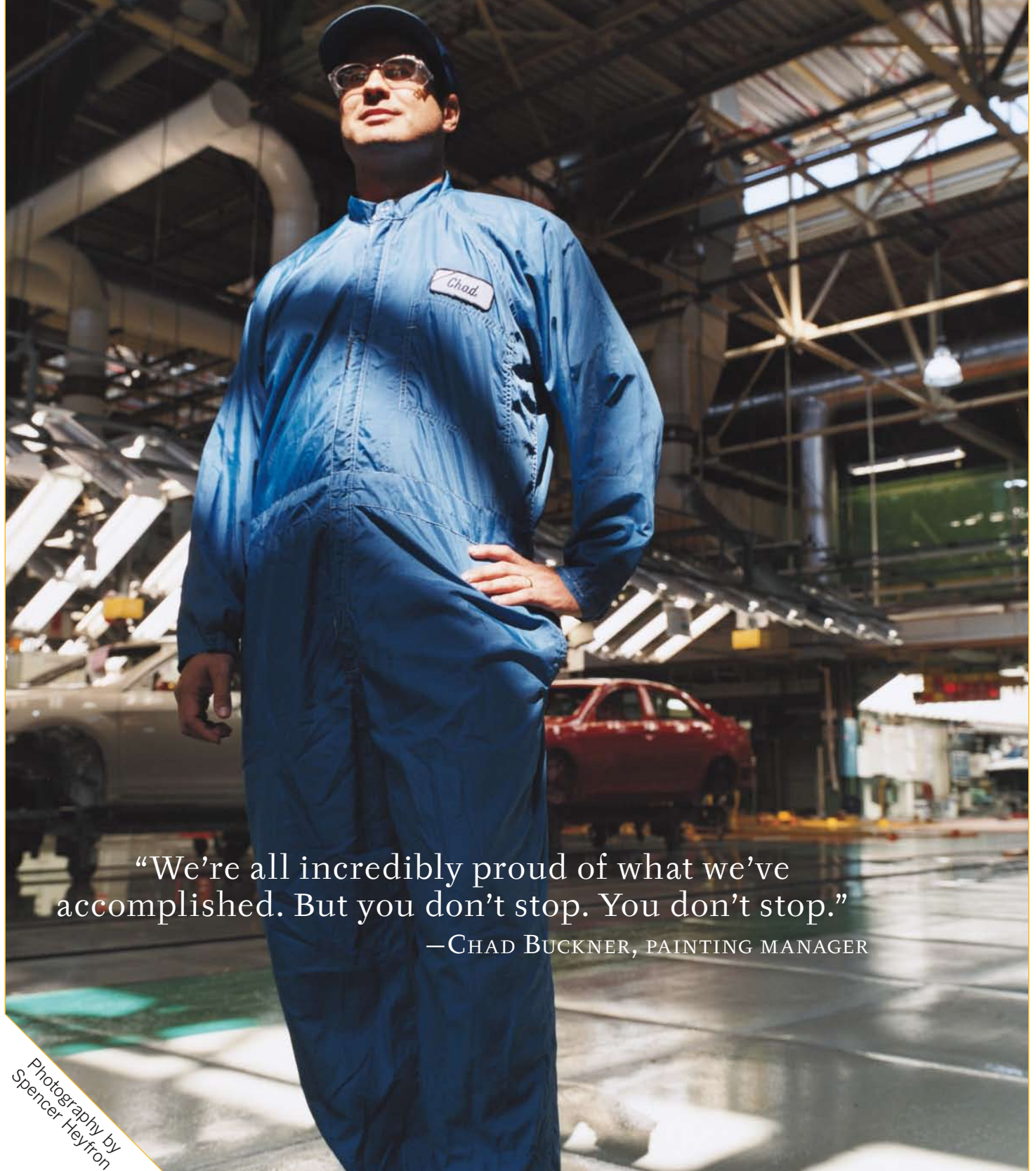


WHAT DRIVES **TOYOTA**? THE PRESUMPTION OF IMPERFECTION—AND A DISTINCTLY AMERICAN REFUSAL TO ACCEPT IT.



