

Lean Thoughts

Inspired People

Robust Processes

Lean Operations

June 28, 2004

For all **Consortium** events – Contact Richard for more information.. For other events – contact directly

Important Consortium Dates to add to your calendar

The **Team Time** schedule has been established for the coming year. Team Time will start at 1:00pm at the host company. This will allow for folks to work with peers in the host site to collaborate, facilitate and implement ideas to advance the implementation of manufacturing excellence. *Participants should be prepared to work on the shop floor and come equipped with proper PPE.* The host site will advise 1 week in advance Team Time Projects. Part of the Team Time activity will include a plant tour.

- June 19, Community Splash Open House, Nestle Waters,** contact Mariela Castano, mcastano@perriergroup.com
- July 08, Team Time, Eaton Cutler-Hammer** contact Joe Fisher, JoeRFisher@eaton.com
- August 12, Team Time, Messier-Dowty.** contact Richard Evans, Richard.Evans@Messier-Dowty.on.ca
- September 09, Team Time, CGL Manufacturing** contact Dave Desker, daved@cglmfg.com
- September 25, Consortium ShareShowcase, Eaton Cutler-Hammer** contact Joe Fisher, JoeRFisher@eaton.com
- October 14, Team Time, CTS Corp.** contact Bob Garces, Bob.Garces@ac.ctscorp.com
- October 18-22, AME Annual Conference, Cincinnati.** contact www.ame.org for details
- November 06, Consortium ShareShowcase, Eaton Cutler-Hammer** contact Joe Fisher, JoeRFisher@eaton.com
- November 11, Team Time, Morrison Lamthe.** contact Tony Vita, tvita@morrisonlamthe.com
- December 09, Team Time, Inscape.** contact Joe Cyr, jcyr@inscapesolutions.com
- January 06, Team Time, Alumabrite Inc.,** contact Richard Kunst, Richard.Kunst@Kromet.com
- February 10, Team Time, Kromet International.** contact Richard Kunst, Richard.Kunst@Kromet.com

Consortium Practitioner Circles

- **Create Flow in a High Mix Low Volume Environment, Host; Messier-Dowty, Sept.01** contact Richard Evans, Richard.Evans@Messier-Dowty.on.ca
- **Formal Problem Solving, Basic, Six Sigma and Jidoka, Host: Morrison Lamothe Sept.08** contact Mike Richards mrichards@morrisonlamothe.com
- **Creating Cells and Flow Synchronization, Host Kraft, TBA** contact Hanif hjivrage@kraft.com

- **Preventative Maintenance and TPM, Host Stackpole AGD, July 22** contact Cindy Grolleman cindyg@stackpole.on.ca
- **Advance Part Quality Planning (APQP) or new part introduction Host, CFN Precision July 20,** contact Barry Wood bwood@cfn-inc.com
- **Set-up Reduction host Stackpole CSD Aug. 19**

“Lean” and the Toyota Production System

- contact Don Barber Don.Barber@stackpole.ca
- **Creating the Visual Factory host, Eaton Cutler-Hammer, Sept 09** contact, Joe Fisher JoeRFisher@eaton.com
- **Effective Health & Safety host Alumabrite date TBA** contact Bob Krosue Bob.Krosue@alumabrite.com
- **5S+1 Implement, Enhance and Sustain host, Nestle Waters** contact Mariela Castano mcastano@perriergroup.com
- **First Time and Sustainable Quality host, CTS of Canada** contact Bob Garces Bob.Garces@ac.ctscorp.com
- **Hyjunkia & Creating the Lean Office host, Kodak of Canada** contact Joanne Heighway Joanne.Heighway@Kodak.com

Profit is not something you take from your customers ... it is what you earn by making a positive difference for them!!

Submitted by Bob Riehl

Special Issue ~ the Difference Between the Toyota Production System & Today's Lean... And there is a difference!

by Robert W. Hall.

A preliminary look at an insightful and valuable article soon to be appearing in **Target** Magazine ~ the flagship publication of the Association for Mfg Excellence of which Dr. Robert Hall is Editor-in-Chief.

Preamble...

Differences between the Toyota Production System, as practiced by Toyota, and lean manufacturing are significant. Two of those are that TPS emphasizes worker development for problem solving, and spends much more time creating standardized work, which lean seldom incorporates.

