



cosia®

# OIL SANDS WATER CONFERENCE AND WORKSHOPS 2014

FINAL PROGRAM

Shaw Conference Centre • Edmonton, Alberta • March 11-13, 2014

# WELCOME

It is our sincere pleasure to welcome you to the inaugural COSIA Oil Sands Water Conference, built on a foundation of 10 years of successful CONRAD Water Conferences.

The focus of this year's conference is around achieving and measuring oil sands water management performance improvement goals through strategic planning, applied research, technology development, and operational excellence. The presentations and posters span the topic areas of oil sands mining, in-situ operations and environmental monitoring. As a committee, we hope you find the program as informative, engaging and insightful as we do.

We encourage you to connect with fellow delegates, speakers, committee members and sponsors at our networking cocktail receptions the evenings of March 11 and March 12 at the Shaw Conference Centre in Salon 12. We look forward to you taking part in this event and trust that you find it valuable.

**\* THANK YOU TO THE COSIA WATER CONFERENCE TECHNICAL COMMITTEE:**

JOHN BROGLY, COSIA | KELLY MUNKITTRICK, COSIA | CHRIS GODWALDT, COSIA | JAMES MOTTERSHEAD, COSIA | MIKE ROGERS, ALBERTA TECHNOLOGY & SCIENCE INC. | BASIL PERDICAKIS, STATOIL CANADA LTD. | PRIT KOTECHA, SUNCOR ENERGY INC. | SUBODH PERAMANU, CANADIAN NATURAL RESOURCES LIMITED | TROY VASSOS, GOLDER ASSOCIATES LTD. | WARREN ZUBOT, SYNCRUDE CANADA LTD. | JACOB DENIS, DEVON | JIM KANG, URS | JOHN GIBSON, AI-TF



## GREEN MEETINGS

### GREEN CITY. GREEN BUILDING. GREEN MEETINGS.

The Shaw Conference Centre is a proud corporate citizen in a city internationally renowned for its environmental leadership. Through their "Simple Steps" program they remain committed to increasing sustainable best practices throughout the hospitality industry. They emphasize environmental best practices in facility management and the promotion of eco-events to their clients and guests.

## COSIA'S COMMITMENT

The COSIA Water Conference is striving for our meetings to be as green as possible. This document is printed on 100% post-consumer stock. Please reuse this program by passing on to a colleague; if you must dispose of it, please recycle.

# COSIA OIL SANDS WATER CONFERENCE 2014

Under the theme “Achieving and measuring oil sands water management performance improvement goals through strategic planning, applied research, technology development, and operational excellence”, this event will focus on the following five areas.

## REGIONAL WATER MANAGEMENT AND STRATEGIES

- Drivers in water management and technology development plans
- Regional water strategies and plans (regulatory, industry and NGO perspectives, regional sourcing and disposal)
- Groundwater and surface water sustainability
- Provincial and federal government water plans and policies

## RESEARCH AND DEVELOPMENT

- Water characterization and analytical techniques
- Novel treatment technologies and processes
- Treatment of tailings processed affected water
- Waste disposal treatment and methods

## TECHNOLOGY DEPLOYMENT

- Field pilots
- Commercialization of technologies and lessons learned
- Advances in online instrumentation
- Collaborative projects

## OPERATIONAL EXCELLENCE

- Best practices
- Training and staff development
- Unit process optimization (e.g. recycling efficiencies, reduction in water usage)

## MONITORING REGIONAL WATER QUALITY

- Measuring regional water quality: understanding variability and sources
- Methods development for chemical fingerprinting
- Development of management tools (e.g. water models)
- Determining long-term changes in on-site water

# SCHEDULE AT A GLANCE

TUESDAY			
7:30 - 17:00	REGISTRATION		
7:30 - 8:00			
8:00 - 9:00			
9:00 - 10:00	<table border="1"> <tr> <td><b>OIL SANDS 101</b> Mining &amp; In Situ Water Fundamentals</td> <td><b>OIL SANDS 103</b> Design of Monitoring Programs</td> </tr> </table>	<b>OIL SANDS 101</b> Mining & In Situ Water Fundamentals	<b>OIL SANDS 103</b> Design of Monitoring Programs
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10:00 - 11:00			
11:00 - 12:00			
12:00 - 13:00	LUNCH & NETWORKING		
13:00 - 13:10	<table border="1"> <tr> <td><b>OIL SANDS 201</b> In Situ Water Fundamentals</td> <td><b>OIL SANDS 202</b> Mining</td> </tr> </table>	<b>OIL SANDS 201</b> In Situ Water Fundamentals	<b>OIL SANDS 202</b> Mining
<b>OIL SANDS 201</b> In Situ Water Fundamentals	<b>OIL SANDS 202</b> Mining		
13:10 - 14:00			
14:00 - 15:00			
15:00 - 16:00			
16:00 - 17:00			
17:00 - 19:00	COCKTAIL RECEPTION & POSTER SESSIONS		

WEDNESDAY		
REGISTRATION		
BREAKFAST & NETWORKING		
WELCOME ADDRESS from COSIA Water Director, <b>John Brogly</b>		
PLENARY 1 Regional Water Management Initiative		
PLENARY 2 Oil Sands Water Valuation		
NETWORKING BREAK & REFRESHMENTS		
PLENARY 3 Impact of Climate Change on Water		
PLENARY 4 An Integrated Approach to Regional Water Management		
PLENARY 5 Assessing the Role of Subsurface Heating on Element Mobility and Groundwater Quality		
LUNCH & NETWORKING		
<b>STREAM A:</b> OSPW AND BASAL WATER TREATMENT TECHNOLOGIES FOR REUSE	<b>STREAM B:</b> PRODUCED WATER TREATMENT	<b>STREAM C:</b> ANALYTICAL TECHNIQUES & REGIONAL ISSUES
1.A Treatment of OSPW by a Submerged Ceramic Microfiltration	1.B Coagulation of SAGD Produced Water	1.C Evaluating Biodegradation of Organic Contaminants using Carbon Isotopes
2.A Treatment of OSPW with Ceramic Ultrafiltration Membrane	2.B Fossil Water Liquid-Solid Separation for Slop Oil Treatment	2.C Analysis of Leachate from Acid Rock Drainage
3.A Basal and Tailings Water Management using Desalination Technologies to Reduce Fresh Water Intake	3.B Horizontal Falling Film Pilot Program	3.C Mass Spectrometric Techniques and Bioassays to Characterize OSPW
4.A High Recovery and ZLD Pilot Trials with CNRL	4.B Pilot-scale Evaluation of Solidification Technology for SAGD ZLD	4.C Disambiguation of Seepage in Alberta Oil Sands
NETWORKING BREAK & REFRESHMENTS		
5.A Novel Filtration Technology of Waste Water Disposal	5.B Coagulation and Fenton Oxidation	5.C Water Disposal Challenges and Solutions for Oil Sands
6.A Evaluating Microbial Biofilm Communities for OSPW	6.B A Review of Brine Management	6.C Quantifying Devonian Groundwater Inflows to the Basal Aquifer
COCKTAIL RECEPTION & POSTER SESSIONS		