“We’re all incredibly proud of what we’ve accomplished. But you don’t stop. You don’t stop.”

—CHAD BUCKNER, PAINTING MANAGER

Photography by
Spencer Heyfron



IN THE WORKS Toyota's Georgetown, Kentucky, assembly plant is its largest outside of Japan. It makes a half-million cars a year—one every 27 seconds.

NO SATISFACTION

By Charles Fishman



BODY 'BOTS: Toyota makes judicious use of automation. Car bodies are welded together by robots, but interiors are still mostly installed by hand.

DEEP INSIDE TOYOTA'S CAR FACTORY IN GEORGETOWN, KENTUCKY, IS THE PAINT SHOP, WHERE NAKED STEEL

car bodies arrive to receive layers of coatings and colors before returning to the assembly line to have their interiors and engines installed. Every day, 2,000 Camrys, Avalons, and Solaras glide in to be painted one of a dozen colors by carefully programmed robots.

Georgetown's paint shop is vast and crowded, but in two places there are wide areas of open concrete floor, each the size of a basketball court. The story of how that floor space came to be cleared—tons of equipment dismantled and removed—is really the story of how Toyota has reshaped the U.S. car market.

It's the story of Toyota's genius: an insatiable competitiveness that would seem un-American were it not for all the Americans making it happen. Toyota's competitiveness is quiet, internal, self-critical. It is rooted in an institutional obsession with improvement that Toyota manages to instill in each one of its workers, a pervasive lack of complacency with whatever was accomplished yesterday.

The result is a startling contrast to the car business. At a time when the traditional Big Three are struggling, Toyota is thriving. Just this year, Ford and GM have terminated 46,000 North American employees. Together, they have announced the closing of 26 North American factories over the next five years. Toyota has never closed a North American factory; it will open a new one in Texas this fall and another in Ontario in 2008. Detroit isn't being bested by imports: 60% of the cars Toyota sells in North America are made here.

Toyota doesn't have corporate convulsions, and it never has. It restructures a little bit every work shift. That's what the open space in the Georgetown paint shop is all about.

Chad Buckner helped clear the space. Buckner, 35, has a soft Southern accent and an air of helpfulness. He is an engineering manager in the painting department, where he arrived straight out of the University of Kentucky 13 years ago. His whole career has been spent at Toyota.

As recently as 2004, a car body spent 10 hours in painting. Robots did much of the work, then as now, but they were supplied with paint through long hoses from storage tanks. "If we were painting a car red, before we could paint the next car white, we had to stop, flush the red paint out of the lines and the applicator tip, and reload the next color," Buckner says. Georgetown literally threw away 30% of the pricey car paint it bought, cleaning it out of equipment and supply hoses when switching colors.

Now, each painting robot, eight per car, selects a paint cylinder the size of a large water bottle. A whirling disk at the end of the robot arm flings out a mist of top-coat paint. When a car is painted—it takes just seconds—the paint cartridge is set back down, and a freshly filled cartridge is selected by each robot.

No hoses need to be flushed. There is no cleaning between cars. All the paint is in the cartridges, which are refilled automatically from reservoirs. Cars don't need to be batched by color—a system that saved paint but caused constant delays. Cars now

spend 8 hours in paint, instead of 10. The paint shop at any moment holds 25% fewer cars than it used to. Wasted paint? Practically zero. What used to require 100 gallons now takes 70.

The benefits ripple out. Not only does Georgetown use less paint, it also buys less cleaning solvent and has dramatically reduced disposal costs for both. Together with new programming to make the robots paint more quickly, Buckner's group has increased the efficiency of its car-wash-sized paint booths from 33 cars an hour to 50.

"We're getting the same volume with two booths that we used to get with three," Buckner says. "So we shut down one of the booths." If you want to trim your energy bill, try unplugging an oven big enough to bake 25 cars. Workers dismantled Top Coat Booth C, leaving the open floor space available for some future task.

