Invasion of the Kaizen Blitzers

Why they brought in a pit crew, the red Mustang had to go, and other stories.

Gwendolyn D. Galsworth and Lea A.P. Tonkin

It almost sounds too good to be true. People wear "kaizen" hats for a few days, and suddenly they're reducing leadtimes and inventories, chopping space requirements and changeover times, creating a more orderly workplace, and curing most everything except hair loss and "that unfortunate itch." And all of this good stuff comes your way without a major capital investment in sight. We're not sure about banishing the last two ailments, but during an intensive, three-day "Kaizen Blitz" held in Farmington, CT, attendees and their host companies *did* slay a few dragons in material handling, cell design, changeover times, and other areas.

Participants boned up on the basics of kaizen concepts and activities. (See "Improvement Tools and Approaches.") Thus armed, they fanned out to several Connecticut manufacturing sites, joined forces with plant employees in kaizen teams, and spent the next 2.5 days attacking problems. Here's a selective look at victories claimed by these warriors on waste. A description of kaizen is offered in the box, "About Kaizen."

About Kaizen

Ongoing improvement involving everyone — managers and associates alike — is the essence of kaizen. Although kaizen can yield improvements in productivity, cost, and speed of delivery, the chief purpose of a kaizen event is to show that change is achievable — to serve as a catalyst for revolution. When this realization permeates all levels of an organization, *then* significant productivity improvements unfold.

Jackson Corrugated Container Inc.: Barney's World

Several AME teams were assigned to Jackson Corrugated Container Inc., a small manufacturing company specializing in corrugated shipping cartons, with about seven percent of its business going to Wiremold, a wiring systems manufacturer in West Hartford. This account focuses on the AME team assigned to the firm's warehouse.

Jackson Corrugated's warehouse, built in the early 1900s, is a 65,000 sq. ft. facility, with 25,000 sq. ft. of the Middletown facility dedicated to Wiremold. It is a classic! Silos of corrugated paper reach towards the 15-foot ceiling. With some 163,000 to 520,000 items in inventory at any time, the place looks like chaos to the uninitiated. Yet Barney Moore, who mans the facility single-handedly, had a system — his system. Barney knew "exactly" where everything was — it's just that, to get to them, he had to travel upwards of a mile each day by foot or tow motor.

The team took on the challenge of reducing Barney's cycle time. For one thing, there was only one route in or out of the stacks; since all of the turns were at 90-degree angles, the flow of material via tow motor could be long and difficult. Secondly, although the beginning of a Kanban system was in place, with some 85 Wiremold kanban processed daily, no visual inventory definition system was installed. Getting to the right location depended heavily on Barney's memory. And Wiremold associates could be counted on to regularly call or fax in order changes and updates. Barney operated in this complicated situation using a stack of cardboard as his desk. Sometimes it took three or four hours to pick and pack a complete Wiremold shipment. Clearly Barney knew his job, but he was interested in improving the process.

After assessing the situation, the AME blitz team decided that an application of visual systems, starting with the 5-Ss, would probably reduce Barney's pick/pack time by 20 percent. The team was committed to "making it easier for Barney." Focusing strictly on the Wiremold inventory, Barney and the team first removed all unneeded items from the facility, including obsolete inventory and a 1967 red Ford Mustang that belonged to the company's owner. Then they reorganized the inventory layout, changing the flow design from angular to diagonal and removing many 90-degree angles. Wiremold inventory was then stacked in categories and identified by large-letter ceiling signs. The most popular items were clustered in an area nearest the warehouse dock, with less popular items further away; the slowest-moving items were moved completely out of the mainstream.

The net effect was greater maneuverability for Barney and his tow motor, a decrease in the material flow line of 105 feet, and a 30 percent reduction in Barney's overall trip time.

The team also designed a new workstation for Barney to replace his stacked

cardboard "desk" and got it built by Wiremold overnight. It was waiting for Barney the next morning. Barney and the team then applied the 5-Ss to the station (see Figure 1).

The team's three-day blitz transformed Barney's "world," leaving him grinning from ear to ear as he shook his head in disbelief and said, "I never would have believed that all this could happen in three days! Thanks."

Plastic Design Inc.: The Ultimate Changeover Cart

Whipping changeover times into better shape on a 110-ton Van Dorn injection molding press was the charge of one of the kaizen teams at Plastic Design Inc. (PDI), a custom injection molder and mold manufacturer in Middletown. Other teams attacked the quote process and materials headaches.