## THURSDAY

7:30 - 17:00	REGISTRATION
7:30 - 8:00	BREAKFAST & NETWORKING
8:00 - 9:00	WELCOME ADDRESS from COSIA Water Director, <b>John Brogly</b>
9:00 - 10:00	PLENARY 1 Demonstration Pit Lakes
	PLENARY 2 Adventures in Water Treatment
	PLENARY 3 Biofilm Technology for Biodegradation of Oil Sands Tailings
10:00 - 10:20	NETWORKING BREAK & REFRESHMENTS

### STREAM A: OSPW CHARACTERIZATION

### STREAM B: IN-SITU WATER CHALLENGES

10:20 - 11:00	1.A Modeling of TSS Concentrations in Tailings Ponds and Lakes	1.B SAGD Organics and Fouling Mechanisms
11:00 - 12:00	2.A Characterization of Napthenic Acids Removal from OSPW in a Study of Biofilm Treatment	2.B OSLI's Environmental Net Effects Evaluation Tool Development of Water Sourcing Alternatives
	3.A Mehanogenesis Alters Pore Water Quality in Oil Sands Tailings	3.B Corrosivity of Brackish Water for In-Situ Operations
12:00 - 13:00	LUNCH & NETWORKING	

### STREAM A: MODELING

### STREAM B: IN-SITU STEAM GENERATION CASE STUDIES

### STREAM C: UNDERSTANDING THE ATHABASCA WATERSHED STUDIES

13:10 - 14:00	1.A Mechanistic Model Development for OSPW	1.B Steam Quality Soft Sensor Technology	1.C Water Supply Management
14:00 - 15:00	2.A Thermal Water Chemistry	2.B Rifle Tubes	2.C 600 Years of Annual Flow to the Athabasca River
	3.A Oil Sands Mine Water Salt Loading Model	3.B Push the Boiler to the Limit – Steam Quality	3.C Natural Salinity Sources in the Athabasca River
15:00 - 15:50	4.A Understanding Tailings Water Quality and its Sensitivity to Mining Operations	4.B Blowdown Vaporizer	
NETWORKING BREAK & REFRESHMENTS			

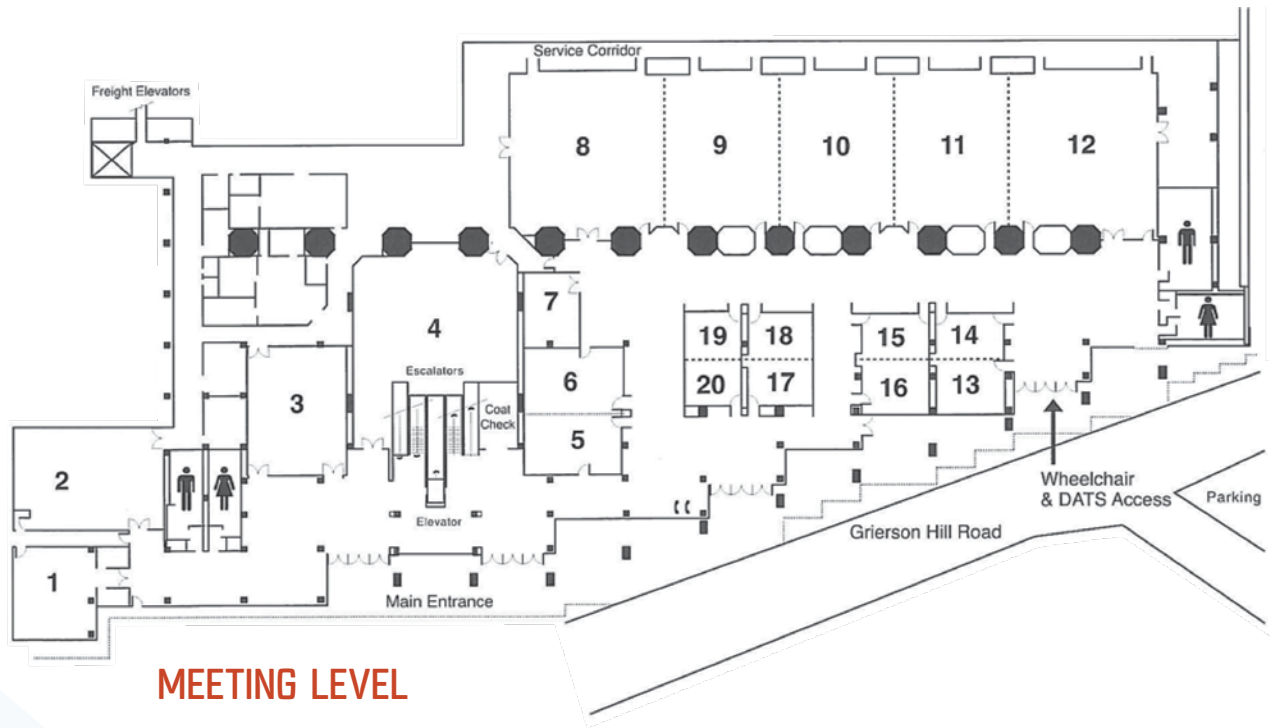
### STREAM A: BIOLOGICAL TREATMENT TECHNOLOGIES

### STREAM B: TAILINGS WATER RECLAMATION

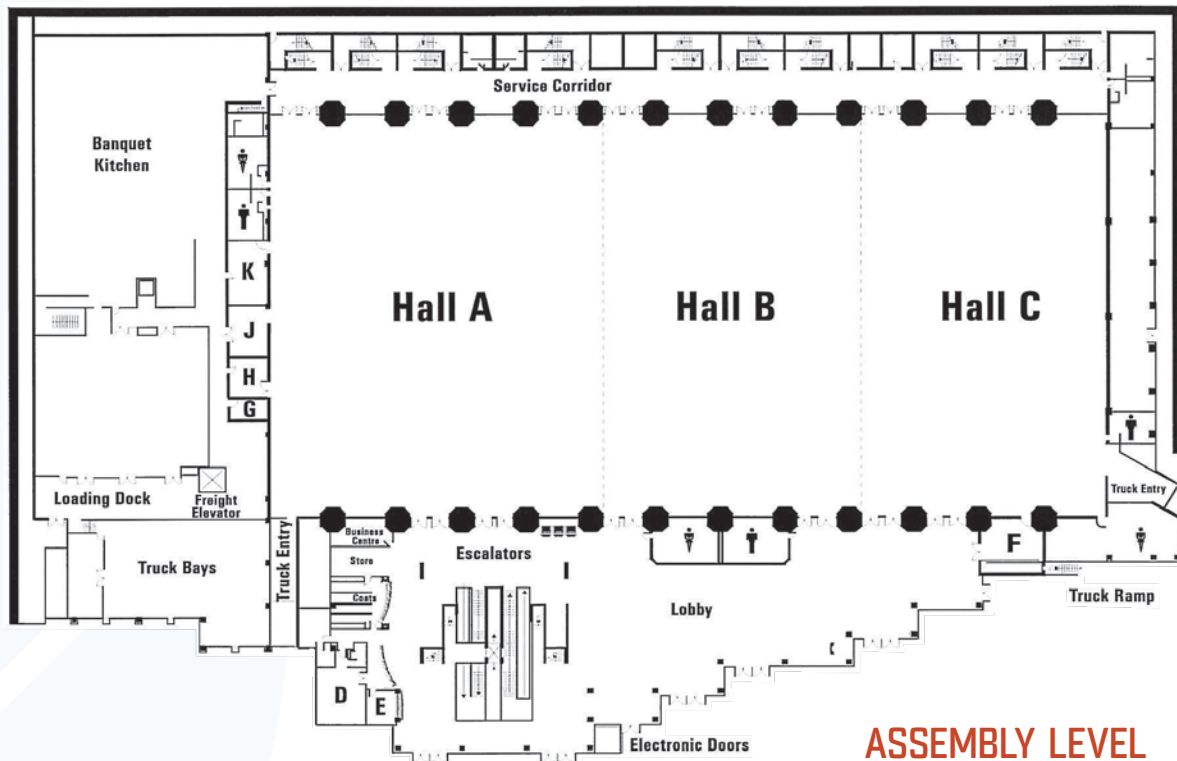
### STREAM C: OSPW ANALYSIS AND TREATMENT

