



With Bechtel's
help, one of the
world's longest oil
pipelines will begin
service in 2009.

LAYING IT ON THE LINE

It's been a dozen years since the network of pipelines moving oil across North America was expanded. Now an important new route in the continent's energy expressway is months away from service.

The Keystone Pipeline System will be one of the longest crude oil pipelines in the world. Originating in Hardisty, Alberta, the Keystone Pipeline will serve refineries in Oklahoma and Illinois. An expansion project, dubbed Keystone XL, will extend service to refineries on the Texas Gulf Coast. The system will have a capacity of more than 1 million barrels per day. Bechtel is handling engineering management, procurement, and construction management of the two projects for customer TransCanada Keystone Pipeline (a partnership of TransCanada and ConocoPhillips).

On a map, the system may look like a connect-the-dots drawing between Western Canada and the Midwestern United States. But its length and cross-border nature have made the project far from simple. Keeping construction of the Keystone Pipeline on track has required a team effort as well as Bechtel's collective wisdom from 80 years of pipeline experience.

"Logistics is one of the biggest challenges due to the sheer span of it," says Jim Henschel, project director. "Simply getting materials to the right place at the right time is everything. The jobsite is 2000 miles long and you can't leave any gaps due to material shortages or late deliveries.

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A LONG REACH



innovations like semiautomatic welding and high-strength pipe.

Every pipeline offers fresh challenges, and Keystone has plenty. Bechtel is managing the acquisition and shipment of more than \$1.7 billion of materials among myriad contractors and destinations. No pipe mill in the world is big enough to supply the entire length, so pipe comes from far-flung locations including Alberta, Florida, and the West Coast of India.

The team purchases materials from requisitions issued by four engineering contractors and ships them to 11 construction contractors at 20 warehouses and fabrication shops. Simultaneously, Bechtel coordinates delivery of every pump, motor, e-house, valves, fittings, and electrical and instrumentation equipment to 50 pump station sites in Canada and the United States.

And those numbers don't even include pipe. The project needed 2,300 railcars to ship 30-inch mainline pipe during 2008 and will use about 4,000 railcars in 2009.

"We spent a lot of time building relationships with railroads, pipe mills, and trucking companies

The traditional method of moving to another workfront in a refinery or powerplant to work around a problem doesn't work on a pipeline.

Bechtel has faced logistical challenges on pipelines from Thailand to the Arctic Circle. It completed

its first, the Tres Piños–Milpitas in California, in 1929. Bechtel worked on the 1,719-km (1,068-mile) Trans-Arabian pipeline in 1947 and completed the 1,287-km (800-mile) Trans-Alaska pipeline in 1977. It has laid enough pipeline to circle the globe twice, leading

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RAISING THE BAR ON PIPELINE SAFETY

Pipeline safety can be especially challenging due to the sprawling work sites, long driving hours and number of contractors involved. On a major pipeline project like Keystone those factors are only intensified. So Bechtel, TransCanada, and ConocoPhillips have developed programs to promote the best possible safety culture.

“Pipelining safety performance has traditionally lagged behind major construction projects,” says Bechtel Safety Manager Don Olson. “We are going for a step change in safety in North American pipeline construction.”

In the first nine months of 2008, drivers clocked nearly 50 million kilometers (31 million miles) in all types of weather. Numbers like that highlight the significant risk that more centrally located projects would not face, especially considering the lack of control on public roads. So the team conducts regular training on

driving safety, holds mandatory defensive driving courses, and has written many project-specific driving requirements. For example, cellular phone use is absolutely forbidden on the road.

For 2008, the first year of active construction, there were 14 prime contractors, each with their own safety systems and programs. Each program was carefully reviewed and modified to meet or exceed the customer’s safety standards. Safety professionals audit, inspect, and provide training to prime contractors. The team has also set up safety leadership meetings at the executive level of every organization involved with the project.

The safety record to date has been enviable. And as the project moves toward completion, “safety will continue to be a major focus area for TransCanada and all of the contractors that are involved in the project,” says Dean Cowling, TransCanada project director.

to ensure the availability of rail cars, the ability of rail sidings [or auxiliary tracks] to accept and unload unit trains, and to ensure that rail companies could quickly trace and report the whereabouts of the manifest cars and unit trains,” says Beverly Tinn, project procurement manager.

Freezing weather is another factor. During one 2008 storm, five inches of snow fell in the Dakotas, complicating delivery of pipe. Low temperatures also affect the testing of the pipe. About 864 km (537 miles) of existing pipe in Canada are being converted from natural gas to oil, requiring smart PIG (pipeline inspection gauge) technology to inspect the 50 year old existing pipeline from the inside.

Fondly nicknamed “pigging” (in addition to its acronym, the unit makes a squealing sound), scraper pigs physically clean the inside of the pipeline, and the smart pig that follows, tests its integrity. When pigging is conducted in winter, the unit can’t be pushed along with water, which would freeze. So engineers use diesel fuel or ethanol.

As complicated as the project has been so far, Keystone is on track to begin service to Illinois in 2009, with the extension to Cushing, Oklahoma,



opening a year later. Federal permits for the United States and Canada have been secured. All major construction contracts have been awarded and construction has begun on 39 pumping stations spaced 80 to 161 kilometers (50 to 100 miles) apart. Delivery of 176 skid-mounted pump units started in December 2008 and will finish by mid-September 2009.

At peak construction in 2009, some 7,000 workers

will be involved on construction. “In 2009 we will have about three times as much work as in 2008, which makes it a lot more challenging to manage,” says Henschel.

Fortunately, the keys to success are already in place.