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GREENING THE VALUE CHAIN: PART 1 – HOW TO LEVERAGE YOUR SUSTAINABILITY STRATEGY WITH LEAN MANUFACTURING.

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Global companies are adopting “green” or sustainable strategies in response to consumer demand. Many of these companies are also implementing production process improvement methods, such as lean manufacturing, throughout the value chain to increase efficiency and reduce costs. The pressure to be more environmentally responsible and sustainable, and to “tighten the belt” to be more competitive in a price-sensitive market for goods were cited by supply chain professionals as “the biggest drivers for change in supply and demand chain operations this year and beyond”¹.

While large global companies have the challenge of managing increasingly broad and complex trading partner relationships, their medium and small suppliers are under increasing pressure to quickly begin implementing sustainability policies and procedures at a time of reduced profitability and unstable market conditions. The same survey found that “economic, social and regulatory dynamics are putting real pressures on global companies to be both ‘lean and green’ in their product sourcing, logistics, transportation, distribution and operational practices”². In this economic climate, companies of all sizes can benefit from leveraging their lean production implementation to support their sustainability efforts.

What is Lean to Green?

The “Lean to Green” movement in manufacturing capitalizes on the similarities between these two strategies. The lean goals of (1) improving quality, (2) eliminating waste, (3) reducing time to complete a task, and (4) reducing total costs, are very compatible with sustainability goals of eliminating waste and pollution³, improving energy efficiency, increasing utilization of renewable resources, and lowering the “costs” to the planet of conventional material sourcing, production, and distribution practices. In addition, both

¹ Acceleration of Eco-Operation: Achieving Success and Sustainability in the Supply Chain. BPM Forum, 2009.

² See footnote 1.

³ EPA Lean and Environment Toolkit, Environmental Protection Agency, EPA-100-K-06-003, Revised, October 2007.

lean and sustainability emphasize the importance of stakeholder education, employee teamwork, and applying analytical tools and metrics to continually drive performance.

Shared Principles

To better understand how sustainability and lean manufacturing can have a synergistic effect on both environmental performance and business value, it helps to look at some of the principles they share in common, such as integration, respect for people, and focus on process.

Integration of the three areas of economics, environment, and (social) equity is at the core of sustainability. Only when we weigh the relative economic costs, environmental impacts, and social consequences of our choices about energy or natural resources can we move towards sustainability. By the same token, one of the fundamental tenets of lean manufacturing is to “see the big picture”, and to evaluate how changes in one area or activity will affect other processes. To be effective, a lean solution must have a positive effect on the whole system.

Sustainability and lean management are both processes-oriented activities, where the focus is on the journey more so than the destination. In lean production, this is embodied in the core principle of continual improvement. Not surprisingly, the best-in-class environmental management and sustainability systems reflect this aspect of business philosophy as well.

The third principle is respect for people, which in lean management translates into taking stakeholders problems seriously, making every effort to build mutual trust, and placing a major emphasis on team problem solving. This is remarkably compatible to the Equity pillar of sustainability, which involves caring for the health, well-being and fair treatment of all the stakeholders influenced by the value chain, including workers, suppliers, and the community where the enterprise is located.

Integrating sustainability into manufacturing and core business processes can result in important benefits to an organization⁴. By aligning goals and objectives into an integrated Lean & Green strategy the organization can deliver greater value from its efforts in both fields.

While lean and sustainability have much in common, there are also important differences, which, if not addressed can lead to implementation problems. Lean manufacturing does not explicitly incorporate environmental performance issues resulting in “blind spots” in the areas of environmental risks and life cycle assessments⁵. One example is the lean definition of waste, known as the Japanese word “Muda”, which means “anything that does not add value to the final product”. The seven “Mudas” or types of wastes, include transportation, inventory, motion, waiting, overproduction, over-processing, and defects. However, these are typically seen through the prism of production inefficiencies, such as

⁴ Lean Manufacturing and the Environment, Research on Advanced Manufacturing Systems and the Environment and Recommendations for Leveraging Better Environmental Performance. EPA 100-R-03-005, October 2003

⁵ Lean Manufacturing and the Environment, Research on Advanced Manufacturing Systems and the Environment and Recommendations for Leveraging Better Environmental Performance. EPA 100-R-03-005, October 2003.

defective items, poor tool design, time-motion studies, and equipment maintenance, and do not necessarily include energy sources, waste byproducts, disposal costs, or the fate of a product after it reaches the end of its usable life. On the other hand, it is easy to see how sustainability improvement opportunities in waste reduction, green procurement and carbon footprints could be incorporated into the Muda categories.

Applying Lean Tools to Sustainability

The lean process uses a number of qualitative and quantitative tools to identify and evaluate waste reduction opportunities. These tools have specific applications at various levels of the organizational hierarchy from the management team to the shop floor.

The tools should be seen as supportive elements to the cultural transformation that precedes them. To be successful, it is essential to first promote an understanding and shared vision of the Green & Lean philosophy throughout the organization, and then to reinforce these values during the implementation process. Constant training, communication, encouragement and recognition help to change the culture of the organization and transform the members into Green & Lean thinkers.

Some of the more familiar tools are described below, along with suggested Green applications.

