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LEAN THOUGHTS

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Laying Out the Factory

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Lean Blog

I did some of my long-ago masters thesis work on factory design. I've had the opportunity to design factory layouts ranging from a $1B investment down to a company with $4M in revenues. Factories were designed a long time ago to take advantage both of gravity, and the fact that you have to run belts off a main drive shaft, and so you used multiple floors and had material generally work their ways down to the bottom. Once factories could be run on electricy, new factory designs didn't change to accommodate the changes in production
processes for almost 40 years. Now that lean has been affecting production processes for a
couple decades, how far has factory layout/design come? In my experience, not very. I just worked on another factory layout this week, and thought it was a good opportunity to share some of the common mistakes and problems with factory layout that people aren't considering in their approach. Instead of writing another thesis, I will post a few comments throughout the
week in smaller bite-sized chunks.

1. Learning

We design factories as if that we the best we could, and will, do. If we know of future business, or are growing, we might put in some room for some known factors. But we don't design in a generic sense that tomorrow's business will be different than today, and our factory must change. It will change because of changes in the business. It will change because of continuous improvement. It will change because of technology improvements. It will change. Don't try to have the best design that will only be the best for one day. Try to have the best design that is flexible to adapt and change with your journey.

2. Human / People Infrastructure

We leave to brute force the fact that people must manage this factory. How many factory designs incorporate team meeting areas near their work areas? Or allow a supervisor to have line-of-sight with all of the people they support? Or plan for management and engineers and other resources to be within close distance to where they are needed? We leave this as an afterthought, versus a primary criteria of design. A good example of this is maintenance. In far too many places, maintenance is a corner off away from where their customers are. Why not have satellite maintenace areas close to each production area, with the needed parts, tools and depending on your overall resources, people?

3. Secondary Flows

We place our primary material flow of raw material into WIP into finished goods on a pedastal and all other flows must be subservient to that. This is the way it should be, to a point. But there are a lot of resources, time, material and other problems with the material flows of dunnage, offal, waste streams, containers and so on. In one factory, their offal from a large blow molded product was almost 40% of material usage, but in volume was equal to the
material coming in. This wasn't considered, and they dedicated as much resources to taking care of this waste stream as they did the value added work.

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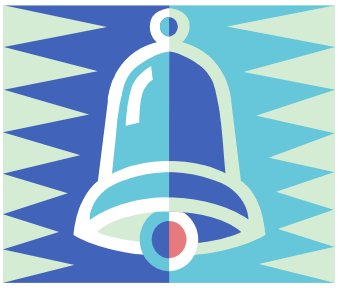
Where "Lean Thoughts" Become Reality



4. Right Angles

This one kills me, especially as an engineer. Even if we're not obsessive compulsive, we feel compelled to put everything, equipment, racks, aisles, at right angles. People don't move at right angles. Forktrucks don't either. Everything naturally flows in arcs. Why do we insist on putting 3 pieces of equipment in a straight row, then turn right 90 degrees, then two more pieces of equipment? Why do aisles have to be straight? Yes, there are some real constraints and they start with the outside walls, but just because Autocad automatically snaps our elements to a grid, doesn't mean we have to do it in real life.