"We set a goal of 70 percent reduction in changeover time on the press," said Phil Parda, PDI president and the facilitator for the changeover team. "Then we started by baselining, understanding what we had to

Improvement Tools and Approaches

Cell Design/Cellular Manufacturing means linking machines and value-adding operations so that the end of the sequence is as easy to access as the start point. The ultimate is one-piece flow. Begin by arranging machinery in product families rather than functional groups, so a product can be made in a continuous flow. Cellular production is based on four principles: takt time and standard work (see below), flow production, and a pull (versus push) system.

Takt Time is a calculation used to set the production pace so that the exact daily quantity demanded by the customer will be produced within the exact time the supplier has available for that production — one piece at a time. It can be likened to the beat of an orchestra conductor's baton, when the conductor is the customer and the orchestra is the production system. It may change frequently. Takt time, which can be applied to a wide range of processes, goes hand-in-hand with standard work.

To calculate takt time: Divide daily customer demand by the result of total production time available per shift which has been multiplied by the number of shifts. For example, if 450 minutes of production time is available per shift and there are two shifts, you get 900 minutes of total daily available production time. If customer demand is 2700 pieces, production is needed at the rate of three per minute (2700 divided by 900).

Cycle Time is the total time required for an operator to complete one cycle of operations in the processing of a part or product; it includes the time required for walking, loading, unloading, inspection, etc.

Standard Work (SW) defines the interaction between operator and machine in producing a unit, separating what the machine can do from what the person can do. Begin by documenting the exact operations and movement the operator performs and the sequence of machining (or otherwise processing) a unit. Then focus on improving each operation to eliminate variability, waste, and opportunity for error. The resultant procedure is SW, which defines cycle time. As SW becomes more efficient, production capacity expands; it can be constantly revised to eliminate additional waste.

Equipment Setup Time and Quick Changeover is the total elapsed time between the last good piece of one run and the first good piece of the next run; the time in between is non-value added. Quick changeover, also known as single minute exchange of die (SMED), refers to a setup in the shortest possible time, in minutes or seconds. One key is: If it doesn't add value but it must be done, do it when the previous job is running. Among the ways to cut changeover times: Eliminate the need for wrenches and other tools by replacing nuts and bolts with quick clamps, apply the 5-Ss (see below), and organize dies and fixtures at the point of use; use templates, positive stops (pins, V-blocks, guides, etc.) and other poka-yoke devices to eliminate adjustments; and assign teams instead of single employees to do a changeover. Note: The cost of dedicated changeover tools is less than the cost of lost production from long setups.

Total Productive Maintenance (TPM) is a set of small group activities involving all employees in restoring equipment to its optimal condition and changing the work environment to maintain that condition. Goals include zero machine stoppages, zero equipment-related defects, and equipment operating at optimum speeds.

5-S Principles of industrial housekeeping and workplace organization, include, among other things, getting rid of all unneeded items, and creating addressed locations for what is left. "A place for everything and everything in its place" is the idea; if you don't use the 5-S approach, you're probably wading through a lot of waste.

Visual Factory means creating devices and mini-systems that share vital information and make the distinction between normal and abnormal production and quality conditions. Then you move on to visual controls and fail-safe systems, so you can understand the status of a given area at a glance and quickly identify any abnormalities.

Spaghetti Chart shows the movement of material, people, and/or information between and within departments and functions; it provides a quick snapshot of wasteful or illogical movement. Map out your floor plan on paper; include the location of machines, furniture, parts storage, etc. Then trace the paths associates actually follow to get work done. The result usually looks like a plate of cooked spaghetti.

5 Whys work like this: When a problem occurs (such as a defect or unscheduled downtime), ask "Why" five times; in the process of finding a response, you'll probably turn up hidden reasons for the problem.

Kanban is a card or sign, visually signalling that a product needs to be made and in what quantity; a container, bin, or marked floor area also may be a kanban signal. Work in downstream processes is only done in response to a kanban signal from upstream processes (pull system). Quality must be 100 percent to make it work. — *Gwen Galsworth*

begin with in setups." Approximately five-six people from the shop and an equal number of AME attendees teamed up on the project. They videotaped a setup on the Van Dorn, made some improvements, and repeated the process the same day.