15:50 - 16:00	1.A Biodegradation of Organic Compounds in OSPW	1.B Base Mine Lake Toxicity Identification	1.C Principal Component Analysis on the Data Mining of High Resolution Datasets
16:00 - 17:00	2.A Treatment of OSPW Using Ozonation Combined with Fixed-Film System	2.B Effects of Tailings Reduction Operation on Microbial Diversity	2.C Anoxic-Aerobic Membrane Bioreactors for Oil Sands Processed-Affected Water Treatment

# SHAW CONFERENCE CENTRE FLOOR PLAN



**MEETING LEVEL**



**ASSEMBLY LEVEL**

# THANK YOU TO OUR SPONSORS

With industry support from these leading organizations, COSIA is proud to present a world-class event focused on the issues of water use in the oil sands industry in Alberta.

The COSIA Oil Sands Water Conference, like the CONRAD conferences over the past decade, simply wouldn't happen without sponsorship. We encourage all delegates to make an effort to speak with these dedicated industry supporters.

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## STREAM SPONSORS



# FUTURE SPONSORSHIP

Thinking about sponsoring a future COSIA Water Conference? Our team is happy to answer any questions you might have – we look forward to hearing from you.

### James Mottershead

COSIA Water Administration

**Phone:** (403) 444-5280

**Mobile:** (403) 630-8038

**Email:** james.mottershead@cosia.ca

# TUESDAY, MARCH 11, 2014

7:30 - 17:00

## REGISTRATION

Meeting Room Foyer (outside Salons 19/20)

8:30 - 12:00

## MORNING WORKSHOPS

### OIL SANDS 101 – MINING & IN SITU WATER FUNDAMENTALS

Rm #: Salon 8

PRESTON MCEACHERN

TERVITA CORPORATION

This course is essential for anyone new to the oil sands, offering an introduction to water issues in oil sands mining and in situ production. The course will provide a broad overview of the oil sands history, current development, and its global context, before focusing on water in the oil sands for mine and in situ production. Water in the oil sands will be explored in the context of obtaining, using, and cleaning it for reuse or return. Finally, the course will provide an overview of current and emerging water policy issues, and highlight current challenges and hot topics everyone new to the oil sands should be aware of.

### OIL SANDS 103 – DESIGN OF MONITORING PROGRAMS

Rm #: Salon 9

DR. KELLY MUNKITTRICK

COSIA

This course will provide an overview of the essential questions to ask for designing a monitoring program. The course is primarily philosophical, based on Dr. Munkittrick's experience in designing regional monitoring frameworks in eight different countries and in five regions of Canada. It covers 10 specific aspects to focus on during program development, including the philosophical differences and limitations of different monitoring approaches and different receptors (i.e. community versus population versus individual). It will also address issues of appropriate sampling designs, power analysis, replication and statistical approaches which apply to any environmental monitoring program. Interpretation of monitoring data can be challenging and participants will learn how to consider confounding factors, natural variability, ecological relevance and pseudoreplication. The course will cover issues related to interpreting study results, and warning signs and issues related to interpreting other peoples' data, and the future direction that monitoring is heading. While much of the data will examine fish, benthic invertebrates and water quality, the principles are easily applied to any environmental program.



**12:00 - 13:00**    **NETWORKING LUNCH**

**Rm #:** Salon 10

**13:00 - 16:30**    **AFTERNOON WORKSHOPS**

**OIL SANDS 201 - IN SITU WATER FUNDAMENTALS**

**Rm #:** Salon 8

**ANDREA GRANGER**

CLEAN HARBORS

This course is a continuation of the Oil Sands 101 morning session (also offered at CONRAD 2012). It is also relevant for those who already have an understanding of basic water use at in situ facilities. In Oil Sands 201, we will dive deeper into water issues extending from the basic flow sheet for standard through to ZLD designs. We will examine issues including boilers and boiler feed requirements, treatment options such as softening, RO, and emerging desalination as well as managing waste streams from concentrated brines, and lime sludge, to emulsions. The intent is to provide a more detailed examination of water use for in situ production and the challenges in obtaining, using and cleaning it for disposal or reuse.

**OIL SANDS 202 - MINING**

**Rm #:** Salon 9

**PRESTON MCEACHERN**

TERVITA CORPORATION

This course is a continuation of the Mining 101 Workshop held at CONRAD 2012 or for those who have an understanding of basic water use at mine sites. In Oil Sands 202, we will dive deeper into design and ongoing operational issues including: planning and use of site water; depressurization management including salt accumulation; treatment (physical, chemical & biological) for reuse and/or discharge; and tailings management issues from the perspective of water (rather than clay) management. The course will also examine challenges including aquifer management, water liability as it may interface with MFSP and finally review reclamation issues and the reconstruction of watersheds with good water quality.

**17:00 - 19:00**    **COCKTAIL RECEPTION & POSTERS SESSIONS**

**Rm #:** Salon 12

COSIA is pleased to present a cocktail reception on both Tuesday and Wednesday evenings following the sessions. Over refreshments and appetizers, delegates can look forward to relaxing and connecting with fellow attendees, speakers, committee members and sponsors. Don't forget to bring business cards.

# POSTER SESSIONS

To complement our technical program, COSIA is pleased to showcase 22 poster presentations at this year's conference. The posters will be unveiled during the cocktail reception on Tuesday, March 11 and will be available for viewing until the close of the conference Thursday, March 13.

