İndustry leaders' roundtable

The Chemical Processing Advisory Board pinpoints trends and opportunities Provocative and poignant—that was the mood when the business and technical leaders on *Chemical Processing's* Editorial Advisory Board convened recently to identify the trends and opportunities shaping the chemical industry.

For three-and-a-half uninterrupted hours in a hotel meeting room at Chicago's O'Hare International Airport, they identified trends, exchanged views and looked ahead to the industry's future. The event was another step in *CP*'s effort to engage the community in an ongoing examination of issues.

CP's editors abridged the highlights of the first half of the discussion for this article. Look for more in the July issue.

Board members sharing their ideas were Earl Beaver, retired director of waste elimination. Monsanto Co.: Timothy Bell, research associate at DuPont; Karl Jacob, global technical leader for solids processing at The Dow Chemical Co.; Gloria Keesee, vice president of information technology at Ashland Chemical Co.; Norman Li, president of NL Chemicals: David M. Pond, vice president of chemical technology at Eastman Chemical Co.; William Smith, executive director of global manufacturing services at Eli Lilly and Co.; and Dan H. Stites, president of the Process Operating Co. at Fluor Daniel.

The discussion was led by Peter Knox, *CP* editor-in-chief and associate publisher.

Driving technology



Knox: What emerging technological changes promise the greatest benefit to plant profitability?

Smith: Agility with supply arrangements is something that's most important to us, and part of my role in Eli Lilly is to free up cash from inside the business to fund the R&D end.



What keeps [our company] alive is spending almost 20% of our sales on R&D and having that be productive. We've got to continue to

drive efficiencies out of our organization. If you're going to be quick, you've got to find out what the new technology is and how you might apply it, make an assessment of it and get moving.



Bell: I agree completely with the emphasis on agility. One of the things that happens, from a technology standpoint, is a product

is developed at bench top, and that goes to an expanded capacity of a pilot plant or manufacturing operation and there are problems. Where there is an opportunity to improve the agility or the development speed is to help make sure that the whole train, from the person at the plant—who will ultimately be making this—to the person that's developing it, knows what all of the issues are as the product goes through its life-cycle from the bench to the manufacturing. In the past, these things were thrown over a succession of fences, and that doesn't work when you need to be fast.



Jacob: You don't see any more of the traditional, "Let's invent it, let's take it to a mini plant, let's take it to a pilot plant, let's take it

to a market development plant and then to a production plant." Process and product development are often going on simultaneously with engineering the full-scale plant. So you're operating in a world where you may not have all the data to build that plant. All that causes discomfort for folks. It's a whole new paradigm in which engineers are being asked to operate.



Stites: Lilly has made pretty good progress in this area. Historically, the pharmaceutical industry has had unique projects where one

assignment is completed by a person who does the conceptual engineering, and then it's tossed over the fence to someone who would do the detailed engineering, and they'll toss it over the fence to someone who'll do the construction and they'll toss it over the fence to someone who'll do the validation and get approval. As a service company you don't make serious mistakes within a silo of responsibility. Where they make mistakes and have problems is at interfaces. Our experience has been that those interfaces can be broken down and you assemble one team.



Li: I did a study quite a few years ago on some of the major industrial products from the inception of an idea to the product in the market-

place. Surprisingly, in the early days it would take something like 20 years to develop something. My experience with the multifunctional teams is that they should be able to cut through this.



Beaver: Another aspect that I see is combinatorial chemistry and computational chemistry leading to whole families of new molecules.

In the past it would have taken ages to build a library of that size. Being able to come up with a thousand new compounds in a very short period of time and get whatever works out into the marketplace quickly means that agility is going to translate into the ability to use existing facilities that were built to be flexible or agile in terms of what they can produce.

Economic trends

Knox: What are some of the big issues in the economy today?

Beaver: There is a focus—on the part of what I consider to be un-successful companies—on developing better solutions

to yesterday's problems or today's problems. They tend not to have the foresight to think about what the products will be and what the process streams will look like and, therefore, what the technologies will be. The same is true with economics. They judge things by today's standards. Who would have foreseen 20 years ago that companies would have to start carrying future health cost as a current cost on their books. That has made a big difference in the culture of companies. So, the ability to have the vision from an economic trend standpoint and also from a technical trend standpoint—so that you are dealing with tomorrow's values instead of dealing with today's or yesterday's-is absolutely crucial for the survivors.

