

# Read a Plant – Fast

by R. Eugene Goodson



Harvard Business Review

Reprint R0205H

# Harvard Business Review



May 2002

HBR CASE STUDY R0205A  
**A Pain in the (Supply) Chain**  
John Butman

---

HBR AT LARGE R0205B  
**How Resilience Works**  
Diane L. Coutu

---

DIFFERENT VOICE R0205C  
**Turning an Industry Inside Out:  
A Conversation with Robert Redford**

---

**Change the Way You Persuade** R0205D  
Gary A. Williams and Robert B. Miller

---

## HBR SPOTLIGHT: PRACTICAL STRATEGY

**Divestiture: Strategy's Missing Link** R0205E  
Lee Dranikoff, Tim Koller, and Antoon Schneider

---

**Why Business Models Matter** R0205F  
Joan Magretta

---

**Disruptive Change: When Trying Harder  
Is Part of the Problem** R0205G  
Clark Gilbert and Joseph L. Bower

---

TOOL KIT R0205H  
**Read a Plant – Fast**  
R. Eugene Goodson

---

THE ENTREPRENEUR R0205J  
**A Test for the Fainthearted**  
Walter Kuemmerle

# Read a Plant– *Fast*

*To the trained eye, even a quick plant tour can reveal a lot about a company. Here's how to tell if a factory is truly lean – in as little as 30 minutes.*

**by R. Eugene Goodson**

**I**N THE EARLY 1980S, when I was heading up the automotive seating operations at Hoover Universal (later acquired by Johnson Controls), managers from a Japanese competitor that supplied parts to Toyota asked permission to visit our plant. We agreed, on the condition that they reciprocate and because we believed they would learn little from a brief tour. The visitors spent less than an hour in one of our best plants, taking no notes. Eventually, we got to read their tour report, and we were shocked at the detail with which they had described our plant and our technology, right down to an accurate estimate of our cost of sales. Meanwhile, our senior managers had visited their Japanese plants and learned next to nothing.

After that experience, I resolved to train our managers—and myself—to approach a plant tour with an educated eye, one that could discern a plant’s strengths and weaknesses as accurately as the Japanese managers had read ours. The Rapid Plant Assessment (RPA) process, the tool I’ve developed over the years to accomplish this task, has been used in more than 400 tours of over 150 operations since 1998. The information this tool has given us has influenced activities and decisions ranging from benchmarking to competitor analysis to strategic acquisitions. And the results of a tour are available in a day or less, whereas most rating systems typically take weeks to complete.

Let me give you an example of how powerful the tool can be. When I was the CEO of Oshkosh Truck, we were engaged in a highly competitive auction for Pierce Manufacturing, a leading U.S. fire truck maker. Pierce’s executives didn’t favor Oshkosh as the acquirer, so they only permitted us one 30-minute tour, after hours, of each of their three plants. But we learned so much about their operations in those short tours that we were sure we could cut costs by a few million dollars per year—for example, by eliminating materials-handling bottlenecks, consolidating plants, reducing inventories, and running the paint shop on one shift instead of three. As a result, we offered a higher price than the company’s financials would have indicated and won the auction.

To be sure, the RPA process is not a substitute for due diligence when you’re making an acquisition, and likewise, you’ll consider a wide range of factors when choosing a supplier. But managers all too often ignore visual information in favor of the numbers, and as a result, you might miss vital cues about an operation’s strengths and weaknesses. This may cause you to miss out on a highly desirable opportunity or to enter into a relationship that sounds promising only to discover a performance problem later. You can also apply the tool to your own operations to learn what your plant is telling visitors and where you might find opportunities for improvement.

Donnelly Electronics, Eaton Corporation’s Aeroquip Group, Haworth’s office furniture plants, a Lockheed Martin division, and Seagate Technology are just a few of the organizations I know of currently using the RPA process in their own lean transformation journeys. I’ll lay out the tool below, along with two work sheets that will help you codify and analyze the results of the tour.

## A Tool for the Tour

At the heart of the RPA process are two assessment tools for teams performing plant tours. The RPA rating sheet presents 11 categories for assessing the leanness of a plant, and the RPA questionnaire provides 20 associated yes-or-no questions to determine if the plant uses best practices in these categories. Following a tour, team members will capture their observations in work sheets like the two shown on the next pages. There are many quantifiable factors by which to assess performance in the rating sheet’s 11 categories; an exhaustive list of elements to consider in conjunction with them is located on the Web at [www.bus.umich.edu/rpa](http://www.bus.umich.edu/rpa) along with other advanced assessment tools mentioned in the last sidebar in this article.

