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A Match Made in MEXICO

Physical distribution and Six Sigma, that is.

Physical distribution may not be at the top of most Six Sigma "targeted for improvement" lists, but I've found that it's an untapped resource for Six Sigma projects. Most black belts focus their efforts in the areas of manufacturing and product development, but few apply Six Sigma techniques to physical distribution.

Soon after I joined Butler, Indiana-based Therma Tru Doors, I was given the responsibility of managing a freight utilization project in Matamoras, Mexico. Even though I was not an expert in transportation, I was able to utilize Six Sigma and total quality management (TQM) techniques which eventually saved Therma Tru over $1.5 million in annual freight costs. We'll examine the tools that were used and demonstrate how any logistics department can achieve similar benefits.

While I was working at General Electric, I was fortunate enough to receive Six Sigma black-belt training from GE's premier Six Sigma instructor, Scott Lasatar. Scott was not only responsible for all of GE Industrial System's black belts and green belts, he also taught Six Sigma to the likes of Jack Welch and the senior management of GE. Little did I know how much his instruction would benefit me down the road.

At-a-Glance

- Proper application of Six Sigma methodology to the area of physical distribution can produce significant benefits for many manufacturing companies.
- DMAIC—Define, Measure, Analyze, Improve, and Control—represents the five key phases of Six Sigma.
- Involving all project members in the key decision-making processes of a Six Sigma project—as the author did in his project at Therma Tru Doors—greatly increases the chances for success.

A brief refresher

SIGMA IS SIMPLY a letter used in the Greek alphabet. The actual term sigma is used to designate the distribution or spread about the mean (or average) of any process or procedure. For any particular process, the sigma value is a metric that indicates how well a process is performing. The higher the sigma level, the better the process is actually performing.

With Six Sigma, the common measurement index is referred to as defects-per-unit, where a unit can be anything being measured—cubes per truck, transit times, and so forth. The sigma value indicates how often defects occur. As sigma increases, costs are reduced, cycle times decrease, and customer satisfaction increases.

The difference in sigma levels is significant. For example, a good sigma level (3.8), will result in 20,000 lost articles of mail

per hour. However, improving this process to a level of Six Sigma will result in only 7 lost articles of mail per hour. Thus, the goal of every organization should be to increase their processes to the level of Six Sigma.

Six Sigma techniques can be applied to many areas other than manufacturing. At GE, all business units require that all salaried personnel complete at least two green-belt projects per year. These departments include finance, customer service, sales and marketing, purchasing, quality, engineering, physical distribution, and human resources.

Although some of the statistical tools used in Six Sigma can be somewhat perplexing, we'll focus here on the basics of Six Sigma techniques, many of which are taught worldwide. Let's begin with the foundation of Six Sigma: DMAIC.

DMAIC is an acronym for Define, Measure, Analyze, Improve, and Control. These are the 5 phases of Six Sigma. Each phase is linked to the previous one as well as the next. All 5 phases must be used in this specific order. We'll look at each of the 5 phases and describe how I used each phase in my physical distribution project.

Define

THE DEFINE PHASE is crucial to the success of any project. During the define phase, a project charter is developed. It's also important to define the project's purpose and scope, which is called the project definition.

Step 1: project charter. The project charter includes a project manager (often the green belt or black belt running the project), a business champion, a project sponsor, the team members involved, and a mentor (usually a master black belt or black belt).

Our project charter was laid out as follows:

Business Champions: Mark McCoy/Matt Reineke

Sponsor: Materials Group

Green Belt: Chris Anderson, corporate materials and logistics planner

Team: Jesse Casher, Oklahoma warehouse manager; Mark Hare, Butler door warehouse manager; Rick Kessler, Butler door traffic manager; Guy Lugo, Mexico materials manager; Luis Macedo, Mexico warehouse supervisor; Jack Chapman, molding warehouse manager; Scott House, Oklahoma warehouse supervisor; Ken Kalua, Oklahoma warehouse supervisor, Jon Oliver, Butler door warehouse supervisor; Pat Imhoff, black belt; Paul Bugajski, mentor/master black belt.

Step 2: project definition. The project definition includes a problem statement, the name of the project, a baseline measurement, and the potential savings opportunity. Our project definition looked like this:

Problem: Mexico was not utilizing trailer space properly for their outbound shipments

Project: Improve utilization of trucks in Mexico.

Baseline: January 2001 trailer utilization: 57 percent

Opportunity: 2001 savings: 5 percent of overall freight costs.

The scope of the project is critical. You must ensure that you narrow your scope to exactly what you want to accomplish. If you attempt too much, the project will lose momentum and focus. A common slogan used at GE was "Don't boil the ocean." Focus instead on the area in which you want to concentrate your efforts.

