



Communication keeps Bechtel projects running smoothly. It doesn't matter whether the medium is telephone, fax, videoconference, e-mail, or the Internet. Every Bechtel person's workday includes exchanging ideas, discussing best practices, and sharing information with colleagues, partners, or stakeholders worldwide.

On Mexico's Mayakan pipeline, Bechtel consulted closely with government scientists to make sure the route didn't endanger ancient sites. **"We worked hand in hand with archaeologists every step of the way,"** says Gary Herd, project manager. **[GO THERE]**

Bechtel associate Royal Dutch/Shell advocates an open dialogue on sustainable development. **"Companies and their stakeholders must be able to measure progress,"** says Mark Moody-Stuart, Shell chairman. **[GO THERE]**

The Davyhulme wastewater treatment plant in England recently completed a major improvement without a single complaint from local residents. **"We always give the community advance notice of activity,"** says Colin Merrick, project manager. **[GO THERE]**

Flexibility is helping cultures learn from each other at China's Meizhou Wan power plant. **"It's not a question of 'our way' or 'your way.' The best solution may be an accommodation by both parties,"** says Bob Clipper, project director. **[GO THERE]**

The Alma aluminum smelter in Quebec is a close-knit project, bound by trust between all organizations involved. **"We actively fight surprises by full 'open book' communication amongst our team,"** says Maher Boutros, project manager. **[GO THERE]**

Clear communication is a two-way process. Please let us know what you think of *Bechtel Briefs*, and what you'd like to see in future issues. Our e-mail address is briefs@bechtel.com. We'd love to hear from you.

Features

MARTIN L. YARGAS/LIAISON INTERNATIONAL



Progress and preservation share the right-of-way on the Mayakan pipeline.

Making History

Mexico's Mayakan pipeline is connecting the present to the future with a route that preserves the past.

Meeting in the Middle

Cultural cooperation sets the tone at China's Meizhou Wan power project.

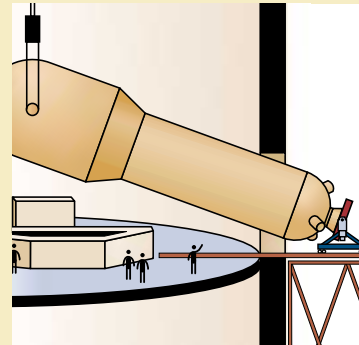
FRONT END

Beating Boston traffic, Santiago brownouts, and the deadline of the millennium.

MILESTONES

Keeping up with Bechtel projects and people on job sites and in offices worldwide.

DETAIL DESIGN



Steam generator replacement requires precision and pace.

LIFE'S WORK

Rami Ghandour hit the slopes for stricken children in a marathon ski session.

Shell's Commitment

Sustainable development is part of the way Royal Dutch/Shell does business.

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No Surprises

Communication keeps work on track at Quebec's Alma aluminum smelter.



Teamwork is an essential element at the Alma aluminum smelter.

Dynasty at Davyhulme

Environmental upgrades help England's Davyhulme wastewater treatment plant uphold a century-long tradition.

RON LEVINE/LIAISON INTERNATIONAL

No Surprises

The Alma aluminum smelter is a sure thing.

THE CITIZENS OF ALMA weren't surprised when Quebec Prime Minister Lucien Bouchard and Alcan Aluminum Chief Executive Jacques Bougie announced that Alcan would build a new aluminium smelter in their town. They weren't surprised when the first of 180,000 cubic meters of concrete was poured. They weren't surprised when Bechtel began erecting the 45,000 metric tons of steel for the smelting structures. And they don't expect to be surprised in September 2000, when the first "pot" is energized. Alma, a town of about 25,000 on the shores of Lac Saint-Jean in Quebec,

Canada, heartily embraces its new 375,000-ton-capacity smelter, which will replace the 75,000-ton-capacity Isle-Maligne smelter about 2 kilometers away (see "Aluminum Valley"). With a total construction cost of US\$1.6 billion, the new smelter will be one of the largest such installations in the world.