"One of the big things they did was externalize a lot of things — doing prep ahead of time," Parda said. "And they made sure tools that were needed were readily available for changeovers." A quick changeover cart (Parda calls it the "ultimate changeover cart"), developed by the team, was equipped with a full set of tools to eliminate the time and steps previously required. (See Figure 2.) Hose fitting clamps were standardized, with the assistance of PDI's tech support.

By the end of the third day, the original setup time on the Van Dorn dropped from 135 minutes to 15.59 minutes. "We're not doing 16-minute mold changes on all the machines," Parda said, "but we showed it *can* be done, it can help us to reduce our lot sizes and inventory, and it's probably easier than we thought."

Parda also liked the frugality of initial changeover success. "We could go beyond this level at some point, with more money, but this project involved virtually no money — just setting up the cart with tools, externalizing, and creating standard procedures," he said.

Pressing for Progress at The Connecticut Spring and Stamping Corporation

Finding a way to run smaller lots so inventory — and the space it claims — can be reduced is a primary concern at The Connecticut Spring and Stamping Corporation (CSSC) in Farmington. Business is growing 15-20 percent annually for CSSC, a precision custom component manufacturer of stampings, springs, wire forms, and assemblies.

Kaizen teams addressed two projects at CSSC: one in the 200- and 300-ton press area of the stamping division and the other in the medium coiler area of the spring division. In both cases, teams looked at originating operations as well as secondary and other downstream operations.

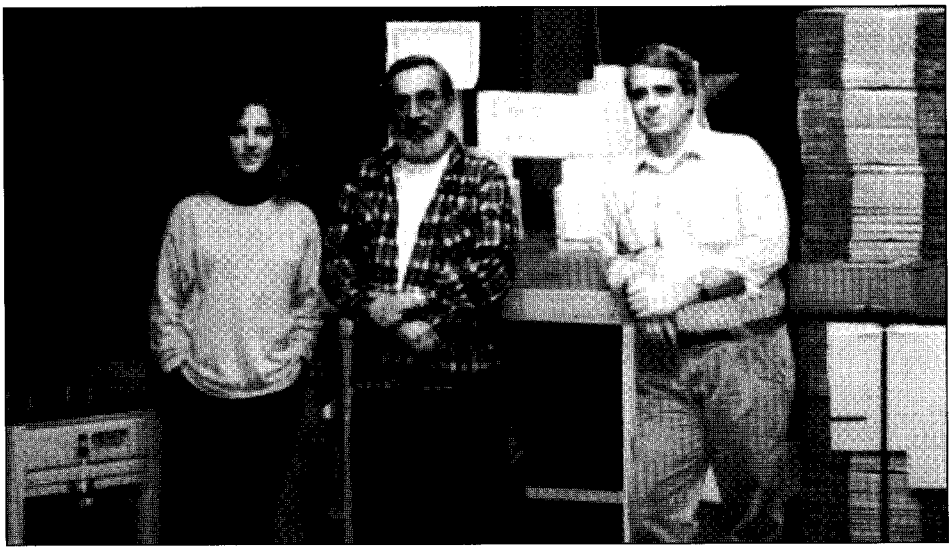


Figure 1. *"Barney's world" at Jackson Corrugated Container Inc. changed significantly during the Kaizen Blitz. He gained maneuverability in the warehouse operation, decreased flow line and overall trip time, and a new workstation with a place for everything (plastic wrap storage, snip storage, etc.). Pictured at the new workstation, from left, are Marie Charette of Wiremold, kaizen team facilitator; Barney Moore of Jackson Corrugated; and Don Foster, kaizen team member and Wiremold production planner/buyer.*

