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Driving “End to End” Lean in a Complex Value Chain

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Driving successful lean initiatives goes beyond four-wall manufacturing techniques and continuous improvement models. Companies must embark on cross-functional, end-to-end collaboration, analysis and execution to achieve true results in cycle time and inventory reduction. The challenge of today’s businesses is to develop a suitable Continuous Improvement and Lean model that meets the needs of the customer, internal business objectives, and the organizational culture. This article summarizes aspects of the Black & Decker Lean and Six Sigma models and how it drives end-to-end lean solutions to improve cash flow for the business.

Black & Decker, founded in 1910 in Baltimore, Maryland, formed the foundation of today’s power tool industry with the first portable drill. Today’s Black & Decker includes DeWalt, Emhart Technologies, Price Pfister, Delta Machinery, Vector, Porter Cable, Weiser Lock, Kwikset and Baldwin. The Industrial Products Group is located in Towson, Maryland and includes DeWalt, Porter Cable and Delta Machinery, all of which hold a #1 Global Share Position.

Black & Decker’s Lean journey began in 1997 by utilizing Six Sigma process-improvement methodology. In 1998-1999, Black & Decker focused on internal inefficiencies with a productivity focus, including cost of failure, manufacturing and purchasing initiatives. From 2000 to 2002, Black & Decker’s efforts began to impact the customer with new product Six Sigma, with its drive for end-user critical to quality/ satisfaction requirements and supply chain efforts to drive customer critical to quality (CTQ) needs. In 2003-2004, Black & Decker focused on delighting the customer through a focus on overlapping processes, integration across business processes, leveraging Six Sigma for growth, and integrating Lean principles.

Black & Decker uses Lean and Six Sigma hand-in-hand, targeting Lean or Six Sigma initiatives to the problem that needs to be solved:

- *Lean initiatives* to target non-value added, to speed the process, to reduce invested capital, remove buffers or expose capability issues.
- *Six Sigma initiatives* to fix capability issues, reduce process surprises, improve process control, or to solve customer-focused issues.

In 2005-2006, Black & Decker focused on Lean Six Sigma (LSS) efforts including driving LSS as one continuous improvement engine, integrating LSS into “Operational Excellence Models”, driving consistency throughout all operations, and four-walls Lean activities (such as cellularization, internal pull, and 5S activities). In 2007, Black & Decker focused on LSS transformational activities to continue to drive LSS as one model. Its plants are using LSS as a model to drive efficiency and overhead, and “Lean Transformational” strategies to drive inventory and supply line.

Black & Decker’s Global Lean Scorecard Metrics includes:

- Manufacturing Cycle Time (aka Lock Period)
- Plant Schedule Attainment
- Customer Unit Fill Rate (in units and dollars),
- Inventory: Total Inventory, WIP Inventory, Excess (more than 6 months) & Obsolete (no longer used), Finished Goods Excess & Obsolete, Inventory Accuracy (by Location). Inventory accuracy is critical.
- 5S Score (20 questions to rate the plants weekly and monthly, and is audited),
- Employee Multi-Skill attainment (defining this can be challenging – is it the ability to go up or down one position on the line, go from line to line?).

One problem faced by Black & Decker was a “complex” and “chaotic” supply chain. Driving its supply chain complexity was low cost regions, customer expectations, processes, complex systems (internal and external), complex products, supplier capability, market behavior, and change (new products, moving products and improving products). This complexity was causing higher inventory, lower turn rates, service level challenges, a higher cost for poor quality rates, lack of customer focus, high costs, central functional and bureaucratic departments, long internal lead-times, lack of defined organizational structure, and complicated and undefined processes. Black & Decker needed a way to manage low inventory and maintain a high service level.

This led Black & Decker to initiate an “End to End” Lean solution and utilize a Lean Supply Chain methodology. This Lean solution gave Black & Decker a means to react to customer demand fluctuations, and a potentially significant reduction in the cost of holding inventory. Black & Decker’s Lean Value Chain includes:

- *Lean suppliers* who can optimize minimum order quantities (MOQs), manage inventory, manage obsolescence, and meet supplier attainment requirements;
- *Lean Plants* that can eliminate non-value added processes, achieve 5S standardization, optimize production cells, reduce costs, and improve accuracy;
- *Lean supply chains* that reduce inventory, increase flexibility, react to the end users and to customer demand.

Black & Decker utilizes an “RRS Strategy” to manage the conversion of material in different ways based on the varied nature of its customer demands. Runners-Repeaters-Strangers (RRS) is

a way of identifying product based on usage frequency, and assigning it a materials management strategy:

- *Runners* are defined as products shipped out weekly or at least 40-52 weeks/year.
- *Repeaters* are defined as products shipped out 20-39 weeks/year.
- *Strangers* are defined as products shipped out 1-19 weeks/year.