During a tour, team members will be observing all aspects of a plant’s environment, talking with the workforce and managers, and looking for evidence that the plant adheres to best practices. It’s important that team members not take notes during a tour, because note taking detracts from picking up visual cues and impedes communication with employees on the plant floor. Instead, each member of the team is assigned primary responsibility for a few categories, and the team should meet immediately after the tour to share impressions and fill out the work sheets. We also recommend that everyone on the team answer the last question, “Would you buy the products this operation

produces?” (See the sidebar “Team Composition and Training” for a discussion of who should be on the tour team and how to prepare for it.)

Let’s take a look at each of the categories in turn.

### Category 1 Customer Satisfaction

Workers in the best plants clearly know who their customers are—both internal and external—and make customer satisfaction their primary goal. What’s more, they understand that it’s their job to make tours exceptional experiences so visitors leave with resoundingly positive feelings about the facility. Such care for customers, or lack thereof, is readily apparent in a brief plant tour. You should be welcomed to the plant and given an overview of its layout, workforce, customers, and products. Quality and customer satisfaction ratings should be prominently posted. And try asking an employee, “Where does your product go next?” If you hear, “Ford” or “John, over on line 6,” you can rate the plant higher on this measure than if you hear, “I put it in this bucket and I don’t know what happens to it after that.” (Questions 1, 2, and 20 on the RPA questionnaire relate to this measure.)

### Category 2 Safety, Environment, Cleanliness, and Order

In a clean and orderly plant, parts are easy to find, inventory is easy to count or estimate, and products move safely and efficiently. The plant should be well lit, the air quality good, and noise levels low. A visual labeling system should clearly mark inventory, tools, processes, and flow. A short plant tour will readily reveal how successfully the company attends to all these factors.

All component parts should be treated with equal care. Many companies go to great lengths to keep expen-

---

*R. Eugene Goodson is an adjunct professor of operations management at the University of Michigan Business School in Ann Arbor. Previously, he served as the chairman and CEO of Oshkosh Truck and led Johnson Controls’ Automotive Systems Group. He was the chief scientist for the U.S. Department of Transportation in the 1970s and a professor of mechanical engineering at Purdue University from 1963 to 1981.*

sive parts in order while giving short shrift to low-cost ones like labels or fasteners. That habit can be costly. Indeed, when we were making seats at Johnson Controls, we never lost a seat back or cushion, but occasionally the bolts that joined the recliner mechanisms to the back and cushions were left off or not available. We couldn't ship a seat that was missing a bolt (or collect payment on it, naturally), so a single bolt was essentially as valuable as a larger, more expensive part. (Questions 3–5 and 20)

### Category **3**

#### **Visual Management System**

Tools that provide visual cues and directions are readily apparent in well-functioning plants. Such signage, clearly guiding employees to appropriate locations and tasks, can greatly enhance productivity. Look for organizational tools such as kanban scheduling and color-coded production lines as well as plainly posted work instructions, quality and productivity charts, and maintenance

records. Other indicators of good visual management include kiosks displaying information like the names of team members, productivity measures, and vacation schedules, as well as a central location such as a control room or status board from which you can see the current state of the overall operation. Chemical and other process-industry plants typically have strong visual management practices (as opposed to multiple, fragmented displays); even the largest plants tend to display product line flows, plant layouts, and other key information on a single display. (Questions 2, 4, 6–10, and 20)

The next three categories are intertwined. Rating a plant quickly on these three is straightforward from obvious visual clues.

### Category **4**

#### **Scheduling System**

The best plants rely on a single “pacing process” for each product line and its suppliers. This process, usually at the

end of the line, controls speed and production for all the upstream activities, much as a pace car sets the speed at a racetrack. Demand for product at each work center is triggered by demand at the next. This keeps inventory from building up, improves quality, and reduces downtime because production lines aren't kept waiting for parts.

Plants that use a central scheduling system nearly always over- or under-produce some parts at some point in the process because instructions come to each line from a central computer, not from the production line that actually uses the part. I saw the downside of central scheduling in the extreme when I visited a tractor factory in the Soviet Union. The plant was diligently producing according to its centralized schedule, but the engine plant wasn't shipping enough engines, so each incomplete tractor was towed out to the yard. I counted a full six months' supply of lifeless tractors, each waiting for its final, all-important, part.

