

Water Tech News Oil & Gas

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Osum Oil Sands Corp. chooses MBD™ Technology



Osum Oil Sands Corp. in Alberta, Canada has awarded Veolia Water Technologies the Orion Phase I Crystallizer system, which reduces costly disposal of evaporator blowdown waste. The system will utilize Veolia's cost-saving Modular Bulldozer Design (MBD™).

The Orion oil field is currently producing approximately 8,000 barrels per day and with regulatory approval in hand for expansion to 20,000 barrels per day. The Orion Phase 1 facility required a crystallization system in order to minimize the evaporator blowdown waste.

Veolia's MBD™ crystallizer will reduce the disposal costs and increase the amount of recovered water as the new system will reduce wastewater

disposal by up to 80%, remove 6 trucks per day from the road on average, and recycle up to an additional 90,000 m³ of water annually for reuse to generate steam at the Orion oil field.

Modular design proven to be very cost-effective

The philosophy of the modular solution is to minimize fieldwork to the greatest extent possible. It is designed to be relocatable and can be installed and fully commissioned in approximately 4 weeks. Welded connections have been eliminated and ship loose items have been minimized to the greatest extent possible. This highly modularized concept is perfect for rapid deployment remediation. The economics of modular Zero Liquid Discharge (ZLD) installations has proven to be very efficient in remote oil and gas production sites. It has since become apparent that the modularization of ZLD systems is also very cost-effective at non-remote locations.

"The MBD™ system has been designed to meet many of our industrial customers'

needs. With this new modular design we are able to fabricate and install the crystallizer system several months faster than with conventional methods, which will allow Osum to effectively reduce waste and remove trucks from local roads. This combined with accelerated OPEX savings is a win-win for Osum," said Klaus Andersen, CEO of Veolia Water Technologies, Inc.

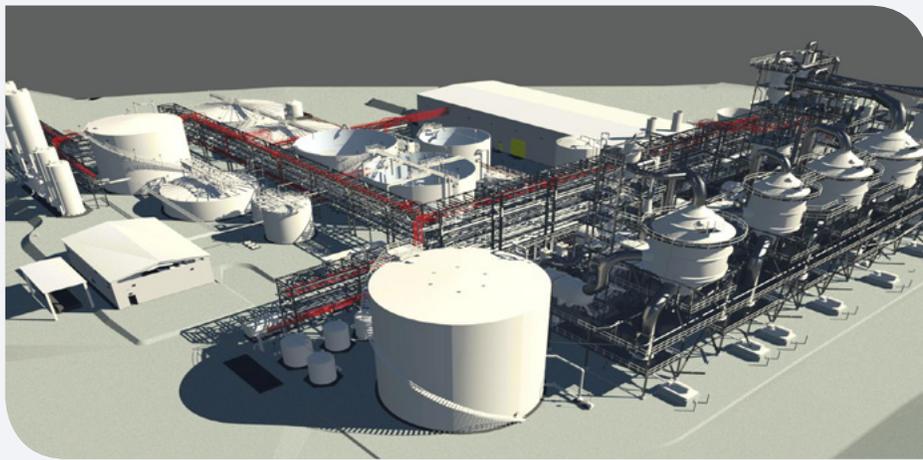
The Technology

The MBD™ system is a crystallizer designed to separate the blowdown into mixed suspension for disposal and distilled water for use as boiler makeup water. It operates as a mixed suspension mixed product removal (MSMPR) crystallizer, operating at steady state with multiple crystalline species precipitating.

ABOUT OSUM

Established in Alberta in 2005, Osum Oil Sands Corp. is a private, low cost oil sands producer focused on the responsible and environmentally conscious application of in-situ recovery technologies within Canada's oil sands and carbonates. Additional information on the Company is available at www.osumcorp.com.

Antero Awards Contract to Veolia for Waste Collection at Clearwater Treatment Facility



Veolia has been selected by Antero Resources to manage the sophisticated process of loading, packaging, transporting and proper disposal of water treatment sludge generated at its Clearwater Facility near Pennsboro, West Virginia.