By matching a product's RRS against an assigned dollar volume/value of A (80%), B (15%) or C (5%), you can assign a materials management strategy to the product. A's tend to be runners with a high forecast accuracy. Runners or products with an "A" value utilize a push strategy with the customer demand aligned with MOQs (which are kept low). In some cases, if you need fillers or you have to run something, run the "A Runners" because you will sell them. If an "A Runner" is not being produced in the plant every week, when it ships every week, you need to question "why not?". Producing and shipping every week keeps inventories lower in the regional distribution centers for "A Runner" products.

C's tend to have low forecast accuracy, holds more safety stock, and tend to be Strangers. "C Strangers" will be on a pull or self-scheduling system with higher MOQs. Set up a min/max system and hold inventory levels on these items so you don't have tight scheduling requirements or service level issues for these items that tend to have a low dollar value and are shipped less often. In some cases, like with Delta tabletop saws, you could end up with an A (high value) Stranger, which adds complexity, and you might want to set-up a made-to-order system for this product. This RRS/ABC strategy can be applied to many processes, including WIP optimization, by aligning production work-in-process with weekly customer demand.

To reduce supply chain complexity, consider the following:

- Consider whether the product or service is making money for the company – especially if it is adding complexity or creating havoc in the supply chain.
- Question whether you should be producing products that do not add a lot of value.
- Reduce your total number of SKUs. Apply the RRS/ABC analysis to your SKUs and consider reducing or eliminating C-SKUs. Delta cut out a lot of C-SKUs, which made a big difference, but finding the right mix is still a challenge.
- Evaluate MOQs and reduce where possible.
- Evaluate your total number of suppliers and reduce where possible.
- Spaghetti diagram your value stream. Look at where all your inputs and outputs are for each SKU and assembly line. You could have a product that is produced in Asia, incremental value is added in the U.S., and it is shipped to Europe and then shipped back to the U.S. Is this really low cost? Value stream a product, show the complexity, show the total cost incurred including expediting costs, and you may make a different decision.

Inventory is also stratified differently depending on whether the product is produced close to market or not. A product that is close to market will utilize a strategy that increases line flexibility and reduces demand variation. Close-to-market inventory is made up of safety stock, cycle stock and WIP. A safety stock target can be established by determining your demand variation plus lead time (Black & Decker uses a program called Optiant to help manage this). If you were perfectly Lean you could hold safety stock targets, without additional cycle stock.

Cycle stock is affected by MOQs, frequency, over- and underselling, in-transit goods, and early delivery.

Black & Decker's close to market in-plant strategy consists of line flexibility and reducing demand variation by identifying component commonality among products. By keeping identified components on the line, Black & Decker can minimize changeover time to only the time it takes to bring in unique components. Finished goods are managed closely using ABC/RRS optimization and tying components with finished goods – do you have the components needed to meet a change in demand? Will you use a push or pull strategy with this product? It utilizes plant flexibility in mix and volume to drop safety stock settings, optimizing safety stock by setting targets and staying within targets. WIP is optimized using the ABC/RRS strategy, running to orders and eliminating over-runs. Forecast accuracy is key. Black & Decker's goal is a seven-day manufacturing cycle time by mix.

Product that is not produced close to market has inventory that is made up of Safety Stock, MOQ, and In-Transit product, and utilizes a MOQ reduction strategy. This plant will have a much larger cycle stock than a close to market plant. Optimize safety stock by finding the reason behind each time you are over your target in dollar value of your safety stock. To reduce MOQ, consider the following:

- Compare the actual transit lead time vs. the system settings on a quarterly basis.
- Determine what is driving MOQ sizes – cost, supplier capability, initial negotiations? Suppliers will often not acquire components until you have confirmed an order. Work with your suppliers to reduce MOQ.
- Determine whether you can reduce MOQ through container consolidation, port consolidation, and comparing MOQs against an ABC/RRS analysis. You may have a supplier who is supplying many different products to you and driving their assembly line to fill up that container. You can negotiate to have three different SKUs on a single container (container consolidation). Ports might take separate suppliers and consolidate them (port consolidation) on your behalf.

Key Takeaways:

- Four-wall Lean activity is only the start (5S, cells, line pull system). It is the foundation upon which you must build before starting the other activities.
- Must include the entire Value Stream to drive results (with ABC/RRS as a decision making tool).
- Align with customer demand where possible (A Runners) and improve flexibility in the plants.
- Establish pull/grocery stores/self-scheduling/min-max for C Strangers.
- Monitor the appropriate metrics. Lean Scorecard measured monthly; align projects with scorecard.