

## Simulation, better forecasting, and advanced planning smooth lean transition to the supply chain

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By Malcolm Wheatley, senior contributing editor | Manufacturing Business Technology,

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At Nissan's Sunderland, U.K. manufacturing plant, demand for the new "crossover" Qashqai sport utility vehicle has exceeded all sales expectations. Already running 24/7, the plant just recently created almost 800 new jobs.

To squeeze every scrap of manufacturing capacity out of the plant, simulation tools from Lanner Group have been at the forefront of the battle to eliminate waste and improve efficiencies.

Simulating improvements is better than traditional lean-based experimentation and analysis approaches, explains Nissan's Anthony Timmiss, an industrial engineer. Stopwatch studies and "trial-and-error" improvement tend to absorb capacity, he points out—thus reducing output rather than increasing it, at least in the short term.

"Experimentation in the virtual world doesn't impact production," says Timmiss.

Most recently, the battle to boost production has seen Nissan use simulation to look at links between its lean supply chain and the lean assembly process it feeds.

"We've been looking at forklift utilization, which occurs in a fixed cycle," says Timmiss. "The cycle times of the processes that are being fed by the forklift trucks can vary due to changes in volume and product mix. Simulation can recognize problems before they cause difficulty."

Another goal is reducing the cost of purpose-designed, closed-loop stillages and component containers commonly used in automotive manufacture. There's something of a balancing act involved, says Timmiss. Purpose-designed stillages and containers are expensive, and having more than necessary is wasteful.

But keeping too few containers also is wasteful. Should demand for the special-purpose containers exceed supply, ordinary wire baskets must be used. But as parts can't actually be transported in the baskets—merely stored in them—use of wire baskets necessitates a costly transfer operation: labor to perform the transfer, plus use of a forklift

to move parts to where the transfer takes place. Simulation calculates an optimal number of containers to keep the two costs in equilibrium.

"With no spare capacity at weekends to carry out industrial engineering studies," Timmiss says, "simulation lets you try things out before you make changes to the actual equipment."

Instance of trend

As manufacturers shift lean aspirations to the supply chain, various software tools and technologies are being pressed into service. Detailed simulation—sometimes using 3D "virtual workplaces" created by tools such as those from Dassault Systèmes' DELMIA digital manufacturing unit—is surprisingly common in the automotive industry, where Toyota, Nissan, Ford, and German truck and bus manufacturer MAN Nutzfahrzeuge are making use of it.

If that's a surprise, remember this: Few industries have made as much progress with lean as the automotive industry, where lean tools and techniques are at the forefront of the battle against low-cost imports, health-care costs, and a slew of other competitive disadvantages.

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—David Jones, managing director, Lanner Group  
Ford in particular actively encourages component suppliers to emulate its own use of simulation, says David Jones, Lanner's managing director. "For suppliers, agreeing to supply chain simulation is part of the process for winning new business," he says. "Eliminating supply chain risk is important."

That's why more familiar approaches to lean supply chains and the interface to lean manufacturing aren't out of favor, either—especially in industries lacking the auto sector's lean prowess.

Sugar Land, Texas-based Imperial Sugar Co., for example, is one of a number of manufacturers seeking to heighten manufacturing and supply chain stability by reducing the level of forecast error in demand projections.

A forecasting application from Foresight Technologies, capable of “learning” underlying demand patterns through neural nets, fuzzy logic, and advanced predictive algorithms, improves accuracy of demand signals placed on Imperial’s factories, says Gene Tanski, CEO, Foresight Technologies.

“Many companies run at forecast error rates of 40 percent to 60 percent. When you’re running lean, this creates havoc,” says Tanski. “By reducing the waste of not producing what isn’t needed, we are directly impacting a manufacturer’s lean objectives—and also improving the flow of material along the supply chain and throughout the factory.”

Foresight, Tanski adds, guarantees in writing that its technology will reduce the forecast error rate by 25 percent—“and if we don’t deliver that, we give the customer their money back,” he says.

Planning to succeed

Useful as such “point solutions” are in sending clear signals about demand, they also lead to automation and repeatability.

Aamer Rehman, VP of manufacturing solutions and services for i2 Technologies, says lean production systems such as heijunka or kanban work well when just one customer is serviced, but operate far less effectively when repurposed to serve multiple customers. “Lean initiatives often are transformational, but just as often that transformation doesn’t last,” explains Aamer Rehman, VP of manufacturing solutions and services for i2 Technologies. “Inventory creeps back in, and flow slows down again. Lean improvements have been genuine, but this drift gradually erodes them. By freezing the process, technology locks in lean for the long term.”

It’s a phenomenon that’s particularly prevalent, Rehman adds, in the very “leanest” of plants or production lines: those designed from the ground up to meet the needs of a particular customer—a modality often seen in the automotive industry. Simple, lean production systems such as heijunka or kanban work well when just one customer is serviced, notes Rehman, but operate far less effectively when repurposed to serve multiple customers.

