

Bringing lean thinking to energy

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Beset by rising costs, resource-intensive manufacturers are applying lean-management thinking in new ways to reduce the amount of energy used in production, to increase resource productivity—or both.

Over the years, many global manufacturers have secured big gains in labor and capital productivity by applying the principles of lean manufacturing. Fewer companies, however, have applied lean know-how to energy productivity. Line workers and even senior managers often consider energy a given when they consider it at all. The waste of energy and resources is typically overlooked or excluded from lean problem solving on the grounds that it is too complex for the front line to address, cuts across too many functions, or both.

That's a mistake, given the importance of energy and raw materials as cost drivers. Indeed, for one LCD-television manufacturer we studied, energy represented 45 percent of total production costs. Meanwhile, for many “upstream” manufacturers (such as steel and chemical makers) energy typically accounts for up to 15 percent or more of overall production costs—the largest share after raw materials, which often account for at least 50 percent of the cost base. Our experience suggests that many of these manufacturers could reduce the amount of energy they use in production by as much as 30 percent (with similarly reduced resource losses), in part by applying lean principles and by shifting mind-sets to focus the organization on eliminating anything that doesn't add value for customers.

Consider, for example, the pharmaceutical company that applied lean manufacturing to a series of processes in its biological reactors, where it grew cell cultures. The combination of loss-mapping techniques along the production chain, deep statistical analysis, and rigorous brainstorming and problem-solving sessions with engineers and operators helped to identify improvements in the productivity of the biological resources. The company expects these improvements to boost yields by over 50 percent—without additional costs. This finding was noteworthy because even though the company was well versed in lean thinking and methods, its production team had initially taken variability in biological materials for granted (a common attitude).

By examining new areas formerly considered off-limits to lean, companies often generate rich opportunities. For example, a European chemical company used a lean value-stream analysis of raw-material flows in one of its businesses to understand which activities created value and which created waste. By comparing the theoretical minimum amounts of raw materials required in each stage of production with actual consumption, the company learned that up to 30 percent of its raw-material inputs were wasted. Moreover, some plants were far more wasteful than others, despite otherwise appearing quite efficient.

These discoveries prompted the company to prioritize a range of improvements—starting with how it sourced raw materials and extending to equipment and process changes in production—that together netted more than €50 million in annual savings. What's more, the analysis helped the company to optimize its plants' production rates to use energy more efficiently. Indeed, the company identified a narrow set of conditions in which the plants' energy consumption was *destroying* value—a situation it could now predict and avoid.

A chemical manufacturer used a similar approach to optimize its variable costs associated with both energy use and materials yields. Theoretical-limit analyses identified a series of process-control improvements, as well as opportunities to lower thermodynamic-energy losses and to optimize mechanical equipment. Taken together, these moves helped the company to reduce its energy consumption by 15 percent. Meanwhile, on the raw-material side, the company

combined theoretical-limit analysis with advanced statistical techniques (for more, see “When big data goes lean,” on mckinsey.com) to map the profit per hour of a set of activities. This approach helped the company to optimize the use of an important catalyst in production, to discover additional process parameters for fine tuning, and to improve the allocation of its production activities across the company’s different lines. All this, together with a few selected capital investments, ultimately helped to increase yields by 20 percent (or, in lean terms, to cut yield losses by 20 percent—a savings equivalent to a plant’s entire fixed cost for labor).

There was also one extra benefit. The use of the catalyst had always resulted in two by-products, both of which the company sold, though at different prices. Now that the workers had a better understanding of how profits in the plant varied hour by hour (an important mindset shift), the company could maximize the profits gained from the more expensive by-product. That opportunity was worth an additional €1 million to €2 million a year.

While all of these examples are impressive on their own, perhaps more impressive is the enduring power of lean principles to generate unexpected savings when companies gain greater levels of insight into their operations—for example, through the use of advanced analytics or profit-per-hour analyses. In the years ahead, as emerging-market growth continues to boost demand for resources and to spur commodity-price volatility, more and more companies should have incentives to experience this power for themselves. ○

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