Wide-open management at Chaparral Steel

Gordon E. Forward

Interviewed by Alan M. Kantrow

HBR:

Your industry, like so many other domestic industries, has been slow to adopt new and better technologies. Why?

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Think back. U.S. steel producers had no real competition after the war. Every time the unions demanded more wages or whatever, the managers said, "Fine, we'll simply pass the costs on to the consumer." Well, this went on for more than 20 years and had a real effect on how managers thought about staying on top technologically.

Even the good ones would say to themselves, "Yes, we know there's first-rate technology out there, but we still have to write off all the equipment we have on our books. Of course, they spent money on improvement. But they went about it the way that bureaucracies are likely to go about something like that: they kept tacking new things on to their established operations.

Tacking on? You mean just adding new stuff and never rethinking what is already there?

Sure. I can just see one of those top-level meetings. The CEO says to all his vice presidents, "I want each of you fellows to have your plans for modernizing your mills on my desk by June first. And by June first, his desk would be covered with plans. But each would call for just a little modernization. Each would add a relatively efficient new piece onto an inefficient operation – a basic oxygen furnace onto a thoroughly outdated ingot operation, for example.

In many cases, they just tried to throw dollars at the problem rather than say to themselves, "Where should we focus? What products should we make? Where should we put our dollars?" They knew they had tough competition, but they didn't know just how tough it would become. They didn't really understand how much Third World capacity was coming on stream.

Chaparral is not your run-of-the-mill steel company. It is a minimill operation, 30 miles outside Dallas, with an enviable record for improving productivity and bringing new technology on-line. Its organization is lean and flexible, with virtually no barriers between laboratory and plant floor. True, its limited product line give it strong advantages over fully integrated producers. But its real accomplishment – its openness to change – is not the result of its favored position in the steel industry. It comes, instead, from a deliberate, clearly defined vision of how a company, any company, can remain flexible.

Would Chaparral swallow hard and scrap unamortized equipment and put in new technology – even if you didn't feel competition nipping at your heels?

Absolutely. We simply can't wait until we've been forced into a corner and have to fight back like alley cats. In our end of the business, we can't afford to act like fat cats. We have a system that's tough by its own definition. If we succeed in making our business less capital-intensive, we'd be naive not to expect a lot of others will want to get into it. If we succeed at what we are trying to do as a minimill, we'll also lower the price of entry.

So we have to go like hell all the time. If the price of what we sell goes up too high, if we start

Alan M. Kantrow, senior editor at HBR, conducted this interview with Gordon E. Forward, president and chief executive officer of Chaparral Steel Company.

making too much money on certain parts of our product line, all of a sudden lots of folks will be jumping in. And they can get into business in 18 months or so. They can hire our people away. They can wave all kinds of incentives under their noses—just as the new software companies do.

This makes us our own worst enemy. We constantly chip away the ground we stand on. We have to keep out front all the time. Our advantages are the part of the industry we're in, but also the kind of organization we have. We have built a company that can move fast and that can run full out. We're not the only ones—there are others like us. Nucor does many of the same things, but it has a slightly different personality. And there's Florida Steel. There are a number of quality minimills. We are all a bit different, but we all have to run like hell.

Not being able to relax must place tremendous demands on your organization.

Well, that's the way it is. We can't treat our business as if it were a large, mature operation that needs to be propped up or pampered. We can't relax and build monuments to ourselves.

Do organizations often do that, build monuments to themselves?

Oh, yes. It's called bureaucracy. Let me give you an example. We've found that there is a pretty constant ratio between the number of civil engineers involved in a new plant's design and construction and the number of cubic yards of concrete that get poured. If you've got a lot of engineers, you're going to pour an awful lot of concrete. If you let large groups of people build something, you're inevitably going to have a large project. But it doesn't have to be that way.

What I'd really like to do is to get a group of our people in a room and say, "OK, each of you has to put up a quarter of a million dollars if we're going to build this project. Go out and mortgage your home or take a loan from the bank or whatever's needed to get the money. But you have to put it in to get a piece of the action. Then I want you to design it, make it work, and start returning money to the company as soon as possible." You can bet that we'd build an entirely different plant than if we'd hired a lot of engineers.

Is that really why plants get overdesigned?

In our industry, certainly. And we're not talking about projects getting done for half the usual cost. We're talking about doing it for a tenth of the usual cost.

But is that because Chaparral is fairly small to start with? If you were a much bigger operation, could you be as efficient in process design as you are now?

