Critikon Declares War on Waste, Launches Kaizen Drive

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Ray Cheser and Cheryl Tanner

By the end of our first Kaizen in June, 1991, none of us at Critikon would ever see things quite the same again. For many of the people of Critikon, Kaizen on that warm summer day was our one defining experience.

What is it that can change our whole way of thinking? Kaizen is a philosophy, a state of mind, a state of being, and in Japan, where the term originated, it is the foundation upon which all endeavors are pursued and the primary process for the continuing improvement of the lives of every individual. The literal translation of Kaizen is “continuous improvement”; while the term has recently been gaining some degree of recognition in the United States, the full scope of its meaning and intent are yet to be widely understood by American managers. And while many laudable efforts have been undertaken in the name of Kaizen, only one or a few of the broad selection of elements have been employed at any one time.

Many of the elements in Figure 1 are readily recognized by anyone who has fought waste and sought improvement in a manufacturing facility. But for these tools to let loose the explosive power of the Kaizen experience, they must be used in the context of both human needs and hard engineering.

Homers, Bunts, and Base-on-Balls

With Kaizen moving more into the mainstream of U.S. manufacturing, why is it still so misunderstood? The answer lies in the way many American managers continue to run their companies. While true Kaizen-oriented organizations focus on “process,” American management philosophy centers around “innovation and results.” Kaizen is one of the most-used words in Japan; it is applied to business, industry, commerce, government, and every other facet of life and provides a guide for how these activities are performed. Not merely a way to improve the quality of manufactured goods, it is the force behind continuous improvement in everyday life of everyday people.¹ (See Figure 2.)

U.S. companies continue to measure indicators like sales, earnings, ROI, etc. Technological home-runs are still seen as the game winners while small but steady gains are disdained; it’s whether you win or lose, and not how the game is played. Results and innovation are often promoted at the expense of the process required to sustain and build upon hard-won victories. By changing the focus from the bottom-line to areas such as training, autonomy, empowerment,
recognition, and real development of the individual, innovation and results become natural, expected and, very often, spectacular products of the process.

There is absolutely no question that we are all in business to turn a healthy profit. As stewards of the company’s resources, we are charged with providing stable, gainful employment, a fair return to the shareholder, and reinvestment into the business for long term success. While the typical U.S. rate of productivity increase hovers around two-three percent per year, Critikon saw two percent per month upon Kaizen implementation. These weren’t homers; they were bunts, singles, and some strikeouts. Sure, we had a double or triple from time to time, but always a steady stream of runners crossing the plate. Technological innovation is indispensable in any enterprise, and bottom-line results tell the score, but how we get there will, in the long run, determine how far we will go.

The Kaizen Paradox

Kaizen produces results through process-orientation. Many would agree that today’s most outstanding example of a process-oriented, results-producing company is the Toyota Motor Corporation. A close look at Toyota reveals a history rich in tradition, and a present shaped by a national catastrophe and a manufacturing icon — namely, a devastated economy resulting from World War II, and an engineer named Taiichi Ohno.

With little or no natural resources, and an industrial base in ruin after the war, manufacturing inputs became even more precious. Waste of any kind was evil. From the time Ohno joined Toyota in 1943, he set about studying the ways work was done and devising methods to eliminate waste and utilize human creativity. His inventions include many of the techniques and concepts that are the foundation of Kaizen and today’s world-class manufacturing. Familiar terms such as JIT, Kanban, and automation are Ohno’s. The culmination of his efforts, the Toyota Production System (TPS) has become synonymous with Kaizen.

Our initiation into the world of Kaizen at Critikon began with thorough training in the use of the same tools utilized so successfully in the TPS, and focused on measuring, observing, timing, and measuring some more. Kaizen meant quantitative analysis. The analysis used most effectively was based on time and motion studies. Through his early work in establishing compensation schemes, Frederick Taylor devised systems to analyze work for the sole purpose of eliminating waste. His primary tool was the time study, the very same one that Ohno said should be the first tool in ferreting out waste in any operation. But therein lies the paradox: Taylor’s quantitative methods have long been considered detrimental to the individual worker while Japanese management has become known for promoting worker involvement and development. How can it be then, that Kaizen can utilize Taylorism and still adhere to its humanistic, process-oriented principles?

