Chapter 1

The Power of AME's Kaizen Blitz

Learning by Doing

The Kaizen Blitz[SM] approach has resulted in 90 percent reductions in setup time in one week, 20 to 60 percent improvements in productivity in four days, and inventories cut in half in only a few days![1] These are truly impressive results, if you can hold them, and they weren't achieved by professionals with unlimited budgets. Indeed, they were delivered by teams of typical employees and ad hoc groups of outsiders gathered from a wide variety of companies and disciplines. They all learned how to achieve these remarkable results by participating in Association for Manufacturing Excellence (AME) Kaizen Blitz events hosted by companies ready to test the principles and benefits of kaizen in their own companies and attended by people eager to experience this powerful improvement technique first-hand, making real changes on processes in real factories.

Since 1994 over 60 companies have hosted hundreds of participants on AME Kaizen Blitz teams applying kaizen concepts to a

[1] Kaizen Blitz[SM]—"A rapid improvement of a limited process area, for example, a production cell. Part of the improvement team consists of workers in that area. The objectives are to use innovative thinking to eliminate non-value-added work. Ownership of the improvement by the area work team and the development of the team's problem-solving skills are additional benefits." From the *APICS Dictionary*, Ninth Edition, edited by Cox and Blackstone, © 1998, American Production and Inventory Control Society, Falls Church, Va.

wide spectrum of processes in a broad range of industries. Results have been consistently impressive, whether improving productivity in forming metal for jet engines, building cells to assemble precise medical products, or reducing setup times on many different kinds of equipment in dozens of plants; these results are all the more impressive because they were all achieved by first-timers, neophytes learning this powerful process for the first time in unfamiliar businesses and surroundings. For many companies, AME's Kaizen Blitz represents their first big step into Lean Manufacturing.

The Kaizen Blitz is about experienced practitioners sharing knowledge and skills in learn-by-doing exercises—not *just* exercises, but projects that change the way people do their work in real companies, yielding results that really make a difference. People learning about kaizen—what it is, how it works, and how they can bring this powerful new tool to their own companies.

There are many reasons for wanting to begin or explore the Kaizen Blitz process; results such as these have been the reward for many companies hosting AME Kaizen Blitz events.

KAIZEN: CONTINUOUS IMPROVEMENT

Kaizen can be simply translated as "continuous improvement," but in what sense?[2] Businesses in the United States have pursued continuous improvement for years under various "Total Quality" or "World Class Manufacturing" banners. Progress is most often incremental, delivering small improvements over prolonged periods. Focus is broad, often across the whole organization; breakthroughs are rare. Risks can most often be characterized as sins of omission—too little change, too late. But kaizen is a different, more powerful approach to continuous improvement.

Kaizen is a highly focused improvement process aimed at producing step function performance improvements—20, 50, 90 percent—in a short time, in narrowly targeted areas.

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[2] Kaizen—"The Japanese term for improvement; continuing improvement involving everyone—managers and workers. In manufacturing, kaizen relates to finding and eliminating waste in machinery, labor, or production methods. See: continuous process improvement." From the *APICS Dictionary*, Ninth Edition, edited by Cox and Blackstone, © 1998, American Production and Inventory Control Society, Falls Church, Va.

Typical Results Achieved by AME Kaizen Blitz Teams

Setup time reduction	**70–90%**
Productivity improvement	**20–60%**
Process time reduction	**40–80%**
Inventory reduction	**30–70%**
Walking distance reduction	**40–90%**

Results taken from Kaizen Blitz projects conducted at the following companies:

Connecticut Spring and Stamping, Farmington, Conn.

Critikon (a Johnson and Johnson Company), Southington, Conn.

Hamilton Standard, Windsor Locks, Conn.

Jacobs Manufacturing, Bloomfield, Conn.

Meriden Manufacturing, Meriden, Conn.

Plastic Design, Inc., Middletown, Conn.

Pratt & Whitney, West Hartford, East Hartford, and Farmington, Conn.

United Tool & Die, West Hartford, Conn.

Wiremold, West Hartford, Conn.

Dell Manufacturing, Farmington, Conn.