The issue isn't size; it's breaking things down into smaller units. Our capacity at Chaparral is 1.5 million tons a year. That's not huge, but it's not small either. We have 950 people on our payroll, but they are located in pockets throughout the company, not lumped together in one big group. If we had to expand our capacity significantly, we wouldn't build onto our facility here. We'd create another unit of manageable size elsewhere.

That's fine, of course, if your business doesn't require increases in its scale of operations to stay competitive. But what if you had to get much bigger in your present location?

Well, if it had to be big in the sense you mean, we simply wouldn't consider it. We'd look in the opposite direction. Right now, for example, we're looking hard at some microtechnology. We've designed a micromill that is considerably smaller than our plant here. We could almost franchise it. In fact, in planning all this, we studied McDonald's and asked ourselves how it did what it did.

A New York banker told us we were getting really good at building these half-million-ton plants. But if we could build something that did around 25,000 tons a year, a really small and efficient plant, we could start putting them in Indonesia.

He also said there were lots of countries that could use very small steel plants, countries that don't have the necessary infrastructure for big operations but that need some local source of steel. Even in the United States, there are market areas for steel that don't need plants even as large as what we have here. They have some local scrap and some local building needs, and what they need is a micromill—a very small and efficient operation.

We got the message. We took a group of managers off site for a few days and planned a very small steel operation. We figured out how to build something small enough you could literally put it on a barge and run it with only 40 people.

That sounds fantastic. The whole thing challenges the assumptions your industry has made for years.

It sure does. Look, we've got our plants down now to the point where they're no longer very labor-intensive. Labor costs at Chaparral are in the neighborhood of 9% to 10% of sales—the traditional figure in the industry has been something like 40%. Some

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time back, when we believed that we'd optimized this mill as much as we could, we changed its electronics and got another 20% out of it.

There was plenty of slack when we started, but we're getting to the point of diminishing returns. To get more people out of the process, we would have to start spending a lot more money. That may not make good sense any more. So the next big step for us will be to cut down drastically on our energy use. That's what some of our new technology helps us to do.

But your focus isn't just on energy. Aren't you looking at new technology across the board?

Of course. We are always trying to push back the technological frontier, to retrofit our existing operations. We have to keep from getting stale. Maybe our largest challenge is to cut the time it takes to get technology out of the lab and into operations. The kind of lags that many industries experience would simply kill us.

How do you do it? That's the $64 question. How do you speed up that whole process?

Let's go back to what I think happened at some of the bigger companies in the industry. Well, nothing happened. Sure, there was research. But I often thought that those companies had research departments just so the CEOs could say something nice about technology in their annual reports. The companies all put in vice presidents of research. The companies all built important-looking research centers, places with 2,000 people in a spanking new facility out in Connecticut or somewhere, with fountains and lawns and little parks.

Those places were lovely, really nice. But the first time I went into one of them I thought I was entering Forest Lawn. After you spend some time there, you realize you *are* in Forest Lawn. Not because there are no good ideas there, but because the good ideas are dying there all the time.

What was the problem? The facilities? The parks and fountains? Being too far removed from the mill environment?

No, many of the ideas weren't all that hot either. You know, someone would come up with a harebrained scheme that would burn out the refractory lining of a furnace. Now, if this fellow had only had some production experience, he would know perfectly well that iron oxide, pure iron oxide, is a solvent for refractories. But chances are, he doesn't even talk to anybody in production.

Now, I'm not arguing that pure research has no place in our industry. But what we had was a lot of technical work that never got linked to real production needs. It was partly the fault of all those folks in the research centers, but it was also the fault of production people who were suspicious of any new ideas.

They saw change as a challenge to their positions. But they also treated the research people as safety valves. You can guess the way they thought. "If all those smart PhDs are responsible for new ideas, we don't have to worry about them. Besides, most of the ideas are nonsense anyway. Just get out of our way and let us make the stuff we're supposed to make."

Is this response inevitable? Does it have to be this way?

It's what happens when you treat research as a staff operation. So we've tried to bring research right into the factory and make it a line function. We make the people who are producing the steel responsible for keeping their process on the leading edge of technology worldwide. If they have to travel, they travel. If they have to figure out what the next step is, they go out and find the places where people are doing interesting things. They visit other companies. They work with universities.

Working with universities is particularly important. We were having trouble modeling the heat flow in a tundish, the bathtub that distributes the streams of molten steel into different molds. As the steel comes out of the ladle in different streams, some of those streams are much hotter than others. But we didn't know how much hotter or how we could even them out.

