



Aerial view of the intake expansion

TAP IN – ATCO’s Heartland Industrial Water System

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INTRODUCTION

The ATCO Heartland Industrial Water System is a sophisticated network of pump stations, pipelines, and storage facilities representing an evolution in the management of water assets in Alberta’s Industrial Heartland (AIH), Canada’s largest hydrocarbon processing region.

In 2007, the Government of Alberta (GOA) implemented the Water for Life strategy as part of an initiative to help preserve the province’s water resources for future generations. To be successful, the GOA recognized local solutions were critical and further developed the Water Management Framework for AIH and the Capital Region (WMF). This framework is specific to the industry-heavy stretch of North Saskatchewan River (NSR) extending from Devon to Pakan.

With more than 40 companies engaged in major industrial operations in AIH, a primary consideration of the WMF was the number of water intake structures along the affected section of the NSR. In addition to the quantity of water being withdrawn by these industrial facilities, the ecological footprint of having multiple intake structures on the NSR could not be ignored.

While the WMF emphasized the need for a regional solution to water management, its success relied upon the emergence of a willing proponent to take on the challenge.

ATCO was able to be that proponent. ATCO had a distribution system equipped with an existing intake on the NSR that they used for their own purposes. To position themselves as a water services provider for industrial clients, ATCO needed to upgrade the capacity of their intake and build a pump station to distribute water to other users.

With this in mind, ATCO stepped forward to help realize the WMF vision with their plans for a multi-use, regional, industrial water system. While there are many municipal regional water systems, this would be the first system of its kind to provide process water to industry on any significant scale in Alberta.

THE SYSTEM

There were significant logistical and practical challenges in developing a regional industrial water system in AIH. Historically, from a logistical perspective, industrial companies in the area have been inclined to construct, own, and operate

their own intakes and associated water supply systems. Reliance on others for delivery of a critical process element, water, is often viewed as an operational risk.

From a practical perspective, AIH is an extremely congested area. There are literally hundreds of existing pipelines, railway crossings, and industrial developments that need to be considered when constructing new infrastructure. To be considered a viable alternative to dedicated intakes for each facility, ATCO had to ensure their system would be reliable, cost-effective, and able to adapt to changing market and regulatory environments.

Originally, ATCO was equipped with a small bank-style river intake, wet well, control building, and an 8.5 km pipeline to their existing salt cavern gas storage facilities. In 2009, ATCO reached an agreement to provide water service to the new multi-billion dollar North West Redwater Partnership (NWR) Sturgeon Refinery. To support such a large customer, ATCO's infrastructure had to change, and develop a strategy to upgrade the existing intake and construct a new state-of-the-art river water pump station and supply pipeline.

INTAKE UPGRADE AND EXPANSION

A critical component of ATCO's water distribution system is the bank intake on the NSR. To satisfy customer demands, it was determined that several initial upgrades were required. These included conductor pipes to handle up to 2,500 m³/hr and the installation of vertical louvers at the intake face to mitigate fish ingestion. Stantec's engineering team, and ATCO worked very closely with the regulators throughout the design process to ensure the intake upgrades would have minimal environmental impact both during construction and during operations. Extensive modeling was also performed to optimize hydraulic performance and fish protection. Construction was completed in 2012.

In 2014, the intake was connected to the new Heartland River Water Pump Station. To reduce disturbance to plant and animal life along the riverbank, two conductor pipes and a spare were installed within a hand-dug rib and lagging tunnel over 75 m in length between the intake and pump station. Lastly, the existing wet well was abandoned in place.

In 2015, the intake was further upgraded to expand the capacity of the system by an additional 1,500 m³/hr (total 4,000 m³/hr). Two new fish screens were installed in the river and the previously abandoned wet well was repurposed to include pumps that would discharge directly into the Heartland River Water Pump Station via the spare pipe installed in the tunnel.