It is also imperative that all project members be included in the project definition. Involving the team members in the definition sets the tone for the entire project, and you will greatly increase the chances for success if you have everyone's input. Everyone on the team will be fully engaged if they know their opinions and suggestions are included.

Once the project charter and definition are completed, it's time to move into the measure phase.

Measure

THIS IS THE SECOND PHASE of DMAIC. The goal of the measure phase is to identify the source of the problems, backed up by actual data. The most important part of the measure phase is developing a baseline measurement.

There are several statistical tools to use in the measure phase. These tools include things like process maps, cause and effect matrixes, Pareto charts, control charts, and so forth. We won't go into detail on all of these tools, but we will examine those used during our project.

During the measure phase it's helpful to include a photo of the present state, if applicable. Since our project consisted of freight utilization, we included a digital photo sent to us from our Mexico facility that showed what a typical trailer looked like before it was shipped (see photo above).

A picture is worth a thousand words, as they say. This one shows obvious room for improvement. This was a picture of an actual trailer that was going to be shipped from our Mexico facility to one of our manufacturing facilities in Indiana.

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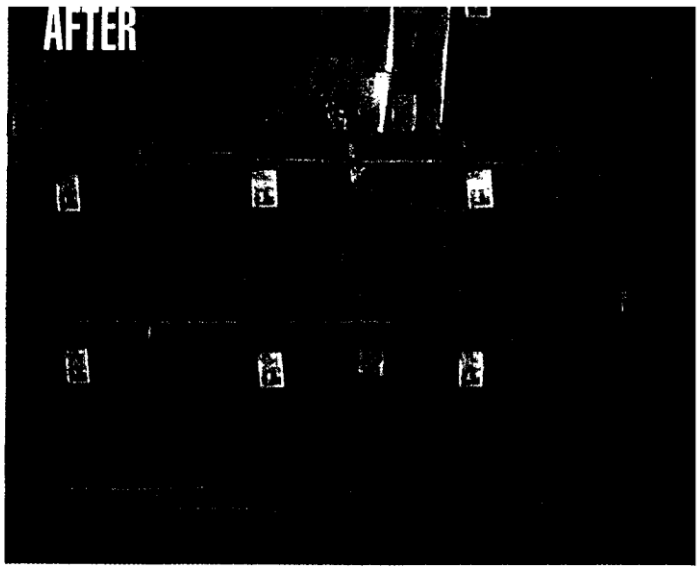

Step 1: baseline measurement data. The first step in the measure phase is to establish baseline measurements for your process. This allows you to measure your progress during all phases of the project to track overall improvement. Our project measurement was very simple: the percent utilization of each trailer shipped. We used a simple graph to demonstrate the average trailer utilization per shipment.

In the year 2000, out of 2,200 shipments, there were only 4 trucks that had 100 percent utilization (approximately .002 percent). Since our eventual goal was to stabilize at 90 percent utilization, we had an enormous opportunity for improvement.

Step 2: test process for stability. The second step in the measurement phase of our project was to test our process for stability. For our project, we used an individual moving range (IM&R) chart, which plots the difference between the highest and lowest data points in a sample. For this specific process, there were three different areas where our process proved to be out of control.

Analyze

THE GOAL IN the analyze phase is to determine the root cause(s) of the problem. Employee involvement, "Red X" identification (which we'll explain a little further on), and cause and effect diagrams all can be used in the analyze phase. We used brainstorming and asked the five whys to determine two Red X's.

Step 1: employee involvement. The APICS Dictionary, Tenth Edition, defines employee involvement as "The concept of using the experience, creative energy, and intelligence of all employees by treating them with respect, keeping them informed, and including them and their ideas in decision-making processes appropriate to their areas of expertise." Involving all employees in the analyze phase is critical because they are the experts in this particular area. At Therma Tru, these people knew what was holding them back from maximizing the trailer space. All we needed to do was involve them in this process and simply ask "What is preventing us from improving our process"? The results are magical when you involve all members of the team.

Step 2: Red X's. Red X's are the critical inputs to a process that hinder its stability and effectiveness. Identifying and controlling Red X's is the key to maximizing the effectiveness of any project. For our particular project, we determined that the two Red X's were product mix and bulky glass racks that were used to transport sheets of glass. Our product mix in Mexico varies in terms of how it's packaged. Some of our product dimensions contain irregular shapes and sizes, which restricted the way in which the product was configured on a pallet.

The second Red X was more of a challenge. Mexico was responsible for shipping sheets of glass that were contained in large, bulky racks. These racks were not conducive to effectively using our trailer space. Taking advantage of employee involvement and identifying the Red X's set the stage for our next phase: improve.

After developing a solution to our Red X's, our baseline measurement of **58** percent utilization improved an astounding **71** percent by the end of December.