- 5S (Five S), which sometimes is modified to 5S+ Safety or 6S, is a technique used to create and keep an orderly, clean (and safe) work environment consistent with the motto of “a place for everything, and everything in its place”. 6S is commonly one of the first tools used in lean implementation. This method is applied at the work area level on the shop floor, and may involve training, inspections, checklists and periodic audits. Green opportunities include segregating hazardous from non-hazardous waste, reducing lighting and air conditioning costs by saving space, reducing accidents by keeping orderly work areas, and reducing hazardous waste by eliminating spills.
- Kaizen events, also called rapid process improvement events are team efforts designed to look at a specific part of a process to identify and eliminate waste and to quickly make process changes. Kaizen events may last from a few days to a week from analysis to implementation. The word Kaizen means continual improvement. This tool works well at the process level and involves people at various levels of the organization. Sustainability efforts can be helped by using Kaizen events to train workers and supervisors on environmental impacts of proposed process or material changes, such as air emissions from volatile organic compounds, and wastewater discharges from water intensive processes.
- Value Stream Mapping (VSM) is a method used to examine a business process from beginning to end and to develop a present state map of current conditions, and a future state map of conditions after making the waste-reduction changes identified. VSM maps describe a variety of process inputs and outputs representing material and information flow using standardized symbols to illustrate the various elements. The boundaries of the VSM may extend beyond the facility to encompass suppliers and customers. The objective is to look at the whole process, and to identify the key changes needed to “lean” the process and obtain the most significant improvement. This tool is applicable to the supply chain level. Examples of sustainable issues added

to VSM include lower carbon footprints from local sourcing of materials, increasing recycled content of products, or developing zero wastewater discharge processes.

- Six Sigma is a very detailed statistical control and data analysis method used to identify variation in a process as a way to diagnose root causes of performance gaps and improve quality control of a product or process. It is a tool of continual improvement that can be used either independently or as part of lean processes. Green opportunities that may be uncovered by Six Sigma include reducing raw material and packaging costs by eliminating defective products, and considering the life cycle impacts of discarded products.
- Five Whys is a method used to find root causes of a problem by asking why five times in sequence to identify the relationship between causes and effects. It is used as a tool in the initial steps of the Six Sigma process, but can have wide applications in environmental and health and safety areas as well.
- Ishikawa Diagrams or cause-and-effect diagrams are representations of a process helpful in brainstorming the contribution of different causes to a problem outcome. They usually take on a “fishbone” shape with diagonal inputs representing six “causes”: materials, machine, method, people, measurement, and environment that can affect a central process line. It is easy to introduce sustainability criteria into each of the input categories.
- Key Performance Indicators are metrics used in manufacturing, supply chain management, and sustainability. They are useful in relating outcomes from two different activities. Some common examples include linking business metrics, such as sales, inventory levels, transportation costs or production units, to energy use, water or fuel consumption, accident rates, or environmental aspects.

A number of other lean tools applied in the manufacturing environment include Kanban (cards used for “pull-system” inventory replenishment), work cells (an alternative to production lines), Just-In-Time inventory (a system to reduce warehousing space), Visual Controls (a method to communicate and identify deviations more quickly), and market locations (intermediate re-supply points)⁶. While their application to sustainability may not be obvious at first, by reducing wasted space, unnecessary inventory, and extra transportation costs, they can have important indirect effects on resource utilization, energy efficiency, carbon footprints, and help promote the use of local materials, green procurement policies, improved worker safety, and other elements of an effective sustainability strategy.

The Environmental Protection Agency’s EPA Lean and Environment ToolKit, suggests this five-step approach to using lean tools at various levels of the organization to implement a Green strategy:

1. Commit to eliminate environmental waste through lean implementation.
2. Recognize new improvement opportunities by incorporating EHS icons and data into VSM.

⁶ The Environmental Professional’s Guide to Lean and Six Sigma. EPA-100-K-09-006, August 2009.

3. Involve staff with EHS expertise in planning for and implementing lean events with environmental opportunities.
4. Find and drive out environmental waste in specific processes by asking key questions and using new process improvement tools.
5. Empower and enable workers to eliminate environmental waste in their work areas through 6S training, workplace evaluation checklists, and colored tags to identify EHS hazards and issues.

EHS Department's Role in Green & Lean

One of the major reasons that typical lean implementation projects led by production staff often miss opportunities for improvements in sustainability is that EHS personnel in many companies are not well integrated into lean project teams, and are not familiar with lean concepts and tools. This "silo effect" builds walls between areas of the organization and prevents the sharing of valuable information on environmental, safety and health, and sustainability impacts of lean alternatives. Initiatives such as Life Cycle Analyses and Design for Environment are excellent opportunities to integrate sustainability into lean projects.

Our next issue in this series will deal with how to develop and implement a Green Strategy.

Alliance Consulting International has the expertise in EHS program development, auditing, greenhouse gas verification, and regulatory compliance in a wide range of manufacturing and business environments to help you implement a sustainability strategy for your organization. If you have any questions or would like to discuss this article or other health, safety or environmental issues, please contact us at (619) 297-1469 or send us an email at emedina@pulse-point.com.

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