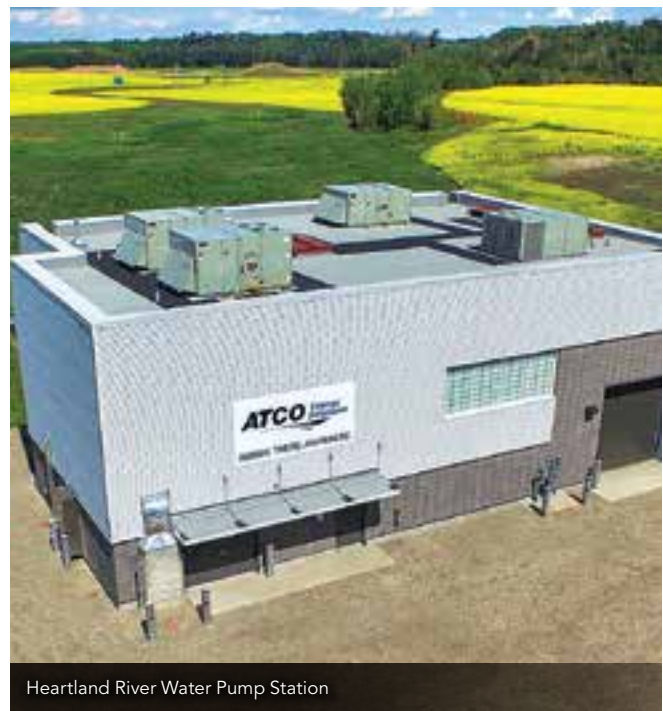
HEARTLAND RIVER WATER PUMP STATION

The Heartland River Water Pump Station is critical to the function of the industrial water distribution network. The facility directs water through the Sturgeon Water Pipeline and the Heartland Water Pipeline to service all of ATCO's customers.

From the intake, the conductor pipes convey river water into two intake wells, where travelling water screens prevent fish from entering the pump well. Specialty fish handling pumps draw from the intake wells and direct any fish back to the river via a dedicated fish return line. Downstream of the travelling screens, two 600 horsepower vertical turbine



Construction of storage tank



Heartland River Water Pump Station



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pumps discharge to the Heartland Water Pipeline and two 250 horsepower vertical turbine pumps discharge to the Sturgeon Water Pipeline. The station will eventually be upgraded to include four 600 horsepower pumps at full build-out of the NWR Sturgeon Refinery. The overall system supply capacity to customers is 3,750 m³/hr, with 250 m³/hr returned to the river as fish return flow.

PROTECTING THE FISH

During design of the intake upgrades and Heartland Pump Station, of critical importance was the protection of the aquatic environment. Stantec and ATCO worked closely with the Department of Fisheries and Oceans (DFO) Canada to ensure water velocity through screens would not result in the impingement and potential damage to fish, and fish would be returned to the river safely. A computational fluid dynamic (CFD) model was developed and used successfully to optimize performance.

WATER PRE-TREATMENT FACILITY

As river water TSS levels substantially exceed the water quality requirements for some of ATCO's customers during high flow events, a pre-treatment facility was needed. The pre-treatment facility consists of coagulation (PACL) injection systems, two 15,000 m³ capacity high density polyethylene (HDPE) lined sedimentation pond cells, a polishing disk filtration system, and distribution pumping facilities. Flow is always conveyed through the pre-treatment facility to improve TSS levels; however, in situations where river water TSS levels exceed requirements, flow is chemically conditioned to aid in solids settling in the sedimentation pond cells. Disk filters are used post-chemical addition to further reduce TSS concentration as required.

Pumping systems include two vertical turbine pumps to convey pond effluent through the facility's disk filtration system, and two 250 horsepower vertical turbine pumps to distribute

the water. The system has an overall treatment and distribution capacity of 600 m³/hr.

During design, extensive water quality analysis was required to optimize treatment systems to provide economical treatment over a wide influent (river water) quality range. Consideration was also given to site location to balance earth quantities, and mitigate groundwater issues which are predominant in this area.

A RESILIENT SYSTEM

Fluctuations in NSR water quality provided both challenges and opportunities for the design of the pretreatment system. The system needed to reduce solids to the same level regardless of influent quality several features were incorporated to accomplish this efficiently. The sedimentation pond was designed to reduce suspended solids with or without coagulant addition. When NSR suspended solids levels are low, the chemical addition and disk filters are not used and the ponds are capable of meeting the treatment targets. During moderate suspended solids events, the chemical addition can be coupled with the ponds to achieve the treatment target without the disk filters. During heavy suspended solids events, all three systems can be utilized. This operational flexibility was planned into the design to reduce energy usage and chemical consumption.

CLOSURE

ATCO has achieved their vision for a regional industrial water system in just a short seven years. At the inception of the project ATCO had a small distribution system consisting of an intake, 8.5 km of pipeline, and one pump station. Now, ATCO operates a system that includes an upgraded intake, three pump stations, 25 km of pipeline as well as storage and treatment facilities. To date, ATCO has invested more than \$70 million into the system. With the ability to provide additional water service solutions to industry in the region, opportunities are continuously being investigated to enhance the performance of ATCO's multi-user water system. 💧



TAP INTO OUR SOLUTIONS

Our multi-user system in Alberta's Industrial Heartland allows you to connect into our existing infrastructure – getting you the water you need quickly, efficiently and sustainably.

Whether it's transportation, storage, clarification or reuse, we deliver reliable and responsible solutions to meet your complete industrial water needs.

Visit ATCO.com to learn more or contact us directly at industrialwater@ATCO.com

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