## IN-SITU

### Fluid Clarification Inc.

New Technology: Self-Cleaning Microfiltration

## MINING AND IN-SITU

### Golder Associates Ltd.

Alternative Technology Paths to ZLD

## MINING

### Tetra Tech Inc.

A Conceptual Framework for Modeling Ecological Risks Associated with Oil Sands Mining

### Titanium Corporation

Improving the Quality of Process-Affected Water in the Oil Sands to Replace Imported Raw Water

### University of Alberta

Effect of UV/OCl<sup>-</sup> on the Degradation of a Model Napthenic-Acid Compound and its Chlorinated By-products

### University of Alberta

Moving Bed Biofilm Reactor for Bio-degradation of Recalcitrant Organic Compounds in OSPW

### University of Alberta

Optimization of Purging Time in Organic Carbon Content Measurement

### University of Alberta

Solar UV/Chlorine Process for the Degradation of Toxic Constituents of OSPW

### University of Calgary

Aerobic Granulation: An Innovative Biotechnology for OSPW Treatment

### URS Canada Inc.

Tailings Water Management: Lessons Learned from the Mining Industry

## MONITORING

### Athabasca University

Modeling Framework of Integrated Terrestrial and Aquatic Systems for Athabasca River Basin

### Matrix Solutions Inc.

Estimation of Surface Water

### Matrix Solutions Inc.

Purpose Driven Modeling and Uncertainty Analysis

### Matrix Solutions Inc.

Using Cased Hole Well Logs for Shallow Geo-Models

### University of Alberta

An Estimation for pKa of Napthenic Acids based on pH-Dependent Fractionation Extraction of OSPW

### University of Alberta

OSPW and O3OSPW: Can fish smell the difference?

### University of Alberta

The Effect of Different Solvents and pHs on the Extractability of OSPW Organic Contents

### University of Alberta

The Role of OSPW on Bacterial Growth and its Metabolism

### University of Alberta

Toxicity and Speciation of Napthenic Acids in Extracted Fractions of OSPW Before and After Ozonation

### University of Guelph

Biomonitoring 2.0

### University of Guelph

Napthenic Acid Mixtures Affect Differentiation of Mousse Embryonic Stem Cells

# WEDNESDAY, MARCH 12, 2014

7:30 - 17:00

## REGISTRATION

Meeting Room Foyer (outside Salons 19/20)

7:30 - 8:00

## BREAKFAST & NETWORKING

Room #: Salons 8-10



8:00 - 8:50

## WELCOME ADDRESS

Room #: Salon 9

JOHN BROGLY

COSIA

8:55 - 9:25

## PLENARY 1

Room #: Salon 9

## REGIONAL WATER MANAGEMENT INITIATIVE

DAVID VAN DEN ASSEM

SUNCOR ENERGY INC.

This plenary will discuss the COSIA Regional Water Management Initiative: Can the oil sands reduce water management Environmental Net Effect by using regional water infrastructure? Currently, with few exceptions, oil sands producers manage their water sourcing and disposal independently. But since water is a regional resource, the RWMI is studying the possibility of creating regional utilities which source water, share/transfer once-used water with producers who can use a lower quality feed water, and dispose of SAGD blowdown and mine depressurization water. This regional approach is intended to reduce the footprint of water management and potentially lower costs.

9:30 - 10:00

## PLENARY 2

Room #: Salon 9

## OIL SANDS WATER VALUATION

KIM STURGESS

ALBERTA WATERSMART

Improved water management is a key area of interest for oil sands producers due to the opportunity for enhanced operating performance and an internal focus on water use in energy production and development. The objective of the COSIA OSWV Project was to develop a water valuation tool and guidebook that could be used by water managers in COSIA member companies, and to conduct a case study using real data from a COSIA member company.

**10:00 - 10:20 NETWORKING BREAK & REFRESHMENTS****Room #:** Meeting Room Foyer**10:20 - 10:50 PLENARY 3****Room #:** Salon 9**IMPACT OF CLIMATE CHANGE ON WATER****DR. ED SUDICKY**

AQUANTY INC.

Upon mine closure, mine operators are legally obligated to return the landscape to a natural state. One of the major factors influencing mine closure and landscape reclamation planning is the impact of climate change on the regional hydrology, and in particular, on future surface water flow in the Athabasca River basin. With this in mind, an integrated, high resolution surface water-groundwater-climate change model was developed to assess the potential effects of climate change on water resources in the Athabasca Oil Sands area, and to assist with planning mine closure and land reclamation activities.

**10:55 - 11:25 PLENARY 4****Room #:** Salon 9**AN INTEGRATED APPROACH TO REGIONAL WATER MANAGEMENT****GREG BOONSTRA**

SUNCOR ENERGY INC.

Geophysical surveys for Suncor Energy's North Steepbank Extension were designed to map the presence of a saline basal water sand unit, Devonian stratigraphy and structure, as well as Precambrian structure to target drill locations and to determine potential pathways for saline water migration.

**11:30 - 12:00 PLENARY 5****Room #:** Salon 9**ASSESSING THE ROLE OF SUBSURFACE HEATING ON ELEMENT MOBILITY AND GROUNDWATER QUALITY****JON FENNELL**

INTEGRATED SUSTAINABILITY CONSULTANTS LTD.

The vast majority of oils sands deposits (>95%) require in situ recovery technologies. As steam is injected into the oil sands deposits (using dedicated wells of steel construction), heat is transferred to adjacent freshwater aquifers. This transfer of heat has the potential to mobilize certain soluble constituents to the local groundwater environment, and possibly impact nearby

receptors that interact with it. Considering the scale of in situ development planned in the coming years, regulatory and stakeholder concern is increasing regarding the risk associated with this phenomenon.

**12:00 - 13:00**     **NETWORKING LUNCH**

**Room #:** Hall B

**STREAM A:** OSPW and Basal Water Treatment Technologies for Reuse

**13:10 - 13:40**     **BREAKOUT 1.A**

**Room #:** Salon 8

## TREATMENT OF OSPW BY A SUBMERGED CERAMIC MICROFILTRATION

**SHIMIAO DONG**

UNIVERSITY OF ALBERTA

Low pressure driven membrane filtration, including microfiltration, ultrafiltration, has been identified as an effective and cost-competitive technology for water and wastewater treatment. The objective of this study was to evaluate the performance of a flat-sheet ceramic MF membrane and a bench-scale filtration system in terms of transmembrane pressure and permeate quality. Membrane fouling reduction was investigated by applying direct coagulation-flocculation process and three different types of ceramic membranes, including unmodified ceramic membrane, silica-modified ceramic membrane, and titania-modified ceramic membrane.

**13:45 - 14:15**     **BREAKOUT 2.A**

**Room #:** Salon 8

## TREATMENT OF OSPW WITH CERAMIC ULTRAFILTRATION MEMBRANE

**DR. ALLA ALPATOVA**

UNIVERSITY OF ALBERTA

One of the effective routes to reduce membrane fouling during OSPW filtration is to alter the feed water chemistry by coagulant addition. The increase in particle sizes and decrease in the particle surface charge occurring during coagulation/flocculation will reduce the interactions between the foulants and the membrane and improve permeability. This study aimed at investigating ceramic 1 kDa ultrafiltration membrane for the removal of organic and inorganic compounds from OSPW. The objectives were: (1) to investigate the effect of coagulant addition on the treatment efficiency in terms of permeate flux and membrane's selectivity; (2) to evaluate the effect of hydrodynamic conditions on the membrane's performance; and (3) to evaluate the membrane fouling and to elucidate the fouling mechanisms.

**14:20 - 14:50****BREAKOUT 3.A****Room #:** Salon 8**BASAL AND TAILINGS WATER MANAGEMENT USING DESALINATION TECHNOLOGIES TO REDUCE FRESH WATER INTAKE****KAVITHAA LOGANATHAN**

CANADIAN NATURAL RESOURCES LTD.