So what do Buckner and his crew do with a triumphant operational improvement like that? By way of an answer, he walks to the second area of open space, where the sealer-application robots used to sit. They've been consolidated, too. Buckner points to another undercoating booth that the engineering staff is now working to eliminate.

Indeed, shutting down Top Coat Booth C liberated a handful of maintenance engineers—who turned their attention to accelerating the next round of changes. Success, in that way, becomes the platform for further improvement. By the end of this year, Buckner and his team hope to have



Even at home, constant improvement is the rule: “When I’m mowing the grass, I’m trying different turns to see if I can do it faster.”

—HOWARD ARTRIP, ASSEMBLY MANAGER



LINEMAN: Artrip has spent 19 years at Georgetown—not making cars, but looking for ways to make cars better.



cut almost in half the amount of floor space the paint shop needs—all while continuing to paint 2,000 cars a day.

For Buckner, the paint-shop improvements aren’t “projects” or “initiatives.” They are the work, his work, every day, every week. That’s one of the subtle but distinctive characteristics of a Toyota factory. The supervisors and managers aren’t “bosses” in any traditional American sense. Their job is to find ways to do the work better: more efficiently, more effectively.

“We’re all incredibly proud of what we’ve accomplished,” says Buckner, a little puzzled that his attitude might be considered unusual. “But you don’t stop. You don’t stop. There’s no reason to be satisfied.”

THE PROCESS PROCESS

What is so striking about Toyota’s Georgetown factory is, in fact, that it only looks like a car factory. It’s really a big brain—a kind of laboratory focused on a single mission: not how to make cars, but how to make cars better. The cars it does make—one every 27 seconds—are in a sense just a by-product of the larger mission. Better cars, sure; but really, better ways to make cars. It’s not just the product, it’s the process.

The process is, in fact, paramount—so important that “Toyota also has a process for teaching you how to improve the process,” says Steven J. Spear, a senior lecturer at MIT who has studied Toyota for more than a decade. The work is really threefold: making cars, making cars better, and teaching everyone how to make cars better. At its Olympian best, Toyota adds one more level: It is always looking to improve the process by which it improves all the other processes.

There’s a certain Zen sensibility to that—but also a relentlessly capitalistic, tenaciously competitive quality. If your factory is just making cars, once a day the whistle blows and it’s quitting time, no more cars to make that day. If your factory is making a new way to make cars, the whistle never blows, you’re never done.

Without fanfare, in fact, Toyota is confounding conventional wisdom about U.S. manufacturing. Toyota isn’t outsourcing; it’s creating jobs in the United States. It isn’t having trouble manufacturing complicated products here—it’s opening factories as quickly as its systems and quality standards allow. It’s offering union wages



and good health insurance (to avoid being unionized), and selling the products its American workers make to Americans, profitably and more inexpensively than its U.S. competitors.

So put aside everything you think you know about the current state of the car business in the United States. Sure, Toyota enjoys some structural advantages in the form of lower health care and pension

costs. But the real reason it is thriving is because of people like Chad Buckner saying, “There’s no reason to be satisfied.” It’s not just the way Toyota makes cars—it’s the way Toyota *thinks* about making cars.

That thinking is hardly novel: Lean manufacturing and continuous improvement have been around for more than a quarter-century. But the incessant, almost mindless repetition of those phrases camouflages the real power behind the ideas. Continuous improvement is tectonic. By constantly questioning how you do things, by constantly tweaking, you don’t outflank your competition next quarter. You outflank them next decade.

Toyota is far from infallible, of course. In the past two years, recalls for quality and safety problems have spiked dramatically—evidence of the strain that rapid growth puts on even the best systems. But those quality issues have seized the attention of Toyota’s senior management. In the larger arena, when the strategy isn’t to build cars but to build cars better, you create perpetual competitive advantage. By the time you best your competitors, they aren’t just a bit behind you, in need of a reorganization and a sales

surge to regain the lead. They are a decade behind. They just don’t realize it.

THE STORY OF THE TOTES

The Toyota factory in Georgetown sits on a piece of green ground as flat as a table. The factory itself is low, yet so large it stretches to the horizon, no matter what side you approach it from. There’s space inside to play 100 football games, with room for fans on the sidelines. A network of heavily trafficked streets runs through the place, with travel lanes in each direction.