Well, the university helped us build a working model of the process out of plexiglass, with dyes, penetrants, and everything else we needed. They used water, which is a marvelous simulator for steel. By inserting some dams and weirs, they were able to balance flows and thus temperatures. The attraction for the university people is that they get to work with Chaparral people who can go back and really make something happen. They know they're not working with someone who's just going to return to the office and write a report.

Did the line people, the production people, resist being responsible for their own technology?

Not at all. We've always done things that way. The line is responsible for safety; the line is responsible for training; the line is responsible for hiring. Well, we do have a couple of trainers but only because they have very specific things to do in electronics. We have no staff group for training, though. We don't delegate that kind of thing.

Let's look at that more closely. Does Chaparral have labs?

No. The lab is the plant. Sometimes I bite my lip because it tries things that scare the daylights out of me. Of course, we don't give the whole plant over to laboratory work, but the whole plant really is a laboratory—even though it is one of the most productive steel mills in the world. We don't stop operations to try crazy things, but we do try to do our research and development right on the factory floor.

You know, if you put a production fellow and a maintenance fellow and an engineer together, you're going to find out pretty quickly whether something has a chance of getting off the ground. And if it does, having them there means that you have a pretty good chance of getting it up and working—and fast.

But if your lab is the plant, you're not likely to try anything radically new, just incremental improvements of things already in place.

You're right to an extent. We'll do things intended to increase production by 30%—things like that. And we are not likely to turn the furnace upside down. Not yet, anyway.

Still, this puts a lot of weight on the shoulders of your manufacturing people. They have to be darn good at production but also talented technologists. There are no folks in a lab somewhere backing them up. Where do you find people like that?

We don't. We've had to create some of them. We have, maybe, 70 or 80 four-year graduates in the plant. They like the fact that they get to jump in right away and learn the business firsthand. One fellow who came in had a BA in biology. He joined our metallurgy department and thought he'd like to learn more about the field by taking a part-time course. That got us thinking about it, and we told him instead that we'd send him back to school. We've paid his whole tuition and salary while he's been in school. It was a risk we took—he might graduate and say, "I'm not going back there." But he came back, and now he's our general foreman.

But you're trying to attract technically competent people to a manufacturing plant, not to a laboratory. How do you do that?

Well, that's where our sabbatical plan comes in for people at the front-line, supervisor level. Some time ago, when we sat down and asked ourselves what kind of company we wanted to be, we knew we were going to have to be aggressive. We knew we had to stay on top of new technology. And we knew that the best way to get technology into the workplace is through people. Now, that may sound great, but how do we do it?

We all felt that most factories stifle young people, cripple them with bureaucracy. We wanted Chaparral to give people freedom to perform, to really tap a person's ego.

Our organizational chart showed that about 70% of our people were going to report to front-line supervisors—70%! Well, if our idea of the company we wanted was ever going to take shape, we had to make sure to get those supervisors excited about what we were trying to do.

Did you have any models to draw on? Any precedents?

No—but we had some history. Many of us had noticed how young people in our industry were scared stiff on the first day that they became foremen. For a year or two, they would find the job exciting. They might take a management course, seek out new responsibilities, try to learn new things. But after about three years, it all became rote. By that time, if they were any good, they could run a shift on the back of an envelope. They could stop thinking and go get their excitement somewhere else—off the job.

So we thought, let's get them out of their regular jobs and put them on a kind of sabbatical. Let's give them some special projects.

While they're gone, we move some people around and choose substitute foremen. Usually, the substitutes manage to break production records while the first person's away—just to show what they can do. When the people on sabbatical come back, they have their adrenalin pumping again. Our challenge is to keep cycling our people in and out, keep them doing exciting things, so they don't go stale.

What makes for a good sabbatical project?

Project is just a word. Sometimes we have these people travel. Or we have them visit other steel mills, visit customers. Or we have them look into a new kind of furnace we're considering or a new program we're working on for our computer. Sometimes they just spend time with customers. We believe that's really important. Production people—everyone in the company—pays attention to our customers. Everyone in the company is a member of the sales department.

How do you mean that?

Literally. About four years ago, we made everyone in the company a member of the sales depart-

"Everybody can help ensure product quality and customer satisfaction and be held directly responsible."

ment. That means people in security, secretaries, everyone. When you think about who talks to customers, you realize that a lot of people do—on the phone, when customers visit on a tour, whatever.

If we have bent bars coming off our production line that are causing problems for our customers, we might send a superintendent over with the salesperson or the person who did the bundling or somebody from production or metallurgy. It's everyone's job. We mix crews. We send off maintenance people along with some people from the melt shop and from the rolling mill. We want them to see Chaparral the way our customers do, and we also want them to be able to talk to each other. We want them to exchange information and come back with new ideas about how to make improvements or new ways to understand the problem.