Multi-phase pilot tests were conducted over a period of one year to investigate effectiveness of the desalination technologies employing reverse osmosis (RO) and electro dialysis (ED) based processes. ZLD technologies were tested to completely eliminate concentrates from RO/ED. The test objective was to remove more than 95% TDS from the basal water to make it suitable to reuse in extraction operations. In another test phase, tailing water was treated to achieve TDS concentrations less than 300 ppm. Water reuse after the targeted treatment is expected to reduce fresh water intake significantly. A Configuration of polymeric and ceramic ultra-filtration followed by RO, along with innovative pretreatment processes, was successful in meeting the treatment objectives for both basal and tailing waters.

**14:55 - 15:25****BREAKOUT 4.A****Room #:** Salon 8**HIGH RECOVERY AND ZLD PILOT TRIALS WITH CNRL****MALCOLM MAN**

SALTWORKS TECHNOLOGIES INC.

Two novel desalination processes were developed for treating basal water from oil sands mining operations. The first process involves Saltworks advanced electro dialysis-reverse osmosis hybrid. An improved version of electro dialysis reversal unit (EDR) was employed both upstream and downstream of RO. The EDR-RO hybrid results represent 80% recovery, without the need for chemical softening such as lime, soda ash, or ion exchange. Simultaneously, the brine is concentrated and volume reduced by roughly half over conventional reverse osmosis treatment trains.

**STREAM B: Produced Water Treatment****13:10 - 13:40****BREAKOUT 1.B****Room #:** Salon 9**COAGULATION OF SAGD PRODUCED WATER****SUBHAYAN GUHA THAKURTA**

KEMIRA

High levels of dissolved organic matter in steam assisted gravity drainage (SAGD) produced water and OTSG blow-down have been implicated in equipment fouling in the SAGD water treatment plant, most notably in the OTSG tubes and evaporators. Research is ongoing into

the exact chemistry and mechanisms of these fouling problems, but one fouling mitigation approach is to remove the dissolved organics from the process water. The objective of this work is to determine the efficacy of coagulation-flocculation as a treatment option for removal of dissolved organic matter from SAGD produced water and boiler blow-down water.

**13:45 - 14:15**

### **BREAKOUT 2.B**

**Room #:** Salon 9

## **FOSSIL WATER LIQUID-SOLID SEPARATION FOR SLOP OIL TREATMENT**

**BILL BERZINS**

K'NOWBE

Slop oil represents 2-8 per cent of production for new SAGD projects and is treated using a variety of traditional on-site and off-site treatment methods including tri-cantier and cavern disposal. The application of more innovative technology is hampered by tightly-bound emulsions and variable feedstock that frustrated automated control systems. The presenters will synopsis of technology currently in use for conventional slop oil treatment systems and introduce technological innovations that are being piloted for the application to slop oil treatment.

**14:20 - 14:50**

### **BREAKOUT 3.B**

**Room #:** Salon 9

## **HORIZONTAL FALLING FILM PILOT PROGRAM**

**ROI ZAKEN**

IDE TECHNOLOGIES

The Horizontal Falling Film Evaporator enables the recycling of produced water into high purity distillate for the SAGD industry. IDE has installed a pilot evaporator at the AITF (Alberta Innovates Technology Futures) facility in Edmonton. The 1 m<sup>3</sup>/day pilot simulates the performance of a horizontal falling film evaporator, treating produced water from different SAGD sites. The objectives of the pilot program are to validate and optimize a more sustainable evaporation technology.

**14:55 - 15:25**

### **BREAKOUT 4.B**

**Room #:** Salon 9

## **PILOT-SCALE EVALUATION OF SOLIDIFICATION TECHNOLOGY FOR SAGD ZLD**

**ANITA SELINGER**

SUNCOR ENERGY INC.

In the Steam Assisted Gravity Drainage (SAGD) recovery of bitumen in the Alberta oil sands industry, waste brines are generated from evaporator and boiler blowdown streams. The

Suncor MacKay River SAGD facility concentrates the blowdown stream using evaporation and crystallization processes followed by thermal drying. The characteristics of the waste material have affected the stability and capacity of the landfill. Solidification/stabilization techniques have been used extensively as a means of making waste sludges and brines suitable for landfill disposal in other industries, and this approach was tested to stabilize the MacKay River landfill.

## STREAM C: Analytical Techniques and Regional Issues

13:10 - 13:40

### BREAKOUT 1.C

Room #: Salon10

## EVALUATING BIODEGRADATION OF ORGANIC CONTAMINANTS USING CARBON ISOTOPES

DR. JASON M. E. AHAD

GEOLOGICAL SURVEY OF CANADA

One of the key concerns in the Athabasca oil sands region is the fate of organic contaminants contained within the large volumes of oil sands process-affected water (OSPW) stored in surface impoundments. Both investigations involved analysis of phospholipid fatty acids (PLFAs) "biomarkers for active microbial populations. Low levels of radiocarbon in PLFAs will point to significant microbial uptake of carbon, since organic contaminants derived from petroleum are millions of years old and hence contain no detectable  $^{14}\text{C}$ .

13:45 - 14:15

### BREAKOUT 2.C

Room #: Salon 10

## ANALYSIS OF LEACHATE FROM ACID ROCK DRAINAGE

DR. ALSU KUZNETSOVA

UNIVERSITY OF ALBERTA

The surface-mining oil sand industry in Alberta produces ~1 million m<sup>3</sup> oil sand tailings day<sup>-1</sup> during bitumen extraction from oil sands ores. Sulfidic minerals in the tailings are quite stable when stored in tailings ponds under anoxic conditions, but may produce ARD when exposed to the atmosphere. However, ores may also contain alkaline minerals such as carbonates that can neutralize the acid-producing potential of rock material. Options for managing oil sands tailings include surface application of consolidated tailings for atmospheric drying and land reclamation. Therefore, it is important to determine the ARD potential of consolidated tailings (including neutralizing capacity) before large-scale land application. The aim of this study was to evaluate ARD potential of consolidated tailings and examine the geochemical processes occurring during ARD.



14:20 - 14:50

### BREAKOUT 3.C

Room #: Salon 10

## MASS SPECTROMETRIC TECHNIQUES AND BIOASSAYS TO CHARACTERIZE OSPW

DR. ZVONKO BUKUS

UNIVERSITY OF ALBERTA

In this work, OSPW was treated using ozonation at intermediate and high-concentration levels, and various analytical and bioassay methods were used to assess the treatment efficiency. The objectives of this study were: (1) to validate the use of ion mobility spectrometry (IMS) for the qualitative analysis of untreated and ozonated OSPW; (2) to correlate ultra-performance liquid chromatography (UPLC) time-of-flight mass spectrometry (TOF MS) and electrospray ionization (ESI) Fourier transform ion cyclotron resonance (FT-ICR) MS and validate the use of UPLC-TOF MS for the quantitative analysis of NAs species; (3) to assess the acute toxicity of untreated and ozonated OSPW using *Vibrio fischeri*; (4) to determine whether OSPW and ozonated OSPW alter olfactory tissues of fish and act as an odorant; and (5) to examine the effects of OSPW and ozonated OSPW on macrophage antimicrobial responses using a flow-through exposure apparatus.

