Waste-Zapping Ways at ESCO Corporation, Portland, OR

Brainstorming, breakthroughs, and debugging using kaizen concepts.

Lea A.P. Tonkin

Rewriting the book on their jobs, ten operators at ESCO Corporation's Plant #3 joined forces with ten "outsiders" during a recent AME Kaizen Blitz[SM] to blast time and other wastes out of shell foundry operations. Kaizen (continuous improvement) efforts at the facility had already chopped plant throughput time by more than 30 percent during the previous year. Impressive results from the five-day blitz event included a 40-50 percent reduction in space requirements,[1] setup reductions,[2] and 5S improvements.[3] Plant #3 employees produce wear parts for construction equipment (see the box, "About ESCO Corporation").

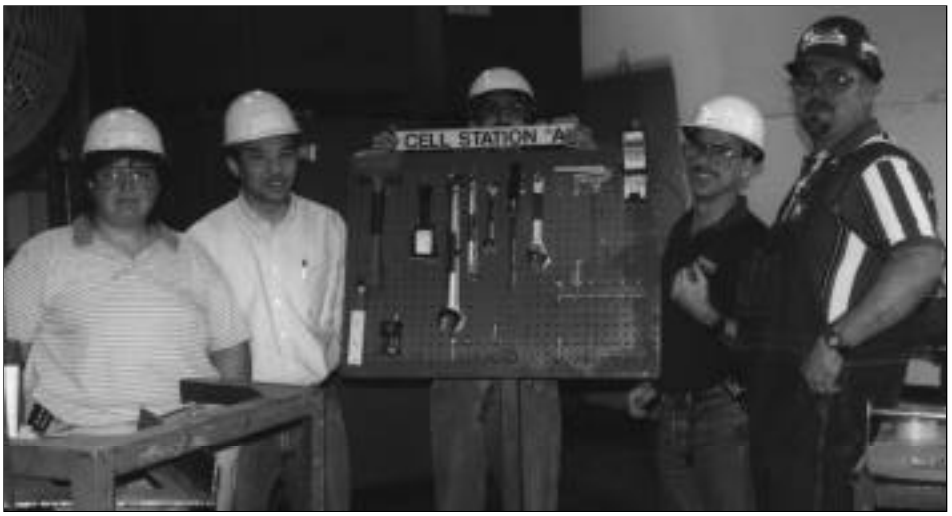

Figure 1. *Setup team members at ESCO Plant #3 showcase some of their workplace organization handiwork, with their tool board; left to right, they are Charlene Jaehne, Dean Nguyen, Joseph Andrews, Tim Chase, and John Brown.*

Blitzers split into three teams, working concurrently on setup-SMED (single minute exchange of die); standard work; and work flow, explained Dale Gehring, Plant #3 manager. The non-union ESCO blitz participants from the work area (selected by their peers) included maintenance, mold, and core area employees. (Blitz photos are shown in Figures 1-6).

Leadtime Reduction and Cell Formation

"Their combined effort in the mold and core area resulted in trimming six days out of the overall leadtime to produce a mold," Gehring said. "The time savings came from

About ESCO Corporation

Innovation's a way of life at Portland, OR-based ESCO Corporation. The company's foundry operations started when Pacific Bridge Company's Charles Swigert recognized a need for locally-produced steel castings. He launched Electric Steel Foundry Company using a novel, imported electric furnace. ESCO (first using that name in 1926) turned out locomotive parts used by timber operations and sawmills. The company continued to develop new products and products through the Depression. Then ESCO began selling and distributing stainless steel plate and other products through its Steel Distribution Division.

After World War II, ESCO initiated centrifugal and shell cast process[4] foundries and metallurgical labs in Portland. Sophisticated technology powered its expansion into production of components for the nuclear power industry and the U.S. Navy during the 1950s.

An award-winning, patented CONICAL tooth system for earthmoving buckets and a continuing stream of innovative products for construction, mining, dredging, logging, and conveying products sparked additional growth through the next two decades. ESCO pioneered an AOD (argon oxygen decarburization) process and other new technologies. Acquisitions in the 1980s added hydraulic hammers, cutting edges, and investment castings to the product mix. A bucket production facility in Kentucky and production capacity in the United Kingdom joined the ESCO fold.)