Cars are the most complicated objects most people use routinely; to watch cars get made is to pull back the curtain on raw human ingenuity. At Georgetown, that ingenuity often appears in unexpected, and unexpectedly simple, ways.

Howard Artrip, 45, is standing at the assembly line alongside a rack of blue plastic totes filled with sun visors and seat belts. Just beyond Artrip and the rack of totes, a line of Camrys and Avalons pass by, freshly painted but hollow—no engines, no dashboards, no seats.

Artrip, a manager in the assembly area, is telling the story of how the totes—ordinary Rubbermaid carryalls—solved a decision-making problem. “There used to be eight racks of parts here,” he says. The racks crowded the workstation, giving the worker ready access to all possible parts. The operator would eyeball the car coming up the line, step to the racks of visors and seat belts, and, says Artrip, “grab the right parts and run to the car.” He or she would step into the slowly advancing car, bolt belts and visors in place, step back onto the factory floor—and do it again. All in 55 seconds, the unvarying time each slowly moving car spends at each workstation.

The problem was, there were 12 possible combinations of sun visors and nine variations of seat belts. So just deciding which parts to snatch had become a job in itself. In every shift, 500 cars passed the racks, each car needing four specific parts: 2,000 opportunities to make an error. Even with 99% perfection, five cars per shift got the wrong sun visors or seat belts. The job—installing parts—had become cluttered with meaningless decision making.

So a team of assembly employees made a real decision. Don’t make the worker pick the parts; let him focus on installing them. The idea seems obvious in retro-

>> TOYOTA'S SALES GAIN IN 2005 FROM THREE YEARS BEFORE: 34% • ITS PROFIT PER CAR: \$1,587 • SHARE OF CARS IT SELLS IN NORTH AMERICA THAT ARE MADE HERE: 60%

spect: Deliver a kit of presorted visors and seat belts—one kit per car, each containing exactly the right parts. The team applied the simplest technology available, the blue Rubbermaid caddy. “We went just down the road to Wal-Mart and bought them,” Artrip says. Now, the line worker doesn’t have to make any decisions at all. Just grab the handle of the blue tote like a lunch pail and step into the car.

Media accounts often report that a typical Toyota assembly line in the United States makes thousands of operational changes in the course of a single year. That number is not just large, it’s arresting, it’s mind-boggling. How much have you changed your work routine in the past decade? Toyota’s line employees change the way they work dozens of times a year.

In the case of the blue tote, the change came out of a routine analysis of dozens of assembly-line jobs at Georgetown. When the simplification effort started three years ago, Artrip’s team found 44 jobs where assemblers had to make 1 or 2 decisions as they installed parts. They found 23 workstations that required between 7 and 11 decisions.

Any jobs requiring 7 to 11 decisions in 55 seconds were going to cause problems. So dozens of jobs incurred small changes—grab the blue tote instead of choosing individual parts. Now, 85 line jobs require just 1 or 2 decisions. Not a single job requires 7 or more decisions. The work is easier, the results are better.

This is exactly the kind of work Artrip has spent more than half his career at Toyota doing: looking for ways to make the assembly line faster, simpler, safer—ways to make it easier to do the work perfectly. Continuous improvement is not some add-on to the real work, it isn’t some special project Artrip has to do on top of his routine responsibilities, nor is he a guy who parachutes into the assembly line from an engineering building somewhere else. It is what he comes to the factory every day thinking about. It isn’t exhausting, it’s exhilarating.

Artrip has been at Georgetown for 19 years. The way he does his work is so compelling it has become part of his per-

sonal life. “When I’m mowing the grass, I’m thinking about the best way to do it. I’m trying different turns to see if I can do it faster,” he says. He has analyzed his morning routine. “I do the same standardized work in the shower every morning. I have to get here at 6 a.m., and I know it takes 19 minutes, including walking into the plant.” He smiles. “I’ve maximized my sleep time.”

