Lean Manufacturing and Environment

Baxter Healthcare Corporation Case Study

Background

In 2001, Baxter Healthcare Corporation, a worldwide leader in the manufacture of global medical products, was concerned that its environmental footprint per unit output, a key benchmark of efficiency, was growing. To combat this, the company adopted a host of business and manufacturing methods. One worked: Lean Manufacturing. As Baxter began to see waste generation drop with the deployment of Lean, the environmental engineering group realized that environmental improvement was often an unintended benefit of Lean Manufacturing. In order to maximize this benefit, this group began to seek ways to further integrate environmental metrics and performance into traditional Lean Manufacturing tools.

Using Lean practices, sometimes integrated with an environmental focus, the company was able to double in size and revenue while keeping its total waste generation close to 1996 levels. Baxter has been so successful at reducing waste that many of its largest facilities are now classified as small quantity or conditionally exempt small quantity generators under EPA's hazardous waste regulations.

This case study highlights a water value stream mapping (VSM) exercise held at a Southeastern United States facility. It became apparent that because the 12-foot slices produced by the conventional process and equipment were ultimately trimmed down to a usable (less than 6-foot) size, using a veneering process that is "right-sized" to more usable dimensions would not only require smaller, less expensive equipment, but also will allow the business to use a much wider variety of logs all while obtaining similar quality end-results.

Baxter's Key Lessons Learned

Based on a value stream mapping (VSM) event held at this facility, as well as other similar events, Baxter has developed a number of key lessons for making value stream mapping work:

- The targeted aspect (energy, water, materials, etc.) should be linked to facility challenges and the company strategic plan. For example, if the facility has boilers or uses steam or distilled water, it should find opportunities in water and its associated energy. In ISO 14001 terms, the facility should be targeting one of its environmentally significant aspects.
- A cross-functional team is essential to successfully identifying and understanding the challenge. Upper management support is critical for the follow-up on implementation.
- Good, accurate data is also essential. Data can be gathered in a number of creative ways, as simple as a bucket and stopwatch (water), a clip-on current reader (energy), or a portable flow meter for water discharge. Many utilities provide these services for low or no cost.
- If necessary, bring in expertise. If expertise is not available in-house, then use the many free resources that states provide, such as energy experts, water engineers, etc.
- Do not rely on Lean consultants alone. Lean is a way of seeing and thinking, not merely a set of tools. Lean consultants can be a great source of tools and training, but a facility cannot truly learn Lean without living Lean.
- The metrics chosen should be appropriate to measure progress in the targeted processes. The team must be ready to revise or scrap an ineffective metric.
- Environmental personnel should be given the same representation and responsibilities as other staff. For example, if an operations manager has to provide a monthly report, so should the EHS officer. The environmental staff is an integral part of the team.

Baxter Manufacturing Plant, Southeastern United States

Baxter's solution plants, which manufacture flexible-container IV and peritoneal dialysis products, often use large quantities of water and energy. With steadily increasing energy costs and increasing pressure on clean water supplies, these facilities are encouraged by Baxter's Corporate Vice President of Manufacturing to reduce water and energy consumption. Plants were specifically encouraged to perform a "utilities value stream map."

The plant selected for this study is one of Baxter's largest facilities. The facility has received numerous honors, including the Shingo Award for Manufacturing Excellence. In its quest for "Perfect Processes," the plant actively uses Lean practices.

Because the plant gets its water from its own wells, employees incorrectly assumed that water had little cost associated with it, thus ignoring the energy use and costs of pumping, storing, heating, filtering, and disposing water. Baxter views water waste as an indicator of other costly inefficiencies. For example, water waste is often directly tied to excessive energy consumption.

Creating the Current State Value Stream Map for Water

To attack the water waste challenge, managers chose to use value stream mapping (VSM), one of four key approaches Baxter uses to incorporate environmental metrics into Lean practices (see appendix). This marked the first time that VSM was used at this facility to track a material resource—in this case, water—through the entire production process. To create the VSM, a diverse team was chosen that included utility and water experts as well as maintenance, production and EHS personnel. The value stream maps and associated implementation plans were developed over a three-day event.

The first day began with introductions, followed by an explanation of the format and process of the VSM event. Then, the mapping began. Using sticky notes, the team graphically walked through the entire production process, highlighting water usage and major processing steps. The first pass of mapping was high-level and general; each subsequent pass would add more detail and refinement. During the second round of mapping, the major processes were broken down into sub-processes. Then, using the expertise of the participants, the water volumes, cycle-times, value-added calculations (e.g., cost of pumping the water to the next step) and other relevant information were added to the map, with costs normalized per 1,000 gallons. The team also listed the “triggers” that caused each process step to initiate (e.g., an empty tank might trigger a rinsing/flushing process step).

In addition, the team emphasized differences between what should happen in theory versus the actual practices on the floor. For example, although standard operating procedure (SOP) was to rinse the floors and surface areas of certain rooms following a shift, often the entire room, including the walls, was rinsed, thus wasting water. Emphasizing the difference between procedure and practice allowed waste to be better identified, with some SOPs tagged for further evaluation at a later date. The result of the mapping was the current state value stream map, a credible outline of the destination, use, value, and waste of the water throughout the production process.

Metrics

The team then deliberated on which indicators and metrics to use to evaluate the water usage. They understood that the correct choice of metrics was critical to the VSM’s success. The choice of indicators and metrics had to be consistent with Baxter’s strategic objectives as well as capable of measuring progress relative to the opportunities developed through the VSM. For this VSM, the key metrics included costs (e.g., the dollar value of energy used to process the water) and water volumes. The amount of water withdrawn from the on-site well versus the amount of product produced was an additional efficiency metric. In addition, the team had to be prepared to adjust or replace these indicators and metrics if they proved ineffective in practice.

Ranking Opportunities

Through the VSM, the team identified and prioritized 96 opportunities, with many graphically represented by starbursts. These opportunities were categorized by the estimated length of time for implementation (e.g., 6 months, 12 months, 24 months) and potential for improvement. Then, they were visually plotted on a grid with the magnitude of the potential benefit on the Y-axis and ease of implementation on the X-axis. After all the starbursts had been evaluated on this grid, the results were transferred onto various "future state" timetables, to prioritize the opportunities and plan for their implementation. Generally, starbursts that can be implemented within 6 months require little or no capital investment (although some may require further analysis to accurately gauge potential benefits). These starbursts are often the first priority for implementation, because of their high return on investment (ROI). Because Baxter makes medical products, changes in a production process might conflict with FDA requirements. Any costs associated with pursuing an adjustment in those requirements would affect the production change's ROI, and thus, its implementation priority.

Then, the team created three future state VSMs (6 months, 12 months, and 24 months) that incorporated the prioritized opportunities. New teams were formed to coordinate the changes. These teams were composed of a mix of personnel that had appropriate knowledge of the processes involved as well as a solid awareness of how each chosen process fit within Baxter's strategic objectives. As some members of these new teams did not participate in creating the VSMs, (for example, quality personnel) it was important to ensure that they all understood the strategy and methods behind the VSM effort. The teams developed specific timelines for implementing the changes using traditional Lean techniques, like *kaizen*.

Projected Savings

At the end of the event, Baxter had an action plan that should save 170,000 gallons of water per day and $17,000 within 3 months, with little or no capital investment. The plan also eliminated the need to expand the plant's wastewater treatment plant. Also, since the event, both the head utilities manager and plant manager have been promoted to positions in the corporate office.

For More Information:

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