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Whenever Toyota trans-planted the system to other companies, variations appeared; no Toyota supplier has DNA identical to Toyota. As others re-interpreted TPS, variations became more distinct. Some of these have clustered in “lean manufacturing,” a descendent of TPS made popular by the Lean Manufacturing Institute.¹

Comparing the offshoots with the rootstock is inevitable when attending “Overview of the Toyota Production System,” a workshop being given twice a year for AME audiences by TSSC, a Toyota subsidiary. The biggest differences relate to how TPS, much more than lean, emphasizes developing people to solve basic process problems.

Process Mapping vs. True North

Lean implementations are likely to start with overall process flow charts called Value Stream Maps, a term attractive to the dollar minded. These help leaders visualize how to proceed with implementation. First they construct an “as is” flow chart, sometimes opening their eyes to how much waste lards their operations. Then they construct a “to be” chart representing a slimmer, trimmer future. Comparing the “as is” with the “to be” chart generates a vision for implementation, including a few driving performance indicators. They also identify big blobs of muda as initial targets for kaizen event teams.

The charts also prompt up front strategic decisions. What will be the effect on capacity, employment, and cash flow? Why kaizen processes that should be outsourced or eliminated entirely? For example, companies have found that, in modest volumes, printed circuit boards can't be made on-site competitively if waste were zero – can't afford the capital and can't keep up with the technology.

Guided by Value Stream Maps, management leads the implementation. Overall goals are quantified as indicators for a “dashboard” to track progress toward the vision. Kaizen events then start attacking sub-processes. Staff are likely to direct the attacks.

Toyota doesn't start with Value Stream Maps. Initially they marshal the changes in sub-processes by heading them all True North. “Material and information flow” charts appear much later to link processes and march them along together.

True North is what we *should* do, not what we *can* do, the ultimate ideal for the overall process, and for every sub-process within it. There is no other vision. Point every person and every sub-process True North; once they are all loping along in the same direction, they will easily merge into a common takt. That is, Toyota grubs the waste out of sub-processes before linking them closely.

In Figure 1 below (Pg. 3), both human development and process revision (for customer satisfaction) are trekking True North. The word selection of the last bullet point under “human development” intimates more. “Professional development,” by direct experience more than formal training, intertwines with process improvement. Everyone, including all workers, learns how to solve problems and improve processes. If someone else does it, then “turns the process over to production,”

workers are ill prepared to continue kaizen on their own. To become professional workers in this sense, they should experience how and why their process was developed. TPS grows people in all their talents – *even some they didn't know they had*.

On the customer satisfaction side of Figure 1, the ideals of True North are absolute. Zero defects means zero – none. Not even Six-Sigma is good enough. If one customer in a million receives a defect, we're not at True North – zero unhappy customers. The same rigor applies to zero waste and lot sizes of one in sequence. Of course, Toyota rarely reaches absolute zero, but going for it prevents complacency about performance that is great by other people's standards. As long as Toyota is south of True North, they have problems to work on – somewhere.

The purpose of TPS is not rapid material per se, but process visibility. Smooth flow is only one factor that makes it easier to spot that one-in-million problem. Visibility spotlights the teeniest little bits of waste, prompting more kaizen. Of the seven classic wastes, Toyota deems overproduction the most serious; any of the other six may begin with that one.

Because deployment depends on each site's history of processes and working culture, neither Toyota nor lean practitioners employ unwavering formulas for it. However, Toyota's “creates” TPS. Lean practitioners more likely “implement lean techniques.” Toyota stresses that TPS is human development. Lean organizations frequently try to stretch the worker-to-supervisor ratio. Toyota keeps foremen or team leaders, converting them into coaches and backups for workers. However, everyone agrees that the human side, learning new patterns of working and thinking, is the highest hurdle.

Lean Implementation

In a lean implementation, leaders as well as workers may be feeling their way, coaching less from experience than discovery as you go. Sensing that the work culture must build up to lean, leadership may first do something to engage people in problem solving, become familiar with process visibility, and improve teamwork as a way of life. For example, they may institute 5S before starting cell building, and big cultural leaps, like moving from an independent craft tradition, can be painful and time-consuming. A few go “cold turkey” to cell building.