The fact is, these quantitative tools are placed directly in the hands of the line worker. This trust and confidence in the person on the floor transforms every worker into an industrial engineer.
Kaizen unlocks human potential and frees that which is already there.

becomes a more valuable asset to the company.

But that’s only one side of the coin. Back in 1965, one of Japan’s largest department stores published a statement to their employees declaring their Kaizen beliefs that:

1. the development of individuals’ skills at work benefits both the worker and the company;
2. people are constantly seeking self-improvement; and
3. the real meaning of equal opportunity is to provide opportunities for personal growth.

These beliefs are still widely held in Japanese firms, and reflect not only the ever present Kaizen philosophy, but also the key elements of motivational theory developed in the 1950s by the humanistic psychologist Abraham Maslow. Maslow described self-actualization as the coming to full development of the individual, or the process of personal growth, the unfolding from within. Placing the right tools in the hands of the worker, providing him with the right training, and empowering him to act allows the growth and maturation to take place. Kaizen unlocks human potential and frees that which is already there, resulting in greater gains than would be expected from the more conventional machine speed increases or head-count reductions. So, through Kaizen, the paradox is resolved by integrating Taylorism and humanism into a single powerful approach to both personal development and manufacturing productivity.

Our defining experience has indeed brought us to a new way of thinking. Philosophies once thought to be worlds apart are now seen to not only co-exist, but to truly thrive under the same roof.

The Critikon experience is not entirely unique in American industry today. But what is remarkably different from many other stories is the way and speed with which Critikon significantly eliminated waste, reversed operating losses, and changed the culture of the organization.

The plant had been stagnant for nearly four years. Many initiatives were underway — training, capital investment, and reorganization; but the plant’s performance was not improving. Leadtimes were too long; productivity had been flat for at least five years and inventories were high.

“I think we were similar to many U.S. companies. We knew what the solutions were, we knew all the buzz words, we had done quality training, developed work cells, and even sent a team to JIT training, but all of this was not positively impacting our manufacturing performance,” said Herb Brown, vice president, Vascular Access Products.

“We needed dramatic improvement; not evolution, but revolution,” he said. “We knew we had to become more cost competitive to succeed in our market. We also knew that service levels had to improve in order to be truly responsive to our customers. These things could not be accomplished through improved scheduling and inventory management. Manufacturing leadtime and flexibility had to be improved. We sought a philosophy, an approach and results that would enable us to regain and sustain world-class competitor status.”

Brown’s management team was made up of three business unit managers, and managers of engineering and technical services, quality assurance, human resources, and the plant controller. They decided that the Kaizen philosophy of continuous improvement through total employee involvement, introduced via a breakthrough event that was to be very hands-on, people oriented, and biased for action, held enough potential for significant results that they should try it. Herb summed up the meeting with his management team, “It was essential for the success of Kaizen that I have consensus and involvement from my management team. I couldn’t expect the plant population to follow a program that they felt management only believed in halfheartedly, if at all.”

**Why Breakthrough?**

Significant breakthroughs happen with the improvement of manufacturing performance. Breakthroughs also occur within the minds of the employees. Breakthroughs, or “paradigm shifts,” involve the tearing down of old ways of thinking about and/or doing things and the opening up of completely new thought processes. Breakthroughs happen as managers, engineers, quality assurance, human resources, finance, and shop floor employees work side by side on Kaizen teams.

Breakthroughs occur as all building services, plant trades, and safety personnel remain on “Kaizen alert” to fabricate parts, prepare tooling, and immediately hook up electric and air as equipment is moved. Breakthroughs occur as teams report goals realized and results achieved within a 48-72 hour period of time; and finally breakthroughs occur as recognition is awarded and celebrations take place.
The Four Steps of Successful Shop-Floor Kaizen

Monthly Kaizen Session

<table>
<thead>
<tr>
<th>STEP 1</th>
<th>STEP 2 and 3</th>
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<th>STEP 3 and 4</th>
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<tr>
<td>Organize</td>
<td>Learn</td>
<td>Hit the floor running</td>
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<td>PRE-KAIZEN</td>
<td>DAY 1</td>
<td>DAY 2</td>
<td>DAY 3</td>
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Why Total Employment Involvement?