Gros-Ite Manufacturing, Farmington, Conn.

Marion Metals, Southington, Conn.

Rand-Whitney, Montville, Conn.

Seitz Corporation, Torrington, Conn.

AMS Schneider, Minneapolis, Minn.

Hoffman Engineering, Anoka, Minn.

Intek Weatherseal, Hastings, Minn.

Northwest Airline Overhaul Facility, St. Paul, Minn.

Pfizer, Minnetonka, Minn.

Fel-Pro, Skokie, Ill.

HydraForce, Lincolnshire, Ill.

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TYPICAL RESULTS ACHIEVED BY AME KAIZEN BLITZ TEAMS

(continued)

White Cap, Chicago, Ill.
Century Mold, Rochester, N.Y.
Diamond Packaging, Rochester, N.Y.
ENBI Corporation, West Henrietta, N.Y.
EG & G Sealol, Warwick, R.I.
Liquid Metronics, Acton, Mass.
MicroTouch, Methuen, Mass.
Nyman Manufacturing, East Providence, R.I.
Nypro, Inc., Clinton, Mass.
Bird Packaging Limited, Guelph, Ontario
Hammond Manufacturing Company Limited, Guelph, Ontario
Kenhar Products, Inc., Guelph, Ontario
Boston Scientific Corporation, Redmond, Wash.
Genie Industries, Redmond, Wash.
MicroSurgical, Redmond, Wash.
Junkunc Bros., Crete, Ill.
US Robotics, Mt. Prospect and Morton Grove, Ill.
Keene Manufacturing, Warwick, R.I.
Tech Industries, Inc., Woonsocket, R.I.
Uvex Safety, Inc., Smithfield, R.I.
Barrday, Inc., Cambridge, Ontario
Keene-Widelite, Cambridge, Ontario
Rockwell Automation Allen-Bradley, Cambridge, Ontario
ACCO North America, Wheeling, Ill.
Flexible Steel Lacing Co., Downers Grove, Ill.
Atlas Copco, Holyoke, Mass.
Greenfield Industries, South Deerfield, Mass.

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TYPICAL RESULTS ACHIEVED BY AME KAIZEN BLITZ TEAMS

(continued)

Human Resources Unlimited, Springfield, Mass.

Palmer-Goodell Insurance Agency, Springfield, Mass.

Springfield Institute for Savings, Springfield, Mass.

Springfield Wire, Springfield, Mass.

Tubed Products, Division of McCormick, East Hampton, Mass.

There are several types of kaizen activities, ranging from those that focus on developing solutions to problems on the factory floor, to implementing a predetermined plan for change, to streamlining the flow of paperwork. The most familiar and common type, the factory kaizen, provides a good example of the technique.

In a typical Kaizen Blitz project, a cross-functional multilevel team of 6 to 12 members work intensely, 12 to 14 hours a day, to rapidly develop, test, and refine solutions to problems and leave a new process in place in just a few days. They don't plan, they don't propose, they *do*. This focus on doing is what sets kaizen apart from other improvement tools, but in order for it to work effectively, we need to recognize that it has other similarly unique characteristics.

➤ Kaizen Is a Top-Down Process

The kaizen process must begin with the process owner, the individual with real ownership and responsibility who has the authority to change the process and be answerable for the consequences. He or she may be the general manager, president, or in some cases plant manager, but *always* the person in charge. Kaizen cannot be successful without strong support and direction from the top.

➤ Kaizen Is a Team Process

A team of individuals is selected from a range of functional disciplines, with a core of members from the area attacked, the real people who do the work. These are often the true experts who can,

with real management support, make change stick. The team's work involves the intense application of a few simple tools in a straightforward, commonsense approach to bringing about real and profound change.

The team is brought together prior to, or at the beginning of, the project period and given basic education in the principles of lean manufacturing and training by experienced experts in the kaizen tools required to do the work.

The team then spends three to five days defining and carrying out the actions necessary to change the process and bring about the needed improvement. Several 12- to 16-hour days are spent developing, testing, and implementing their ideas. Kaizen experts also facilitate during the project itself, working with teams and management to ensure success.

