

Lean Sigma Impacts in Manufacturing Relocation

by Joe Ficalora & Steve Zinkgraf

Whether you are a CEO, Managing Director or Plant Manager, decisions in off-shoring production to lower cost labor centers have no doubt crossed your desk.

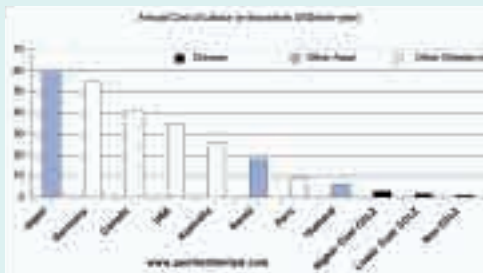
This trend has had significant impacts in most major markets and usually takes the form of market challenges from traditional as well as new competitors who have taken advantage of these lower cost areas. The decision you made might have been moving one or more of your own product lines to these lower cost labor centers or you may have chosen to compete head-on by reducing your existing labor costs. In either situation, Lean and Six-Sigma™ methodologies, either together or separately, will play a critical role in a successful outcome.

This article will review key concepts and considerations of Lean and Six-Sigma™ in both of these situations.

Situation#1 - Competing with products from lower-cost labor areas:

Lower cost labor centers in Asia have in general *one tenth or less of the labor cost of western manufacturing*, see Figure 1. If your product or service is labor intensive, these manufacturing centers may provide significant challenges to your companies' products and services.

Figure 1 2002 Labor Cost Comparisons



Lower materials costs are also a consideration since many of the lower cost regions also affect the raw materials used in production. Please see Table 1.

Material	Western Price	Asia Price
HDPE	\$940	\$700
Hot-Rolled Band Steel	\$825	\$540
Aluminum	\$1840	\$1370

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Six-Sigma™ methods deliver breakthroughs in overall process performance and yields by reducing defects in your products and services. Defect reductions of 10 to 20 times are possible. Often times the defect reductions are accompanied by increased customer satisfaction due to improved flow with fewer defects and typically large annual cash savings. A 30:1 return on your investment for overall Six Sigma outlay is not unusual. Average Six Sigma projects deliver \$250K USD in manufacturing with higher values achieved in service delivery or business process areas. Several percent of total revenues in savings in the first year of a Six-Sigma deployment can be expected and delivered with a fully deployed initiative.

Your first question in considering how to compete might be: "What is the potential cost reduction?" A thorough evaluation of labor, materials, scrap and rework costs is required for each core process in your business. If you truly have proper estimates of the waste and defect counts, then you know what potential cost reduction is possible. Often an assessment with an outside consulting firm is necessary because most management information systems were designed to capture manufacturing and service delivery costs, as opposed to process performance, rework and defect counts. In addition, one can become

blind to the amount of rework inside your business processes (production, service and supply chains). Only a proper assessment can determine if it is better to compete with local production even if entitlement levels of scrap and rework are achieved.

So how can Lean and Six-Sigma™ methodologies impact these labor and materials? Their impacts on processes, data and people will work to drive out defects and speed up manufacturing and service delivery. These methods provide the opportunity to take cost out of your current manufacturing processes where they are located right now. Only by reducing your internal costs can you compete on a price basis. Competing on the other dimensions of features, service, quality and flexibility are certainly options, depending on the market competition. However, there is always a segment that will decide on price alone.

You may also want more flexibility in custom or short order deliveries to local customers, providing faster service than long-distance foreign competition. **Lean tools deliver improved speeds by eliminating waste and non-value added steps in your value streams.** The less time your product or service spends in your company, the lower the cost. This lower time translates into less opportunity for defects. Additionally, 5-day Kaizen events can drastically improve a problem area of production or service delivery, with outstanding results. \$50K USD is an average result when focused in the right areas and led by experienced personnel. Savings results of 3 to 5 times that are not unusual if management is committed to the event and outcome. In one urgent situation, SBTI delivered over \$1M USD in 16 weeks of Kaizen events to a new client. Only after that did the real work of process understanding and improvement begin for Six-Sigma projects.

Your key metrics in this situation are speed and defects to drive down production costs. In the manufacturing of incandescent light bulbs, the same production lines today manufacture at 100 times the speeds that the original



equipment was set up to operate. At those speeds, the labor content is only a fraction of the cost content. Therefore competing with lower-cost labor centers is entirely feasible. Before you can speed things up however, you need to understand your processes, baseline performance, and defect rates. The three primary metrics that work to reduce labor costs are cycle time, re-work and scrap. Causes for higher costs may be attributed to defects in manufacturing or in process flow of product/information.

