Critical Elements for

Major Improvements

by Ted Schaar

At a Glance . . .

- The MEDRAD Critical Elements improvement team employed IMAGES®, the company's trademarked continuous improvement methodology, to focus on processes in the packaging area.
- The team reduced expenses by $160,000 annually by using Six Sigma and quality tools, including brainstorming techniques and a solution priority chart.
- The team also eliminated excessive overtime and the need to hire temporary workers on an annual basis.

The MEDRAD packaging team worked 685 hours of overtime in 2007 and 443 hours in 2008. In addition, two temporary employees were needed each year to keep up with the workload.

Overtime and expenditures on temporaries added up to a total of $40,000 in 2007 and 2008.

Many organizations face production problems such as excessive overtime at higher-than-normal labor rates and a reliance on temporary workers. MEDRAD's successful packaging area improvement project shows what can be done to rein in these costs.

About MEDRAD

MEDRAD Inc., headquartered in Warrendale, PA, designs and manufactures products used in medical diagnostic imaging. Founded by a physician-entrepreneur in 1964, MEDRAD is now a business of Bayer Medical Care, which acquired it in 2006. The company has approximately 1,700 employees and offices in 17 nations.

Forty-two MEDRAD injector, pump, and coil products are readied for shipment in the 8,888-square-foot packaging area, which is part of the Heilman Center, a 154,000-square-foot MEDRAD manufacturing facility in Pittsburgh.

Injectors are delivery devices used to inject contrast dyes into patients undergoing CAT scans or MRI procedures. Product names are Stellant, Provis, and Spectris Solaris EP. Pumps such as the Continuum regulate the flow of dyes. Coils go over a patient's head, neck, and shoulders and help to facilitate scanning procedures. An example is the NVA-8 high-definition coil.

The packaging area is a first-shift operation where five assemblers called packaging clerks place products in foam molds and deposit them in cartons. Literature such as operator instructions and accessories are added; the box is then sealed and transferred to the shipping area.

Why Quality?

In early February 2009, Shawn Simpson, a process analyst and leader in the packaging area, was concerned about the overtime and temporary employee costs and decided to take action. "I talked with Lori Smith-Sakalousky, the manufacturing manager, to see if she would approve an improvement project," he said.

Her reaction was "very positive," Simpson recalled. Simpson and Smith-Sakalousky felt that making the packaging area more efficient would advance progress toward three corporate goals: improve quality and productivity, exceed the financials, and improve employee satisfaction.

Smith-Sakalousky arranged for other process leaders to fill in for Simpson as needed so he could manage the project. She also apprised upper level managers and received their support.

The Critical Elements Improvement Team

From left to right:
Mike Bann, packaging clerk
Jeff Balog, procurement supervisor
Dominic Cicchirillo, electromechanical engineer
Ken Utiss, packaging clerk
Jim Vida, packaging clerk
Mark Suhanin, packaging clerk
Shawn Simpson, process analyst
Dave Yaksetich, packaging clerk

Simpson credits his ASQ membership with helping him learn about many of the quality tools and approaches he used in the project: "I've gained a great deal from seeing presentations at ASQ conferences and applied many of the techniques I became acquainted with through ASQ to build our project."

He is also a Six Sigma Green Belt. "MEDRAD's Six Sigma training is called the Green Belt Wave," Simpson said, "and it's a combination of classroom and hands-on training." Online coursework is taken through MoreSteam University.

An earlier improvement effort had already produced major changes to the packaging area.

"Before that project, employees specialized in packaging certain products," Simpson said. "It was determined that if everyone was cross-trained, so all clerks could package any product, efficiency would improve. It became more of a team effort."

Assembling the Improvement Team

Simpson asked the five packaging clerks who work in the area to join the improvement team along with two others.

Dominic Cicchirillo, an electromechanical engineer, was invited for his track record in packaging. He is also a Six Sigma Black Belt who has helped implement numerous improvements and mentored others on how to use project tools.

Jeff Balog is a procurement supervisor who was chosen for his procurement expertise and leadership skills.