Kaizen stresses creativity before capital and is different from technological innovation. Innovation requires large amounts of capital and the accomplishments can only be attributed to a small, specialized group of employees. Kaizen relies on the creativity of the entire workforce. Ideas and the ability to swiftly implement those ideas fuel the continuous improvement process.

We developed total employee involvement to support a Kaizen culture markedly different from one based on hierarchy and seniority. In the Kaizen culture, the heroes are people who fix problems, who apply creativity before capital, who challenge, test, learn, and continuously improve.

Full worker involvement is sought to establish standard work procedures based upon the identification of the best combination of worker and machine that provides balanced production among all processes with minimum labor and inventory.

Key Elements to Successful Shop-Floor Kaizen

The central focus of Kaizen is where the action is — the manufacturing floor. Every aspect of Kaizen concerns itself with the people, materials, and processes involved in producing a product and drives the entire facility toward a hands-on, do-it-now attitude. We began our Kaizen activity with a sharply defined starting point for continuous improvement that is almost entirely experiential. Herb Brown described the approach as a “kick-start” leading to “one success after another.” The results sought are “quantum improvement” in the form of substantial reductions in operating costs and a means of unfreezing the organization in order to start “living continuous improvement.” We think the following are essential elements in starting and sustaining Kaizen (see Figure 3):

1. Organize
2. Learn
3. Hit the floor running
4. Boast and brag

Kaizen Workshop

- Emphasis is on true productivity improvement.
- Waste elimination in all its forms.
- Learn new concepts:
  - Standard work procedures
  - Cycle time
  - Work sequence
  - Standard work-in-process
  - Jodoka (automation)
  - Small lot production (SMED)
  - TAKT time
  - “Five why” problem solving
  - Multi-process operations
  - Worker reduction versus labor savings

The heroes are people who fix problems, who apply creativity before capital, who challenge, test, learn, and continuously improve.

Organize

- Leadership Commitment

At Critikon, the commitment to Kaizen began with Brown and his top management team. Herb joined the company in April, 1991, almost immediately after a group of our employees had gone to a seminar to learn about JIT implementation. They had come back and wanted to put a pilot program in one small inconspicuous part of our business with the intent that over four or five years we could grow this type of implementation throughout the plant. When the management team considered the approach in view of our capital spending, flat productivity, and fairly stagnant performance, it didn’t generate much enthusiasm.

Herb proposed that we put that idea on the shelf and go right for the jugular, go to the heart of the business and try to attack that which would give us the biggest payback fastest. So we went right for our main product line and made the risk of failure so unattractive that we put good time and energy and effort into making it a big success.

For his management team, the decision boiled down to an issue of trust in Herb Brown and frustration with the current situation, says Cheryl Tanner, human resources manager. “No one had a better option.” Everyone on the management team, including Herb’s boss, J. Bowling, the vice president of operations, committed to fully participate in the pilot Kaizen workshop in June, 1991. (See Figure 4.)

- Kaizen Teams

Our Kaizen teams include people from all areas of the plant, outside visitors who have a stake in the success of the company, such as suppliers and headquarters personnel, as well as Johnson & Johnson corporate representatives and interested people from other companies within Johnson & Johnson. Most of the team members are shop floor employees. There is no rank
among team members and discussion is open and encouraged for all. Each team of eight-ten members has a leader who has been pre-selected by the business unit manager. There are usually four to six teams, each concentrating on a specific area of the operation such as packaging or assembly during a Kaizen. Over time, the promise that every individual in the facility will have the opportunity to participate is reinforced as results are reported and enthusiasm peaks.

- Goals

Critikon demands much from its Kaizen teams. Each team sets specific goals, expressed both quantitatively and aggressively, such as 70 percent reduction in changeover time for machine X, 50 percent reduction in WIP at machine Y, 25 percent reduction in manning for work cell #4, etc. As unbelievable as they seem, the teams often beat them. The TAF Cell Team’s initial goal was to increase productivity 20 percent.

Primary opportunity areas included: cell layout/material flow, equipment reliability, changeover/setup times, product evaluation/disposition, and manning requirements.

People were told right up front that there would be no layoffs as a result of Kaizen activities. “Anyone who is ‘Kaizened’ out of a line will be redeployed to a comparable open position or to a Kaizen improvement team (KIT) where they will work on Kaizen homework,” says Cheryl Tanner. We rigorously monitor the results of Kaizens and the redeployment of people. Likewise, we emphasize the distinction between the Kaizen commitment and the possible impact that changing business conditions such as a drop in the sales forecast could have.