■ KAIZEN PRINCIPLES

The kaizen process is based on several rules that may vary in detail from company to company. But the underlying concepts are the same:

Be open minded.

Maintain a positive attitude.

Reject excuses, seek solutions.

Ask Why? Why? Why? Why? Why? There are *no* stupid questions.

Take action. Implement ideas immediately, don't seek perfection. That is, do what can be done *now,* with the resources at hand.

Use all of the team's knowledge. The experts are frequently found on the factory floor.

Disregard rank. All team members are equal and everyone has something to contribute.

Just do it!!

➤ Kaizen Is Doing, Not Proposing

Kaizen fundamentally differs from traditional continuous improvement processes because it is almost entirely action-based.

Teams are charged with both developing and implementing their solutions; they create processes or change existing processes, leaving a *new* process in place.

➤ Getting Dirty Together

Kaizen is very much a *hands-on* process. Team participants not only plan, they clean equipment, sort tools, move machinery (within the bounds of safety), assemble, build, and run the process. They get tired, they get frustrated, and they *get dirty together.* Rank is not recognized—factory managers and company officers work side by side with machine operators to find and implement the best of their ideas. The team's job is to make change happen. To create and leave in place a *new way of doing things.*

➤ Kaizen Is a Low-Budget Process

As a tool for bringing about improvement in a rapid and targeted manner, a Kaizen Blitz is a low-cost process. When teams are charged with demonstrating and implementing changes to live processes in three to five days, there is no time to spend money on new capital equipment, complex and expensive tooling, or elaborate systems solutions.

Setup time reduction projects are good examples. When asked to reduce changeover time for a machine by 90 percent, say, from one hour to six minutes, the engineering solution may be a new machine, programmable controller, or sophisticated (read *complex*) new tooling. A Kaizen Blitz team has *at most* five days to complete its work—that means to demonstrate new methods and to start to make them the new standard way of doing the work.

Even if unlimited funds were available, the money couldn't be spent and the goods received in the time allowed. The team must make do, for the most part, with what is already at hand and concentrate on eliminating waste to achieve its goals.

Most teams work with a very modest budget ($300 to $400 is typical to support their projects), the kind of challenge that leads to the most creative solutions. The kaizen technique itself teaches that eliminating waste and developing creative solutions using the equipment and tools at hand are the preferred methods for achieving improvement goals.

CUTTING TO THE CORE OF VALUE

Many companies that have adopted kaizen improvement techniques as part of overall lean manufacturing or lean enterprise initiatives report that their more effective application of the means already at hand has resulted in significant reductions in their new capital equipment costs.

Certainly, many opportunities exist for companies to sample the process, but in reality, the biggest payoff comes to those willing to commit the resources required to do it right—to choose, train, and follow up.

Kaizen is not a process easily mastered. Although the principles can be simply defined, learning their effective application through cross-functional kaizen teams requires study, commitment and perseverance.

Guidance by experienced practitioners, often on a prolonged basis, is cited time after time as an underlying fundamental of success, and as with most business improvement processes, the rewards are commensurate with the investment.

Although the range of projects that a kaizen team might be asked to carry out is large, the scope and focus must be narrowly defined, clearly bounded (for example, improve a press or cell, not a stamping plant). In a factory environment, a team might be assigned to build a manufacturing cell from individual functionally applied machines, another might attack changeover times on a key bottleneck machine, yet another might create a pull system to regulate a part or all of a process. Results must be unambiguously measured—parts per shift or man-hour, minutes per setup, setups per day, and so on.

From Pratt & Whitney's jet engines to Wiremold's wiring devices to Johnson & Johnson's medical products, from metal stamping to turning to cost accounting systems to product distribution, kaizen has proven its worth in cutting to the core of value in what we do and how we do it.

FOCUS AND COMMITMENT

One of the keys to kaizen's success is the close focus that this method brings to the process.