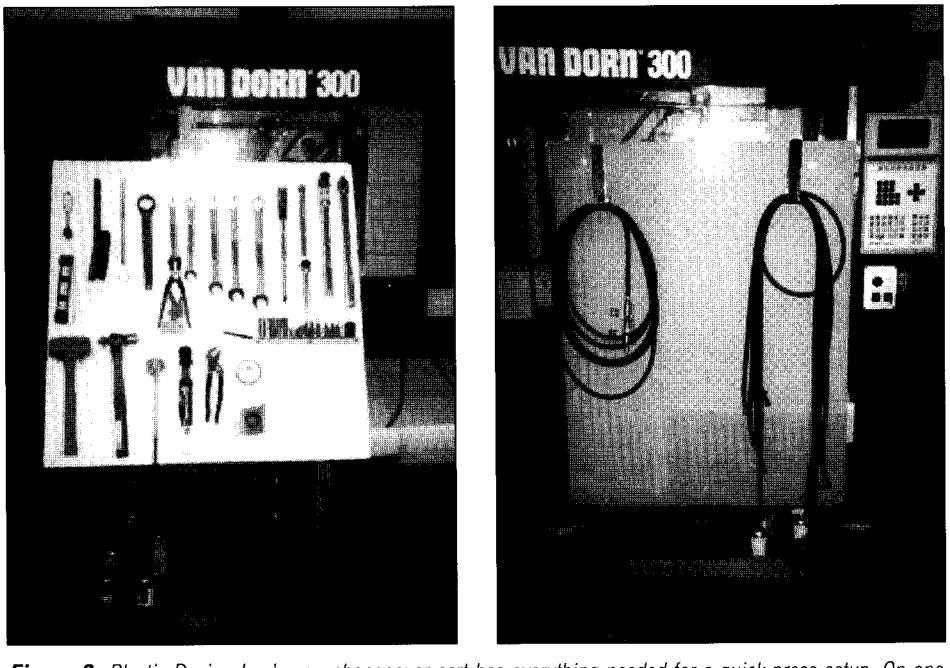


Figure 2. *Plastic Design Inc.'s new changeover cart has everything needed for a quick press setup. On one side are the tools (complete with silhouette addresses), step-by-step procedures, and quality criteria. Hoses and other fittings to speed the change are on the other side. President Phil Parda calls it the "ultimate changeover cart."*

Kaizen Press Team One: 200-300-Ton Press Changeover Reduction

The company's 200- and 300-ton Minster metal stamping presses ($300,000 and $500,000 cost, respectively) are always in use, turning out approximately 40 part numbers between them. Production lot sizes were running anywhere from 200-50,000 pieces. Most production lot sizes represented four to eight weeks of customer demand for repetitive parts, while non-repetitive parts were run in specific quantities responding to

actual customer orders.

CSSC management figured that freeing up capacity on these presses could enable the company to double its sales without capital investment. It would also allow completed parts to be stored near the presses, reduce material handling, and make it easier to implement a visible Kanban system in this area.

Kaizen Team One performed takt time and cycle time analyses, determining that CSSC could produce parts to customer demand on one press instead of two if changeover times were reduced to 15 minutes or less (compared to the previous setup average of six hours). They also calculated that 14 repetitive part numbers could be set up and run daily and still get production out on non-repetitive part numbers. Using this approach, CSSC could significantly prune the space required to house this inventory, many pieces of which measure 18 inches in length and/or width.

During their 2.5-day stint on this project, the team:

1. Implemented standardized, positive die positioning and fastening mechanisms, such as locating pins, V-blocks, shut-height parallels, and quick clamps.
2. Identified setup steps that could be executed while the press was running.
3. Located a point-of-use storage area next to the press for parts used by that press.
4. Developed a "pit crew" changeover team approach similar to the Indianapolis 500 crews.

The combined impact of these improvements was an impressive 50 percent reduction in changeover time.

Kaizen Press Team Two: Secondary and Other Downstream Operations

Kaizen Team Two focused on secondary and other downstream operations for one of 14 repetitive part numbers (a brake cup) originating from the 200-300-ton press area. The team documented seven steps required to make the completed cup, two of which were lancing operations done on two presses with one operator per press. One press lanced about 250 units per hour and the other press, 350 units per hour. The team's cycle time study showed that a part could be cycled through both operations on the two presses in 23 seconds.

Using a "time observation sheet" and a "standard work combination sheet," the team also discovered that some parts were moved several times during the two-press process, even though the presses were only four feet apart. So they devised a new process using only one press and one operator instead of two apiece. They did it by putting two dies into one press, reducing cycle time from 23 seconds per part to 12.5 seconds. One-piece flow was another bonus of this change.

The team also tackled the problem of excess oil on parts that were placed in a wooden bin after lancing. To correct this problem, the team built a metal drainer with a slanted grating which allowed surface oil to drip from the pieces into the bottom of the bin. (See Figure 3.)

This go-getter group also eliminated a hopperizing operation and dramatically cut the processing time of a tumbling operation from three hours to 40 minutes. This last change happened only because one of the AME team members, a representative of the company that bought the part, said that tumbling was unnecessary.