"We have a limited amount of area and were trying to figure out ways to free up space," Simpson said. "Jeff understood what we could do and what was off limits. For example, he knew what items we needed to order in large quantities and store to get the best pricing. We couldn't do anything about those things. Jeff helped us focus on things that we could change."

Getting Started

After writing a project charter to set expectations and goals, the team created a solution priority chart and listed tasks on an action log. The focus would be increasing the packaging area's ability to meet its objective without overtime or temporaries.

Team priorities were maintaining conformance to requirements and improving productivity. Exceeding the baseline capacity of 500 units per month by 20 percent was a primary goal.

Simpson had read the book *Toyota Culture,* and the observation, "Toyota trains employees like they are surgeons" stuck with him. The Toyota approach calls for extensive classroom training and a support staff that supplies the tools needed to be successful.

"There were similarities at MEDRAD," Simpson said, "but I didn't feel like a surgeon when I went into the packaging area at the Heilman Center. I felt like a scientist. It was a discovery process. We were sitting down with managers and trying to figure out how to improve the process, creating theories and testing them. We were experimenting to find the *critical elements* that lead to major improvements." This is how the project name Critical Elements originated.

Stakeholders

Nine kinds of internal stakeholders were identified as business partners of the packaging team: multi-vendor service, service, planning, shipping, procurement, plant management, performance excellence center, the Finish Goods Area Optimization Project, and manufacturing engineering.

The Finish Goods Area Optimization Project was another improvement effort running parallel to Critical Elements.

The project team created a stakeholders analysis chart (Figure 1) to give each stakeholder a ranking and to create a method of engagement. "We wanted to determine what areas and people we would impact and rank them," Simpson said, "So we met with every group in the plant."

Figure 1—*Stakeholders analysis*

Stakeholder	Relationship to Project					Priority		Method of engagement
	Is affected by outcome	Can influence outcome	Has useful expertise	Provides resources	Has decision authority	Total	Rank	
Internal								
MVS	1	1	1	1	1	5	10	Inform
Service	1	1	1	1	1	5	9	Inform
Planning	1	1	3	1	1	7	8	Advisor
Shipping	3	1	1	1	3	9	7	Inform
Procurement	3	1	3	1	1	9	6	Team
Plant Management	3	1	1	1	3	9	5	Sponsor
PEC	1	1	3	3	1	9	4	Steering
FGA Optimization Project	3	1	3	1	3	11	3	Inform
Mfg. Engineering	1	3	3	3	3	13	2	Team
Packaging Team	3	3	3	3	3	15	1	Team

IMAGES® Continuous Improvement Methodology

The Critical Elements project team followed MEDRAD's trademarked continuous improvement methodology IMAGES®:

- **I**dentify the problem
- **M**easure the current state
- **A**nalyze the root causes
- **G**enerate potential solutions
- **E**xperiment and then **E**xecute proven solutions
- **S**ustain improvements over time

"IMAGES was our foundation throughout the Critical Elements project," Simpson said.

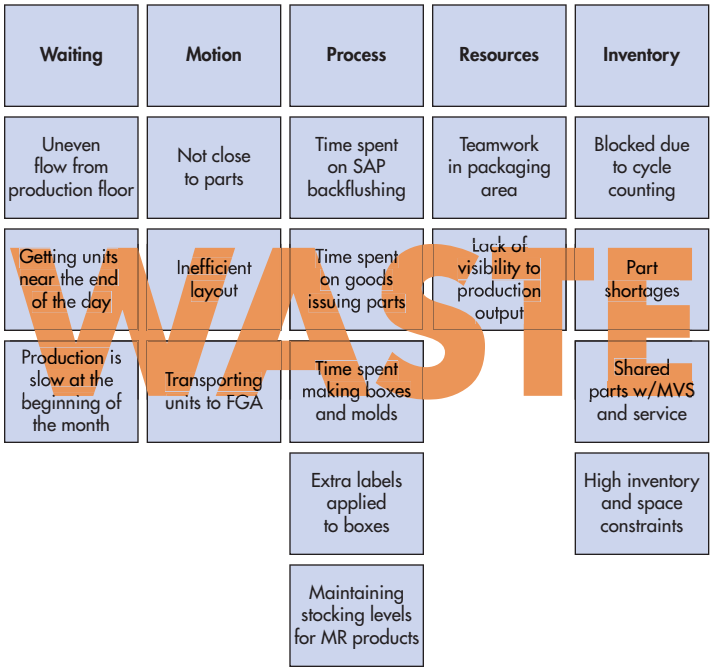
Brainstorming to Identify the Problem

"I chose to have a brainstorming session early to kick off the project, because I thought it was important to understand the voice of the customer," Simpson explained. In this case, the voice of the customer was the packaging team itself, so Simpson says he posed a simple, boiled-down question: "What stops us from packaging more units?"