Figure 2. *Brainstorming improvement ideas: setup team.*

elimination of waste in the scheduling, core making, and molding processes. The formation of a cell simplified the planning and eliminated the queue, move, and wait time between the operational steps.

"Whenever a process is viewed as independent steps rather than interdependent steps, it is very likely to contain a lot of waste," he continued. "Each hand-off not only created move, queues, and inventory; it also added to the complexity and time required to schedule. The first step to 'fix' the area was taken before the kaizen and addressed how we schedule — our policies and procedures associated with sending work to the shop floor. The idea of releasing work both to keep people busy and make customer orders was changed to only releasing work for orders and the specific order quantity. This was a huge change in mind set. It proved to be a natural lead-in to the cell formation.

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Dale Gehring

"We knew what equipment needed to be in the cell, but didn't know how to arrange it or who the operators should be," Gehring said. "We knew the theory, but we were very uncertain how the dynamics would play out (both people and equipment). This issue was central to the kaizen. Prior to the event, we had both shifts select operators to represent them on the team and pilot the cell. We described the attributes we wanted in terms of physical ability, technical skill, and teamwork. The guys did a great job in coming to a consensus and selecting the new cell members." Before the event, maintenance overhauled and prepped the key pieces of equipment; too many other issues would emerge once cell design started.

"It was a bit unsettling to everyone concerned that we didn't know exactly how everything was going to turn out," Gehring recalled. "To this day, some people believe we knew all along what we were going to do (we didn't). It's at this point you have to trust the kaizen process, your people, and JIT principles.

Change Gets Personal

"Although we had been training on previous kaizens in the mold and core area, nothing prepares someone when change begins to affect them personally," he said. "The focus of the first day and a half is on training and re-grounds the group in the elimination of waste (the seven wastes of motion, transportation, waiting, overproduction, rework, inventory, and processing.). It also develops the concept of making value flow. This intro/review prepares people intellectually and lowers the hurdle when the change physically starts to take place on the shop floor."

Gehring said the flow team laid out two core machines, work tables, and a mold press. "While the group had input and added to the overall outcome," he said, "the team members working in the cell were the only 'voting' members (Figure 3 shows cell members discussing a proposed layout). We didn't use anything high tech. While we own CAD and flow modeling software, it came down to tape measures, sketches, and full-size cardboard paper dolls. This proved to be a great method because it was very visual and interactive. The operators used the mock layout to simulate the cell's operation. In four hours, we had measured the existing cell, laid out several alternatives, and achieved consensus on the new layout."

Standard Practices: Not Glamourous, But They're Essential

The blitzers scrutinized standard work practices, making suggestions for several radical changes. They documented both existing and new work methods. This process cemented the operating principles the cell was going to live by. "Using a digital camera, each step was photographed and documented," Gehring said. "The final product was an 8 1/2 x 11-inch laminated sheet showing the agreed-upon method. It can also be used as a train-

Figure 3. *Work flow team "registered voters" (left to right, Cal Mitchell, Willie Hart, and Howard Marks) discuss proposed new work area layout.*

ing aid for new cell members.

"Work standardization extended to the cell members agreeing to hold daily meetings (five to ten minutes) between shifts and one-hour meetings twice a month to work out issues that require more time," he said. "The team agreed on the performance measures for the area: on-time delivery, number of setups, setup time, machine cycles, and a top 25 action list."

Figure 4. *What a difference 5S (housekeeping) activities make; "after" view shows clearly-marked areas for equipment, etc.*

Although standard work was viewed as the least glamourous part of the project, it is a key to long-term improvement. Now the cell team initiates improvements, tracks their progress, and renews their commitment to work as a team. "The term 'standard work' has a restrictive connotation, but it has proven to be the springboard for sustaining ongoing improvement," according to Gehring. "It forms the context for the team members to initiate their ideas (top 25 list) into ongoing improvements."

Participation by employees from the work area helped to build understanding about the need for what Gehring described as "fairly major job changes." He added, "Their participation was probably the single biggest value of the process."

"Surprisingly Few" Bugs

Much of the blitz-related improvement in Plant #3 evolved after the event."We're following up to sustain the kaizen improvements and remove roadblocks," Gehring said. "And where it makes sense, we'll apply cellular work flow in other areas such as mold and core. There have been surprisingly few bugs. The biggest concern was how this change would be viewed by the other members of the department. People had to change job roles to accommodate the cell and people had to adjust to the shorter leadtimes (three days).