Smith: Most of the consolidations are defensive. Our studies show that in the pharmaceutical industry if you took the independent market shares of every merged company and added them up and said, "OK, there ought to be some synergy-they should wind up with a higher percentage of the global market share after they merge." Every merged entity wound up with less than the sum of market share going in. So, in fact, they lost market share and all of them consumed shareholder economic value-added by throwing together. So, to us that's a very strong statement that it's technology you ought to be acquiring, and if you



The Chemical Processing Editorial Advisory Board met in Chicago to examine trends, issues and challenges.

do that you can sustain your growth in the future. Otherwise, you wind up consuming shareholder wealth.

Stites: One of the other trends that's been around for several years now is traditional chemical companies moving into what is now called life sciences—nutraceuticals, agrichemicals and pharmaceuticals.

Bell: The drive to increase shareholder value means you're trying to drive stock prices up. Stock prices are higher for companies that are believed to have a life sciences component.

Knox: How can chemical companies plan for the long term while maintaining stable quarterly reports?



Pond: What we try to do is continue to maintain about 20% of our R&D funding for long-term work, and we work hard to guard that.

As long as we've been able to keep paid off with some new things, there's no problem dealing with the short term. Everybody wants to help with that. The challenge is how can you do a little for the long term.

Stites: A good way to balance between the short and long term

is to recognize the company's core competency—typically it's to discover the molecule and then market the product.

Bell: There is an ongoing need for corporate CEOs or investor relations people to educate the stock market analysts on the nature of our businesses. There is a lot more sympathy for long-term R&D spending in a pharmaceutical company than there is in a chemical company. There is wisdom on the part of a corporate executive to recognize the R&D projects that are going to die and the ones that aren't. It's a real valuable skill that's maybe not held widely enough.

Team-based decisions

Knox: How widespread is team-based decision-making? Is there a downside?

Jacob: For one thing, science wasn't democratic the last time I checked. That is the one danger I find in teams. It's good to have teams, but it's important to have people who understand technology issues when you're making technology-based decisions or business when you're making business decisions. With one man, one vote when the whole team's getting together, all of a sudden you end up with a decision that isn't the right one.

Beaver: Our culture in the United States, in my view, is that decisions are

always the province of a person. The team can gather data. The team can generate alternatives. The team can build an action plan. But sooner or later it comes down to a decision by a person. I don't see many situations where a team takes a democratic vote.

Pond: Many decisions these days are so complex, and the downside of a wrong decision is so heavy. What you need is a small team. Big teams don't do too much. But if you have three or four people that have the fire—maybe have one that's the leader—the leader's very important, for sure.

Smith: At some point that leader or another individual has to be accountable. Once you say the team is accountable, then no one is accountable and things just happen.

Bell: On engineering efforts there are a lot of teams, but the final responsibility for the actions of the team winds up being an individual's. On the whole, we're not hearing a lot internally about teams right now. Not to say that they are being diminished, but that was last year's news—or maybe even five years ago. We're on to other issues right now, and we're just accepting where we are on teams. I don't see as much energy being put into team building and team technology.



Keesee: I think it's because crossfunctional teams are mainstream now. Teams make recommendations, and then there is usually a leader who makes the final call but you have to have the cross-functionality. The downside is that they do sometimes take forever to make decisions. You have to have a deadline, an

outcome, deliverables—when you want the deliverable delivered.

Beaver: Teams have followed the trend of the NASA space project, which is wild enthusiasm at first—where everybody is putting in the teams—and then mild concern because some errors happen and people begin to be a little concerned about teams. Then comes deep despair followed by the search for the guilty, the punishment of the innocent and the reward to the nonparticipant.

Knox: There's been a spurt of accidents, with 30 people dead from six incidents in the last five months. Has the movement toward teams thrust unqualified people into key decision-making roles?

Pond: Our culture is such that we just don't have accidents. I don't know that there's a linkage between teams and accidents.

Smith: The risk is seeing failures attributed to the team, when much of it wasn't the team. The team probably was fine. It was management that basically abdicated and said, "I'll put a team in charge of that process. They are now running the

show. Look how well everything is being accomplished." And then management didn't make certain that the training was done, and they didn't check to be sure the training was active and utilized on a daily basis. The issue comes not with the team. The teams struggle along the best they can. Plant management is the one that really needs to continue to find out what needs to be accomplished to operate that plant in compliance and in control.

