In seven months, a chip-fabrication plant reduced wafer-manufacturing costs by 12 percent and cycle time by 67 percent. How'd they do it?

spectral lines

It's Not Easy Being Lean

EVERYONE WANTS to be the Lance Armstrong of lean business these days. Healthcare operations want to get lean; manufacturers of every stripe want to get lean; even personal-improvement coaches want to help us get lean.

Lean manufacturing comes in many flavors. The most admired, and for long the least understood, is what's known as the Toyota Production System (TPS), an empirical method that aims for the complete elimination of waste and mistakes by continually and incrementally improving the process. TPS also makes that improvement—and thus the quality of the final product—the active responsibility of every person in the company, from the most junior worker to the CEO.

TPS is the driving approach behind the success of automotive powerhouse Toyota. The company began developing its system some 60 years ago, building on techniques set forth by the management expert W. Edwards Deming to improve mass production methods in the United States during World War II.

For decades, companies large and small have attempted to use Toyota's system to fix their own production problems. But these efforts have largely failed, and it hasn't been clear why. Cultural issues? Is TPS suited only to the automotive industry?

But now management guru and Harvard Business School professor Clayton M. Christensen and his colleagues have demonstrated that you can successfully apply TPS to the semiconductor industry. In "The New Economics of Semiconductor Manufacturing," in this issue, they describe how they won over the initially unenthusiastic staff of an unnamed integrated-device manufacturer's logic fab. In just seven months they got results that made everyone at the company sit up and take notice.

Why did it work in this case when it hasn't in so many others? For one thing, the fab committed itself wholly to the new way of working. You can't do TPS just a little or pull out the parts you like and toss the rest. You have to put the entire system in place. You have to give up your investment in the status quo and begin scrutinizing all your processes, both the ones that aren't working and those that are, not just once but every day, forever. You have to be willing to stop what you're doing to think about what's not working and accept that it's not working. It's hard to stay in a hypercritical mode for long periods of time without defaulting to blame and recrimination. These folks toughed it out.

And that brings us to another crucial TPS component: people. TPS must suffuse a company's culture in order for it to work. Employees need to feel that what they say matters and will be acted on. And TPS can't be a management mandate handed down from on high. Managers have to roll up their sleeves and jump into the fray. They must work hard to keep it going, training new employees, retraining current ones, and keeping everyone actively engaged, including themselves.

So you can imagine why there have been so many failures—TPS is hard to consistently do well over time.

Christensen and his colleagues also discuss how thoroughly applying TPS may result in what they call disruptions—a complete change in the way companies do their business. Christensen has long been interested in disruption and disruptive technologies, as his books *The Innovator's Dilemma* (2000) and *The Innovator's Solution* (2003) attest. The disruption he and his colleagues describe in their article would certainly be nerve-racking. But at a time when building new fabs costs billions and companies are scrambling to find new uses for their soon-to-be-obsolete fabs, disruption could also present much-needed opportunities for the struggling semiconductor manufacturing industry.

—SUSAN HASSLER

SMALL STEPS forward are key to fab efficiency.
PHOTO: INTEL CORP.