Management is often unwilling or unable to authorize, or to give full authority, to those charged with bringing about a change. Problems range from the possible impact on other parts of the operation to the real risks, the unforeseen impacts, of dramatically changing too large a part of the business. The larger the area affected, the larger the potential risks. Intended actions become "recommendations" as the fruits of change are watered down in endless studies. Risk avoidance outweighs the opportunity for gain.

In kaizen, a more narrowly defined focus is established along with clear, measurable improvement goals.

The team's target might be a machine, a cell, perhaps a department, but the scope is generally such that the risks of unforeseen consequences are minimized. An authorization to "do what needs to be done" becomes feasible. Furthermore, because kaizen is a short-term change process, typically spanning no more than several days (an AME Kaizen Blitz lasts three to four days), whatever is changed can be changed back.

➤ Commitment Is Key

Management *must* be ready to make a real commitment to change—not only to acquiesce or agree to the need for change but to lead the process.

A kaizen team should be directed to "*do what needs to be done.*" If you're not ready to see a new process in place by next Monday, not just proposed, but in place and functioning as the new way of doing business, then don't start—kaizen just isn't for you.

■ IN THE LONG RUN, ONLY THE SIMPLE STUFF WORKS

Kaizen is a simple process. Like the game of golf, the rules are simple but mastery takes practice and above all, commitment. The results kaizen brings come from the application of simple, commonsense principles in an organized and disciplined fashion in an environment of real commitment to continuous improvement. Kaizen stresses linkages of simple steps that build on each other to reach a goal, rather than developing complicated, broadly focused systems.

Complex solutions are hard to maintain and harder to monitor. Most organizations lack the energy and attention span required to make them work. The simple, easy-to-follow solutions, the kind that kaizen delivers, are the ones that last.

The Kaizen Blitz process offers outstanding benefits at many levels. If you are interested in kaizen as part of an overall commitment to adopting lean manufacturing, to achieving results like these on a broad scale, for the whole enterprise, if you want a tool for addressing specific problems or opportunities, if you need a remarkably effective tool for demonstrating that *radical change can happen*, that it's safe to *try*, to do it *fast* and do it *now*, then you may find that kaizen is the way to *do it*.

■ KAIZEN: FOUR DAYS TO BLITZ

➤ The Story of a Typical Kaizen Blitz Team

Monday 7 A.M. At Universal Valve's largest plant, an hour from Nashville, Tennessee, the team—machine operators, assemblers, an engineer, a tool designer, a salesman, a local supplier, an executive from corporate—assembled in the cramped conference room for the kickoff meeting.[3]

The team's objective was to build a manufacturing cell that would incorporate all of the necessary equipment and people to machine, clean, assemble, and package parts to customer order in the same day.

The Valve Cell Team

Frank Harris, team leader	Supervisor, machining
Bill Walsh	Machine operator
Sally Ford	Machine operator
"Doc" Moore	Assembler/Setup, second shift
Mary Romano	Assembler
Sammy Garcia	Tool designer

[3] Universal Valve, the site of the Kaizen Blitz in our story, isn't a real company, but the experiences of the team are an accurate composite of real teams in real companies that have hosted AME Kaizen Blitz events. The principles behind the story are what's important, what counts.

Figure 1.1. Four Days to Blitz

Scott Olsen	Product engineer
Marty Ross	Lake Metals Foundry (supplier)
Mike Werner	Sales, Philadelphia office
Tom Nichols	Corporate materials manager

The team leader, Frank Harris, the machining department supervisor, introduced each member and presented their objective. They were to solve a chronic problem—build a manufacturing cell that cuts the process time for completed valves in half—by Friday! Along with a process time target, the team had goals to meet in productivity and work-in-process inventory reduction as well. Two other teams were introduced, each with equally challenging goals.

Larry Wilson, the plant manager, and Steve Sandusky, the team's facilitator, an experienced kaizen veteran, added their exhortations, and the work began.

➤ How It Began

Larry and Steve had talked for several months about the plant's first projects, choosing them carefully for maximum impact. They wanted to find highly visible opportunities that would showcase the power of a kaizen team and allow Larry to demonstrate convincingly his commitment to change and to the teams themselves. The cell-building project represented a radical departure from the traditional batch and queue concepts the plant had followed for its entire 20-year history. Its process time reduction goal would highlight improvement in lead time, a chronic problem area for the

plant. The productivity improvement goal was set to address the skepticism of much of the staff with regard to multiple-operation cells versus traditional dedicated operations.