5. The Design Process

How groups go about their factory design is perhaps the most troubling aspect. We come up with some objectives, far too often driven by a myopic objective such as a single piece of new business, hand it off to an engineer to sit in front of Autocad and come up with a design. This is followed by a million criticisms which put the engineer into a box in which no happy solution exists. There are several flaws with this from an approach standpoint including (a) all designs are only iterations from the first one which is the 'anchor' design, (b) only a small subset of factors are considered, the rest are forced later, and (c) only a small fraction of those who live with the outcome understand how the solution was determined. While I could write a whole chapter on this, I will only provide a simple template for a design. First, understand your current state. Map your material, information and people flows, waste streams, options for expansion and so on. Understand what you like and don't like. Then, work carefully to develop a full-set of design criteria, or critical success factors. These criteria are important as you will use them to evaluate your design. It is unlikely that one design will be superior in all criteria, because you will have to make tradeoffs. Then you start to develop alternative layouts. In your first round, include as many people as possible in separate teams and develop many alternatives simultaneously. This is the only way to get a wide range of options. Leave no constraints on the teams. They should focus on what is possible, what is ideal. But do these designs with paper, scissors and tape spread out on a table. This is the 'paper doll' method. DO NOT do this on a computer, even if you have a great laptop, incredible CAD software and a great projection system (hey fellow engineers, please heed this advice). Despite advances in software, it is much easier to collaborate and think out of the box huddled around paper than pointing at a screen while you wait for someone to turn a machine 90 degress. Evaluate these designs and go at it again, taking what people like and don't like and another set of clean sheets of paper. Do this as many times as possible given your resources and time. Eventually you will begin to converge on a handful of solutions at which point, it is helpful to get broader involvement, allowing people to see, think about and give input. You will also need to do more detailed analysis, as paper and scissors can't tell you if you just stuck a 18 inch conveyor through a 17" opening. As last points of advice on the processes, make sure you have cross-functional involvement. Also, make sure those crossfunctional people don't 'represent' their department, but are focused on the overall performance of the factory. This isn't a negotiation or a land-grab, this is to fix the process. Use current reality to help you solve problems. Do your work close to the floor or if possible, carve out an empty spot on the floor and set up some tables and do it there. And lastly, don't try to be perfect. Focus on making progress and assume that whatever you do will be wrong the day it's out there. Factory design is only a step forward, not a replacement for daily continuous improvement.

By Jamie Flinchbaugh, Lean Learning Center
http://www.leanlearningcenter.com/

Calculating you KANBAN Level

The following calculation recently posted on the NWLean Blog is a good method which will get you to a good starting Kanban level:

No. Of Kanbans = Average Daily Demand x (OC+LT+TT+ST/CC)

OC = Order Cycle

LT = Process Lead Time

TT = Transit Time

ST = Safety Time

CC = Container Capacity

Consortium Event Schedule

Tour **W**orkshop **C**onference

January	February	March	April	May	June
T **Wednesday 25** **Eaton Electrical,** contact Joe Fisher, JoeRFisher@eaton.com	**T** **Wednesday 15,** **CFN Precision,** contact Barry Wood, bwood@cfn-inc.com **W** **Date & location TBA** **Your own "STEP Diagnostic" to create Vision, Mission and Direction** Contact Richard Kunst Richard.kunst@la-z-boy.com	**T** **Wednesday 22,** **Nestle Waters,** contact Mariela Castano mcastano@perriergroup.com	**T** **Wednesday 19,** **CTS Corp.,** contact Bob Garces, Bob.Garces@ac.ctscorp.com **Consortium Shareshowcase** **Saturday 29** **Kraft Oakville.** Contact Cindy Grolleman cindy.grolleman@stackpole.com	**T** **Wednesday 17,** **Stackpole CSD,** contact Don Barber Don.Barber@stackpole.ca **W** **Date & location TBA** **"Compartmentalize the Noise"** *** Daily Report-outs** *** Standard work for Leaders** Contact Richard Kunst Richard.kunst@la-z-boy.com	**T** **Wednesday 21,** **Morrison LaMothe,** contact Tony Vita tvita@morrisonlamthe.com **C** **AME Regional Conference** **Mon 12 to Thurs 15** K-W Ontario Contact www.ame.org
July	**August**	**September**	**October**	**November**	**December**
	W **Date & location TBA** **"Establish Anchors"** *** VSWI … Visual Work Instructions** *** TPM … Total Productive Maintenance** Contact Richard Kunst Richard.kunst@la-z-boy.com	**T** **Wednesday 20,** **Kraft Foods,** contact Hanif Jivraj hjivraj@Kraft.com	**T** **Wednesday 11,** **Stackpole PMC,** contact Cindy Grolleman cindy.grolleman@stackpole.com **C** **AME National Conference** **Mon 16 to Friday 20** Dallas, Texas Contact www.ame.org	**T** **Wednesday 15,** **Messier-Dowty,** contact Richard Evans Richard.Evans@Messier-dowty.on.ca **W** **Date & location TBA** **Your own "Get Organized"** *** 5S+1** Contact Richard Kunst Richard.kunst@la-z-boy.com	