The Two Kaizen Spring Teams

Approximately 1300 part numbers originate from 18 medium coil machines at CSSC, then travel through secondary operations, heat treating, grinding, mechanical deburring, benchwork, outside plating, etc. processes. Two kaizen teams zeroed in on problems here. As with the two press teams, one spring team focused on originating operations and the other looked at secondary and other downstream operations.

Kaizen Spring Team One: Medium Coilers

Team One addressed: 1) changeover times on the medium coilers, 2) the lack of a simple visual signal to trigger production, and 3) inefficiencies requiring extra equipment to meet customer needs. They focused on a family of eight high-volume parts, run on three high-speed Sleeper & Hartley medium coilers.

After takt time and cycle time analyses, the team was convinced that the parts could be run on two machines instead of three — if setup times shrank to 30 minutes or less. Lower setup times would also allow all eight part numbers to be run daily. In turn, inventory would shrink enough to locate it in the production area instead of the warehouse

This go-getter group also eliminated a hopperizing operation and dramatically cut the processing time of a tumbling operation from three hours to 40 minutes.

Wooden Bin and Metal Strainer (see-through view)

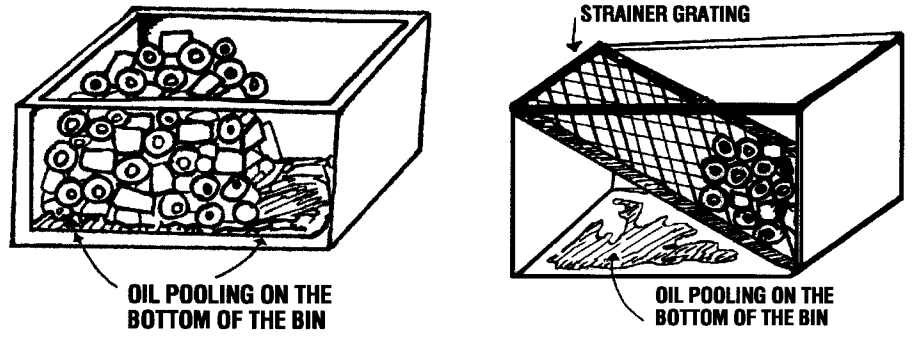


Figure 3. *CSSC's wooden bin versus a metal strainer. Parts loaded in the wooden bin were covered with the excess oil pooled on the bin's bottom. The new bin was made of metal (easier to clean), with a slanted grating that allowed the oil to drip safely away from the parts.*

or shipping areas. These part numbers absorbed 600 cubic feet of space and represented $20,000 in inventory.

Their results in 2.5 days were impressive:

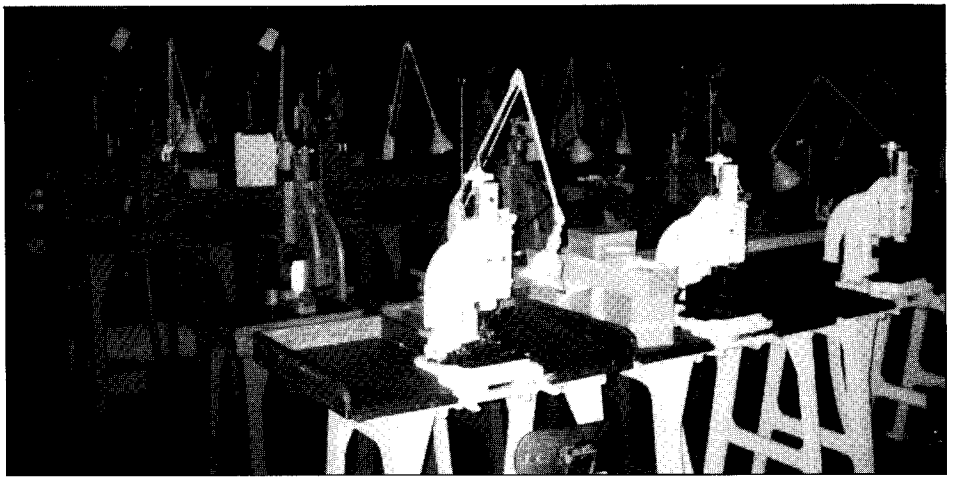
1. They cut a three-hour and 15-minute changeover (including first-piece inspection) down to 30 minutes by reducing the number of changeover steps from 108 to 28.
2. The team created a "standard work" setup card for the eight part numbers and posted it in the work area.
3. Parts storage was transferred to the production area, eliminating the need to move parts to a warehouse.