## Team Composition and Training

An RPA team is small, usually four or five people, with one person designated as the leader. Someone with equipment knowledge for the industry being examined is a good choice for the team, and people with production experience are particularly valuable members, but team members should possess a variety of types and levels of experience. The RPA reports developed by different teams I've sent to tour the same plants have come in with remarkably consistent ratings and recommendations for improvement despite the fact that their members had widely varying levels of experience.

Depending on how experienced team members are with lean operations, it takes one to three days to

train a team to read a plant using this tool. After initial training classes about leanness, tours of employees' own plants provide excellent opportunities to work with the RPA process. What's more, reports completed during these and future tours can become vital additions to the company's records, providing benchmarks for performance improvement and case materials for future trainings.

Raters familiarize themselves with general background about a plant by examining annual reports; analysts' reports; and the Web site of 10-K Wizard Technology, an industry association. Easily located benchmarking Web sites that focus on specific manufacturing and service industries also provide valuable initial insight.

It's vital that the team review industry-specific characteristics prior to conducting a tour since inventory or practices that would be considered excessive in some industries may be unavoidable in others. The pharmaceutical industry, for example, must comply with purity requirements that call for a level of oversight that would be redundant in a commodity business. And restaurants or electric power plants will typically have either high inventory or underutilized capacity, traits that wouldn't be desirable in other industries. By taking such practical and regulatory requirements into account, a team will ensure greater accuracy in its assessment.

# Rating Leanness

Plant \_\_\_\_\_

Tour date \_\_\_\_\_

Rated by \_\_\_\_\_

## RPA Rating Sheet

Team members use the RPA rating sheet to assess a plant in 11 categories on a scale from “poor” (1) to “excellent” (9) to “best in class” (11). The total score for all categories will fall between 11 (poor in all categories) and 121 (the best in the world in all categories), with an average score of 55. Factors to consider to rate a plant in each category are described in this article; a more detailed list of evaluative factors appears on the Web at [www.bus.umich.edu/rpa](http://www.bus.umich.edu/rpa). The rating sheet also guides team members to questions in the RPA questionnaire (opposite) that relate specifically to each category.

When plants are rated every year, the ratings for most tend to improve. Ratings are usually shared with plants, and motivated managers first improve their plants in the categories that receive the lowest ratings.

Ratings

Categories	Related questions in RPA questionnaire	poor (1)	below average (3)	average (5)	above average (7)	excellent (9)	best in class (11)	category score
<b>1</b> Customer satisfaction	1, 2, 20							
<b>2</b> Safety, environment, cleanliness, and order	3–5, 20							
<b>3</b> Visual management system	2, 4, 6–10, 20							
<b>4</b> Scheduling system	11, 20							
<b>5</b> Use of space, movement of materials, and product line flow	7, 12, 13, 20							
<b>6</b> Levels of inventory and work in process	7, 11, 20							
<b>7</b> Teamwork and motivation	6, 9, 14, 15, 20							
<b>8</b> Condition and maintenance of equipment and tools	16, 20							
<b>9</b> Management of complexity and variability	8, 17, 20							
<b>10</b> Supply chain integration	18, 20							
<b>11</b> Commitment to quality	15, 17, 19, 20							

Total score for 11 categories \_\_\_\_\_  
(max = 121)

## RPA Questionnaire

The total number of yeses on this questionnaire is an indicator of a plant's leanness: the more yeses, the leaner the plant. Each question should be answered yes only if the plant obviously adheres to the principle implied by the question. In case of doubt, answer no.