- Frequency

We schedule formal Kaizen sessions every four-six weeks for two and one-half or three and one-half days. New teams form and new goals are set for each session. We have been rigorous in keeping our commitment to these schedules. Once we are confident Kaizen has become an integral part of everyone’s thinking and that Kaizen activities have become spontaneous and no longer require breakthrough events or frequent booster shots, the frequency is reduced.

Learn

- Condensed Learning

The Kaizen event is kicked off by four hours of condensed learning in a specially designated “Kaizen room.” Key Kaizen concepts and tools that will enable the teams to identify and eliminate waste are introduced. (See Figure 5.) Waste is defined as excess inventories; walking, rework, motion, inspection, and all forms of non-value adding work is evil and the enemy to be eliminated. Tools include ways to assess the speed of production against the demand for the product, the step-by-step analysis that separates the product production cycle into the details of the machine’s work and the work of the operator(s), the development of standard work, practice in time and motion study observations, and the “Five Whys” problem solving process. The emphasis is on practical use of these tools the next day.

- Continuous Flow

Central to efficient manufacturing is the continuous flow operation. During this pre-floor learning period, we use games and simulations demonstrating traditional versus continuous flow configurations and their impact on number of units produced, WIP and worker productivity. Stop watches are used, units are counted, and all results are documented on a flip chart. This aspect of the condensed learning is fun and it illustrates the concepts well and stimulates “can-do,” and “do-it-now” attitudes.

Linking equipment and processes may be painful, but the waste that Kaizen attacks is most clearly exposed in this configuration. The relocation of equipment is encouraged; creativity over capital expenditure is stressed. Simulations and mock-ups, followed by actual linkages, should be tried and changed if necessary.

- Quantitative Tools

On day one, everyone has a calculator and each team receives a couple of stop watches. The concept of Takt time is introduced. “Takt” is a German word for time or measure, and conveys the idea of a conductor setting the beat. In manufacturing, the calculation of takt time reveals the appropriate rhythm of the factory floor as signaled by the daily customer demand or orders. Takt time is the speed at which parts must be manufactured in order to meet, not exceed, the customer demand and is calculated by dividing the number of working minutes available each day by the daily customer demand.

Cycle time, which is a measured value, is the time it actually takes to manufacture one piece of product. In
the culture of Kaizen, the goal is to work within Takt time — to neither overproduce or underproduce. (See “Takt Time Determination” p. 18.)

The first and most important step in any Kaizen project is to understand what is being done now. Kaizen begins with observation — observation in an overall sense and observations anchored in time. Practice calculating Takt time, manual and machine cycle times, equipment capacities, and deriving labor loading and machine requirements took place during the learning workshop with an emphasis on immediate and practical implementation. (See p. 18.)

Hit the Floor Running
First thing in the morning

The day following the learning period starts with a continental breakfast at 7:00 a.m. in the Kaizen room. In this “Kaizen headquarters,” each team has a large round table that serves as a base of operation for the next two days. Each team reviews its goals and a plan of action for deploying the team to the floor is formulated. The team is on the shop floor by 7:30 a.m. At this point it is important to guard against prolonged discussion that might lead to “pencil Kaizening,” or the more traditional “analysis ‘til paralysis” syndrome.

We focus attention on the goals. The TAF cell team reviewed its goal to increase productivity in the cell, assigned team members to identify opportunities in terms of the cell layout/material flow, the equipment reliability, changeover/set up time, product evaluation/disposition, and manning.

It’s showtime

Now it’s off to the floor, into the core of manufacturing. As Taiichi Ohno said, “At our factory, we start our Kaizen efforts by looking at the way our people do their work, because it doesn’t cost anything.” Kaizen team members, in bright red shirts and caps, are now highly visible all over the manufacturing floor with clipboards and stop watches in hand. Good observations and good records are mandatory. Decisions to reduce manning, eliminate inventories, move equipment, compress equipment layouts, reduce walk time, link machines, modify tooling, and the like are based on data collected during this intensive time on the floor.

