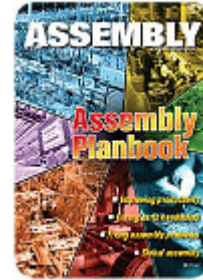


## Low-Tech Fixes Can Solve Pesky Problems

by Austin Weber

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Sometimes, it's better to keep things simple. That's true whether you're baking a cake, throwing a football or walking on a tightrope. In the world of manufacturing, the best remedy to pesky production problems is often the simplest, rather than more complex or expensive alternatives.

Assemblers in many different industries solve problems every day by turning to low-tech answers, such as retrofitting a common household object. Some manufacturers have even turned it into a strategic weapon.

"Most companies have a few big problems and thousands of small, irritating problems," says Quarterman Lee, president of Strategos Inc. (Kansas City, MO). "The cumulative effect of the small problems is often greater than the effect of the few big ones. This is a real gold mine, but the 'gold' is scattered in small specks all through the river bottom."

Often, some of the best solutions to plant-floor problems come from the employees who are nearest the bottom. Many simple ideas are the brainchild of operators, who often have the most productive and cost-effective fixes.

"First off, they are closest to the problem, having to deal with it every day," says Don Penkala, president of Granite Bay Consulting Inc. (Granite Bay, CA). "Second, operators are often frustrated by the red tape involved in getting approval for implementing ideas, so they are likely to devise simple solutions that they can self-implement.

"These quick fixes don't involve capital expenditures and lengthy approval processes," adds Penkala. "They can serve as a creative outlet for operators who have limited decision-making authority in a repetitive production environment."

"Nearly every manufacturer has creative plant people who take great pleasure in solving problems in unique ways," says Kurt Greissing, product marketing manager for manual production systems at Bosch Rexroth Corp. (Buchanan, MI). "They are the experts. They work day in and day out in a particular area and, if empowered to do so, will eagerly find ways to improve processes.

"A little lean training, which typically includes an invitation to find such opportunities and to improve things, can go a long way toward unleashing your employees' power," claims Greissing. "[In those environments] it is fairly typical to find low-tech fixes ranging from unsafe haphazard machine guards to sophisticated reconfigurations of manufacturing systems."

Simple solutions can be extremely effective if operators have sufficient understanding of the equipment and the process. Good troubleshooting and team skills will also help ensure that a low-tech fix on one end of an assembly line doesn't create unforeseen problems elsewhere.

Jamie Flinchbaugh, partner in the Lean Learning Center (Novi, MI), calls the process of fabricating something that doesn't exist in the marketplace creativity before capital. "We see a lot of companies doing it, but few of them develop the resource as a strategic capability," he says. "On the other hand, companies can decide to throw resources at a problem, but they may end up going bankrupt in the process."

## Kaizen Teian

Most people have heard of the word “kaizen,” but fewer know what kaizen teian means. Kaizen is a commonly used lean manufacturing term that means “continuous improvement.” It refers to small, incremental improvement of an activity to create more value with less waste.



A kaizen event is a highly focused, action-oriented workshop that typically involves a team of five to 15 individuals. It usually lasts three to five days. The goal of a kaizen event is to concentrate on improving one specific process.

Kaizen teian is another Japanese term that means “continuous improvement proposals” or improvement through suggestion. It focuses on participation rate, rather than the value of specific ideas. The emphasis is on encouraging individual operators to continuously make improvements. Kaizen teian suggestions are usually small-scale ideas confined to the operator’s workcell that are easy, cheap and quick to implement.

“Taiichi Ohno [the father of lean manufacturing] used to say that the Toyota Production System comes from the continuous search for the root cause,” says **Sammy Obara**, president of Honsha Associates (San Diego). “Kaizen teian relies on finding the root cause and standardizing the solution.

“W. Edwards Deming said that 40 percent of our work does not add value,” says Obara, who spent 3 years studying lean manufacturing principles at Toyota City, Japan, and another 10 years applying it at Toyota Motor Corp. (Nagoya, Japan) plants in Brazil, Venezuela and the United States. “If every operator has half of his work not adding value, then it is a natural outcome that operators with trained eyes can find and eliminate waste where they have their hands on.”

Toyota encourages its operators to continuously make quick and easy improvements. When Obara first joined the automaker in Japan, his boss required him to implement five kaizens every day. “It was just a short time until I learned that my mind had to be constantly alert and aware of opportunities to eliminate waste,” he recalls.

While kaizen teian is a simple philosophy, it can be difficult to implement. Obara says he sees the same initial struggle in every company that attempts to implement the philosophy.