The brainstorming session led to the creation of the affinity diagram shown in Figure 2. The team employed the Post-it® note method and grouped waste into five categories: waiting, motion, process, resources, and inventory.

"The affinity diagram was our road map to the measure and analyze phase," Simpson said. "All of the areas for improvement were identified." Stocking levels for magnetic resonance (MR) products were analyzed first.

***Figure 2**—Affinity diagram*



Measuring Process Waste and Analyzing Causes

Time studies were proposed as a means of analyzing process steps and identifying waste. The team needed to quantify how much time was spent obtaining parts, putting parts away, working on the computer, conducting necessary transactions, and taking parts to storage locations in the shipping area.

"We package 42 different products, and I needed help," Simpson said. "Kennametal Center for Operational Excellence personnel were conducting training at our plant, so I asked for resources to complete the time studies. They provided interns."

The interns observed employees like Jim Vida, a packaging clerk. "Every morning I walked across the warehouse to the MR storage location, which is 130 feet from the packaging area," Vida said. "I'd compare the quantities of each product against the stocking levels and write the part numbers down on a priority list."

Another example of waste the team identified involved the Spectris Solaris EP battery, a high inventory item. "Through the analyze phase, we found we were carrying 963 batteries. Our safety stock level was 87 with a minimum order quantity of 200 pieces," Simpson recalled.

One Spectris Solaris EP battery powers an injector and is shipped with the product. It's about as long as a laptop and five inches high. Production and service demand inventory for the battery was stored in the packaging area. The project team met with service personnel to discuss the high inventory of EP batteries.

The service department was driving demand through the SAP (systems applications and products in data processing) system, but it was not taking the parts on a monthly basis. This turned out to be a major cause of the inefficiency the team was targeting.

***Figure 3**—SAP times compared to overall time*

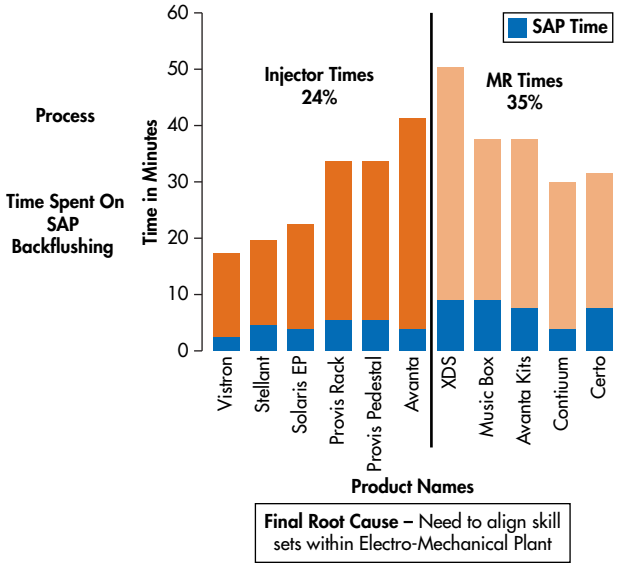


Figure 3 shows how much time the packaging team spent on SAP transactions. When packaging an injector, for example, SAP transactions consumed 24 percent of a packaging clerk's time.

Time at computers completing SAP transactions was identified as an obstacle to packaging work efficiency.

"It was a large piece of our cycle time that we wanted to eliminate," Simpson said. "We had a cross-functional meeting with different levels of management. They were supportive, but it was difficult to accomplish. So we formed a sub-team to figure out ways to do it."