Every two-three hours the team reassembles to review progress and then hits the floor again. Trial runs and mid-course corrections may be necessary, scope may be shrunk or expanded, but bottom-line quantitative results are always sought. People are encouraged not to be afraid to cut steel, revise procedures, move people, or modify anything; everything is fair game in the crusade to eliminate waste. Leader Herb Brown temporarily moved his office to the Kaizen headquarters; Herb is on the manufacturing floor frequently, problem solving and brainstorming with team members.

In the team leader meeting at 4:00 on the first day, Herb participates in the discussion of goals, progress, obstacles, and next steps. He encourages team leaders to coach their members to communicate frequently and thoroughly with off-shift personnel. Since most of this frenzy of floor activity takes place on first and second shift, it is all too easy for third shift employees to arrive for work only to find that “the living room furniture was completely rearranged while they were out shopping.”

Boast and Brag
Presentations preparation

The grand finale of the Kaizen session consists of presentations by each team of their progress and results. Since the format was reviewed during the learning session and the objectives were kept in front of each team throughout the session, the final presentations are put together in one-two hours. Handwritten overheads of goals and results continue the on-the-spot, right-now spirit. Other visual displays such as modified tooling, changeover carts, before-and-after videos, etc., further emphasize the accomplishments.

The presentation

Each team presents its goals and corresponding results; what starts out as a group of nervous stand-up presenters quickly builds to a goal-line pep-rally. Pride in accomplishment and mutual admiration among team members and across teams allows for good natured boasting, bragging, and one-upmanship. Competition and camaraderie usually reserved for the bowling alley or ballpark is let loose on the factory floor with unbelievable gains in cost reduction and productivity improvement.

The wrap-up

After the last team has collected their kudos and returned to their seats, the facility leader recaps the accomplishments, lavishes praise on the teams, recounts the principles of Kaizen, and individually recognizes

Taiichi Ohno said, “At our factory, we start our Kaizen efforts by looking at the way our people do their work, because it doesn’t cost anything.”

July/August 1993
### Standard Work Combination Sheet

<table>
<thead>
<tr>
<th>Step #</th>
<th>Work Content Description</th>
<th>Part Name Walking</th>
<th>Work Content Graph (1 sec/div.)</th>
<th>Manual</th>
<th>Automatic</th>
<th>Walking</th>
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### Takt Time Determination

\[
\text{TAKT Time} = \frac{\text{Net Operating Time/Period}}{\text{Customer Requirements/Period}} 
\]

* Time periods must be consistent (shift, day, week...)

**Net Operating Time (one shift operation)**

- Shift = 480 minutes
- Break - two at 10 minutes
- Clean-up - one at 4 minutes
- Net operating time per shift (minutes) 456
- Seconds per shift 27360

**Customer Requirements**

- Monthly requirements (units) = 9,600
- Number working days/month = 20
- Customer requirements per shift = 480

\[
\text{TAKT Time} = \frac{27360 \text{ seconds per shift}}{480 \text{ units per shift}} = 57 \text{ seconds per unit}
\]

### Tools for Standard Operations and Kaizen

**Time Observation Form**
- To observe the operations and break into small elements.
- To establish best/repeatable elapse time per element.

**Process Capacity Table**
- To determine if machines have sufficient capacity.
- To determine level of manning in the cell.

**Standard Work Combination Sheet (SWCS)**
- To train new operators.
- To record actual shop practices.
- One SWCS/operator — posted in the cell.

**Standard Work Sheet (SWS)**
- To train new operators.
- To record actual layout and flow.
- One SWS/operator — posted in the cell.

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**Figure 5.** Tools for self-directed work team operations and Kaizen. Reprinted with permission of TBM Consulting Group.
TAF Cell

With the help of our facilities people, all this was done in a matter of hours. After several trials in the new configuration and a lot of input from and consultation with the operators, we were ready to go back into full production. Comparing the new total cycle time with the Takt time, we found the entire cell could operate with seven operators instead of nine; this resulted in a whopping 22 percent increase in productivity in only two days of Kaizen. (See Figure 6.)

NextCell

Later in the year, we attacked the remainder of the work cells, composed of different types of machines which performed the same operations. In this case, the three forming machines had been combined through a previous automation program into one single final assembly machine (FAM). It still required a separate needle assembly machine and a catheter assembly machine to feed the FAM these components. The manning consisted of two operators and one mechanic. Once again, after Kaizen training, the stopwatches came out, the layout was examined, and areas of improvement were discovered.