PROBLEMS FIRST

James Wiseman remembers the moment he realized that Toyota wasn’t just another workplace but a different way of thinking about work. Before joining the company, he had been a factory manager, first for a swimsuit maker, then for a steel-tubing manufacturer. He joined Toyota’s still-new George-

town plant in October 1989 as manager of community relations. Today, he’s vice president of corporate affairs for all of Toyota manufacturing in North America.

At the swimsuit factory and the tube factory, “there was always a lot of looking for the silver bullet,” Wiseman says, “looking for the big, dramatic improvement. And I had the attitude that when you achieved something, you achieved it. You enjoyed it.” He was steeped in the American business culture of not admitting, or even discussing, problems in settings like meetings.

In Wiseman’s early days, Georgetown was run by Fujio Cho, now the chairman of Toyota worldwide. Every Friday, there was a senior staff meeting. “I started out going in there and reporting some of my little successes,” says Wiseman. “One Friday, I gave a report of an activity we’d been doing”—planning the announce-



ment of a plant expansion—"and I spoke very positively about it, I bragged a little. After two or three minutes, I sat down.

"And Mr. Cho kind of looked at me. I could see he was puzzled. He said, 'Jim-san. We all know you are a good manager, otherwise we would not have hired you. But please talk to us about your problems so we can all work on them together.'"

Wiseman says it was like a lightning bolt. "Even with projects that had been a general success, we would ask, 'What didn't go well so we can make it better?'" At Toyota, Wiseman says, "I have come to understand what they mean when I hear the phrase, 'Problems first.'"

It's another cliché that is powerful if you take it seriously: You can't solve problems unless you admit them. At Toyota, there is a presumption of imperfection. Perfection is a fine goal, but improvement is much more realistic, much more human. Not a 15% improvement by the end of the quarter, a 1% improvement by the end of the month.

The challenge, of course, is to make the rhetoric real, to make the presumption of imperfection integral to how people think and work. Pete Gritton knows better than most how that happens; he and his staff have hired all the Kentuckians who work at Toyota Georgetown. He's vice president of HR and administration for Georgetown, and vice president of HR for Toyota manufacturing in North America.

"We want people to be problem solvers," Gritton says. "Because every time there's a problem, we don't send out some guy in a white shirt with a clipboard." New hires—10% of job applicants make it through screening tests that include a team-building exercise—are immersed in Toyota's process for process improvement. There are daily work-group meetings, a written suggestion program, and longer-term problem-solving teams. But everything is grounded in two hard realities.

First, of course, "we have to make 2,000 cars a day. We can't vote about how to make each one," Gritton says. "We can't stop every few minutes and change the process." And then there is the most basic rule, the reason "continuous improvement" is not a matter of character or national culture or willpower, but is itself a kind of assembly line. "The rule here is that improving something starts after understanding the standard—understanding how we do it now," Gritton says. "If you don't understand what you're trying to improve, how do you know



FINISH LINE: A worker does final inspection. Toyota's assembly lines make thousands of changes a year to how the work is done.

that your suggestion is an improvement?"

No one at Toyota Georgetown can talk about his work without explaining how it has just changed, or is about to change. Chris Gentry, a supervisor for instrument-panel assembly, is showing how his area is about to be redesigned. It was set up just this year to handle the 2007 Camry—but after working with it for most of a year, workers now see inefficiencies. Some work will be moved back to an area where kits are assembled; some movement of parts can be off-loaded to seven newly built transport robots. Two jobs will be eliminated and the workers redeployed elsewhere; 18 seconds can be shaved from the assembly process.

"We set it up for the model change," says Gentry. "Now we'll fix it. We standardized it, now we're improving it." It's not the instrument panel—it's the way you make the instrument panel.

In the 2007 Camry, there is a tiny change that drivers won't notice. The Camry's radiator support bar—a brace of steel running across the lower front of the engine compartment—isn't installed when the body is first made. It used to be, but it blocked access to the engine compartment. Workers had to stretch and lean in to install engine wiring and components. With the bar's installation held out until near the end of assembly, workers simply step into the engine compartment and get right up close to their work. That idea ricocheted from the plant floor in Georgetown, up to Toyota's design team, and then out to Camry assembly plants around the world.

