



SHELL CANADA ALBIAN SANDS

LOCATION

Muskeg River Mine,
Ft. McMurray, Alberta, Canada

PROFILE

Shell Canada's Albian Sands project is dedicated to extracting oil from Canada's vast reserves and developing the Oil Sands responsibly.

CHALLENGE

Develop a modularized shop-assembled steam system to provide over 2 Million lb/hr steam flow with maximum efficiency and reliability.

SOLUTION

The Nebraska Elevated Drum D-Type boiler with Natcom burner maximizes shop assembly while minimizing field work. This approach saved millions of dollars over conventional field-erected designs.

RESULTS

- Qty: 5 boilers
- 426,000 lb/hr each
- 550 psig saturated
- 499 mmbtu/hr input each
- <80,000 btu/hr-ft³ heat release
- 86% HHV efficiency

Cleaver-Brooks Responds to the Unique Needs of Canada's Oil Sands Industry

Cleaver-Brooks' innovative Elevated-Drum D-Type watertube boilers provide over 2 Million lb/hr for a major oil refinery in Alberta, Canada.

When Shell Canada approached Cleaver-Brooks in 2007 with plans for a 2 Million lb/hr steam plant at their Muskeg River Mine facility, they knew we would draw upon over 80 years of engineering experience & expertise to develop a custom solution that precisely met their needs.

Historically, the largest shop-assembled (packaged) boilers available in the marketplace were limited to 250,000 lb/hr steam capacity. Larger capacity boilers were typically field-erected at the jobsite by an army of boilermakers. Given the high cost of skilled labor in the Oil Sands, Cleaver-Brooks' approach was to maximize shop-assembly in order to minimize this costly field work. The end result was the first of its kind: the Elevated Drum D-Type boiler.

The Nebraska Elevated Drum D-Type is designed for large steam capacities (up to 500,000 lb/hr) and high pressures (1,000+ psig). The steam-generating module is completely shop assembled, hydro-tested, insulated and lagged, and shipped as one piece. The steam drum is assembled with the trim, hydro-tested, insulated and lagged and shipped as the second piece. Field work to complete the packaged boiler includes: 1) setting the steam drum on saddles; 2) welding the prefabricated downcomers and risers (approximately 28 pipe welds); and 3) mounting the burner using pre-installed mounting plates. With the boiler package now complete, the rest of the work is simple field erection and installation.

This robust boiler design features a generous furnace with low heat release rates; a low gas-side pressure drop to reduce fan power consumption; and external (unheated) risers & downcomers to ensure superior natural circulation and extended operating life. The elevated steam drum is adequately sized to handle load fluctuations with oversized drums (up to 72" ID x 45 ft long) and properly sized drum internals.



The Elevated Drum D-Type watertube boiler during manufacture.



Installation in progress.

Each boiler also includes a dual burner, state-of-the-art, low NOx combustion system with rack-mounted fuel trains including flame safety and combustion controls that maximize system reliability and efficiency. Fuel skids were pre-piped, pre-wired & tested at the factory. The original contract called for 76 ppm NOx emissions. Final source testing revealed that our design achieved <45 ppm NOx (nearly half the emissions).



"Each boiler also includes a dual burner, state-of-the-art, low NOx combustion system with rack-mounted fuel trains."

In addition, this design includes a finned tube economizer and a system of air heaters utilizing thermal fluid to transfer waste heat from the stack flue gas to the inlet combustion air to optimize heat recovery. This approach yields 2 to 3% higher thermal efficiency than conventional boiler systems.



Elevated Drum D-Type watertube boiler in transit.

Successfully commissioned in 2009, this installation is the first of its kind and continues to serve as a model of efficiency.

Shell Canada also purchased a 264,000 lb/hr superheated D-Type boiler firing refinery gas for their Scotford Refinery Upgrader. The Albian Sands Muskeg River Mine facility and the Scotford Upgrader

together form the Athabasca Oil Sands Project (AOSP). At full production, AOSP is capable of producing approximately 155,000 barrels per day of crude bitumen. In addition, a seventh 180,000 lb/hr D-Type boiler firing natural gas was also purchased by Shell Canada for their Waterton facility.

In all, we are producing over 2.5 Million lb/hr of steam in Alberta for Shell Canada alone. Cleaver-Brooks, in partnership with our authorized local representative, Tundra Boiler & Instrumentation, is proud to be part of the on-going efforts to extract oil from Canada's vast reserves and to aid in developing the Oils Sands responsibly.

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