	yes	no
1 Are visitors welcomed and given information about plant layout, workforce, customers, and products?	<input type="radio"/>	<input type="radio"/>
2 Are ratings for customer satisfaction and product quality displayed?	<input type="radio"/>	<input type="radio"/>
3 Is the facility safe, clean, orderly, and well lit? Is the air quality good, and are noise levels low?	<input type="radio"/>	<input type="radio"/>
4 Does a visual labeling system identify and locate inventory, tools, processes, and flow?	<input type="radio"/>	<input type="radio"/>
5 Does everything have its own place, and is everything stored in its place?	<input type="radio"/>	<input type="radio"/>
6 Are up-to-date operational goals and performance measures for those goals prominently posted?	<input type="radio"/>	<input type="radio"/>
7 Are production materials brought to and stored at line side rather than in separate inventory storage areas?	<input type="radio"/>	<input type="radio"/>
8 Are work instructions and product quality specifications visible at all work areas?	<input type="radio"/>	<input type="radio"/>
9 Are updated charts on productivity, quality, safety, and problem solving visible for all teams?	<input type="radio"/>	<input type="radio"/>
10 Can the current state of the operation be viewed from a central control room, on a status board, or on a computer display?	<input type="radio"/>	<input type="radio"/>
11 Are production lines scheduled off a single pacing process, with appropriate inventory levels at each stage?	<input type="radio"/>	<input type="radio"/>
12 Is material moved only once and as short a distance as possible? Is material moved efficiently in appropriate containers?	<input type="radio"/>	<input type="radio"/>
13 Is the plant laid out in continuous product line flows rather than in "shops"?	<input type="radio"/>	<input type="radio"/>
14 Are work teams trained, empowered, and involved in problem solving and ongoing improvements?	<input type="radio"/>	<input type="radio"/>
15 Do employees appear committed to continuous improvement?	<input type="radio"/>	<input type="radio"/>
16 Is a timetable posted for equipment preventive maintenance and ongoing improvement of tools and processes?	<input type="radio"/>	<input type="radio"/>
17 Is there an effective project-management process, with cost and timing goals, for new product start-ups?	<input type="radio"/>	<input type="radio"/>
18 Is a supplier certification process – with measures for quality, delivery, and cost performance – displayed?	<input type="radio"/>	<input type="radio"/>
19 Have key product characteristics been identified, and are fail-safe methods used to forestall propagation of defects?	<input type="radio"/>	<input type="radio"/>
20 Would you buy the products this operation produces?	<input type="radio"/>	<input type="radio"/>

Total number of yeses \_\_\_\_\_

You can find out how the plant schedules its lines by asking workers but also by looking at inventory levels. If inventory piles up at one work center, then the scheduling systems are likely independent of each other or the process is inadequately paced. Also, if processes are scheduled from a central MRP system, you'll see computer screens or stacks of work orders at the line.

What's more, you can watch for visual and verbal communication between process operators on the same line: People should be close enough to speak to one another and to see another's inventory. Operators can and do override central scheduling and respond to visual cues; for example, they might slow production if they see inventory piling up down the line. (Questions 11 and 20)

### Category **5** Use of Space, Movement of Materials, and Product Line Flow

The best plants use space efficiently. Ideally, materials are moved only once, over as short a distance as possible, in efficient containers. Production materials should be stored at line side, not in separate inventory storage areas. Tools and setup equipment should be kept near the machines. And the plant should be laid out in continuous product line flows rather than in "shops" dedicated to particular types of machines. On my first visit in the mid-1990s to Austria-based Rosenbauer, one of Europe's largest fire truck and equipment makers, I gave the plant excellent ratings except on its pump and truck assemblies, which were done in traditional cells. By the time I visited two years later, the company had converted pump and truck assemblies to lean product lines, and managers reported that both productivity and quality had improved.

Counting forklifts is an easy way to get a sense of a plant's use of space. Forklifts require wide aisles, are expensive to operate, increase pollution, and encourage unnecessary movement of materials. In the best plants, if materials need to be moved a short distance, employees use hand-propelled roll carts; if the materials are too heavy to move

by hand, garden tractors pull the carts in linked trains.

Space is a valuable commodity in any plant, and some companies make generating new space a productivity objective. One of our plant managers elevated this concept to an art form. He would regularly free up manufacturing space, polish the floor, cordon it off with stanchions, and then challenge our sales group to find new business to fill the space. (Questions 7, 12, 13, and 20)

**Category 6**  
**Levels of Inventory and Work in Process**

Internal operations seldom require high inventories, so the observable number of any component part is a good measure of a plant's leanness. You can get a quick read on inventory by watching a production line and counting the inventory at each work center. For example, if one widget comes off the line per minute, you know the line produces 60 per hour. If you count approximately 500 widgets by the work center, then you know that over eight hours of output is just sitting there. In most cases,

you want no more than a few minutes' worth of inventory by a work center at one time; each part should go directly to the next process to be used fairly quickly. (Questions 7, 11, and 20)

**Category 7**  
**Teamwork and Motivation**

In the best plants, people consistently focus on the plant's goals for productivity and quality, know their jobs well, and are eager to share their knowledge with customers and visitors. Motivated employees are easily discerned during a brief tour, as are surly, unkempt, or indifferent ones; even a short talk with an operator tells you a lot.