14:55 - 15:25

### BREAKOUT 4.C

Room #: Salon 10

## DISAMBIGUATION OF SEEPAGE IN ALBERTA OIL SANDS

DR. NIKOLAUS KLAMERTH

ALBERTA ENVIRONMENT AND SRD

The objectives of this project are to analyze secondary information on seepage from tailings ponds and determine linkages of this seepage to groundwater and surface water systems, so that answers to questions of seepage quantity and quality, relationship to soil, groundwater, as well as Athabasca River could be established.

15:25 - 15:50

### NETWORKING BREAK & REFRESHMENTS

Room #: Meeting Room Foyer

## STREAM A: OSPW and Basal Water Treatment Technologies for Reuse

15:50 - 16:20 **BREAKOUT 5.A**

Room #: Salon 8

### NOVEL FILTRATION TECHNOLOGY OF WASTE WATER DISPOSAL

JESUS ATIAS

THE DOW CHEMICAL COMPANY

The pilot demonstrated that the new self-cleaning filter can make oilfield waste disposal facilities more profitable and sustainable by providing an economical solids removal option. This novel filtration technology is a continuously cleaning cross-flow filter which employs centrifugal separation and enhanced settling in one device with proven capability to process difficult oilfield waters with high suspended solids in the presence of residual organics. The TEQUATIC PLUS filter water recovery and throughput were studied as a function of filter rating to determine the system's ability to tolerate variable feed-streams and the impact on bag filter consumption. Requirements for maintenance, operator intervention, consumables and energy were compared to an incumbent 2-stage bag filtration system (10 and 5 micron). The pilot study supported advancement in reducing operator exposure to hazardous gases such as H<sub>2</sub>S and BTEX.

16:25 - 16:55 **BREAKOUT 6.A**

Room #: Salon 8

### EVALUATING MICROBIAL BIOFILM COMMUNITIES FOR OSPW

DR. JOE LEMIRE

UNIVERSITY OF CALGARY

Our research group focuses on microbiology based bioremediation strategies. Recently we have explored mixed species microbial biofilms as a diverse source of biological derived chemistries for remediation of oil sands processing water (OSPW). To accomplish this goal, we have established a facile method to inoculate a bioreactor with a microbial community that is capable of degrading one of the main organic components in OSPW and the naphthenic acids (NA). Ultimately, our objective is to see full-scale implementation of our method in an ex-situ wastewater style treatment facility.

## STREAM B: Produced Water Treatment

15:50 - 16:20

### BREAKOUT 5.B

Room #: Salon 9

## COAGULATION AND FENTON OXIDATION

AHMAD AL-AS'AD

UNIVERSITY OF CALGARY

The purpose was to test the efficacy of different coagulants for the removal of both TOC and silica from SAGD water and explore the lowest possible dose required. Field data in terms of temperature and nature and concentration of contaminants were used while studying the effect of temperature on TOC and Si removal. Exploring advance oxidation treatment based on H<sub>2</sub>O<sub>2</sub>, Classical Fenton Process (CFP) and Advance Fenton Process (AFP) for the removal of recalcitrant organics and silica as a further treatment step.

16:25 - 16:55

### BREAKOUT 6.B

Room #: Salon 9

## A REVIEW OF BRINE MANAGEMENT: A SOUTH AFRICAN PERSPECTIVE

CORNÉ PRETORIUS

GOLDER ASSOCIATES LTD.

South Africa is a water stressed country with an annual rainfall half of the world average and a long history of mining and power generation in areas geographically distant from the ocean. Historically, this situation has served as an ever present driver of increased recycle and re-use of water as a means of achieving the dual objectives of minimization of raw water abstraction and prevention of pollution. These same challenges are faced by oilsands operators today.

## STREAM C: Analytical Techniques and Regional Issues

15:50 - 16:20

### BREAKOUT 5.C

Room #: Salon 10

## WATER DISPOSAL: CHALLENGES AND SOLUTIONS FOR OIL SANDS

DR. JON FENNEL

INTEGRATED SUSTAINABILITY CONSULTANTS LTD.

Most of the oil sands will develop through in situ technologies employing the injection of high temperature steam. Water used to support this activity is typically accessed from groundwater

sources that are often saline. To produce high quality steam this water needs to be treated, which inevitably leads to the liquid wastes requiring disposal. Given the large volumes of liquid waste that will be generated over the coming decades, COSIA launched an investigation to assess the regional disposal to support oil sands development.

**16:25 - 16:55****BREAKOUT 6.C****Room #:** Salon 10

## QUANTIFYING DEVONIAN GROUNDWATER INFLOWS TO THE BASAL AQUIFER

**SANIL SIVARAJAN**

SYNCRUDE CANADA LTD.

The basal water sands aquifer (basal aquifer) underlies the bituminous McMurray oil sands throughout much of the mineable region. Water compositions within the basal aquifer at Aurora have been monitored for over two decades from observation (OB) wells and the mine depressuring (DP) well network, tracking the changes in water composition from pre-mining to the present. The objective of the study was to use the basal aquifer groundwater compositions to assess the magnitude of inflow from Devonian rocks as part of a larger program to evaluate the potential for inflow of saline groundwaters from Devonian formations into existing and planned mining operations at Aurora North.

**17:00 - 19:00****COCKTAIL RECEPTION & POSTER SESSIONS****Room #:** Salons 11-12

# THURSDAY, MARCH 13, 2014

7:30 - 17:00

## REGISTRATION

Meeting Room Foyer (outside Salons 19/20)

7:30 - 8:00

## BREAKFAST & NETWORKING

Room #: Salons 8-10

8:00 - 8:15

## WELCOME ADDRESS

Room # Salon 9

JOHN BROGLY

COSIA

8:20 - 8:50

## PLENARY 1

Room #: Salon 9

## DEMONSTRATION PIT LAKES

JERRY VANDENBERG

GOLDER ASSOCIATES LTD.

This plenary will address knowledge gaps related to oil sands pit lakes that have been identified by researchers and regulators. The creation of field-scale demonstration and experimental water bodies will allow operators regionally to meet approval conditions related to demonstrating the efficacy of pit lakes to reclaim oil sands aquatic ecosystems.

8:55 - 9:25

## PLENARY 2

Room #: Salon 9

## ADVENTURES IN WATER TREATMENT

PRESTON MCEACHERN

TERVITA CORPORATION

This will be a candid review of water treatment issues in oil sands mining and in situ applications, and a structuring of these issues into technology niches. The review will be followed by an assessment of the surprise biota in these niches, their evolution and their potential to solve some of the problems today and establish Darwinian superiority.

9:30 - 10:00

## PLENARY 3

Room #: Salon 9

## BIOFILM TECHNOLOGY FOR BIODEGRADATION OF OIL SANDS TAILINGS

**DR. TONG YU**

UNIVERSITY OF ALBERTA

The overall goal of the research is to develop biofilm technology for biodegradation of recalcitrant organic compounds in oil sands tailings. The specific objectives of this study are to demonstrate there are sufficient microbial activities in mature fine tailings (MFT) that support different microbial metabolic processes; to examine biodegradation of oil sands process-affected water (OSPW) by the microbial processes in batch bioreactors; and to explore the feasibility of using the microorganisms in MFT as seed to develop biofilm to be used in continuously operated bioreactors for treatment of recalcitrant organic compounds in oil sands tailings.