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"The cell team's enthusiasm and teamwork eliminated any doubts that the new process would work," he added. "They have successfully demonstrated its capability. They proved that by eliminating waste, improved performance is possible (and not at the expense of everyone having to work harder and faster). People have seen the benefits and have started to ask, 'When are we going to put in another

And Now a Word From "Outside" Blitz Participants …

Two "outside" participants in ESCO Plant #3's AME Kaizen Blitz℠ shared their learnings from the event:

Phil Taylor, product engineering manager, FEI Company, Hillsboro, OR:

"For me, the Kaizen Blitz revealed that a small group of motivated people can come together to drive change for a common purpose. In the ESCO blitz, team members from outside of the company provided a fresh view and allowed the flow of amazing improvement possibilities. Emphasis was given to the 'paperwork' of the process, but this emphasis was soon appreciated when used to catalog and present the improvement successes.

"A valuable lesson learned was the need for the ability to overcome the overwhelming resistance to change. During the blitz, the blitz team needed to regroup and determine how to better prepare the operators.

"Since the ESCO blitz, I've started breaking down constraints in our manufacturing process, and have performed a blitz to reduce cycle time. After starting the blitz, the team members have been surprised on the amount of waste time and excess travel to perform their tasks. Opportunities were identified and eliminated to reveal a smoother operation."

Dan Hassman, plant superintendent, Safeway, Grandview, WA:

"The blitz was a beginning — a kickoff for our supply division plants' kaizen projects. It provided a primer that we will use in the next year in our facilities. It was good to see that kaizen does work and the importance of planning and preparation for these events.

"Kaizen event planning well in advance involves limiting the scope of the project and developing enough background to evaluate a particular process. Managers need to be prepared up front, and to lay the groundwork with employees. Communicate that you are not going into kaizen to eliminate jobs, but to increase productivity and make other improvements. You're building an environment and a culture — creating enthusiasm so that employees understand, 'I can make a difference.'"

cell?' The blitz activity allowed us to try something quickly and offered the forum to introduce people to JIT concepts while putting them into practice. It helps to prepare people for change and forces everyone (especially management) to focus on making things better."

Figure 5. *Team reports wrapped up the event. John Brown is shown reporting for the setup team; he discussed the setup board which contains every tool required to change a core box. Before their improvements, more than half the bolts in a nearby drawer had stripped threads and most of the setup tools had to be "borrowed or stolen" from another work station.*

Cultivating the Kaizen Culture

Although ESCO's 20-member blitz team was a first here, ESCO employees have been traveling along the kaizen path for more than two years. "We've done about a dozen kaizen projects at this plant — working on 5S (housekeeping), setup reduction, work flow, scheduling, and other areas," said Gehring. "Our kaizen teams have eliminated waste of motion and movement, getting rid of WIP inventory, etc. This event involved the largest number of people we've had on a kaizen team, however."

Getting Started, Sustaining Momentum

ESCO employees worked with an outside consultant at several U.S. facilities (including Plant #3) when they launched kaizen projects a couple of years ago. Although the outside help jump-started such improvement activities — what Gehring described as a "launch pad" — employees had already mastered good problem-solving skills. "We had SMED (single minute exchange of die) training, and we learned through Bob Hall's[5] and other books about continuous improvement," Gehring said.

Previous Kaizen projects at Plant #3 netted gains ranging from SMED to scheduling, furnace, pattern and ladle areas, inserts, the inspection area, etc. Typical gains included: average 25 percent less space required to do the job; 25-50 percent setup time reduction; 25-75 percent leadtime reduction; and motion required to perform a job decreased by several hundred feet (in the furnace area, for example, daily walking for operators decreased 600 feet).

"The key to sustaining this success is to follow up and make sure that the process changes are used as designed and to support people in the affected areas, making sure that the new way of doing things becomes a habit," suggested Gehring. "It's also important to bring these changes and the good results to the attention of individuals and groups of employees. From there, success breeds success. Then others want to get involved.

"There's no magic bullet," he continued. "We need to be out there daily, asking, 'How's it going?' and paying attention to what people are doing."

One-on-one and group meetings, monthly management presentations about progress towards key goals, and celebrations for significant improvements (such as a pancake breakfast served by management to all three shifts) refresh and recognize performance breakthroughs.