The Second Spring Team: Downstream Operations

Team Two concentrated on the foot press process, a secondary operation that puts additional bends and loops in the coils. About 1300 coil part numbers passed through sets of 300-foot presses. Only a small percentage of the presses were used at any given time; many remained idle for a variety of reasons — waiting for available operators, a setup, inspection, or jobs from upstream. The various parts made their way haltingly through a maze of small machines, tracing the pattern that gave the spaghetti chart its name. Meanwhile, inventory build-up, travel distance, and process time grew dramatically.

Team Two selected two representative part numbers for improvement. The first part number required six separate foot press operations. By the end of the first day, the team had moved two of the six presses onto a single bench, reducing the physical space by a third (see Figure 4). This change eliminated material handling and established one-piece flow, which in turn led to significant leadtime reductions. For that part number alone, the required equipment space was cut 22 percent, inventory decreased 40 percent, walking distance shrank 87 percent, parts travel distance dropped 67 percent, and cycle time decreased 26 percent. The team concluded that, with minimal investment, similar percentage improvements could become a reality for almost all of 650 part numbers processed in the area.

Separate Foot Presses



Combined Foot Presses

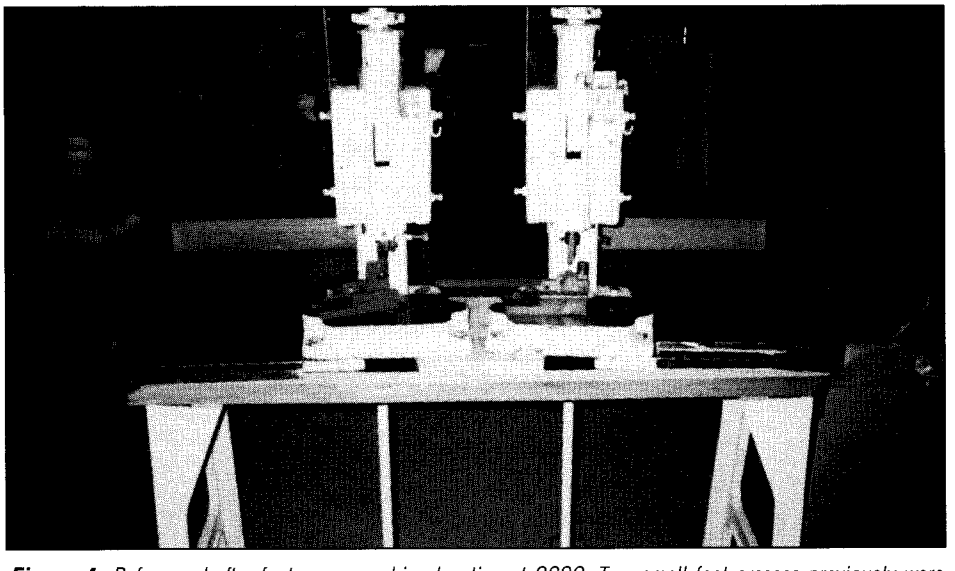


Figure 4. *Before and after foot press machine location at CSSC. Two small foot presses previously were bolted to separate work benches, requiring extra handling steps; now, the two presses are on the same, slightly-expanded work bench, eliminating all handling between the machines.*

...they isolated activities performed because standardization was not used, and found all kinds of unneeded adjustments.

Changeover time reduction was the team's focus on the second part number. Baseline documentation showed that the norm was 40 minutes for six press operations and that three-minutes-or-less setups could trim the number of foot presses required for medium coil alone from 45 to 12 — a savings of nearly 75 percent.

The team videotaped changeovers and used a "time observation" sheet to capture all of the setup steps. Then they isolated activities performed because standardization was not used, and found all kinds of unneeded adjustments. To eliminate the adjustments, the team created a standardized base with positive stop positioning and quick clamping. This solution benefited all part

numbers processed through the area. They achieved an 83 percent reduction in setup time — not bad for 2.5 days' work!