Through a very proactive Alcan communications program, the citizens of Alma have been kept informed about the project since it was announced in February 1998, through public meetings and informational letters mailed to each of the smelter's 620 immediate neighbors. Every month, the community hears firsthand about construction contracts, materials orders, and financial benefits. *"Aucune Surprise"* is the program's motto.

The project team has adopted "No Surprises" as its



guiding principle throughout engineering-and-construction management activities. "Over the 10 years we have worked with Alcan, we have developed a very high level of trust," says Maher Boutros, Bechtel's project manager. "This trust filters both up and down through all organizations involved in the project. We actively fight surprises by full 'open book' communication amongst our team."

It's a long-standing relationship. Since 1987, Bechtel has managed and built four world-class aluminum smelters in Quebec, two of them for Alcan. Bechtel has been the lead engineering, procurement, and construction contractor on three of the last four major aluminum smelter projects built around the world. For the new Alma smelter, Bechtel is responsible for engineering

BY SYBIL HATCH PHOTOGRAPHS BY RON LEVINE/LIAISON INTERNATIONAL

PROJECT PROFILE



LOCATION

Alma, Province of Quebec,
Canada

CUSTOMER

Alcan

PARTICIPANTS

Bechtel Quebec

DESCRIPTION

375,000-ton-capacity aluminum
smelter

SCOPE OF WORK

Construction and engineering
management, procurement,
preoperation testing, and
startup assistance

VALUE

US\$1.6 billion

SCHEDULE

40-month construction,
completed before fourth
quarter of 2001

management, construction management, procurement, preoperations testing, and assistance with startup.

Open communication is essential on an undertaking as complex as Alma. By the end of the project, Bechtel, as procurement manager, will have executed 230 contracts to perform various aspects of the design, construction, and startup, and will have issued 350 purchase orders for equipment and materials. Contractors will be drawn mainly from Quebec, but supplies are procured worldwide.

Bechtel is managing a team of six different architecture and engineering firms to prepare the design and specifications for the plant, working hand in hand with Alcan designers to incorporate their new state-of-the-art smelting processes and technologies.

“Incorporating the new process equipment and techniques presents a very exciting challenge for our engineers and managers,” says Boutros. “We can’t rely as much on previous smelter designs because there are so many fundamental improvements to the heart of the smelting process” (see “Environmental Impact”).

Whereas Alcan’s innovative industrial processes form the backbone of Alma’s new smelter, Bechtel’s state-of-the-art *ProjectWorks*® design and project management software lies at the heart of the team’s successful smelter design and construction. *ProjectWorks*®, and its many components, including *TeamWorks*® and *InfoWorks*®, ensures that, despite the immense design effort, every person on the project team has access to the

Aluminum Valley

With four smelters along the Saguenay River, Quebec’s Saguenay region is often called the Aluminum Valley. Optimal resources abound for Alcan’s new smelter at Alma there: a nearby bauxite refinery, an efficient rail system, abundant hydropower electricity, and a trained workforce.

The first step in aluminum manufacturing is conversion of bauxite-rich ore into alumina. Alcan’s Vaudreuil refinery, about 55 kilometers from Alma, produces the alumina, which is shipped by rail to Alma, where aluminum is made. Alcan operates its own rail system, which Bechtel is upgrading to increase shipping capacity. The project is also upgrading the alumina storage and handling facilities to accommodate the amount of alumina that will be shipped to the new Alma smelter, which is five times the old Isle-Maligne smelter’s consumption.

Electricity lies at the heart of the smelting process. A modern smelter requires about 13,500 kilowatt-hours of electricity to produce one ton of aluminum. Approximately half of the power for Alma’s new smelter will come from Alcan’s own hydroelectric facilities; the other half will come from electricity supplied by provincially owned Hydro-Quebec. Bechtel is upgrading Alcan’s transmission lines to transport 161 kilovolts of energy to the plant.

Almost two-thirds of the 675 people who will ultimately work at the Alma plant will come from Alcan’s nearby Isle-Maligne plant. Some 250 new jobs will be created at the plant. Construction will also employ large numbers of local laborers. Construction activities are expected to peak in the fourth quarter of 1999, with nearly 2,500 workers at the site.