Three Areas Where Productivity Rose And Capital Spending Dropped

1. The Forming Cell

In our facility the same operation gets done several different ways due to different types and generations of equipment. The most critical operation in terms of product performance is the forming of the tip of the intravenous catheter. It is here that the rubber hits the road, or more specifically, where the point hits the patient. A very malleable plastic material must be held to .0005" tolerance or else the "ouch" factor, customer dissatisfaction, goes up. One of the work cells that performs this operation consisted of three machines attached to an in-line conveyor, along with a machine that produces a component assembly and another that produces another component assembly. The purpose of the cell was to take one component assembly, manually mate it with another catheter assembly, and place it back on the conveyor where it was transported to another machine which automatically completes the assembly.

On our very first Kaizen, this cell was selected to be analyzed since, with nine operators, it appeared that some improvements could be found. After our basic training was completed, and our objectives were set, we headed for the floor. Art Myers, the area manufacturing team leader serving as the Kaizen team leader, coordinated the overall effort, while Julie Michaud, a machine operator from the work cell, Cheryl Tanner, human resources, and Paul Schaefer, ETS, began conducting time and motion studies using the methodology learned during the Kaizen training.

As Ohno-taught, our first target was to find out how operators could do their job more efficiently. We found that the sequence of motions, which included picking the component assembly off the conveyor, picking another assembly out of a container, mating them and placing the final assembly back onto the conveyor required 4.5 seconds on average. Based on the Takt time, we found that it would be necessary to reposition the equipment to make walking around them easier in order to meet the time allowed. Additional study showed that if we moved the Instron tensile tester and the catheter assembly machine closer to the conveyor, walk time could be further reduced.

With the help of our facilities people, all this was done in a matter of hours. After several trials in the new configuration and a lot of input from and consultation with the operators, we were ready to go back into full production. Comparing the new total cycle time with the Takt time, we found the entire cell could operate with seven operators instead of nine; this resulted in a whopping 22 percent increase in productivity in only two days of Kaizen. (See Figure 6.)

2. Next Cell

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The team uncovered several problems: first, we found that QC testing done by the operators was a very time-consuming part of their job. By going back through historical quality data, we found that the percent defective was low enough to allow us to reduce the number of samples tested without sacrificing quality or increasing risk.

Another key factor was the elimination of manual material handling of the catheter assemblies. By linking the catheter assembly machine to the final assembly machine, not only was the operator freed from this time-consuming chore, but significant WIP was elimi-
Figure 7.

nated. After these changes, the total operator cycle time was calculated and compared with the Takt time, which indicated only one operator and one mechanic were needed to effectively run the cell. A reduction of one out of three yielded a 33 percent improvement in productivity in an action-packed, two-day period. Once again, quantitative analysis via operator participation resulted in major gains and elimination of wasted space, materials, and labor.

3. Creativity Before Capital

All through the Kaizen sessions, trouble was brewing in the background. We had been in the process of ramping up production of a significant product improvement, including a new package. The new package was also improved and required a special cutting feature on a new packaging machine. Unfortunately, this new packaging machine was still being developed by an outside supplier and we were rapidly running out of time before we needed it for our new package. We had already purchased some manual presses which could cut the packages in the required configuration, but they were labor-intensive and of limited capacity. And they would not be enough to keep up with our increasing production; hence they became a tailor-made target for Kaizen.

One of the basic principles of Kaizen is to substitute brains for bucks. So, a Kaizen team was formed, led by Joe Whitaker, manufacturing team leader, including Diane Marquis, quality assurance auditor; Rick Pyfrom, unit manager; Biff Gallagher, sterilization operator; Len Saponare, toolmaker; Jim Turner, team technician; and Cindy Whitman, team technician; all from the packaging production floor and tool room. Their objective was to find a clever way to stave off an unending capacity shortfall without having to purchase an additional set of manual presses that would only be needed until the new machine was ready. While the rest of us looked for improvements out in the catheter production areas, Joe Whitaker and his team went to work.