United Tool and Die Company's "Mistake-Proof" Material Handling

The blitz team that traveled to United Tool and Die Company (UTD), a tube-forming manufacturer in West Hartford, dug in and implemented many improvements: overhaul of the dies retrieval system, a 5-S application in the pressure test room, and development of a pull system map. The team also came up with a creative solution to a problem for the plant's material handling system.

George (not his real name) has been in charge of UTD's material handling for some 20 years. It isn't an easy job, in this sprawling, three-story facility covering 145,000 sq. ft. George picks up and delivers practically everywhere at the site. He's hard-working, loyal, cheerful, and never says no to any call for assistance. George is everybody's favorite person. He also has a learning disability; as a result, he often checked and re-checked each material move.

Looking for a way to help George be more independent, the team came up with a visual card system that allowed him to match a picture to a location, so that he would not have to ask for direction or confirmation. They drew a book of icons that George would recognize, representing the different departments. For example, heat treat is represented by an oven; and pressure test is signified by a telephone, like the phone outside the test lab that George uses every lunch time to call his wife.

A booklet of the icons is attached to the side of each handling tote. When the operator completes a particular process, he puts the completed parts in the tote and flips to the icon indicating the next process. When George comes by, he immediately knows where to deliver the parts without asking anyone. (see Figures 5 and 6.)

Hamilton Standard's Paper Doll Cell Design

One of the three AME teams at Hamilton Standard in Windsor Locks tackled the challenge of figuring out the flow of a new bulkhead cell. While they used the usual takt time and standard work techniques, they also devised what they called a "paper doll layout." That is, they cut flat cardboard the same floor size as the machines, then found a large, empty floor space, and laid out the pieces according to the standard work diagram that they had previously developed. When they discovered that their original diagram needed adjusting, they simply moved the cardboard pieces accordingly.

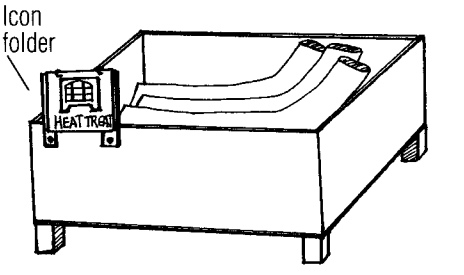


Figure 5. *Mistake-proof delivery tote with icon folder at UTD. A kaizen team simply affixed a booklet of icons on the side to show George his next destination at a glance.*