At one time the plant had been one of the most profitable plants in the company, but domestic and foreign competition had taken its toll. Now Larry and his peers were under increasing pressure from corporate to increase productivity, reduce costs, slash inventories, and improve return on assets. The old remedies just didn't work any more. New capital equipment meant more investment—not less—and potential for payback was harder and harder to justify. Technical or engineered process solutions just couldn't deliver the kind of rapid improvement needed. The problem was how to do more with what was already in hand.

Larry had visited several other plants undergoing a lean conversion using kaizen improvement techniques with some real success. He'd even had the chance to be a team member in a nearby facility in another company. He was anxious to try what looked to him like a breakthrough technique.

➤ A Typical Facilitator

Steve worked in a corporate process improvement group and had helped several other plants begin their kaizen projects. He'd had his first kaizen experience on a Kaizen Blitz team in another company. When Universal began its own program, he'd been mentored by an outside consultant who had many years of experience with the kaizen process in a stamping company. Steve had been a member of several teams and served in some team-leader assignments before formally beginning to develop his facilitation skills. Several successful cofacilitation and training assignments led to independent project development and facilitation assignments. He'd developed a number of technical skills along the way, but his most important role was guiding the team, particularly the team leader, through the stress, pressures, and pitfalls of their kaizen week.

➤ The Team Leader

Frank had been as supervisor at Universal for several years. He had a reputation as a hard worker and someone who wasn't afraid of new ideas. He also was seen as someone trusted by his people;

"tough but fair" was a typical description. Steve and Larry had chosen him to be team leader for these reasons and because he'd ultimately be responsible for the new valve cell. They hoped he'd be able to make the changes stick.

➤ Day One: The Work Begins

Much of the morning was spent cleaning the workplace: scrubbing machines, washing the floor, cleaning out cabinets, and discarding unneeded items. Cleaning and organizing would be part of each day's routine for the rest of the week. The team was a little slow getting started, a bit tentative with each other. They had first met as group only last week. They'd attended a half-day class in lean manufacturing, learning the key principles of the Toyota Production System and specific techniques they would need to use during their kaizen project. Now that they had a chance to work together—and work hard—the tentativeness soon wore off.

By late morning the team was hard at work designing their cell. Up to now, it had taken six weeks to get a valve through Universal because the plant was functionally organized, with machines set up to perform individual operations, more or less one step at a time. Batches of work, usually consisting of several wire baskets holding hundreds of housings or pistons, were moved from operation to operation until they were completed. The parts then went to a central stockroom before being issued to assembly to fill customer or stocking orders. The problem was that the process typically took up to six weeks to complete and customer service was mediocre at best despite huge raw-material, in-process, and finished-goods inventories.

Just Chalk Marks on the Floor

By early afternoon the team had decided on an initial configuration for the new cell, and they, along with several maintenance tradespeople, had begun the process of disconnecting and relocating equipment. No precise engineering drawings were needed—as a matter of fact, they weren't allowed—just some chalk marks on the floor following a familiar U-shaped pattern. No hard wiring or plumbing either—after a few trials they'd probably be moving things around again, anyway. (It took a few kaizen projects for the

plant engineer to get used to the idea, but eventually quick-connect devices became the standard for machine hookups.)

At the late-afternoon review meeting with Larry, his staff and Steve, Frank, and the other team leaders presented progress reports and plans for the evening and next day.

The plant was under a lot of pressure; a key customer was in the middle of a seasonal ramp up. Sales called asking for yet another schedule move up. Larry, the plant manager, anxiously questioned Frank on how long it would be before production was resumed.

They were walking a tight line; he had spent a lot of energy in emphasizing the importance of the team's goals to the whole organization. It would be a mistake to signal that he was backing off to meet another expedite. Frank and his team were already aware of the need, however, and he arranged for the first-shift maintenance crew to stay on late into the evening to make sure they could start up again by noon the next day.