Approximately 75 percent of the total value of the project could potentially be recirculated back into the Canadian economy, with 46 percent of that being spent in the Saguenay–Lac Saint-Jean region alone. “Nearly 100 percent of the labor will come from Quebec,” says Maher Boutros, Bechtel’s project manager. “And most of the bulk materials—steel, sheet metal, concrete—will come from Quebec. This smelter construction has far-reaching benefits, both inside and outside of the plant boundaries.”

latest and most comprehensive design features and information.

“Most project document-control systems store only drawing numbers and titles,” says Boutros. “*InfoWorks*® stores this information plus the document itself, including plans, specifications, and details. Even more important, it stores the logic within the documents, linking every detail to its corresponding reference sheet, for example. Therefore, every designer knows that he or she is accessing the complete picture about every component of the design.”

Through *ProjectWorks*®, Alcan has full access to the design basis at any time. “Our ultimate clients are the plant operators,” says Boutros. “The plant operators, in collaboration with environmental health and safety specialists, regularly review the design to ensure that the equipment and infrastructure will be optimally installed. At the end of the project, most clients develop a ‘punch list’ of items they would like to see incorporated. By reviewing the design, Alcan is starting its punch list now, even though we are only 15 percent finished with construction.”

“Typically, the operations and maintenance people spend years pulling together all the technical information they need to run and optimize plant production,” continues Boutros. “On this project, we are working hand in hand with operations people to make sure they have all the information they need now, while engineers and equipment suppliers are still available for questions.”

“That way, when Bechtel hands over the keys to the Alcan operations and maintenance staff, there will be no surprises.”

Environmental Impact

In 1995, as part of a voluntary greenhouse gas reduction program, Alcan committed to reducing greenhouse gas emissions, despite an increase in its aluminum production capacity. For its efforts, Alcan received a certificate of recognition from Natural Resources Canada.

At the Alma smelter, Bechtel is turning Alcan’s innovative emissions reduction features, some of which have never been built before, into reality. Bechtel provides valuable real-time constructibility advice to Alcan process engineers, thereby refining and improving Alcan’s new designs.

Alumina is a compound of aluminum and oxygen. To extract metal from alumina, the aluminum must be separated from the oxygen, a process that requires electricity. This reaction takes place in large, carbon-lined steel cells, or “pots.” Inside the pot, alumina is dissolved in a molten electrolyte, composed mainly of the mineral cryolite. A strong electrical current passes from an anode (a block of coke and pitch suspended in the solution) to the cathode (the bottom and sides of the pot). The electrolytic solution heats up to around 950 degrees Celsius.

The electrical current causes the oxygen in the mixture to react with carbon in the anode to form carbon dioxide (CO₂), while the aluminum settles to the bottom

of the pot to be siphoned off. Very efficient process and process controls will significantly reduce the rate of emission of CO₂ equivalent, primarily through the reduction of anode-effect duration and frequency. Additionally, because the new smelter uses hydroelectricity as its power source, it will emit only 15 percent of the CO₂ traditionally generated by smelters burning fossil fuels. The use of natural gas instead of fuel oil at the anode baking shop will reduce CO₂ emissions by more than 30 percent.



But even more innovative are Alcan’s plans to reduce dangerous hydrofluoric (HF) gases. In the traditional smelting process, consumed anodes are lifted from the pots and placed on pallets to cool. Fluoride in the hot electrolytic solution reacts with hydrogen in the air to produce HF. Alcan has specially designed a new box in which

the hot electrolytic bath and anode are placed.

This new box prevents air from contacting the anode, thereby reducing HF production. The hot bath and spent anodes (called “butts”) are cooled in a special tunnel. The butts are then crushed and reused to make new anodes. Although the Isle-Maligne plant already meets or exceeds environmental regulatory standards for fluorides, Alcan expects to reduce HF at the Alma smelter by a further 25 to 35 percent with this new process.