See if there are clearly posted safety and environmental measures, pictures of the plant's softball team, posters boasting of quality and productivity improvements, charts showing contributions to charitable organizations. You might also look for posters or charts that describe problem-solving and employee empowerment procedures. These are visible indicators of teamwork—and if you can't spot such signs, chances are the plant hasn't truly embraced team-

work. But you can supplement your observations with questions to the manager and plant staff about these activities as you tour. (Questions 6, 9, 14, 15, and 20)

**Category 8**  
**Condition and Maintenance of Equipment and Tools**

In the best plants, equipment is clean and well maintained. The purchase dates and costs are stenciled prominently on the side of machinery, and maintenance records are posted. Such details ensure that workers know as much as possible about the machines and can plan for preventive maintenance. But perhaps more important, by posting cost and maintenance records, the company signals to employees that management cares about the product, that they've invested in keeping the plant running smoothly, and that they care about the work people do. Those are important factors in maintaining morale.

You can also learn a great deal by asking people on the factory floor how things are working. When some of my

## The RPA Process Database

Since 1998 alone, my students and I have used the RPA process in more than 400 tours of over 150 different manufacturing and service industries ranging from automotive suppliers, aerospace companies, and book manufacturers to cinema complexes, automobile dealers, and microbreweries. The table at the right shows the range of ratings obtained in the RPA rating sheet and questionnaire during some of those tours. These results are for manufacturing operations that were toured at least ten times each between January 1998 and May 2001; the reports in this table represent only

a small fraction of the total reports in our database.

Different teams touring the same plants produce remarkably consistent results, but we've found that the most consistent results are generated when visiting an exceptionally good or an exceptionally poor operation; the variance increases with an average plant, particularly when the team is inexperienced. The majority of team members touring the plants rated here had little or no manufacturing experience.

We've found that typical scores for the sum of the ratings of the 11 categories range between 30 and 90, with

an average of 55. In this table, only four of the operations scored lower than 30 on any tour report, and only three operations have ever scored above 90. In addition, the average number of yeses in the questionnaire for all operations we've toured is seven, and the standard deviation is close to two. In this table, we find that the mean number of yeses was often higher than the average number for all operations because these plants made improvements between tours. The standard deviation remained low, meaning that ratings from different teams remained quite consistent.



students toured a new production line at an automotive supplier, one of them asked a worker how things were going. “Pretty well,” he said but pointed to one critical sensor that wasn’t performing consistently or accurately so that manual, not automatic, inspection of a part was required. Thus, a significant investment in technology was undermined by an increase in person-hours to perform this task by hand when the sensor malfunctioned – a source of waste uncovered by a simple question.

Another question to ask employees is whether operators and product development personnel are involved in purchasing tools and equipment. People on the factory floor and others directly involved with the product are in the best positions to understand the strengths and weaknesses of new equipment and the needs of the line.

Finally, look at the equipment yourself. Machines don’t have to be new, but a recently purchased machine that’s dirty and falling out of repair is a signal of poor preventive maintenance. Conversely, if a machine looks new but was purchased long ago, you know the

plant’s taking care of its investments. And many problems are easily visible to the naked eye – if you know to look. When I visited a petroleum refinery in Haifa, Israel, in 1970, plant managers told me about a problem with two of four temperature charts, one at each end of two pipes carrying raw petroleum. The two “problem” charts displayed significant temperature variations while the other two were flat, leading managers to assume the latter were under control. I asked to climb to the top of the furnace to take a look and discovered that only two of the temperature sensor cables were connected – the two with significant variations. The other two charts were flat because the sensors that led to those charts had been cut. (Questions 16 and 20)

### Category **9** Management of Complexity and Variability

This category judges how the operation manages, controls, and reduces the complexity and variability it faces in its industry. It can be difficult during a tour to judge how a plant performs in this cat-

egory, but you can watch for certain indicators. For instance, many companies collect (and then must process) much more data about their operations than they need; if you observe many people manually recording data and a large number of keyboards for data entry, the company may be doing a poor job of handling complexity, especially if the data collection is done by hand.