After the update meeting, Steve, the facilitator, advised Frank that the team should consider breaking up into subteams to focus on their many remaining tasks. There just wouldn't be enough time for everything to be discussed by the whole group before taking action. Frank was a little uncomfortable. He felt that as team leader he had to okay any major new ideas. Steve pointed out that there was a lot of talent and experience on the team and that he needed to rely on and take advantage of their abilities. He emphasized, as he almost always did, that kaizen teams need to *make mistakes quickly* and then correct and move on, not deliberate. The subteams would just have to use their best judgment and get things done on their own. Frequent progress checks would point out sticking points or false starts before they got out of hand.

The teams had a quick dinner together in the cafeteria. Afterward, Frank's team converged in their conference room. Each team had its own small meeting area with a blackboard and easel; Steve did his best to make sure they spent very little time there—the problems and opportunities were out on the floor!

They broke up into three subteams: One continued with the move; a second sorted out needed tooling and came up with a point-of-use storage system; the third designed a kanban system to regulate the flow of work to and from the new cell (see box on p. 15).

By late evening it was apparent that the move was a larger undertaking than they had expected, so the first-shift maintenance

KANBAN

For our purposes the term *kanban* refers to a pull system whereby product is made only to a signal. The signal is typically a visual cue: a card, an empty container, an empty space. In addition, work-in-process stock for any item in the system should not exceed a fixed upper limit. This definition is a little simplistic; a better sense of its broader meaning is in the following excerpt from *Zero Inventories,* by Robert W. Hall, (Irwin, 1983):

> The Toyota Motor Company assembled ideas from many sources and combined them with their own thinking to create stockless production. . . . Kanban is the corporate name of the version of the system pioneered by Toyota and companies of the Toyota group. It is a Japanese word meaning card, a definition which conveys very little of the total scope of the system. Later Toyota sometimes referred to it as a "just-in-time" system, but that implies only that transfers of material are made prior to being needed; there is no suggestion that many improvements in all phases of production are necessary to do that. (The strict definition of *just-in-time* is to have *only* the necessary part at the necessary place at the necessary time, or, as an American worker would say, "Don't have anything you aren't working on.")

crew stayed on to work with the second shift. But it looked as though the move still couldn't be completed before late Tuesday afternoon. The team called it quits at 10 A.M. and agreed to assemble at 6:30 the next morning.

➤ Day Two

The next day was more of the same, but more intense. The pull-system team had diagrammed the flow of materials and selected locations for kanban "squares" (see Figure 1.2). Because several valve versions required different sequences of operations, they were also preparing work instruction kanban cards to accompany these parts through the process. The team had identified all of the

Figure 1.2. Kanban Squares

tools they needed to set up and run the milling and turning equipment in the cell and were building shadow boards with painted outlines of the tools for mounting on the machines. Under pressure from Larry and Steve to step up the pace, the team finished the machine moves and began running some test parts in time for the 4:00 status meeting.

Larry was relieved to hear that production was starting up again, but his relief didn't last. By early evening it was clear that the cell configuration needed to change. The cell couldn't meet takt time (the seconds per piece needed to meet customer demand). Frank and several of his team were frustrated with the problem. They worried that they'd gotten off on the wrong track and wouldn't have time to recover. They'd be to blame for missing shipments!

Steve could see that Frank was starting to feel some of the pressure that comes with the team leader's role and took him aside for some coaching. He shared his experience with past teams that suffered similar frustrations, and he talked about some approaches Frank could take to move the team ahead. He was careful not to offer what were, to him, obvious solutions. The team still had enough time to get the job done, and helping them to learn ways to solve their own problems was one of the key goals of the exercise.

Frank called the whole team back together to work on the problem. They discussed and argued about several ideas before they chose an approach. By moving a drill press into the cell, they could take some of the load off of the CNC (computer numerically controlled) mill and meet their target. Unfortunately, they would need to relocate three other machines to do so. Con-

vincing the plant engineer to relocate the machines wasn't easy for Frank, especially because he had to depend heavily on him for support in his regular job. The plant engineer wasn't happy: His crew had worked late last night to get the job done and now they had to do it again—life was a lot easier when engineering spent weeks doing formal layouts before any move was approved. (With experience, he eventually agreed that the new kaizen process gave better results in the long run than the traditional technically driven, deliberative approach; it just made life a bit more hectic for a time.)