The team created a fishbone diagram to ensure it had identified all root causes. The fishbone helped team members zero in on root causes such as wasted time on the computer and walking to obtain needed parts.

A simple process map for the Spectris Solaris EP battery line (Figure 4, top half) showed that goods flowed from the supplier to quality control incoming and then to packaging, where they were stored until service had what it needed.

Mike Bann worked in the injector packaging area. "Usually we got 200 batteries in, and my first step was to verify the batch codes," he said. "Different batch codes were placed on different pallets. Once the batteries were separated, I wrapped each pallet and tagged it with the quantity and batch code before putting the batteries away. When I had a service request, I matched the quantity with one of the batches on-hand."

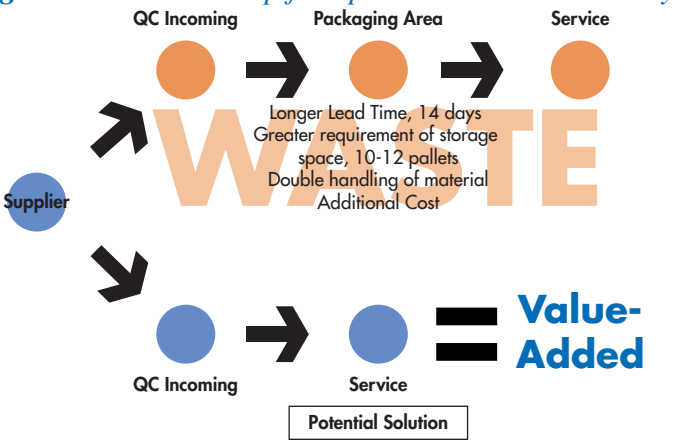
On-hand material for 14 days of production was needed. This was longer than what was typical and required storage space for 12 pallets. Doubling the handling of material and adding storage space were not acceptable solutions because both added costs.

Generating Solutions

New Report

Simpson met with the planning department and asked if a report could be created through SAP to eliminate the non-value-added motion waste associated with maintaining stocking levels.

***Figure 4**—Process map for Spectris Solaris EP battery*



The planning department provided a report that showed material number, description, unrestricted stock (which is the product on the shelf), and the safety stock levels. The report could also be sent through e-mail at a prearranged time.

The Critical Elements team met with materials management and manufacturing management, presented time study findings, and proposed transferring responsibility for making a computer record to the materials management group.

Materials management agreed with the proposal. During the cross-functional review, the team formed a second sub-team to develop the potential solution. Simpson led the new sub-team and invited representatives from materials management and packaging to join.

"The Critical Elements team and the sub-team had a brainstorming session, created another process map, and developed a proposal," Simpson said. "It showed the times for the injectors, which was our focus due to the higher volume of injectors as compared to MR products. Our proposal specified a 16-percent reduction in injector cycle times." (See Figure 5.)

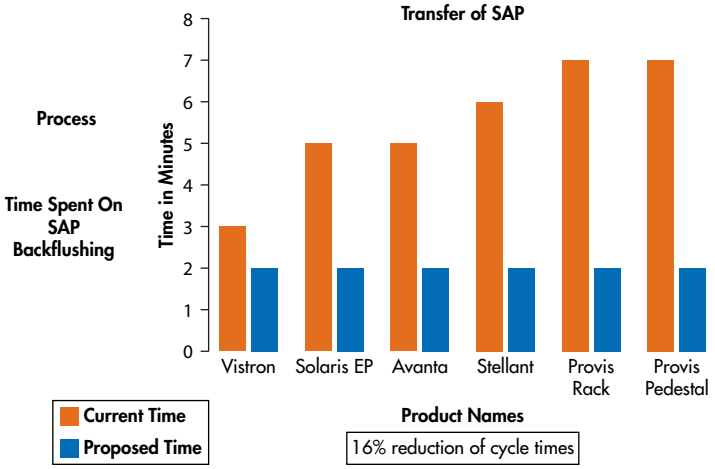
Product Delivered to Service

To eliminate waste and increase value added, product would be delivered directly to service instead of the packaging area, as in the bottom half of Figure 4. This freed up space in the packaging area and eliminated the need to handle material twice.