But once they begin integrated operational conversion, lean leaders convert Value Stream Maps into to key process measures and blitz processes with kaizen events. Kaizen teams may pounce on some fat targets first, but to integrate the effort, they usually start at final assembly and work back, setting up work to flow, as in a cell. They calculate takt times and balance station workloads to them. Often, but not always, conversion is kaizen event by kaizen event, each one addressing problems that plug workflow, such as quality, set up times, maintenance, training, scheduling system, and so on. Pull systems start tying the flow of operations together.

Staff and management almost always direct a lean conversion. Usually, a consultant more experienced in the

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journey guides them at first. Workers participate, and one objective of most kaizen events is to give them first hand experience learning and using the tools of process improvement. Training varies, but almost all companies add instruction in lean techniques to the formal training of all employees.

Being sidetracked by current operating pressures is always a hazard, but with persistent top management leadership, within a year or two most work flows by a pull system from door-to-door. With most of the initial heavy moving over, a plant may declare itself lean, although there is much more to do. Improvement never ends. Management raises the vision, refreshes the indicators on the “dashboard,” and drives again, this time extending the effort beyond the plant into product design, engineering, office work, perhaps even sales and suppliers. While every case is unique, this general theme describes many sustained lean conversion stories.

TPS Creation

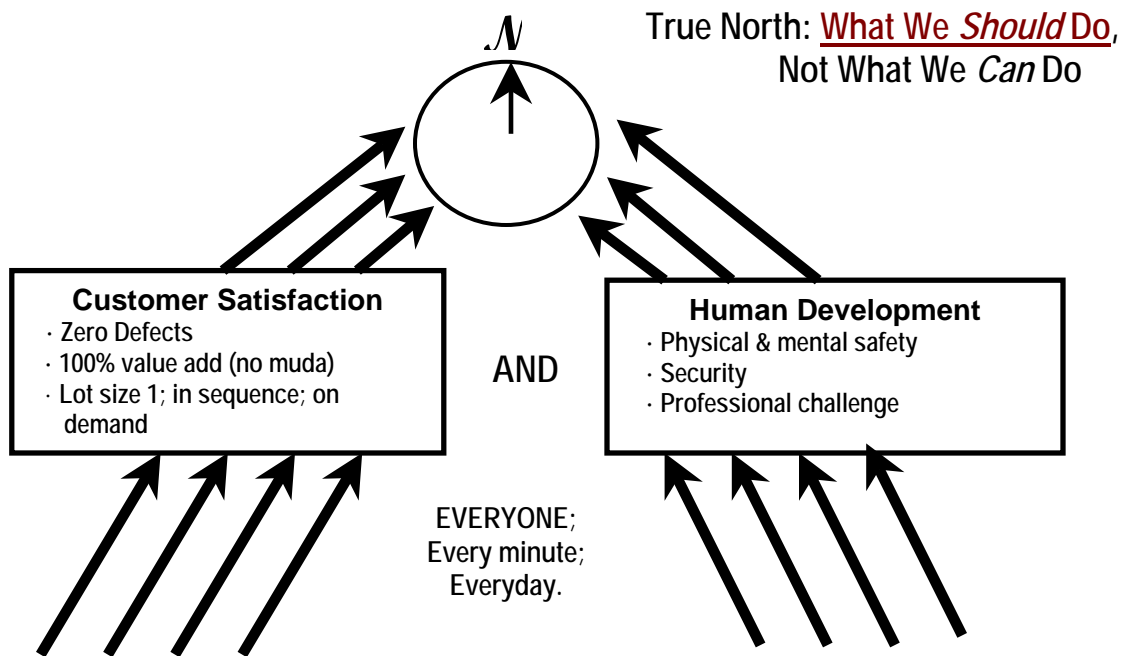
Conversion concentrates on the shop floor, led by veterans of the system, relatively sure of where they are going. Key process measurements are quality and lead times. The shop floor rarely sees unit cost measurements. If muda is disappearing, costs will come down; it's that

simple. Plant efficiency is defined as ability to meet *exact* customer requirements with minimum resources: people, lead-time, and space. (It may have extra equipment.) Toyota's logical pattern is to introduce tools to increase process visibility, gradually stepping up the effectiveness of problem seeing and problem solving. When people and process are ready, move on.