Antero, a leading independent natural gas and oil company, selected Veolia through its subsidiary Veolia North America, which will be supported by the expertise of Veolia's Nuclear Solutions entity. The contract will take advantage of Veolia's best-in-class offerings in providing holistic solutions to tackle the world's toughest waste challenges for clients when it comes to environmental waste and remediation support.

Under this up to 10-year, \$70 million contract, Veolia will utilize its broad

expertise to address the water treatment sludge produced at the facility. This includes collecting and treating TENORM – technologically enhanced, naturally occurring radioactive materials which are exposed to the environment as a result of human activities – highlighting Veolia's ability to deal with the range of clients' toughest and complex waste needs.

"Veolia's broad and comprehensive expertise allows us to provide this vital service for Antero and we're pleased they have selected us to handle this important work," said Veolia North America president and CEO William J. "Bill" DiCroce. *"Ensuring the safe and efficient treatment and recycling of water is a vital part of oil and gas exploration activities, and it is critical that the materials generated from that*

work are properly managed," added Steve Hopper, executive vice president and chief operating officer of Veolia North America Industrial Water and Regeneration Services.

In 2015, Antero contracted with Veolia to design, build, operate and maintain the water treatment and recycling plant near Pennsboro. The facility's construction is under commission. The sludge-related services agreed to in this contract will be provided in addition to the construction and operation-maintenance of that facility, which includes the scope of low-level TENORM waste segregation. As part of the agreement, Veolia will also provide a comprehensive Environmental Health and Safety program to protect Veolia's employees and subcontractors, the public, and the environment.

"Segregation and disposal of TENORM waste in a safe and reliable manner to an approved landfill is key to Antero's operations," said Al Schopp, SVP and Chief Administrative Officer for Antero Resources. *"Veolia's expertise in providing a comprehensive solution for TENORM waste segregation and management has been great value to Antero in achieving its long term sustainability goals."*

Once completed, the Clearwater facility will treat and recycle 60,000 barrels of produced water a day.

Dolphin Energy KHI Removal System to Begin Operating in December

The objective of Dolphin Energy's Industrial Wastewater Management Project is threefold: to reduce the volume of wastewater currently being injected into the existing re-injection wells at the Ras Laffan gas plant, to eliminate Kinetic Hydrate Inhibitor (KHI) polymers from the residual wastewater now re-injected, and to reduce the volume of desalinated water purchased from external sources.

A solution had to be found in particular for the KHI polymer removal due to new Qatari regulations. Industry regulators in Qatar had concluded that the presence of KHI polymers in the re-injected water leads to long-term reservoir damage and possible groundwater pollution. However, KHI is a low-dosage inhibitor that has become an alternative to traditional thermodynamic inhibitors like methanol and MEG. Reverting to these traditional inhibitors would increase capital and operating costs.

Dolphin Energy awarded Veolia Water Technologies a research and development study to evaluate a wide range of water treatment technologies for treating produced water that contains KHI.

Through its research and development study, Veolia identified evaporation as a feasible process to treat KHI-laden wastewaters and generate a recovered

water stream free of KHI. Soon after the study results were reported, Dolphin Energy initiated a tender process for supply of the industrial system to treat their KHI wastewaters at Ras Laffan Industrial City. After years of collaborative interactions, Veolia won the competitive bid to supply the industrial solution.



Pioneering Technology

Veolia's system is divided into two steps of evaporation: the first step is driven through Mechanical Vapor Recompression (MVR) and the second step is driven through Low-Pressure (LP) steam. For both steps, forced circulation technology was selected due to the viscous nature of the

concentrated organic wastewater. In order to further enhance the process distillate quality, vapor washers are also included at the MVR.

The plant will have a capacity of 40 m³/hr and is scheduled to start operations in December 2017. Dolphin Energy's onshore gas facility will rely on the high performance of Veolia's system to maintain gas extraction operations during KHI injection (seasonally November through May of each year).

