Way* by Jeffrey Liker.

Autoliv's Hoshin Kanri

Autoliv's lean Hoshin Kanri (policy deployment) begins at the executive level. Ambrey and the other regional directors work with Autoliv's president and COO to establish a three-year APS plan for ANA based in the Autoliv Manufacturing Vision. This vision parallels the corporate strategic plan, but focuses exclusively on the implementation of APS — with no financials associated with it. Regional plans are coordinated, but vary depending on each region's needs. Those goals are then translated by the directors and plant managers into yearly objectives for each North American plant.

Ambrey compares the process of creating a year's plan to choosing chapters from the APS text book. All the printed information about APS is the text book, he explains, but "you can't just throw the text to the individual plants and say, 'Here it is, go to work.'" Instead, he says he selects various bits of information each year, based on the previous year's plant assessments and the current year's corporate goals. Once the plan is set, Ambrey says, "We're going to follow up through structured visits to the manufacturing plants, which are typically two-day events, and see if the associates are showing intent and following the system."

Autoliv uses policy deployment not only to disseminate lean principles, but to gauge understanding and use-with-intent

of lean tools. Explains Fred Wasden, "Our North American president has set out three goals that cover all that we do. These goals center on customer satisfaction, shareholder satisfaction, and employee satisfaction. They are established yearly, but, because they are overriding themes, the goals continue year-to-year. Just the targets are redefined."

Ambrey and plant managers then translate those goals into specific achievement levels for each plant.

At each level of management, from corporate to cell operator, associates are told: "This is what we need to be successful, you guys make it happen," emphasizes Howell.

Ambrey emphasizes that the goals are focused on *perpetuating* APS, not on achieving the corporate financial numbers or even the operational metrics. Though each plant reports ten Operational Performance Indicators (OPI) to corporate each month, "We're not working to change a number when we're working on the factory floor," he emphasizes. "Ultimately those numbers relate to what I do. But what we're trying to do is affect the actual physical flow of product on the factory floor, which will ultimately roll up into statistics that roll up to the OPIs."

Understanding the Intent

Wasden, who is also operations manager of the Ogden facility, visibly winces when leading visitors to the APS walls, where the plant's "dirty laundry" is on display. He remembers his apprehension at showing a Toyota representative the wall. Looking over the charts that clearly showed areas that needed work, the representative nodded appreciatively, Wasden recalls, and said: "Wasden, you're finally getting it."

For Wasden, the encounter reinforced the true intent behind lean on a very practical, plant-floor, level. "It's not that hard to understand, but it's hard to do," he says. "It's about making problems visual and then having employees ready, willing, and able to solve them."

Ambrey is more philosophical. The

system, he says, isn't created by the implementation of tools. It's created, little-by-little, as problems are solved: As problems are identified and solved using the appropriate lean tool for the right reason, the APS system is built and refined. Best practices are celebrated, shared, and standardized, even as each new standard will uncover yet more problems to be solved. Leishman points out that Autoliv's lean policy deployment launch even had a false start: At first corporate goals were too specific, leaving little goal-setting for the associates closer to the work to do. "We were just repeating what corporate said, rather than setting our own goals to achieve the corporate goals," he says. When corporate understood that and set broad goals, policy deployment became effective.

Autoliv's global lean deployment is successful because Autoliv managers didn't simply install a lean approach at their facilities; they never cease creating an environment in which the lean philosophy takes

root and grows. They applied lean principles to the policy deployment process itself. Indeed, Leishman says, Autoliv "made the managerial portion of lean deployment as much of a system as the production system." With a deep understanding of lean principles and the "why" behind lean tools and works, and guided by policy deployment practices that are as rigorous for the managers as they are for the associates, Autoliv has found a way to successfully implement lean throughout its facilities throughout the world.

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