Overseas production still requires longer lead times, and less flexibility in custom or short order production runs. Shipping times of between 5 and 45 days are still a problem for customers that want customized products with short turnarounds. Increasingly markets are demanding customization, faster response times and smaller lot

sizes. Application of the dual tool sets provides shorter cycle times, lower costs and more flexibility to satisfy your customers. Locally provided services and manufactured items with the ability for customized delivery and short response times will always be in demand if they are of high quality and meet customer needs. So if Lean and Six-Sigma™ methodologies have had their full and proper impact it will translate into competitive advantage, in spite of lower labor costs from another part of the globe.

Situation#2 - Moving product lines to lower-cost labor areas:

The cost benefits have been discussed and you have decided to move the production line or perhaps the entire plant offshore. Lean and Six-Sigma methods are vital to the success of such a venture! Key

processes in production must be thoroughly understood and in control before attempting such a transplant.

If there are any existing challenges in the existing product or service delivery, they will be worsened after moving them. Remember: "Improve before Move!" Not only will most supporting business processes and interfaces be interrupted, but the product assembly and service delivery processes will be changed too. Often, so much time is spent on the physical machinery in manufacturing, and working to link up the supporting utilities and other services, overall process control is overlooked. Only with a well-documented control plan with thorough understanding of all $Y = f(x)$ relationships can an entire process be moved quickly and successfully. This advice applies to service processes as well, with key

Table 2. Operational Kaizen Summaries

Process Target	Event Focus	Lean Tools used	Benefits Realized
Vertical Unit chemical reactor Loading Rack	Turn Around Time	Mapping, SMED, Visual, Visual, 5s,	\$440,000
Dryer Boilout Procedure	Overtime Reduction	SMED	\$45,000
	Cycle Time		37% improvement of product swap time
Catalyst Load	Maintenance Reduction	SMED, Visual,	\$125,000
MagAcetate	Batch Cycle / Waste Red	SMED, NVA Removal, 5S	\$60,000
Reactor Startup	Reduce # of Reactor	SMED, Flow Et Pull,	
	Startup per year	NVA, Line Balancing	\$140,000
Master Batch Mixing area	Reduce inventory, increase mix prep time	5S, Visual Management/ work instructions, kanban	Improved floor space utilization by 35%

information flows being the "production processes". If the investment has been made to thoroughly understand and improve the key processes before moving, set-up will be accomplished with far less difficulty and effort.

The investment to understand the processes before disrupting them should have clear outcomes and deliverables. Here is a short list of items that should be collected in detail before considering a product move off shore:

1. - Product Performance Metrics (e.g. torque, viscosity)
2. - Process Definitions
3. - Defects
4. - Scrap
5. - Rework rates
6. - Key Process Input Variables and Output Variables
7. - Control Plans
8. - Reaction Plans

Personnel in the offshore location will also need training on Six Sigma and Lean methods to effectively understand the control plans and process improvements being passed on to them. They will also be properly and far better equipped to deal with any start-up issues that may arise. This training can help offset the language barriers that often impede startups in transferred production systems. Although globalization of business grows, language barriers will persist for the foreseeable future.

Applications of Kaizen events in operational areas can be especially useful in start-up situations or problematic factory areas. When adding in a new product or line to an overseas factory, the ability to smoothly changeover is a typical concern that can be addressed with Lean tools. While the dollar savings will be reduced somewhat due to lower labor costs, the ability to meet shipping schedules will be of great value. See Table 2 for a sampling of Operational Kaizen events and their outcomes and results in US factories.

These process and personnel investments can pay handsome dividends in starting up a new factory or service delivery. Often quality suffers in the beginning, and it takes "quite a while" to reach the same performance as the original location. These start-up issues often take many months. Yet with the right information, to the right people, at the right time, entitlement levels of a 10-day start-up are possible.

Summary

In conclusion, we can see that whether you are moving a production line or manufacturing plant offshore, or dealing with a direct competitor who has done either one, Lean and Six-Sigma will play a role in your business. If competing locally with foreign manufacture or services, the fewer your defects and faster your processes, the lower your cost and higher your potential customer

satisfaction. If moving a product or service to an offshore location, you should be improving before moving! The investments of improving will only increase your probability of success and the speed at which the planned benefits will be realized. As Dr. W. Edwards Deming once said, "Learning is not compulsory, but neither is survival." Learning about Six Sigma and Lean Methodologies can only help your chance for success in business competition.



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