**10:00 - 10:20 NETWORKING BREAK & REFRESHMENTS****Room #:** Meeting Room Foyer**STREAM A: OSPW Characterization****10:20 - 10:50 BREAKOUT 1.A****Room #:** Salon 8**MODELING OF TSS CONCENTRATIONS IN TAILINGS PONDS AND LAKES****DR. DEJIANG LONG**

GOLDER ASSOCIATES LTD.

Golder Associates has conducted a number of studies for modeling Total Suspended Solids (TSS) concentrations in oil sands tailings ponds and pit lakes. These studies involved the application of various hydrodynamic and sediment transport models. This paper presents the findings from these modeling studies and recommendations for further development of a robust and reliable modeling tool that can be applied to all oil sands mines.

**10:55 - 11:25 BREAKOUT 2.A****Room #:** Salon 8**CHARACTERIZATION OF NAPHTHENIC ACIDS REMOVAL FROM OSPW IN A STUDY OF BIOFILM TREATMENT****MD. SHAHINDOR ISLAM**

UNIVERSITY OF ALBERTA

Appropriate technologies for oil sands process-affected water (OSPW) treatment are urgently needed to reduce the need for water from the Athabasca River and to permit the safe release of treated OSPW into the receiving environment. Our previous studies showed that granular activated carbon (GAC) can be successfully utilized in continuous biofilm reactors as absorbents

and biofilm support media for the treatment of OSPW, which significantly enhanced the organic compound removal efficiency in the biofilm reactors. In the present study, mechanism involved in the simultaneous GAC adsorption and biodegradation treatment of OSPW was investigated.

11:30 - 12:00

### BREAKOUT 3.A

Room #: Salon 8

## METHANOGENESIS ALTERS PORE WATER QUALITY IN OIL SANDS TAILINGS

TARIQ SIDDIQUE

UNIVERSITY OF ALBERTA

The slow settling of tailings under natural conditions releases porewater to the surface of tailings as cap water, also known as process-affected water (PAW), which is re-used in the bitumen extraction process. Methanogenesis (microbial metabolism of organic compounds producing CH<sub>4</sub> and CO<sub>2</sub>) in oil sands tailings drives many biogeochemical processes that govern degradation of petroleum hydrocarbons, emission of greenhouse gases, recovery of porewater and consolidation of tailings in ponds. The results revealed that methanogenesis transformed iron (Fe) minerals in the tailings and altered the chemistry of porewater.

## STREAM B: In-Situ Water Challenges

10:20 - 10:50

### BREAKOUT 1.B

Room #: Salon 9

## SAGD ORGANICS AND FOULING MECHANISMS

DR. DAVID PERNITSKY

SUNCOR ENERGY INC.

All companies operating SAGD operations have experienced oil/water separation challenges and fouling issues in produced water coolers (PWC) and OTSGs. Two collaborative efforts have been undertaken by Statoil, Conoco Philips and Suncor in order to provide some of this fundamental knowledge: the sponsorship of an NSERC Industrial Research Chair at the University of Alberta; and the initiation of a COSIA Joint Industry Project (JIP). One of the first steps in understanding these fouling challenges is to understand the nature of the dissolved organic matter (DOM) present in SAGD produced water, and to understand how the DOM varies through each individual water treatment plant and from site to site.

10:55 - 11:25

**BREAKOUT 2.B**

Room #: Salon 9

## OSLI'S ENVIRONMENTAL NET EFFECTS EVALUATION TOOL DEVELOPMENT OF WATER SOURCING ALTERNATIVES

DR. CAROLYN PRESTON

CH2M HILL

In 2011, the Oil Sands Leadership Initiative (OSLI) Water Management Working Group conducted an integrated water management study to determine if regional cooperation could improve water sourcing and disposal economics, while reducing regional net environmental impacts associated with oil sands mining and SAGD water management. Part of this activity involved development of an evaluation methodology and tool for Environmental Net Effects (ENE) of a series of regional water sourcing alternatives. This work formed the basis for the ongoing work by COSIA to develop a complementary water sourcing ENE evaluation tool.

11:30 - 12:00

**BREAKOUT 3.B**

Room #: Salon 9

## CORROSIVITY OF BRACKISH WATER FOR IN-SITU OPERATIONS

TESFAALEM HAILE

ALBERTA INNOVATES - TECHNOLOGY FUTURES

Alberta's oil sands require 2-3 barrels (bbls) of steam (cold produced and/or brackish water equivalent) to produce one barrel of bitumen per day. Therefore, the production of 100,000 bbls of bitumen per day would require a water treatment capacity of about 300,000 bbls per day. Consequently, 90-95% of the produced and brackish water has to be treated for the whole oil sands extraction process to be sustainable. The objective of this work is to evaluate the corrosivity of brackish water to carbon steel under simulated water chemistry seen in oil sands water treatment systems.

12:00 - 13:00

**NETWORKING LUNCH**

Room #: Hall B



## STREAM A: Modeling

13:10 - 13:40

### BREAKOUT 1.A

Room #: Salon 8

## MECHANISTIC MODEL DEVELOPMENT FOR OSPW

DR. MIKE WANG

TOTAL E&P CANADA

Mechanistic modeling to identify and assess ecological risks provides useful insight and will improve management decisions during design, construction, operation and closure phases to reduce environmental impacts from oil sands development. Several models have been used in the past to assess oil sands impacts. However, the prediction capabilities of the models can be improved by incorporating mechanistic and dynamic interactions among natural and anthropogenic stressors, transport and transformation pathways, and impacts on receptors.

13:45 - 14:15

### BREAKOUT 2.A

Room #: Salon 8

## THERMAL WATER CHEMISTRY

PHIL HEATON

MAXXAM ANALYTICS

Enhanced thermal water chemistry data is required to better understand the migration and fate of potential inorganic and organic material that can lead to fouling and corrosion. Even brief plant upsets and excursions that lead to non-ideal water chemistry can result in equipment fouling that can contribute to equipment failure and extended downtime. This will cover best practices for the collection and use of baseline water chemistry with an emphasis on analytical method selection.

14:20 - 14:50

### BREAKOUT 3.A

Room #: Salon 8

## OIL SANDS MINE WATER SALT LOADING MODEL

JERRY VANDENBERG

GOLDER ASSOCIATES LTD.

The objective of this modeling was to determine the most environmentally-appropriate time to release process water from oil sands operations to the river to address salt build-up issues. In this context, environmentally-appropriate refers to the release timing that will minimize peak concentrations in pit lakes and the Athabasca River. Model scenarios were evaluated to determine which of the following two scenarios will lead to lower concentrations in the Athabasca River: accumulating salts in the mine and releasing them through pit lakes at closure, or releasing a portion of treated process water to the river during operations.

14:55 - 15:25

**BREAKOUT 4.A****Room #:** Salon 8

## UNDERSTANDING TAILINGS WATER QUALITY AND ITS SENSITIVITY TO MINING OPERATIONS

**DR. MACOURA KONE**

SUNCOR ENERGY INC.