The new stocking level report that would be used to eliminate motion waste lists the material number and material description. Now, packaging clerks receive an e-mailed report that shows how many products are in stock and will need to be packaged during a shift. Previously, packaging clerks had to walk to a different area to check inventory.

A report for a two-week period was printed and counts on the warehouse shelf verified. No discrepancies were found, and this produced 42 hours of savings annually.

***Figure 5**—Sub-team proposal for transfer of SAP to materials management*



Daily Meeting

"When we created our affinity diagram, we identified resource waste, which was a lack of visibility to production output," Simpson said. "We took a look at our SIPOC [suppliers, inputs, process, outputs, customers] map and decided to invite one of our business partners to a new daily meeting. This was initiated after we received training conducted by the Kennametal Center for Operational Excellence."

The daily meetings brought two groups together and helped each understand the other's unique requirements and how one group's work impacted the other group.

Electrical Safety Test created a list of all the products that were ready for test and brought it to the daily meeting. Packaging would know how many of each product it would receive and could ask Electrical Safety Test to verify products in a particular order.

"We chose the Final Test Group," Simpson said, "since it was required to perform a final test on all of our injectors, and they would know what the packaging team would receive on a daily basis." This meeting improved communication and helped to decrease non-value-added activities.

Solution Summary

Before moving to the execute phase, the team reviewed its progress. Simpson recalled, "We listed our potential root causes, final root causes, and potential solutions and wondered if the solution would enable us to hit our targets."

The table in Figure 6 lists the expected tangible and intangible benefits for each of the team's four solutions.

Stakeholders involved in developing a solution for reducing inventory and eliminating the non-value-added steps for the battery were suppliers, the planning department and packaging team, QC incoming, and service.

Results

The improvements recommended by the Critical Elements team were implemented with the following tangible impacts:

- Savings of $160,945
- New layout incorporating six new products while reducing overall space by 48 square feet
- Increase in packaging team capacity by 35 percent
- Improvement in customer satisfaction through greater ownership of storage locations within the plant
- Improvement in employee satisfaction by eliminating non-value-added steps

Intangible impacts were:

- Reduced process waste
- Better alignment of core competencies within the Heilman Center
- Improved communication through daily meetings with business partners

"Ultimately, we more than accomplished our goal," Simpson reflected. "We've eliminated all SAP transactions and have achieved a 24-percent reduction in cycle times."

To help sustain the improvements, the team developed a 6S auditing format for packaging by creating a binder of digital pictures that illustrates how key areas should look. The Critical Elements project was officially closed in July 2009.

Along with providing many benefits to MEDRAD, the Critical Elements project was a finalist in the 2010 ASQ International Team Excellence Award process.

Employees Want to Solve Problems

Simpson summed up what made the project successful: "We listened to the experts, established the voice of the customer early, and defined our scope."

He concluded by saying that MEDRAD employees have shown that they want to solve problems, drive down costs, eliminate waste, and reduce how long it takes to perform a task. "Mainly," he said, "our employees *want to* and *can do* a great job! They just need the means and support."

For more information:

- Contact Shawn Simpson at ssimpson@medrad.com.
- Visit MEDRAD's website at www.medrad.com.
- Learn about the ASQ International Team Excellence Award process at http://wcqi.asq.org/team-competition.
- Along with insights and ideas gained through his membership in ASQ, Simpson said MoreSteam University and the Kennametal Center for Operational Excellence were resources that helped the Critical Elements team succeed.

About the author

Ted Schaar is a freelance writer who has written on quality topics ranging from statistical process control to 5S. A graduate of the University of Wisconsin-Madison, he resides in Brookfield, WI.

Figure 6—*Expected benefits of solutions*

Solution	Tangible Benefits	Intangible Benefits
Transfer of SAP	Reduce cycle times by 16%	• Greater control of the process • Greater ownership of storage locations for the materials management group
Daily meeting with business partner (Electrical Safety Test)	Eliminate non-value-added steps	Improved communication between business partners
SAP report	Reduce non-value-added walking time by 15 minutes per day	Information delivered to the user
Reduce order and safety stock quantities	Savings of $100,000	Reduce non-value-added process steps