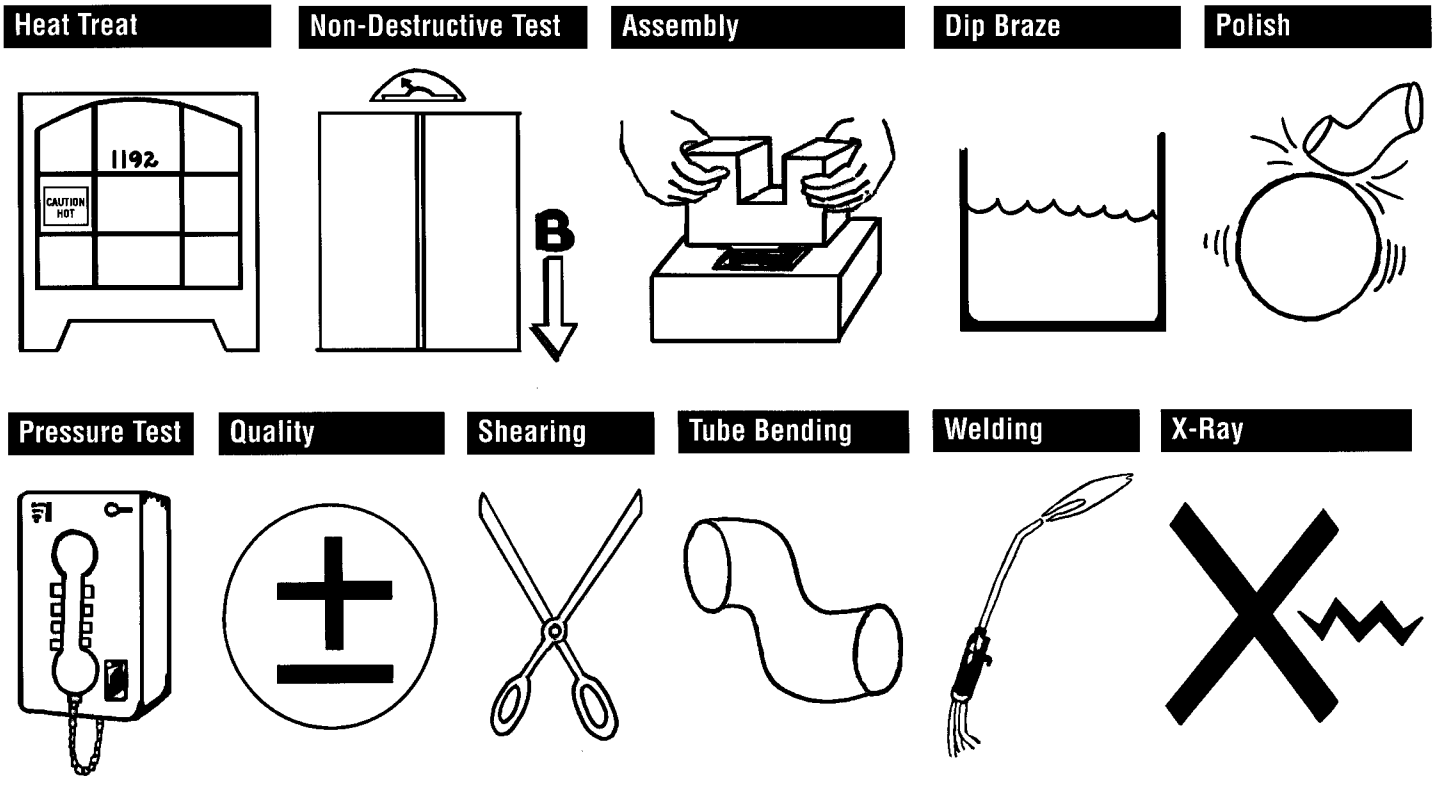


Figure 6. *Icons used on UTD delivery totes.*

"Our shop floor is like Monument Valley in Wyoming — full of machines as big as mountains," said Art Soucy, a Hamilton Standard improvement specialist. "So doing the standard worksheet (diagram) is just not enough. The paper doll layout approach let us work out the walk patterns. Even though we must have changed things a half-dozen times in one morning, it's better to do that now than *after* we get the machines in place. I don't care if we have to do this in a parking lot, we are never going to set up a cell again without doing a paper doll layout first!"

> *"I don't care if we have to do this in a parking lot, we are never going to set up a cell again without doing a paper doll layout first!"*
>
> Art Soucy, Hamilton Standard

The team ultimately reduced the required floor space by 75 percent, to 1100 square feet, and decreased travel distance 85 percent, to 140 feet.

Is there a "Kaizen Blitz" In Your Company's Future?

The ready-fire-aim "Kaizen Blitz" approach may not be for everyone, but supporters cite its strengths: potentially significant improvements in short order, without high cost in most cases. The teamwork sparked by kaizen efforts alone may be worth the effort, according to some of the blitz hosts.

Gwendolyn D. Galsworth, Ph.D., is president of Quality Methods International Inc., a Boston-based training, consulting, and development firm. She is a two-term Baldrige examiner, with over 12 years' shop floor experience in JIT, visual systems, 5-S, and other improvement approaches. Her new book, Smart Simple Design *(omneo Press, 1994), shows how companies can minimize parts inventories and total cost by reducing unwarranted proliferation in products, parts, processes, and control points.*

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

Related Readings

Among additional sources of information on kaizen and/or improvement tools and concepts:

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Editor's note:

The assistance of Jon Brodeur (of The Connecticut Spring and Stamping Corporation) in the development of this story is appreciated.

Another thank you to the employees at the Connecticut companies who helped to make the Kaizen Blitz a success: customer companies Jacobs Manufacturing, Bloomfield; Pratt & Whitney, East Hartford; Wiremold, West Hartford; Critikon, Southington; and Hamilton Standard, Windsor Locks; as well as supplier host companies The Connecticut Spring and Stamping Corporation, Farmington; Pratt & Whitney, Farmington; Meriden Manufacturing, Meriden; Jackson Corrugated, Middletown; Plastic Design Inc., Middletown; and United Tool and Die Company, West Hartford.

For more on Wiremold, see the feature article in the January/February 1995 issue of *Target*, pp. 8-14.

A Kaizen Blitz event is scheduled for May 17-19 in the greater Hartford, CT area.