Making it pay

Five ways to use lean in green HVAC construction

By Dennis Sowards

While lean theories were first designed for and implemented in manufacturing, it has proven effective in reducing costs and improving productivity in HVAC construction. Lean seeks to minimize inventory. It encourages you to only order the amount of product that is needed in the construction process. This helps reduce scrap and keeps the amount of handling and travel required of material and workers to a minimum.

Building green, such as to Leadership in Energy and Environmental Design standards, has already been accepted in the HVAC construction industry as something some customers value. However, most contractors see green HVAC as adding cost and requiring more resources and recordkeeping. They increase their bid prices accordingly. Contractors can also be green by reducing the amount of power, water, chemicals and other resources consumed during ductwork fabrication and installation. Current thinking is that building green will raise the cost of the facility and appeals to a limited HVAC market.

Consider another possibility for building green using lean. James Womack, an expert in lean, made this observation in 2003:

"You'll remember how strange it first sounded when people began to realize that 'quality is free.' To say that 'green is free' if we turn production waste into environmental value sounds equally strange today. But not, I think, for long."

By applying lean techniques, you can reduce the cost of being green and make it affordable and desirable.

Eliminating waste
When lean is applied effectively, much waste is eliminated. You order less material and ship less to the jobsite. You reduce the inventory of material and tools stored on site. You also reduce redundant process steps. All of this reduces energy, fuel and materials consumed, aiding in green HVAC construction.

Here are five ways to apply lean to become green — or even greener:

1. Do a “muda walk” frequently. Muda means “waste” in Japanese. A core lean principle is to look at how work is being performed and look for waste. Muda walks are usually done to spot the seven basic types of waste identified in lean thinking.

Do these walks while putting on “green” glasses. Go watch how material is delivered, stored, installed and scrap removed. Don’t do a “drive-by” but go and watch, really watch, maybe for an hour or more and ask questions. This is not spying; show respect to those doing the work and seek their opinions and ideas. They see more waste than you ever see from your office. Look at what chemicals are used and how water and energy is consumed in the work process. By just observing the work while looking for green opportunities, improvement opportunities will become apparent.

2. Use value stream mapping to do a green analysis. Map out the actual steps followed in any HVAC construction work process. First, look for value-added and non-value-added steps. Seek to minimize the non-value-added steps. (Hint: Value-added

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steps are usually only about 3 percent of all steps.) Then, examine the chemicals, water, material and electricity used in ductwork fabrication, installation or cleaning at each step. Can the quantities used be reduced or even better — eliminated?

Save the paper

LEED requires much documentation but being green does not. If the customer sees LEED certification as valuable, then define the documentation process with as few steps as possible. Lean is into the details of processes, so look at the steps and try to record data only once.

3. Use the “five Ss” — sorting, simplifying, sweeping, standardizing and self-discipline — to sort out and get rid of unneeded material, chemicals, tools and scrap. Many things can be recycled. The five Ss are not done to the workers but with them. As an area is sorted out, engage the workers to look for ways to eliminate non-green material or practices.

While getting rid of excess material and tools, one should also ask why. Why do we have this excess and how do we prevent it next time? Less material fabricated and delivered to a job means more opportunities to reduce the energy and resources used.

The most common types of waste in lean thinking

Unnecessary work is common in HVAC construction and even in shops that have tried to adopt lean fabrication techniques.

They are among the most common types of mistakes made in sheet metal forming and ductwork fabrication.

Defects: It includes doing the wrong installation, defects in fabrication, punch lists and many kinds of change orders and not meeting the required code.

Overproduction of goods: Fabricating or ordering material too early and stockpiling material in the shop, in a warehouse or at the jobsite. Estimating jobs that are not won is a form of this waste. Office overproduction can include printing more job plans or making more copies of a report, material orders or invoices than needed. This waste causes other wastes including: inventory, transportation and motion.

Inventory: This includes unfabricated material; work in process and finished fabrications. Any material, not yet installed and being used by the customer, is inventory. This includes spare parts, unused tools, consumables, forms and copies, and employee stashes and personal stockpiles.

Transportation: This waste happens when material is moved around the shop, loaded on the truck or trailer or hauled to the jobsite and unloaded. Also, it includes when the material is moved from the lay-down or staging area to the installation point or moved to get out of another trade's area. Some research shows that material is moved on average about four times at the job site before being installed.

Waiting: This includes when a crew waits for instructions, inspections, change orders, and materials at the jobsite; when a fabrication machine waits for material to be loaded; and when payroll waits for the late timesheets.

Overprocessing: This includes overengineering, requiring additional signatures on a requisition, multiple handling of timesheets, duplicate entry on forms, and getting double- and triple estimates from suppliers. Any step in a process that is not value added is overprocessing.

Motion: Workers looking for materials, tools, information, where to work, etc., is the waste of motion. These “treasure hunts” happen frequently on worksites but also in the shop, office and jobsite trailer.
Other opportunities

5. Don't forget to look at office and administrative waste-reduction opportunities. One company looked at the amount of printer paper it bought — and employees threw away — each month. They found that:

- Many reports were automatically printed and delivered to designated recipients. Many of these recipients did not want the reports as they had the information on screen and would toss the reports immediately.
- It cost about 10 cents to print a page in color versus 1 cent for black and white. Most documents did not require color printing.
- Most files were printed single-sided even when they could be double-sided, saving paper.

This team was able to make major improvements in what reports were printed and how they were printed, saving money and a few trees.

None of these techniques require major capital expenditures. They are simple and not complex to learn and apply. Applying lean to become green involves getting serious about details and watching for waste reduction opportunities.

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