Keep On Rolling

Asked where ESCO Plant #3 folks go from here in their kaizen quest, Gehring said, "We're continuing to focus on taking time and

Figure 6. *The gang's all here: all 20 kaizen team members in the new work cell.*

other wastes out of processes. We had started with a 4 1/2-week leadtime (from the time an order is received until it is delivered to the warehouse) and decreased it to a two-week leadtime for parts going through the cell.

"We learn from each other and ideas from the outside."

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"With each success, people see improvement and change as more believable," he added. Most people want to make improvements — they just need to know how. That's one of the benefits of having a blitz like this. We learn from each other and ideas from the outside."

Planning, Ground Rules, and the People Side of Change

Charlie Clough, event facilitator,[6] offered added pointers for would-be kaizen blitzers. For starters, thoroughly prepare for a kaizen event to pull in the biggest benefits. Target an area for improvement well ahead of the event. Look for projects offering a strategic reason for improvement and a high likelihood of success. Draft a mission statement for the project. Work out logistical issues such as team selection and production/technical needs.

Communicate the mission, ground rules, and provide for any needed technical training. Before, during, and after the event, management must encourage employee involvement; communication continues to be critical as kaizen projects develop, blitzers develop and debug new processes, report results, hash over related implementation issues, and celebrate results. Ensure that ground rules for the kaizen event are clearly communicated and understood. (Ground rules are shown in Figure 7.

Consider business issues, Clough suggested. For example, what's the impact of blitzers' innovations on schedule, inventories, and customer service, etc.? How will you make production during and after the event? How can you best support the kaizen process through quick response in maintenance, tooling, and other departments?

Ground Rules for Kaizen Events

1. Everybody participates.
2. Please be on time.
3. Be open-minded.
4. Listen to understand.
5. Follow the spirit of improvement.
6. Have fun.

The spirit of improvement includes:

- Company survival depends on improvement; making improvements is the most important part of everyone's job.
- Don't just seek perfection; an immediate 50 percent improvement is OK.
- Don't say "can't;" a closed mind does not make things happen.
- Don't spend money on improvements; invest in brainpower before capital.

Figure 7. *Source: Charlie Clough*

Don't forget about the people side of change. "You need to deal with emotions," Clough said. "Sometimes there is a grieving process when people's jobs are changing."

Recognize that change is not an option; it is a life change.

Added Clough suggestions for kaizen project success include:

- Follow up. Management helps to sustain change by encouraging and monitoring improvements. Promote and celebrate success. Complete projects.
- Recognize that change is not an option; it is a life change. Develop organizational structure and education to enable "safe" risk-taking. Set ground rules.
- Get started.

1. The space savings resulted from combining the work areas of a mold maker and a core maker (work cell); additional space was saved by eliminating the need to store cores (WIP).
2. Employees moved all the core setup time external to the process. "Because we have two core machines and one mold machine, one job can be running while the other is being set up. Overall the team (molder and core maker) are able to fill in for each other during breaks and changeovers," said Dale Gehring, plant #3 manager. "During the first two months of operation, there have been days that they exceeded standard production levels by 60 percent (daily output of molds).
3. The 5S activities focused on a new work cell. Materials and tools not needed on a daily basis were removed. Whatever was needed regularly was located in the cell in a designated area. Employees on both shifts (four workers) agreed on what was needed and where various items belonged. The area and equipment were cleaned and painted, and floors were striped.
4. Centrifugal casting is done in a permanent mold that is spun while steel is poured into it; ESCO no longer uses this process. Shell casting is a molding process using resin-coated sand and hot cast iron dies to create sand molds and cores, Dale Gehring explained. It is similar to putting batter on a waffle iron to create the waffle shape. Gehring said it is one of the best castings methods for surface and dimensional quality.
5. Robert W. Hall is *Target*'s editor-in-chief; he is the co-author, along with Anthony C. Laraia and Patricia E. Moody, of the book, *The Kaizen Blitz; Accelerating Breakthroughs in Productivity and Performance*, John Wiley & Sons, Inc., 1999.
6. Charlie Clough has conducted dozens of kaizen events in assembly, machining, administrative, and other areas; his career includes experience at Oregon Cutting Systems and the Deltapoint Corporation.

Lea A.P. Tonkin, Target *editor, is a member of the McHenry County, IL JTPA (Job Training Partnership Act Private Industry Council.*

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