Keeping qualified people

Knox: What are companies doing to keep qualified, experienced people and to gain their trust?

Li: I read a recent report that was really scary. They said the average duration of a professional with a company is 3.4 years. The last report I read before that said somebody would change jobs six times in his career. That would give you a little longer because, say a career span is 30 or 40 years, divide by six, and you've got six or seven years. Now they said 3.4.



Keesee: What I'm seeing is five to 10 years. In the information technology field, it is also typical for a person to retrain every four years to get new skills, to get current. That's the way the IT professionals were trained—to always manage your own career.

Beaver: I'm not so sure that it's as bad as I thought it was when I started observing it, because I was making the judgement with my values. In today's values, it's natural to have your personal capital invested in your skills as opposed to your longevity with your existing employer. Now companies are letting you take lump-sum pensions, and pensions are becoming more portable. Ten years ago if you were changing jobs every three to five years you had nothing. You wouldn't even invest in one until you were gone from the other. Now you have got a rolling lump sum that goes from place to place. To me the issue is whether companies are prepared for the consequences of the loss of loyalty.

Bell: As cultures have evolved and business needs have

evolved, suddenly you've got an organization that's populated with people looking for stability in a world without stability. Even if you offer all of these financial inducements and you make them whole when they change jobs, it's still not what they wanted.

Keesee: We owe it to our employees to say this is happening. It is a new world. It is not a stable world. And that's why I say they're retooling. People in the information technology field have known that for years. What we have not done, from the employer perspective, is we haven't let people know that while you're here you're very valuable, but life does go on and you need to make certain that you have personal skills or professional skills to keep you moving forward—to keep you whole. Once we start doing that, we start getting the trust of the



employees—maybe not all the older ones, but the younger groups.

Li: We're talking about young chemists and chemical engineers. I

happen to have a chance to talk to quite a few of them—my son is a chemical engineer and his friends are engineers. The values they hold are something like—although the compensation is important, they also have a high regard for things like independence and authority, and the chance of learning is very important and having the company pay for their MBA. Compensation is important, but it is only part of it.

Stites: That's perfectly right. The company's loyalty to the employees has historically been viewed as part

part has had to go away. The real question here is what we can do to fill that gap in compensation without simply throwing more dollars into the situation. What I have seen is that highly motivated employees make the difference. They appreciate the compensation, and they appreciate the loyalty, but what they're really looking for is challenge—an opportunity to make a difference—and some

'If you want to see the future, build a plant in Singapore. People don't have to move to work for 50 different chemical companies. The pension is portable.'—David Pond, Eastman Chemical Co.

of the employees compensation and what we get back from the employee is loyalty in return and other things. For very pragmatic business reasons some of that loyalty on the company's form of recognition for having made a difference. And that recognition does not have to be dollars. That's where I think the industry can go a long way toward replacing the compensation that had been company loyalty toward the employee.

Pond: If you want to see a microcosm of the future, build a plant in Singapore. Singapore is a city-state. Everybody lives in a house. They don't have to move at all and they can work for 50 different chemical companies. The pension is portable. The Singaporean government manages your pension for you. So you can get up and go anywhere you want. The pay is roughly the same. How do you keep employees in Singapore? Many are young, fired up and want to move along pretty quickly. We're building a plant in Singapore, and we have a laboratory in Singapore. Maybe we're early on the curve, and we'll discover it's not going to hold but there is a lot of jobhopping. What we've found is some of the things you're saying-recognition,

being a part of something that's got lots of action and happenings, giving people responsibilities. But once you're past the big growth, how do you keep people in today's world? People that have come to us from other companies say mainly that they like the family feeling—the feeling that management is paying attention to the interest of the employees. So, after all is said and done, it could be we're back to some of these same things we've said before from a generation back.

Information technology

Knox: How is information technology affecting the workplace and the bottom line?