In addition, since the product in lean plants flows through quickly and inventory is kept to a minimum, workers don’t need to keep track of a lot of parts. Furthermore, the best plants are able to use the same types of parts in the manufacture of different products. And finally, some companies – Toyota and Dell, to name two – build complexity handling into their production processes, designing systems that aid operators in picking the right parts out of a broad selection. If a worker reaches for the wrong valve, for instance, he or she might break an electronic beam, which would turn on red lights and possibly trigger an audible signal. Ask workers if such systems are in place. (Questions 8, 17, and 20)

Categories 4, 5, and 6 (scheduling; space, materials movement, and product flow; and inventory) in the rating sheet consistently receive the lowest ratings. Few plants have a discernible strategy for how they move materials, for example, and it’s not unusual to see forklifts trundling large containers with small parts – an inefficient use of space and equipment. Manufacturing plants also make poor or infrequent use of visual management systems; managers underestimate the power of such tools. The associated questions for categories 4 and 5 generally receive noes in average manufacturing plants.

### RPA Data for Plants with at Least 10 Tour Reports Each

Manufacturing operation	Category ratings		Number of yeses on questionnaire	
	mean	standard deviation	mean	standard deviation
A	97.8	3.6	14.3	1.0
D (2001)	89.0	1.0	16.0	0.0
B	86.4	10.2	14.3	1.8
C	82.0	11.0	13.5	1.6
D (1999)	71.0	13.5	13.5	1.0
E	65.5	12.2	10.6	2.9
F	56.5	13.0	8.7	2.9
G	52.0	12.5	7.7	3.0
H	49.8	10.5	7.5	2.4
I	45.5	10.0	4.9	2.8
J	36.9	7.1	2.5	1.7

Note: Results are shown for operation D for 1999 and 2001 because the plant improved significantly over that two-year period.

Category **10**  
**Supply Chain Integration**

The best operations keep costs low and quality high by working closely with a relatively small number of dedicated and supportive suppliers. You can get a rough estimate of the number of suppliers by looking at container labels: Which supplier names appear on containers? Do the containers appear to be designed and labeled specifically for customized parts shipped to this plant? If a

company uses multiple suppliers for the same part or family of parts, it's unlikely that the suppliers were directly involved in the development process.

A best practice for plants is to pay suppliers based on completed, shippable product: Payment is made automatically when the product comes off the line. This cuts down on paperwork and reduces the number of people involved in settling accounts. Ask plant personnel how suppliers are paid; it seems like an innocuous question, so people are

often forthcoming with the answer. The presence of lots of paperwork on the receiving dock is another indication of high costs in the supply chain. The best plants pull the materials from their suppliers as just another link in the pull system for each product line. (Questions 18 and 20)

Category **11**  
**Commitment to Quality**

The best plants are always striving to improve quality and productivity, and

## Estimating Cost of Sales

An estimate for cost of sales is a bonus from a quick plant tour. But the COS portion of the RPA tool is fairly complicated, so I'll outline only the theory here. You'll find work sheets with detailed instructions on the Web at [www.bus.umich.edu/rpa](http://www.bus.umich.edu/rpa).

I break down COS into four broad areas—material; people; property, plant, and equipment (PP&E); and other—rather than the traditional accounting cuts of material, direct labor, and overhead. These groupings give more insight into improvement opportunities because of their relative independence. These four areas are also useful when assessing acquisitions prior to detailed due diligence and in determining the competitive position of the operation.

Briefly, material costs include only the cost of raw materials including freight in, with no other allocations such as purchasing cost, scrap, and rework. People costs include all salaried and hourly wages and fringe benefits such as medical insurance, workers' compensation, and overtime. PP&E costs include costs for depreciation of all plants and equipment, taxes and insurance, scheduled maintenance, and utilities. "Other" costs cover the myriad expenses that commonly occur in any operation, from contracted services to copy paper. The costs in this category are low (generally 5% to 10% of COS) in a lean operation and high (often 15% to 20% of COS) in a traditional plant.

These four types of costs can be estimated rather easily from the information you pick up on a tour. Conversations with employees and the plant manager can yield a surprising amount of data—such as the number of employees, number of yearly production units, rate of employee

turnover, and complexity of the product mix. To estimate COS for these four categories, at a minimum, you'll need to gather the following data: the total number of salaried and hourly people in the plant, the average hourly wage, and the facility's square footage.