Stabilization: Stability is the dependability of man, machine, material, and method, the classic old 4Ms. The first objective is to convert people from firefighting to deliberative problem solving. First create increased visibility in the current process and expose problems, teaching people how to solve them using the five why's and the Deming Circle – and giving them their head to do it. Coach people early and often to carefully observe and document what they are doing now. Give them the means to habitually improve their own work and the processes around them. Don't go to continuous flow if big problems with quality, maintenance, or supply would be overwhelming. The process is still loaded with waste, but predictable enough that it won't choke on continuous flow.

Continuous Flow: This is the big step increasing process visibility. Set up local flows to produce only the quantity needed when needed. Any pull systems between areas are simple, like min-max kanban squares. The

Figure 1. The Toyota Concept of Heading for True North



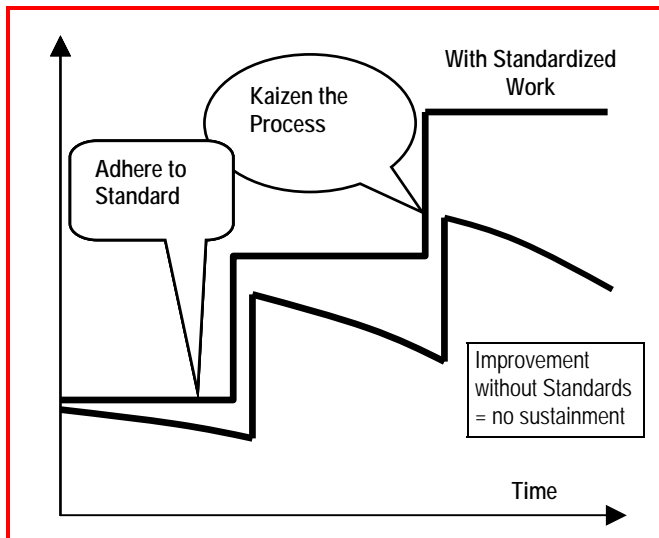
Adapted from presentation diagram by TSSC, a subsidiary of Toyota Motor Manufacturing North America
Note that development of people, all personnel, to head True North is equally weighted with the development of processes toward True North.

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emphasis is on condensing cells and layout; cutting set up times; minimizing lot sizes. Where possible go to one-piece flow with no stock between stations. Doing this effectively requires mastering multi-functional work and group problem solving. Keep this up until the workforce does it routinely.

Quality problems always lurk in product, in equipment, and elsewhere. Learn to build quality into each step of a process. Eliminate inspections using andons, poke yoke methods, and so on. Shorten the feedback time for correction by cell building, juxtaposing workstations, and cutting the inventory and lead times until process variation is reduced because machines stop (or beg for adjustment) before a defect is actually made. Doing this deepens the visibility, expanding the opportunities for problem solving.

Start separating the work of people from that of machines; workers learn to tend multiple machines.



Develop them to make maximum use of their abilities, adding value with every touch, rather than wasting time merely monitoring machines or inspecting parts. People may balance work cycle times, but we have not yet gotten to takt times.

Standardized Work: This is the *big* difference between TPS and lean, begun while still in continuous flow. Standardized work isn't only documentation. It's also an improvement process; layout; work sequence, and work methods. Emphasis is on human motion. To pace work, introduce takt times, and coach people to develop efficient work flow to a takt time considering safety, quality, quantity, and cost (use of resources). Continue coaching until workers with their team leaders can generate their own standard work. This usually takes the longest time, but Toyota considers standardized work to be necessary to sustain the gains going True North, as illustrated below.

Relationship Between Standardized Work and Improvement

"If you have enough meetings over a long period of time, the meetings become more important than the problem the meetings were intended to solve."

... Malice in Blunerland, Thomas L. Martin

Fig. 2: This diagram is a version of similar diagrams much used within Toyota. Progress/output is on the vertical axis.

Because standardized work takes a long time to mature, some Toyota plants are much better developed than others. Tell-tales signs:

- Near the work areas is evidence of worker problem solving, real things in real time like scribbled flip charts, not sanitized computer graphic summaries.
- Work details at each station are crisp; 5S is detailed, so you can identify more than the main flows of material.
- Workers aren't moving at breakneck pace, but are so concentrated on value added activity that they've less time to banter or even smile at visitors.

Thus TPS standardized work combines the disciplines of improving work with that of holding the improvement, which sets up the ongoing elimination of waste that most lean implementations never get to. Standardized work documentation is but the script for a play, often rewritten, which all actors that substitute roles adhere to and help rewrite. The unfolding play is the thing, the distant customer its unseeing audience.