In most companies, a technical representative would be sent on a visit like that and would write a report that might or might not see the light of day. Chances are that it would get lost somewhere.

That's where the issue of staff versus line comes in again. It's all a line responsibility—or should be. Everybody can help ensure product quality and customer satisfaction and be held directly responsible.

Lots of companies do something like this—or pieces of it at least. The real question is, even if you're successful, how do you keep the kind of organization you're trying to build from hardening, from growing bureaucratic? The sabbatical may keep some people from going stale, but how do you do that with the organization as a whole?

Well, we're pretty clear about staying a relatively flat organization. If we grow, we grow horizontally, not vertically. We also work hard at seeing that people are free to perform. And we make it tough for them to hide it if they aren't performing. It's a self-selection process. Some don't like the pressure and leave. Others hear about us and come.

My own background is in research. When you're operating in a technical field, when you're trying to go one step beyond in research, one of the things you learn fast is that you can't fool yourself. You can't try to hoodwink Mother Nature. You've got to be open in your questioning. You can't play games. And you can't succeed by pretending you know things you really don't. You have to go find them out. You have to try an experiment here, an experiment there, make your mistakes, ask your questions, and learn from it all.

Does everyone respond to this kind of challenge?

It's really amazing what people can do when you let them. Take our security guards, for example. Normally, when you think of security guards at four o'clock in the morning, they're doing everything they can just to stay awake. Well, ours also enter data into our computer—order entry, things like that. They put the day's quality results into the computer system each night. We upgraded the job and made a very clear decision not to hire some sleepy old guy to sit and stare at the factory gate all night. Our guards are paramedics; they run the ambulance; they fill up the fire extinguishers; they do the checks in the plant; now they're even considering some accounting functions.

In the plant, our supervisors do their own hiring. The two people we have in personnel do some initial screening and look after group health insurance and a few other things. But the supervisors run their own shows. They're responsible for training their people and for their safety. They have room to grow. Every time a new piece of equipment comes into the plant, the foremen and their crews decide how we are going to operate it. Or if we upgrade some equipment and find a new, better way to operate it, those people make those decisions too.

We don't have a safety department that passes out gimmicks and decals that folks can wear on their hats saying that we are a safe company. Nor do we have any quality inspectors on the shifts. Our people in the plants are responsible for their own product and its quality. We expect them to act like owners. We do have a quality control department that removes the red tags that the people in the plant put on, but the people who put on the tags are the ones who made the products. They are their own toughest critics.

Are there things coming along that might really upset the way you do things? Do you worry about them at all?

We have to. Just yesterday I was looking at an article about the growing amount of plastics that now go into automobiles. Sure we worry. Our business is built on the use of scrap metal. We process some 300,000 cars a year—one every 20 seconds or so—in that big machine out there on the hill. We are acutely aware of what goes into an automobile because junked cars provide us with about 30% of our raw material. We are very concerned about the availability of scrap.

There is a real possibility that we may have to go back to an iron ore base some day. For the moment, however, we are all right. We keep on importing Toyotas, which have a seven-year life. It takes us seven years to get a new Toyota into our furnace. The American people import a lot of finished goods, and those goods represent a large portion of our raw materials down the line. So we watch that balance pretty darn closely.

We look at other things too. We worry about the speed with which the forging industry is leaving this country. We're paying attention to the development of micro-alloyed steels, which eliminate some of the heat-treating steps in the forging process. Further down the road, we're looking at a new process that allows you to eliminate the forging stage entirely.

If you look at something like a knife or a fork, the amount of energy that that utensil represents is incredible. First, there's the energy used up in the steel-making process. Then the steel maker sends the part to a forger, who heats it up and bashes it and mashes it, then sends it to heat treating, then to be cooled down, then to be heated again, then to be trimmed, and so on.

If you added up all the energy that's used on a connecting rod in an automobile, that rod could be melted six times over. A good 60% of the cost of making that rod has nothing to do with the cost of the material itself. If we could ever get to a position of near net-shape casting, we could change all that. There's development work now going on using new techniques to make threaded parts in one step from a die. We have to pay attention to work like that.

It doesn't sound as if you are looking for ways to buttress or defend what you already do against the need for change.

We'd be fools to try. We couldn't begin to hold back the future even if we wanted to. All we can do is try to run as fast as we can to stay even with it—and maybe a little bit ahead. ▽