Once you see how woven into the work improving the work is, each particular improvement seem less interesting. What's interesting is to compare how they think about work at Georgetown with everywhere else. How come the checkout lines at Wal-Mart never get shorter? How come the customer service of your cell-phone company never improves, year after year? How come my PC gets harder to operate with each software upgrade? How come I don't know how many minutes it takes me to get from my doorstep to my office, so I can maximize my sleep?

It's almost as if Toyota people see the world with special four-dimensional glasses; the rest of us are stuck in 2-D.

Without any fanfare at all, Toyota is confounding, if not defying, conventional wisdom about the current state of the U.S. economy.

a science, a way of being and thinking. Not least among those are . . . GM, Ford, and Chrysler. For more than 20 years, in fact, Toyota and GM have operated a car factory together in California—the NUMMI project—that has allowed GM to study Toyota's methods up close.

And the Big Three have each gotten better at making cars: In the past decade, GM and Chrysler have cut by one-third the hours they need to assemble a car. But they all still trail Toyota. No one knows that better than GM. "We've made a whole lot of progress," says Dan Flores, a spokesman for GM's North American manufacturing operations—much of it by learning directly from Toyota. "Transforming a company the size of GM is a daunting task. The culture of the plants doesn't change overnight. But there has been a cultural change in the

company—and that change continues."

Typically, though, the Big Three take an all-too-American approach to the idea of improvement. It's episodic, it's goal-oriented, it's something special—it's a pale imitation of the approach at Georgetown. "If you go to the Big Three, you'd find improvement projects just like you'd find at Georgetown," says Jeffrey Liker, a professor of engineering at the University of Michigan and author of *The Toyota Way*, a classic exploration of Toyota's methods. "But they would be led by some kind of engineering group, or a Six Sigma black belt, or a lean-manufacturing guru of some kind.

"They might even do as good a job as they did at Georgetown. But here's the thing. Then they'd turn that project into a PowerPoint. They'd present it at every place in the whole company. They'd say,

IN THE END, THERE IS NO END



lots of companies have tried to learn and use the methods that Toyota has refined into a routine,



CLEAN ROOM: Georgetown has reduced waste sent to landfills by 96% in part by producing compost used in an on-site greenhouse.

‘Look what we did!’ In a year, that happens a couple of times in a whole plant for the Big Three. And it would get all kinds of publicity in the company.

“Toyota,” Liker says, “is doing it in every single department, every single day. They’re doing it on their own”—no black belts—“and they’re doing it regularly, not just once.”

So you can buy the books, you can hire the consultants, you can implement the program, you can preach business transformation—and you can eventually run out of energy, lose enthusiasm, be puzzled over why the program failed to catch fire and transform your business, put the fat binders on a conference-room shelf, and go back to business as usual.

What happens every day at Georgetown, and throughout Toyota, is teachable and learnable. But it’s not a set of goals, because goals mean there’s a finish line, and there is no finish line. It’s not something you can implement, because it’s not a checklist of improvements. It’s a way of looking at the world. You simply can’t lose interest in it, shrug, and give up—any more than you can lose interest in your own future.

“People who join Toyota from other companies, it’s a big shift for them,” says John Shook, a faculty member at the University of Michigan, a former Toyota manufacturing employee and a widely regarded consultant on how to use Toyota’s ideas at other companies. “They kind of don’t get it for a while.” They do what all American managers do—they keep trying to make their management objectives. “They’re moving forward, they’re improving, and they’re looking for a plateau. As long as you’re looking for that plateau, it seems like a constant struggle. It’s difficult. If you’re looking for a plateau, you’re going to be frustrated. There is no ‘solution.’”

Even working at Toyota, you need that moment of Zen.

“Once you realize that it’s the process itself—that you’re not seeking a plateau—you can relax. Doing the task and doing the task better become one and the same thing,” Shook says. “This is what it means to come to work.” **FC**

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