Keesee: Studies say that the industry has invested X billions of dollars in information technology, and we haven't seen any productivity improvement. That's the dilemma. We have not been able to demonstrate a direct correlation between investment in information technology and productivity improvements. But I do think there has been an improvement in productivity. The next stage for information technology has got to be on the plant floor. That's where I think information technology is going to help us long-term. That's why we can run the plants with fewer people. We don't have to have all the operators we used to have because we have information technology. But qualifiably we have not yet been able to translate that into real productivity improvement statistics.

Jacob: I think of IT as a tool, and you can put it in the hands of the people on the plant floor but unless they embrace it in a pretty aggressive qualitymanagement sense, you don't necessarily gain anything. Understanding how a plant process is performing is essential. But once you understand how it's performed, unless you use that information to make the right change, you don't gain what you bought.

Pond: There's a difference in semantics here—it's just data. It takes

a human being to turn it into information—knowledge—something you're going to affect change with.

Li: I think information technology has allowed small companies to compete with big companies in a way that was not possible in the past. It's really become a very level playing field.

Smith: In a way, our [larger] size lets us be a little less aggressive and a little less effective in utilizing these tools. Some of the smaller companies that would be against the wall—that don't have the infrastructure and don't have the inertia to change—have done some very aggressive things with knowledge, acquisition and exchange that have helped them be competitive.

Stites: Speaking from the service provider's side I think we've probably seen more of an impact. We've gone from a people-based, service-based organization to one that's becoming more capital intensive with significant investments. With the use of 3-D CAD, we've seen measurable impact on the quality of the project and the cost of the project. We've seen opportunities to reduce process engineering by being able to tap into the local workforce. For example, doing detailed engineering in India or in the Philippines, where the cost is a half or perhaps a third of the cost in the States. Information technology has allowed us to do that. So there are some real efficiencies that we have seen. I don't think the potential has been fully realized. And most of it, in my opinion, is in knowledge management and enterprise resource management.

Beaver: I think the promise of productivity gains is frequently overstated. I also think the promise of competitive advantage—for example with SAP or any sort of an enterprise-wide system—is more of a defensive issue. It's a fact that you don't really save that much. You really don't get the advantage, but boy if your competitors have done it, you had better do it.

Stites: There have been movable gains. Often times they may be counted two or three times from different perspectives. Whatever gains are realized clearly are offset by additional cost. It's not inexpensive to implement this.

Jacob: At the plant floor level, where we have data acquisition systems in hand, the one thing I've seen over the past 20 years and I worry about is our engineers' ability to think about what is going on from a physical standpoint. The folks coming out of school today are so good with



FILTRATION TRENDS

Self Cleaning Water Filters Keep Spray Nozzles Clear

Frank Hancock, Manager of Engineering, CitiSteel

CitiSteel USA, located fifteen miles south of Philadelphia in Claymont Delaware, is a discrete producer of low alloy high strength steel plate. Citisteel is celebrating it's tenth year of operation at the facility located on the banks of the Delaware River. Makeup water from the river is utilized for the fifty million gallon closed loop process water system.

The water system contains dirt from three sources. The first source was comprised of makeup, such as sand, algae, silt, leaves and microbiological growth. Another source included



At 50 mic, the pre-assembled, Orival 46PEFL2 Filtration System, provides protection to the descaling pumps.

process by-products, such as scale and iron oxide. The third source was airborne particles that are collected in the open surfaces. The clogging of caster nozzles in the Melt Shop and roll cooling nozzles in the Plate Mill were the most frequently encountered problems. The nozzle clogging was most prevalent in these areas due to the fine spray requirement.

Various methods of solving the contamination problems were discussed. Large system filtration packages for the main process header water feed was the initial concept. This idea of filtering all the water to micron ratings required for fine spray applications was very costly. After careful consideration and a complete system review it was decided that an alternative concept of installing filters in specific locations, designed exactly for the application requirements, was more cost effective. There was a concern, however, regarding system integration and interchangeability of parts in the various filtration locations.

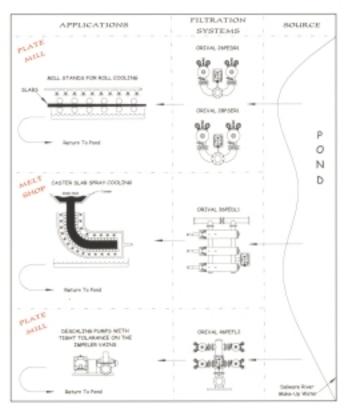
With this in mind, Orival offered a complete system approach where the filters, manifolds and all necessary valves, hardware and gaskets were pre-assembled and prewired requiring only inlet, outlet, backwash and power supply connections. The manifold was prepared and coated with the same care as the Orival filters. Each system consists of Orival, 1320gpm, OR-08-PS units and Orival, 660gpm, OR-06-PE units which allows for almost a complete parts interchangeability between each system, thus reducing the level of spare parts inventory.