The team again worked until 10 P.M. to get the job done and planned an early morning trial.

➤ Day Three

On Wednesday morning the team began running the new cell in earnest, changing from one product to another to develop and refine the new process and ensure that it would work on all required parts. The equipment operators and assemblers were the keys to this part of the process; they brought real skill and experience to the team. They had come up with several ideas for fixtures and quick-change work holders that were being put together by the machine shop.

For the machine operators in particular this was a new and satisfying experience. They'd spent years running and setting up machines, but their opinions had never been considered in the design of the tools and equipment they used. Now they had a real chance to put their own ideas into practice. They'd been hesitant at first, but working with the tool designer on the team had helped; his skills and confidence had encouraged them and drawn them out. Frank, their team leader, had also helped by letting them know he was depending on them to work out the needed solutions.

One of the team members had found a hydraulic clamp they wanted to try at a distributor about an hour away; he'd driven off early that morning to pick it up. The assembly operators were working together with two other members to set up an assembly bench and storage area for packing materials so that they could begin assembly in the cell. This was a difficult concept for them to accept after years of working on large batches one step at a time.

One-Piece Flow

Steve coached and coaxed them through the change. One-piece flow, he felt, was the key to success here, but he knew it would be hard for the plant to accept until they'd seen it work on their own products. Experience told him that it would probably be a long time, if ever, before most of the organization recognized the real value of the one-piece flow cellular concept. The business was still being driven by the old measures. Sales wanted plenty of inventory available to ship at a moment's notice. The plant's mediocre delivery performance over the years had made them skeptical that they could trust the new short-cycle, lean concepts. They'd wait and see.

Most of the manufacturing staff had grown up in an environment in which idle machines were considered a mortal sin—better to produce an extra batch of parts that won't be needed for a while than to have expensive equipment not running. The idea of a cell running at the pace of the slowest operation just didn't make sense. It would take strong personal support from Larry and his staff to make this team's new operation a long-term success.

Managing cash flow was another hard concept to grasp for a plant that had been remotely driven to produce to schedule with little or no direct contact with customers. The realities of global competition were changing all of that to be sure, but change would mean struggle and a real risk of failure.

Following up on the Kaizen Blitz team's work—standardizing the process to get everyone to do the work in the same way—*every time*—would be the real key to long-term success. The kind of diligent, committed, relentless support and follow-up required to reach this goal would be an ongoing challenge to the whole organization.

The New Pull System

The new pull system was beginning to come together; taped squares on the floor would be painted once the team was satisfied. Castings, control rods, assembly hardware, packing material, and piston blanks would flow to the cell along the pull system and be replenished only as they were consumed.

Tools: In the Right Place at the Right Time

As the tooling subteam's work began to come together, tooling was moved from a central crib to new point-of-use locations in the cell,

Figure 1.3. Sketch of a Shadow Board

and individual shadow boards with outlines of individual hand tools were being made for each machine (see Figure 1.3).

At the 4:00 P.M. status meeting, Frank was able to report that their goals were in sight. They'd successfully demonstrated that they could meet the output targets, although assembly was still a little clumsy. That evening they were going to change the work flow

after the machining operation to better balance the assemblers' work and make their jobs easier; Steve constantly reminded them that their objective was to make everyone's job *easier* by eliminating waste—non-value-adding activities—not to get people to work *harder*. Another dinner in the cafeteria and another late night, and the team was on the home stretch.

➤ Day Four

Thursday was another intense day, just shorter. By 5 P.M. the team had run and refined procedures for all of the part configurations the cell would handle. The team demonstrated a process-time reduction of over 90 percent, far exceeding its goal. Standard work documents that described simply the step-by-step flow of work and rates at which it should be performed were being prepared by the team; the work sheets would help institutionalize the changes the team had made. These hand-written documents and sketches would be displayed in the cell to show the way the work should be done and provide a basis for training everyone assigned there in the future.