“People can’t seem to think small and incremental kaizens are better than the breakthrough, home-run kaizens,” explains Obara. “To break this paradigm, it is imperative to do solid training, focusing on areas such as how to make waste visible, how to reduce the visible waste, and how to make sure it doesn’t come back.

“It is crucial to demand daily kaizens,” Obara points out. “Only after people understand that kaizen is a daily thing, can they understand that there is no distinction between work and kaizen. If they are required to do at least one a day, then they will know kaizen is small and incremental.

“If you require one kaizen a year, then it becomes a project or an event,” adds Obara. “This can be misleading to people. The same people who are hands-on are contributing to adding half of their work in wasteful activities.”

An alternative form of kaizen teian is called “quick and easy kaizen.” It was developed by Norman Bodek, president of PCS Press Inc. (Vancouver, WA). According to Strategos’ Lee, who recommends it to his clients, it is “probably the best organized approach.”

Quick and easy kaizen is based on Toyota’s model, combined with elements of the old-style suggestion systems. In this approach, suggestion forms are boiled down to a small index card

and are very simple. Each suggestion should be something that the operator or his supervisor can implement themselves.

“The supervisor has the authority to just do it,” says Lee. “Operators are asked for at least one suggestion per week and encouraged to implement it without any elaborate approval process. The result is hundreds or thousands of small improvements that actually get made.”

## Simple Solutions

Examples of low-tech assembly solutions differ from company to company. “It varies significantly, even in companies with long-standing lean initiatives,” says Kirk Paluska, a consultant with the Lean Transformations Group (Hartford, CT). “Usually, it takes several years of a lean initiative before you see this sort of activity occurring without soliciting operators.”

According to Kevin Duggan, president of Duggan Associates Inc. (North Kingstown, RI), tapping into operators’ knowledge can provide a wide variety of grassroots solutions. “I’ve seen operators bring different types of tools from home, such as things they use in their garage or items used for a hobby,” he explains. “One time, I saw someone bring a lazy susan from her kitchen cupboard, which she modified as a tool storage bin. If you empower operators to think, they’ll come up with all sorts of quick, simple, easy solutions that add flow and add value.”

It often depends on how comfortable operators feel with the kaizen teian concept. Typically, it is easiest to implement within a manual production environment, where operators regularly use tools, fixtures and material handling devices. Many of those items can easily be modified or retrofitted, unlike robots, conveyors, parts feeders and other types of automated equipment.

“It’s easy to integrate one-off solutions in this type of an environment, where you can tweak individual activities,” says Flinchbaugh. Small modifications, such as adding a bracket here or a guide there, can be done on an informal basis.

Many operator-inspired changes involve visual thinking, such as labeling a gauge a certain way or painting a parts cart red for “hot” jobs. Sometimes, adding simple visual cues on a jig or fixture can improve parts alignment. Colored tape can be used to indicate acceptable tool operating parameters or to indicate replenishment levels for fasteners, washers, springs and other consumables.

“A simple example that I remember from Toyota was a gadget we made out of scrap material that resembled a hub-spoke wheel about 4 or 5 feet in diameter,” says Obara. “It was a kaizen to reduce the waste of motion in the wire harness assembly line. Instead of walking back and forth along the cutting board, the operator would clip the end of the wire on the wheel and roll it some 20 rounds and then cut all 20 wires all at once.”

Another time, Obara says he saw an operator use a salt shaker from the company lunch room to solve a maintenance problem. “The operator positioned it outside a welding machine so that lubricant would pass through the salt,” he explains. “That allowed him to visually see when the lubricant was getting older and darker in color. That was something the maintenance department would be responsible for in most plants, but in this case, the operator took the initiative.”

Obara also recalls how he once witnessed a Toyota operator reduce takt time by making a simple modification to a battery installation workstation. “Each time a new vehicle rolled past, it took 15 or 20 seconds for a crane to lift a battery from a cart on the floor and place in inside the hood of the vehicle,” says Obara. “By placing the battery on a platform that was at the same height as the car, he eliminated those 15 or 20 seconds of wasted vertical motion.”

Paluska remembers an operator who once brought in some wire cutters that he found at a local garden supply store. “They were better and cheaper than what he was using before,” he points out. “Another time, I worked with a manufacturer that was having problems with oily parts coming out of a machine. One of the operators brought in a plastic colander from her kitchen,

which allowed the oil to drain before the parts were handled.”

Modular aluminum framing systems provide a good way for operators to come up with creative ideas, especially when it comes to workstations or material handling applications. “[At manufacturers that] have adopted aluminum framing systems as the main structural element for machine bases, guarding and fixtures, you’re more likely to find a low-tech fix, because it’s easy to unbolt an existing structure or bolt extra parts to them,” says Bosch Rexroth’s Greissinger. “Steel weldments are substantially harder to modify.”