The problem of internal nozzles clogging was eliminated in the Plate Mill and greatly reduced in the Melt Shop with the installation of the Orival 50 micron, automatic self cleaning water filtration systems. The virtually maintenance free filtration units were purchased as assembled units ready for flanged bolt-up connections. The only utility source, other than the water to be filtered, is a 120 VAC power source to the Omnitrol 1000 Electrical Control System. The control system required minor pre-startup programming that was so user friendly that a mechanical technician performed the task. Each

> filter can be programmed to backwash at a preset pressure differential and/or a preset time.

Orival was very supportive during the system designs and delivered each unit on or before the scheduled delivery dates. The first of the units has been in operation for two years and has not required any maintenance attention other than normal daily checklist monitoring of the system's controller which displays the number of backwash cycles performed. The other units, although not in service as long, have had similar minor maintenance requirements.

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computers that they latch onto process data without thinking about the underlying physics or chemistry. In that sense it's a little more a curse than a blessing. How do we reverse that trend? It's easier said than done.

Bell: I think that we have benefited

tremendously [from IT] in supply chain management. I think there would be no argument about a really strong relationship between what we put into it and the money we're making from it—also in process control, which is another topic for discussion. In everything else, I think it's a lot less clear.

Smith: We all want to believe that somehow the next system we install is going to be that real good productivity tool, but all the years I've been around our IT budget has never gone down and the number of people working in it has never gone down. Maybe we're better able to compete because we've done what everybody else has done, but the fact is that if you measure productivity by putting something in and I took some cost out of the IT budget, it just never happens. It goes up every year. The complexity goes up every year. But if you ask me, "Is the next one really going to drive the productivity?" It'd be that department more efficient. It is ironic that we have not been able, as an industry, to measure it across the board. So we keep investing because

'The guy in the office next to mine didn't go to a startup in Belgium. He could access the process control computers from his desk in Midland.'—Karl Jacob, Dow

wonderful. Sure I'd believe it, because we want to believe it. But the reality is it doesn't work out that way. If there is productivity, it's showing up someplace else in your business, and we can't even measure it.

Keesee: That's what I'm saying. It doesn't show up in the IT budget, unfortunately. It has to show up elsewhere because it's a tool and, therefore, if you're giving a tool to some other department, you should help make fundamentally we all believe that it makes sense.

Stites: I agree with the observations about not really seeing a lot of bottom line impact of information technology, but I struggle when I look at it from an intuitive perspective. We used to have a mailroom. We used to have a copy center. We used to have a graphic arts department. We used to have an army of draftsmen who simply took the information from the engineers and translated it. Those people are gone. Those functions are gone. Right now the engineers are doing that or an administrative assistant has taken care of all of that. Where has that cost benefit gone?

Keesee: We believe that it is there.

Smith: We believe that it's there.

Beaver: I don't feel that way at all. I think all of that stuff is still there now it's just distributed.

Jacob: I still think some of the savings is there. The guy that sits in the office next to me was supposed to go to a start-up in our plant in Belgium. He didn't go. He had everything on his desk. He could actually access the process control computers from his desk and watch how the plants operate.

He didn't have to make the trip. He's happier because he gets to spend time at home with his family. He still makes the same contribution for the job he is doing. That's a tangible benefit.

Changes in buying

Knox: Are changes occurring in the buying process with equipment suppliers?

Pond: E-commerce is coming. That means a lot of things to a lot of people, but basically much more of the profit is going out of many products as you buy on line. And just because we're used to buying consumer goods online doesn't mean that it's going to be any less intense on virtually anything you want to buy-chemicals, a piece of equipment. Bidding around the world, there'll be no secrets, no place to hide extra profits, I predict. I think it's going to have an increased, profound effect on the chemical industry, because the knowledge will be much more generally and widely known. It'll take more of the profit out for whoever is selling.