The team hoped that new disciplines would be better maintained and accepted because they were being prepared and owned by the some of the people who would do the work. Selling these new concepts to all of the workers and support groups would be critical in the long run.

Both Larry and Steve knew that making the changes stick would be by far the greatest challenge for the plant. Under the pressures of day-to-day problems, customer expedites, breakdowns, and so on, people naturally tend to revert to old familiar ways. That was one of the reasons that building the new cell was an attractive first project: Once the machines were moved into place, the old batch-and-queue approach just couldn't work.

Standard Work

Another difficult concept would be "standard work," a well-documented process followed religiously by everyone doing the work. At Universal things were often done "because that's the way we've always done them." Of course, there were formal routing instructions and process controls, but considerable latitude was always allowed to let individuals perform the work in ways they

found comfortable. The concept of everyone following the same steps *in detail*—for example, in setting up a machine—would require a new set of disciplines that would take a long time and many projects to work out.

Finishing touches were going into the shadow boards, tool racks, and kanban squares. After three days of fast food at the plant, the team enjoyed a celebratory dinner at a local pub. By now the team had really gelled. They were comfortable working together and had worked through some tough problems, although not without some strong disagreements. Above all, they'd accomplished something of real value to the plant and the business.

➤ Day Five

On Friday the team did a final cleanup, did some touch-up painting, and prepared their final report. At about 11 A.M. Larry toured each of the kaizen project sites and chose the one he felt had done the best job in cleaning up and effectively organizing its workplace. He would present a plaque to the winning team at the final presentation.

At noon the teams and plant staff gathered in the cafeteria for final presentations. Each team delivered a 20-minute presentation on its objectives and accomplishments, including recommendations for follow-up improvements to be accomplished over the coming month. No star performers here—all of the team members were expected to play a part. By noon it was over. In five days another kaizen team had met its targets, leaving behind a new dramatically improved process.

VALVE CELL TEAM RESULTS

Process Time reduced *93 percent*, from 15 days to less than 1 day.

Productivity increased *43 percent*, from 2.3 units/man-hour to 3.3 units/man-hour.

Inventory reduced *95 percent*, from 4,200 pieces to 218 pieces.

➤ Following Up

Although the project was complete, its consequences for the organization, and especially for the people whose jobs were directly affected, had really only begun. In the weeks that followed many adjustments were needed. Most affected, of course, were the people assigned to work in the cell. Some were members of the Kaizen Blitz team that built the cell. Others, particularly most of those on the second shift, were not. Training in the new procedures, especially cross-training on all of the operations now together in the cell consumed considerable time and effort. Some of the original team members helped out, but it took almost three months to select and fully train the second shift staff.

Some of the assigned operators did not adapt well to their new positions. The staffing concept that the team had developed called for operators to rotate through different positions twice each shift, but several people strongly preferred to stick to one function as they had in their prior assignments. Others were uncomfortable with the more obvious pacing of the work through the cell, with everyone's output directly pacing the output of the cell.

Support groups were affected as well. Because the whole cell would stop whenever a machine breakdown occurred, normal maintenance response and repair procedures were found to be inadequate. A priority response system had to be worked out to ensure prompt attention to problems. The plant needed procedures for ensuring that repairs continued through shift changes and into the off-hours without interruption. Later, improved preventive maintenance practices had to be adopted, and formal selection criteria for equipment to be used in cells were established. Equipment reliability and support were found to be far more critical for cellular manufacturing than for a traditional functional environment.

These problems are typical of those encountered in the early stages of an implementation. The challenge for management is one of stamina, the ability to stay the course. Considerable energy is required to sustain the attention, support, and emphasis needed and to work through the often-frustrating first steps of changing how individuals and organizations work.

The AME Kaizen Blitz was designed to give companies—especially small- and medium-sized ones—a powerful opportunity to make breakthrough change, to show through their own experience that change is achievable. The Kaizen Blitz approach is a good first step toward Lean Manufacturing.

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