The total people cost can be estimated from these data. Average salaries and fringes are usually well known, but if you need to estimate those numbers, our Web site includes a chart called Typical Operations Measures that contains data about many types of manufacturing costs. These measures show low, average, and high measures for 45 different categories, such as sales per square foot, production hours per year, average salaries, and days outstanding on accounts receivable and accounts payable. Following your assessment of a plant's performance in other categories, you'll be able to place it in the average, below average, or above average category.

Data regarding the material portion of COS is usually divulged during the tour. The PP&E can be estimated by the equipment expert on the tour if he or she has some knowledge of local costs. The "other" cost is estimated from the plant ratings. All of your data can be recorded in a work sheet called RPA Tour Data, also available on our Web site. In turn, the data from that table can be used to calculate a plant's COS in a final work sheet.

Experienced tour teams can get a strikingly accurate picture of a plant's total COS, and the COS estimated by this technique will generally be within 5% to 10% of the actual figure. While not a precise tool, this estimate of COS is nonetheless valuable in comparing similar plants—whether your own, your competitors', or your suppliers.

it shows. Remember that initial tour of the Hoover Universal plant by Japanese executives in the early 1980s? After we received the report from that tour, our managers came to clearly understand what Toyota expected from its suppliers and began to make changes accordingly. In 1985, Hoover Universal won the contract to supply Camry seats for Toyota's new Georgetown plant, based not on the quality or productivity in Hoover's plants but on our highly visible commitment to continuous improvement.

Attention to quality is usually easy to spot. If employees are proud of their quality program, they usually give it a name and post banners displaying the plant's vision or mission statement, business objectives, and metrics showing achievements to date. Both short- and long-term goals for the plant and team—as well as statements about internal and external customer requirements, production schedules, work instructions, productivity levels, incoming and outgoing quality, scrap and rework levels, attendance, vacation schedules, safety, and levels of employee training—should be displayed at each work center. (This overlaps with category 3.)

You should also find out what the plant does with scrap. Better plants call attention to scrap rather than hide it—by shining a light on it, for example, or marking it with red tape—because they want to know right away if scrap is building up or if a portion of the process is producing defective parts. One way to find out: Ask people what they do when a faulty part comes off the line.

Discarding it or discreetly putting it out of the way is a sign of inefficiency. Finally, ask about product development. Are cost and timing goals set during development? Are start-ups well managed and low in cost? (Questions 15, 17, 19, and 20)

### Rating the Plant

Immediately following the tour, team members should meet to share their observations and impressions and to develop a report assessing the plant's leanness and estimating its cost of sales. This meeting should happen right away, since visual data leave a vivid, but fleeting, impression.


The team should use both the RPA rating sheet and the RPA questionnaire to rate leanness. Rate each of the 11 categories on a scale from "poor" (1) to "excellent" (9) to "best in class" (11). "Best in class" is meant literally: Only one plant in each industry, worldwide, deserves this rating. Then total the ratings; the sum will be between 11 and 121, with an average plant scoring 55. The questionnaire is completed at the same time. (The sidebar "The RPA Process Database" explains the scores for some of the plants toured by my students.)

The plant's total score on the rating sheet and the number of yeses on the questionnaire give you a fairly accurate assessment of a plant's efficiency: It's almost impossible to fake a lean operation. Scores in six of the 11 categories and 16 of the 20 associated questions are based almost solely on highly visible elements in a plant's environment. The

assessments on the rating sheet may be particularly useful because the 11 categories highlight broad areas of strength and weakness. Categories with low ratings are instantly visible opportunities for improvement and should be the first steps on a company's journey to leanness.

By the way, the RPA tool also includes a template for gauging a plant's cost of sales (COS), as well as a set of typical operations measures ranging from yearly sales per employee to overhead to the number of hours needed to assemble a personal computer. However, measuring COS generally requires more experience than judging leanness, so I have omitted this computation in this article. For an overview of this aspect of the tool, please see the sidebar "Estimating Cost of Sales."

• • •

The fact is, if an operation looks good to the trained eye, it usually is. I've used this tool many times in conjunction with due diligence when evaluating an acquisition target. I've often made substantial improvements to my own operations after brief tours of my competitors' plants. And I've taught the RPA process to several hundred students and managers, who have in turn looked anew at their own operations and those of their competitors. The tool is pretty simple—easy to learn, quick to put into practice—but it's proved very powerful in application. 

Reprint R0205H

To place an order, call 1-800-988-0886.