“When this happens, you’re taking a simple plant or line and burdening it with a demand structure anything but simple,” says Rehman. “You’ve built a line for Nissan, for example, and are using it to serve—say—General Motors, Toyota, and Ford. And typically, it’s too challenging a demand environment for kanban and heijunka to cope with. In short,

you need technology not just to handle sequencing, but also to make the whole lean process repeatable. If it isn’t, flow will slow down, and inventory will rise.”

Seeing waste and inefficiency in a factory is a relatively straightforward proposition,” claims Christian Verstraete, solutions and technology integration manager at Palo Alto, Calif.-based computer, printer, and technology supplier Hewlett-Packard. “In the supply chain itself, though, it’s more difficult because you can’t physically walk around and see where the waste is occurring.”

With revenues of more than \$104 billion in its latest fiscal year, HP is enterprise solution vendor SAP’s largest supply chain application customer, Verstraete notes—shipping 30 units of output every 10 seconds, including 60 million printers and 35 million PCs each year.

Lean, Verstraete says, is part of the company’s recent resurgence. “It’s how we’re beating Dell at its own game, tightening the supply chain and taking out spare inventories and capacities.”

SAP’s Advanced Planning and Optimization suite, Verstraete adds, orchestrates that supply chain: taking the forecast demand that emerges from the company’s global sales operations, making sense of it with the suite’s demand management module, and then passing it to the supply network planning module that indicates when and where product could be manufactured to meet that demand.

Next up: execution

Suppliers, too, can embrace the “planning for lean” process—especially by addressing disruptive variability in lead time, delivered quantities, and transportation.

“Suppliers will always claim variability is lower than it really is,” warns Verstraete. “Measuring real levels of variability is the first step toward plans that are robust enough to deal with, and ultimately reduce or eliminate, variability.”

Going Lean and Green: The next focus of supply chain management

The move toward leaner and greener supply chains has companies focused on further reducing waste and creating more eco-friendly operations. As companies examine ways to streamline operations, tools that can lower excess inventory, determine the optimal “right-shoring” plan, and reduce fuel and logistics costs while reducing overall carbon emissions are in high demand.

According to David Johnson, senior VP of manufacturing and wholesale distribution for JDA Software, these are the top three supply chain areas companies are focusing on in lean/green initiatives for 2008:

Lower-impact manufacturing: With the ability to access and analyze real-time demand signals, more companies are moving from push to pull manufacturing. By nature,

this not only eliminates excess inventory, thereby reducing waste, but also decreases carbon emissions related to the creation of products and materials.

Reevaluating global sourcing: Offshoring models of the past are being replaced with more efficient “right-shoring” models, as the risks and costs associated with manufacturing overseas continue to surface. Longer lead times, increased fuel costs, larger carbon footprints, and excess inventory are driving companies to reexamine where and how much they outsource. With the ability to analyze the various factors driving costs and environmental impacts, companies can create balanced plans that are both cost-effective and environmentally friendly.

Streamlining transportation: One of the fastest ways to go green is to optimize overall transportation plans by maximizing the space utilization of every truckload, and reducing the number of trucks required to deliver goods. It’s also important to establish optimal routes, which lowers both fuel consumption and carbon emissions. These changes reduce overall supply chain costs, and companies become more socially responsible in the process.

Land Rover makes the “smart call” for lean supply chain

At Solihull, U.K.-based Land Rover, says Dave O’Reilly, manager of manufacturing and purchasing IT, the supply chain terminates at a wireless line-side button called “Smart Call.”

Codeveloped by Zebra Technologies and Land Rover owner Ford Motor Co.—and marketed by Zebra under the “Part Call” brand—Smart Call enhances the link between the plant’s assembly lines and the supply chains that feed them.

Whenever an assembly line operator takes the first component out of the last available line-side stillage, says O’Reilly, pressing the Smart Call button prints out a job ticket at a central “marketplace” in the Solihull plant’s parts storage facility.

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Printed on the ticket, he explains, are picking details of the part required, its location, quantity needed, and which station on the assembly lines it is to be taken. Picked up by a forklift truck driver as the ticket emerges from the printer, the line-side delivery is just minutes away from fulfillment.

O’Reilly says the lean dimension is obvious.

“By keeping the minimal amount of material line-side, it makes it much easier to rebalance the line “on the fly,” as there’s no excess inventory in the way,” he says. “The technology helps us get higher levels of utilization from our material-handling resources.”

A new capability due soon will see those utilization levels significantly boosted, O’Reilly adds. Instead of being printed at the central marketplace, the ticket will be transmitted to an RF terminal on the forklift truck, signalling the need to return to the marketplace to be allocated the next part-replenishment job.

“We should then be able to make use of the truck on the otherwise-empty return leg of the journey, too,” concludes O’Reilly.