Dolphin Energy will be one of the first leading companies to use pioneering evaporation technology for this specific purpose. It will enhance the client's reputation, strengthen its environmental credentials and deepen its commitment to supporting Qatar's sustainability agenda.

BACKGROUND

The Dolphin Gas Project of Dolphin Energy Limited in Qatar is a major regional strategic initiative. The overall investment in constructing the project has made it one of the largest energy-related ventures ever undertaken in the Middle East.

Dolphin Energy Limited is owned by Mubadala Development Company of Middle East, Total of France, and Occidental Petroleum of the USA.

ShaleFlow™ Combines Proven Technologies for a Portable Solution

Veolia has developed a cost-effective solution for treatment and reuse of flowback and produced water at the well head. Designed with hydraulic facturing and completions operations in mind, this three-trailer system has the flexibility to be moved as the field is developed.

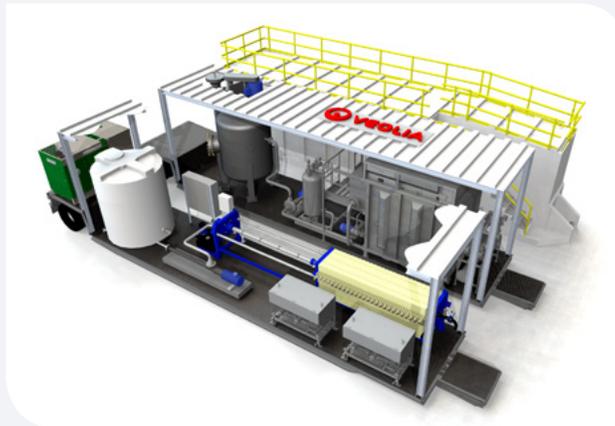
The portable solution can treat up to 10,000 barrels per day (300 gpm). Oil is recovered, as is 98% of the water. The only waste from the process is a non-hazardous sludge that can be disposed in a landfill. Reuse of the water reduces the fresh water demand for fracing and minimizes deep well injection and disposal costs.

A Simple Solution for a Complex Problem

ShaleFlow consists of four basic treatment steps:

1. A **Primary Separator** removes bulk oil and solids from the inlet water and provides buffer capacity for the downstream steps. Oil is recovered from the separator.
2. Oxidant-based chemistry is added into an **Idraflot™ Dissolved Air Flotation (DAF)** to further remove oil and solids along with hydrogen sulfide, iron and manganese while disinfecting the feed water. After

coagulation and flocculation, microbubbles cause the flocs to float to the surface for removal.



3. A **Power Clean® Nutshell Filter**, known for its unparalleled oil removal ability, provides further treatment. The walnut shell media resists fouling, is easily cleaned, and is not affected by heavy oil surges. It uses a fluidized cleaning process to remove contaminants from the media with very little backwash. The backwash is recycled to the Primary Separator.
4. An **automatic filter press** dewateres the sludge produced by the Separator and the DAF. The water is sent back to the Separator, leaving only the solid waste for disposal.

“Unlike competitive mobile solutions, ShaleFlow’s multi-step process produces a high quality water with low levels of particulates and scale-formers even during upset influent conditions. No other system in the marketplace offers such high removal efficiency coupled with real process performance guarantees. That’s a differentiator for ShaleFlow,” explained Aaron Poon, Business Developer, who has been instrumental in bringing ShaleFlow to the marketplace.

Treating flowback and produced water at the well head eliminates the cost and risks of hauling water to and from the site, minimizing overall operations costs. ShaleFlow is available with an Operation & Maintenance service contract that guarantees performance and ensures high uptime availability.

Performance Data

Constituent	Units	Typical Feed	Treated Water
Suspended solids	mg/l	4,000	<5
Oil & grease	mg/l	1,000	<5
Hydrogen sulfide	mg/l	300	<1
Bacteria	CFU/ml	20,000	Non-detect
Iron	mg/l	50	<1
Manganese	mg/l	50	<1