By the end of the second day, the packaging Kaizen team was already demonstrating a mocked-up machine consisting of three cutting heads taken from the cutting presses which had been arranged around a circular plywood table, on which rested a series of packaging nests. The table rotated on demand, the presses cut the packages at an increased rate of throughput, and only two-thirds of the original number of operators were needed to make it all work! While further engineering and fabrication would be required, proof-of-principle had been demonstrated. Kaizen had once again unleashed employee creativity over unnecessary capital expenditures. (See Figure 7.)

Conclusion

U.S. companies are paying much more attention to the Japanese these days. What is frequently overlooked, however, is the extraordinary willingness of the Japanese to learn and adapt — to learn from post-war American industrial experts and to adapt the best of what they learned to their unique situation and culture. At Critikon, a similar willingness to learn and to adapt within the framework of continuous improvement is developing. Critikon has optimized the Kaizen process through a unique combination of passion, precision and perseverance. (See Figure 8.)

Passionate leadership is an absolute. Without overstatement, the leadership must possess an evangelical conviction that the principles and precepts of Kaizen will lead the multitude out of the wilderness into the promised land. When the long hours, hard work, and sometimes grudging results bring out the grumblers and naysayers — which come in the form of upper management, engineers, and shop floor employees — the conviction that Kaizen is the true path will provide the fortitude to press on in the face of adversity. Focus on the goal and a driven pursuit of the rewards for the effort must be put in front of the workforce constantly, without fail and without retreat. The leader must inspire with actions as well as with words; to do all these things, he/she must passionately care about the business, about the people, and about excellence. Success begets success.

Along with passion must come precision; exacting standards, precise analytical methods; clearly
defined and quantifiable goals; hard data; rigorous examination and critique of results. While many quality and productivity improvement programs rely extensively on broad foundations, general principles and a common vocabulary sprinkled with pleas and platitudes, Kaizen relies on putting the basic tools necessary to get at the heart of the problems into the hands of the workforce. Too often industrial cardiac surgery is performed with Gray's Handbook of Anatomy in one hand and a butter knife in the other. That needs to be replaced by X-rays and a tray full of very specific instruments. Everyone in the operating room needs to thoroughly understand the basics of the procedure and to adhere to the discipline demanded. Kaizen turns everyone into a surgeon who can skillfully examine, diagnose, and treat.

Much Kaizen time is spent learning quantitative methodology and the manufacturing operation; understanding where waste occurs, devising ways to eliminate the waste, and measuring in exact detail every activity, process, and procedure.

The third P, perseverance, is probably the least appreciated, but most important element of long-term Kaizen success. Until a team passionately and precisely examines the operation, plucks the low-hanging fruit, and begins reaching higher into the branches, the members will have no idea of the depth of waste to be eliminated or the magnitude of the follow-up work required. There is so much invisible opportunity which only becomes visible through “Kaizen eyes,” that the amount of time and energy necessary to sustain ongoing progress can easily be significantly underestimated. When the full potential of operational improvement becomes clear, the full realization of what can, should and must be done can be either overwhelming or exhilarating. The choice then becomes one of either settling for mediocrity or embracing the opportunity for true excellence.

At the end of the first Kaizen, the esprit de corps, the “creativity before capital,” and the documented savings of over half a million dollars confirmed we were on the right track. (See Figure 9.)

In the monthly workshops following, leadtime reductions of greater than 50 percent, with comparable reductions in square footage, set-up time and work-in-process were common results. Not all results are that impressive. The state of the processes at Critikon at the time of the first Kaizen workshops allowed for changes that reaped phenomenal results.

Workers now volunteer to participate. In the beginning, to encourage participation and set the tone for the cross-functional team style, participants were invited for their particular knowledge or expertise in a specific area of manufacturing process. More than 75 percent of the personnel at Southington have participated in at least one workshop, while many have completed two or more. Approximately one-fourth of the participants are either from other Johnson & Johnson companies or are Critikon suppliers.

Kaizen has allowed Critikon to realize and invest in the creative capital of its workforce through team-based problem solving. Inventory and square footage have been reduced while measurable productivity has increased. (See Figure 10.) Looking back and assessing Critikon’s experience with Kaizen, Herb says, “We have a highly skilled workforce that is now working together to meet the competitive challenges. Kaizen is helping to break down the barriers that exist among the diverse functional areas, the manufacturing floor, and management, and encouraging a team approach to problem solving.”
Manufacturing Performance Before and After Kaizen Implementation

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