Beaver: The real death of the salesman.

'There will be fewer salesmen, and they will have a different role.'—Gloria Keesee, Ashland Chemical Co., on the spread of <u>E-commerce.</u>

Keesee: Or the redefinition of a salesman—there will be fewer salesman, and they will have a different role.

Bell: No room for schmoozing. Our relationships with our suppliers and our customers of equipment are much tighter than they were. We strive to be seamless. The path has shortened considerably in terms of number of people and time. We do not have, in many cases, the engineering resources to investigate every possible vendor of every kind of piece of equipment and do a thorough sort of old line, traditional vendor survey. Consequently, in many cases we are relying on equipment suppliers to provide us with know-how that previously we would either learn ourselves as each job went on, or we'd have some corporate person, actually like me, that would know that. So there is a role for the salesman. There is an enhanced role for the salesman in that kind of case where you're selling a technical product that the customer only has an intermittent use for. That's changed a lot. On the other hand, a separate issue is whether or not the industrial companies are expecting the suppliers of equipment and process technology to pick up the ball and whether or not the suppliers are ready to take that ball. That can cause a lot effort is between us and work to get that eliminated. That opens up a lot more information than you ever had. So whether it's through E-commerce

'Most consolidations are defensive. The combined market share is less than the sum of the combined entities. Shareholders lose value.'—William Smith, Eli Lilly and Co.

of difficulty because they're under the same pressures as operating companies where the prices are being pushed down and they can't afford to have that expert.

Smith: I don't know if you would consider alliances to be new or not. They've been around for a while. If you were to get an alliance going, the only way as a customer that I could pay less and a supplier could make more is find out what the wasted cost and

or an alliance, at some point you've got to go to work on the extra cost that neither of them has to incur to close that transaction, all of which means better information. So it is changing dramatically. Where we used to get the price and you'd take it or leave it, there's no more of that. You get in and start discussing what is going on here, how can we change, how can you change. Eventually everybody is paying less and ultiimately making as good as or more money than they made before. **Pond:** We have a number of products with distributed control systems, of course, running the plants, and our customer is tuned right in and every day is seeing the performance of that plant with his product. When we have a good day they see that and when we have a bad day they see. So information technology is going to unveil everything over time.

Smith: What goes with that is the replenishment style of operation, where instead of placing the orders we provide a production plan. They see what our production consumption is; we pay based on the end lot disposition of our product, not by the stuff coming in. When you're all done, there is still a cost of carrying that inventory and it's placed one way or the other.

Stites: The "value creation" approach

represents a change in mind-set on the supplier's part. Instead of a company like ours thinking we have to deliver a project to you, we have to change the mind-set to having to deliver the ultimate product coming out of the facility. That changes the mind-set and then we start thinking from the perspective of how do we create value real business value to the owner and receive compensation based on the value created, as opposed to compensation based on cost. I think that's a major challenge. I think owners, contractors and suppliers working together is the only way that you'll see that value created.

Knox: Is life-cycle assessment part of the thinking as you move toward alliances or changing the role of suppliers.

Bell: The concept of life-cycle costing

is sound—it's irrefutable, really. But shorter-term economic concerns have really made that a difficult thing to implement in many, many cases. Part of it is that many people have an inherent need to go shopping. In many of the other smaller cases, and we had a lot of these alliances, we found that it was too difficult to implement the life-cycle cost concept and maybe our premise was wrong. Engineers tend to think for the long haul, and business directions are not thinking over such a long perspective. Maybe they're right.

Jacob: Good idea—not enough data. I think it's still something that's on our plate. On big items that you are using a lot of, such as pumps, motors, heat exchangers—things like that—it tends to work pretty well. The other thing you've got to get around is the project manager equals"God" syndrome. The project manager says, "I'm the project manager, I get to make the decisions on this project and I want to buy from X."

Smith: Preferred supplier alliance that's certainly something that is happening. But you still have some of those same things. We buy a lot of glass light reactors. We've got a preferred supplier arrangement. The project manager gets whistled a low bid from somebody who isn't a preferred supplier on a project and squabbling breaks out. But on those items where you are buying a lot of things, and you've got a steady need for it and a steady need for spares, alliances are pretty good.

• Look for more from the Advisory Board's roundtable in the July issue of Chemical Processing.