Getting It All Together

Now orchestrate improvement toward True North. If an overall takt time is at all possible, everything is connected with production of end product with takt times and a pull system. (That's right; a detailed pull system goes in late.) Plant workload is balanced with a heijunka box, container lot sizes, and standard inventory at various points in the system. Decreasing inventories a bit here and there stresses the system just enough to allow the workers, now capable of standardized work, to press as a total group toward True North. Sustained visibility shines light on every little pebble in the path to True North, so every process improver in every little nook of the total process should see something to think about and to work on.

Summary

Lean implementations, mapped and planned, tend to be more "engineered" by staff than TPS. If well planned, lean implementers may better anticipate business issues, like increasing sales to absorb the idle capacity released from productivity improvement. They may also anticipate the cultural changes that will be necessary. Unfortunately, not all are carefully planned, and some cultural changes, as for standardized work, are rarely anticipated at all. A well-structured lean implementation may consider adoption of the tools to be a success, but allow people to remain underdeveloped in problem solving, and detailed process problems to remain hidden.

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Paradoxically, TPS creation, while more organic and intent on developing people to the max, just “bulldozes” through. TPS creation starts immediately on the shop floor, developing people to unravel problems. TPS tools are merely a method to change the work culture to problem solving mode, and TPS leaders may pay little heed to the cultural shock associated with this. The premise is that workers have vast, untapped potential waiting to be tapped. Any system, IT or otherwise, that gets in the way of this goal is discarded on faith that something better will be invented from the chaos. To an extent rarely found in lean manufacturing, TPS develops people to concentrate unrelentingly on machines, maintenance, quality, processes, or any other waste that stands in the way of total customer satisfaction – True North.

Robert W. Hall is Editor-in-Chief of Target and a founding member of AME.

1. The adjective “lean” was first used to describe operations by Toyota and other Japanese auto companies in *The Machine that Changed the World*, James P. Womack, Daniel T. Jones, and Daniel Roos, MIT International Motor Vehicle Program, 1990. “Lean manufacturing” rapidly became popular afterward.

And Finally

WHY I'M SO TIRED

For a couple years I've been blaming it on lack of sleep, not enough sunshine, and too much pressure from my job, ear wax build-up, poor blood or anything else I could think of. But now I found out the real reason: I'm tired because I'm overworked!

Here's why:

The population of Canada is 30 million. 11 million are retired. That leaves 19 million to do the work.

There are 5.5 million in school, which leaves 13.5 million to do the work.

Of this there are 3 million employed by the federal government, leaving 10.5 million to do the work!

1 million are in the armed forces preoccupied with killing the Taliban. Which leaves 9.5 million to do the work.

Take from the total the 7 million people who work for Provincial and city Governments, and that leaves 2.5 million to do the work.

At any given time there are 476,000 people in hospitals, leaving 2,024,000 to do the work.

Now, there are 1,211,998 people in prisons and 812,000 on Employment Insurance and Welfare.

That leaves just two people to do the work. You and me. And there you are sitting at your computer, reading this newsletter..

Nice. Real nice.

This brings back memories of NRC and the Avro Arrow when windshield design testing was done with the original 'Chicken Gun' to simulate the impact of birds crashing into aircraft windshields... here is an update wrapped in some Poka Yoke (Mistake Proofing) humour

Poka Yoke: A True Story

In a recent issue of *Meat & Poultry* magazine, editors quoted from *Feathers*, the publication of the California Poultry Industry Federation, telling the following story. It seems the U.S. Federal Aviation Administration has a unique device for testing the strength of windshields on airplanes. The device is a gun that launches dead chicken at a plane's windshield at approximately the speed the plane flies. The theory is that if the windshield doesn't crack from the carcass impact, it'll survive a real collision with a bird during flight.

It seems the British were very interested in this and wanted to test a windshield on a brand new, speedy locomotive they were developing. They borrowed the FAA's chicken launcher, loaded the chicken and fired. The ballistic chicken shattered the windshield, went through the engineer's chair, broke an instrument panel and embedded itself in the back wall of the engine cab. The British were stunned and asked the FAA to recheck the test to see if everything was done right.

The FAA reviewed the test thoroughly and had only one recommendation: **"Thaw the chicken first."**