Improve

THE FOCUS OF the improve stage is to develop, implement, and evaluate solutions targeted at the root cause of the issues. The overall goal is to demonstrate, with data, that your solutions actually solve the problem and lead to improvement. Tools used in the improve phase include benchmarking, (or sharing best practices), brainstorming, and flow diagrams. Since we had already identified our two most significant Red X's, it was now time to determine the solutions for overcoming these obstacles. Our first Red X—product mix—was significantly reducing the amount of trailer space that we were using. The product was only single stacked on one pallet, which left each trailer with an enormous amount of empty space. As stated previously, some of our product dimensions contain irregular shapes and sizes, which also restricted the way in which the product was configured on a pallet. When we asked the Mexico associates why they were loading the trailers this way, they simply responded "Because we've always done it that way."

Step 1: best practices. Sharing best practices is sharing effective processes between facilities. Sharing best practices between facilities is used extensively at GE, resulting in spectacular success stories. Therma Tru normally did not share best practices between their facilities, so this was a golden opportunity to instantly improve Mexico's processes. Since our Oklahoma facility already had effective procedures in place for maximizing their trailer space, Scott House, one of Oklahoma's

Figure 1: Trailer Utilization in

Month	Trailer utilization (%)	# of trucks above 90%	Stable ops	Zone
Dec.	99	93	0.90	
Nov.	98	83	0.87	
Oct.	97	78	0.86	
Sept.	80	30	0.74	Yellow
Aug.	83	34	0.76	Yellow
July	93	72	0.82	Yellow
June	87	28	0.78	Yellow
May	80	20	0.74	Yellow
April	73	10	0.70	Yellow
March	58	1	0.68	
Feb.	58	1	0.68	
Jan.	57	0	0.67	

warehouse supervisors, traveled to Mexico to train their associates on how to increase trailer space. In one week's time, he was able to train the Mexico associates on how to reconfigure the product so they were maximizing the space on each pallet. He also recommended they purchase several different varieties of pallets, for the irregularly-shaped boxes.

The results were remarkable: After Scott's visit to Mexico in April, the trailer utilization increased from 58 percent in March to 93 percent in July. Even though we had increased our utilization significantly, we knew there was more room for improvement. This is when we began to use brainstorming techniques to improve our process even further.

Step 2: brainstorming. The APICS Dictionary: "A technique that teams use to generate ideas on a particular subject. Each person on the team is asked to think creatively and write down as many ideas as possible..."

After overcoming our first Red X, we still needed to determine a solution for our second one, which was maximizing our trailer space with the bulky glass racks. During our second visit to Mexico, we met with all of the warehouse personnel for a brainstorming session. We simply asked all of our associates for recommendations to overcome this last obstacle. The associates recommended that we reconfigure the racks in the trailer, which increased the trailer utilization, and to double stack the racks for every shipment.

The results were astonishing. By actively involving all members of the warehouse, we were able to load twice as many glass racks onto each trailer, and we were able to show statistically that there was a significant improvement to our process. After developing a solution to our Red X's, our baseline measurement of 58 percent utilization improved an astounding 71 percent by the end of December.

Although our process declined slightly from July to September, we were able to reevaulate our Red X's and improve our trailer utilization average to an all-time high of 99 percent (which represents the 71 percent increase over the baseline 58 percent) during the month of December. Since the improvements were made, the final phase of the project was the key to continuing process stabilization. That phase is known as the control phase.

Control

THIS PHASE IS to ensure that the process remains stable by continuous monitoring. Control charts and graphical representation can be used. Constant communication and feedback are necessary as well as identifying the process owners. It is also imperative to assign process owners to the project to ensure that the controls remain in place.

For our project, we used a simple Excel file to gauge our stability. Daily feedback was provided to Mexico to ensure that the process remained intact. A monthly report was also generated to inform our Mexico facility how well they were performing. The report identified the trailer utilization averages for the month, the number of trucks that were above our goal of 90 percent utilization, and the status of their stable ops (red=below average, yellow=caution, and green=good). Figure 1 is an example of the chart we sent to Mexico.

Assigning process owners to the process is the final and most important step of the control phase. Individuals who have been involved with the project extensively should be assigned the key role of ensuring that the proper controls remain to ensure the process remains stable. Here is how our process owner chart looked for our freight utilization project:

Monitoring freight utilization: Chris Anderson
- Monitor cube averages/savings weekly
- Provide Mexico with feedback
- Ensure measurements are accurate

Continue utilization improvements: Guy Lugo, Luis Macedo
- Continue to challenge associates
- Monitor on a daily basis

Door plant feedback: Scott House, Jon Oliver
- Evaluate shipments, provide advice to Mexico.

Utilizing Six Sigma tools within the realm of physical distribution is an untapped resource at many companies. Perhaps the best testimonial for focusing these tools on physical distribution is the photo of the now nearly fully-loaded trailer (see page 46). A picture really *is* worth a thousand words. ◆

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