Greissinger has also seen aluminum-frame based fixtures made from left-over components from other projects. “These fixtures may be tool holders at the end of robot arms, air conduits for supplying air to tools along a bank of workstations, or fixtures to hold a product in place while assembly work is performed,” he explains.

However, engineers should avoid implementing low-cost fixes simply because they’re low cost. “It’s important to make sure that ergonomics, safety and productivity improvements result from any low-tech fix,” warns Greissinger. “Otherwise, it’s not really a fix.”

Some manufacturers make it easy for operators to put their ideas into action. “They operate ‘magic shops’ that can quickly turn around a concept idea without a formal work order,” says Duggan. “They’re often staffed by a carpenter and a machinist who are assigned to the shop for a designated amount of time.”

Boeing is a good example of a big manufacturer that believes in reaping the benefits from low-tech solutions. The company has developed in-house “moonshine” shops that prototype equipment, then actually build devices and put them into production.

According to Mike Herscher, lean enterprise office leader at Boeing Commercial Airplanes (Seattle), the term “moonshine” is derived from the days of Prohibition, when individuals illegally made their own liquor, usually late at night. “They used inexpensive materials; borrowed, adapted and made their own equipment; and adopted the best ideas and methods,” explains Herscher. “Our ‘moonshiners’ brainstorm ways to develop space-, time- and cost-efficient equipment.

By using homemade devices, Boeing has saved millions of dollars. Employees who staff the moonshine shops are chosen for their ability to think outside the box. Herscher says they tend to be individuals who enjoy taking apart motorcycles or repairing mechanical watches and clocks in their spare time.

Boeing annually sponsors a Moonshine Wars competition, which pits people and ideas from different plants. The winning team last year received a week-long trip to Japan to hone their lean manufacturing skills.

## **Operator Involvement**

Managers and engineers play a key role in engaging and encouraging operators to participate in problem-solving activities. But, sometimes, that’s easier said than done, especially in union shops.

“Operators have an implicit peer pressure to stick together,” says Obara. “One who goes a step further than their job description is perceived as an outsider, and that keeps some operators from wanting to do more. Once you establish a mechanism of recognition and reward, which do not mean the same thing, then operators have a safe reason why they want to do more. Their negative peers can’t argue against a concrete motivation, such as perks or gifts.”

While many U.S. manufacturers still use traditional suggestion schemes, they have generally not been very effective in engaging plant floor personnel and generating productive ideas. “Traditionally, innovative thinking was criticized and frowned upon in manufacturing,” says Lee. “There were always many reasons not to do something. As a result, suggestion programs were

not very successful in American manufacturing.”

According to Don Penkala, the trend is definitely moving “toward encouraging self-implementation of ideas. But, the leadership team must make a compelling case for increased plant competitiveness and ask for support from all employees.

“They must be visible in the plant on all shifts and in all areas to ask questions and understand the real concerns and challenges that operators face,” says Penkala. “Supervisors and team leaders should conduct brief team meetings with their operators to discuss solutions to problems and get operators to think differently about their processes.”

Eventually, Penkala says operators will begin developing solutions individually and in groups. “When done correctly, this method is effective at accelerating goal achievement and building operator ownership and commitment to continuous improvement,” he claims.

Penkala believes operators should be recognized for their ideas, which can take many forms. Many people think that ideas should be rewarded financially. However, in a true lean organization, recognition is even more important than money.

When he worked at Toyota, Obara says operators received a “prestigious gift” for their ideas, such as Toyota-branded merchandise, during a plant-wide celebration of kaizens. “Sometimes, even a key chain with the company logo would get people excited,” recalls Obara, but that was on top of small monetary rewards and verbal recognition.

“Toyota does [hand out] monetary rewards, but it is just a fraction of what Western companies give,” says Obara. He advises companies to initially reward kaizen teians with gifts and merchandise. “This is better than starting with monetary rewards,” claims Obara.

At Toyota, responsiveness is almost immediate. “Within a day, you would get feedback from your superior,” recalls Obara. “The rewards and recognition, however, would come only after the proposals had been evaluated, graded and recorded, which could take around a month.”

Toyota operators use a special form for submitting personal kaizens for rewards and recognition. “They are simple to fill out and they encourage people to use before-and-after photos in a standardized layout,” explains Obara.

The three main fields in the form are: Before, After and Effects. In the Before section, operators need to show the root cause of the problem and include a photo. For After, operators must show the standardization on the solution and a photo. Under the Effects heading, Obara says “you need to show the results in a measurable form, if possible. When eliminating waste, measuring is typically easy to do.”

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