In this study, some of the factors that control the tailings water quality, in particular the salinity and organics, over time and across ponds are discussed. The sensitivity of recycle water usage in mining operations (pipeline, upgrading, extraction, reclamation, etc.) to specific ions and organics is examined. Chemistry parameters forecasted using a Pond Effluent Water (PEW) Chemistry Model developed in house is presented along with a discussion of chemistry risks and opportunities related to operations.

### STREAM B: In-Situ Steam Generation Case Studies

13:10 - 13:40

**BREAKOUT 1.B****Room #:** Salon 9

## STEAM QUALITY SOFT SENSOR TECHNOLOGY

**BIAO HUANG**

UNIVERSITY OF ALBERTA

Steam quality should be controlled within a tight range to ensure the optimal performance of the OTSG. Unfortunately, neither current online measurement nor lab analysis of steam quality can meet this real-time control purpose, because online measurement is not always accurate or reliable and lab analysis is taken infrequently in a manual manner. Therefore, it is necessary to develop predictive soft sensors to obtain real-time and reliable steam quality measurements.

13:45 - 14:15

**BREAKOUT 2.B****Room #:** Salon 9

## RIFLE TUBES

**ANNIE SUN**

SUNCOR ENERGY INC.

The rifled tube internal surface has a series of rifles or ribs that impart a rotational direction to the fluid flow. Improved water contact on the inside surface prevents overheating and enables impurities within the water to stay in solution. The centrifugal force from the rotation pushes all entrained water to the pipe surface equally around the pipe perimeter; the wall remains wet well above 90% steam quality. One 64.5 MW OTSG at the company's facility has been retrofitted with modified pipes and operated at 90% steam quality for a 8 month trial period. This presentation will review the results from the field testing of the retrofitted unit.

**14:20 - 14:50**    **BREAKOUT 3.B**

**Room #:** Salon 9

## **PUSH THE BOILER TO THE LIMIT – STEAM QUALITY**

**SUSAN SUN**

CENOVUS ENERGY

To challenge the industry practice of steam generation in 75-80% steam quality using once through steam generators with no modification to the boilers.

**14:55 - 15:25**    **BREAKOUT 4.B**

**Room #:** Salon 9

## **BLOWDOWN VAPORIZER**

**KARINA HEITNES HOFSTAD**

STATOIL CANADA LTD.

Thermal recovery methods for producing extra heavy oil or bitumen are water and energy intensive processes. It is well known that using existing commercially proven evaporative based technologies to reduce water use comes at the expense of increases in indirect GHG emissions as well as the inevitable consequence of producing brine or slurry waste streams with increased TDS and TSS levels that require additional resources to manage properly. A technical economic evaluation of utilizing separated water (i.e. OTSG blowdown) from a partially vaporized stream in a secondary vapourizer has been evaluated against other SAGD configurations.

## **STREAM C: Understanding the Athabasca Watershed**

**13:10 - 13:40**    **BREAKOUT 1.C**

**Room #:** Salon 10

## **WATER SUPPLY MANAGEMENT**

**DR. GETU BIFTU**

GOLDER ASSOCIATES LTD.

Climate change is one of the factors that can affect future water supply and water management in the Athabasca River basin. The Cumulative Environmental Management Association (CEMA) completed and forwarded to provincial and federal regulators the Phase 2 WMF recommendation (referred to as Phase 2 Framework Committee (P2FC)) report in February 2010 to address the cumulative effects of water withdrawal and potential climate change on the aquatic resources. The effects of potential future climate scenarios predicted by General Climate Models (GCMs) on stream flows and water supply management for oil sands developments were evaluated using Phase 1 and Phase 2 WMF.

13:45 - 14:15

**BREAKOUT 2.C****Room #:** Salon 10**600 YEARS OF ANNUAL FLOW TO THE ATHABASCA RIVER****DR. DAVE SAUCHYN**

UNIVERSITY OF REGINA

The primary objective of this research project is to reconstruct the annual flow of the Athabasca River using the annual growth of Douglas fir at a network of sites in the headwater region of the river basin and in adjacent watersheds. A second objective is to compare the range of flows inferred from the tree rings to the streamflow variability and extremes recorded in recent decades, and thereby identify extended periods of low annual flow that pre-date and exceed the worst case scenario in the instrumental records.

14:20 - 14:50

**BREAKOUT 3.C****Room #:** Salon 10**NATURAL SALINITY SOURCES IN THE ATHABASCA RIVER****ROBERT PERRIN**

DMT GEOSCIENCES LTD.

Saline Lake, located approximately 50 km north of Fort McMurray is a lake with high levels of naturally occurring salinity. The purpose of this study was to investigate the pathways for salinity at Saline Lake to reach the surface using a combination of airborne magnetics and marine seismic.

15:25 - 15:50

**NETWORKING BREAK & REFRESHMENTS****Room #:** Meeting Room Foyer**STREAM A: Biological Treatment Technologies**

15:50 - 16:20

**BREAKOUT 1.A****Room #:** Salon 8**BIODEGRADATION OF ORGANIC COMPOUNDS IN OSPW****MIA YU**

UNIVERSITY OF ALBERTA

This will investigate the biodegradation of organics within acetic acid amended OSPW with indigenous microorganisms carried by MFT and carriers; and characterize the biodegradation of organic compounds in advanced oxidized OSPW with indigenous microorganisms in MFTs. This will also investigate the feasibility of developing biofilm on the carriers from MFT to treat OSPW in a biofilm reactor.

16:25 - 16:55

## BREAKOUT 2.A

Room #: Salon 8

# TREATMENT OF OSPW USING OZONATION COMBINED WITH FIXED-FILM SYSTEM

CHUNKAI HUANG

UNIVERSITY OF ALBERTA

The main objectives of this study were to investigate for the first time the potential application of a combined ozonation and IFAS reactor processes to treat OSPW; to determine the optimal bioreactor operational conditions; and to obtain a better understanding of the removal mechanisms of the combined system. Floc and biofilm samples from the reactors were characterized in terms of their physiochemical properties, morphological features, and microbial community composition. A better understanding of these systems will be useful for modeling and optimizing the treatment systems.

## STREAM B: Tailings Water Reclamation

15:50 - 16:20

## BREAKOUT 1.B

Room #: Salon 9

# BASE MINE LAKE TOXICITY IDENTIFICATION

DR. JONATHAN MARTIN

UNIVERSITY OF ALBERTA

Large scale OSPW remediation is now underway in end-pit-lakes, the very first of which is Base Mine Lake (BML) was formed in December 2012. The present study is the first step in a fractionation and effect-directed analysis of OSPW from BML, with the preliminary goal being to identify or exclude chemical groups that are responsible for the acute toxicity of OSPW to embryos of fathead minnows. Secondary goals include identification of the most persistent and bioaccumulative chemicals in Base Mine Lake.

16:25 - 16:55

## BREAKOUT 2.B

Room #: Salon 9

# EFFECTS OF TAILINGS REDUCTION OPERATION ON MICROBIAL DIVERSITY

DAMON BROWN

UNIVERSITY OF CALGARY

Suncor has adopted Tailings Reduction Operations (TRO) as a new tailings treatment process. Our objectives were to study the effects of the TRO process on geochemical parameters and microbial diversity in samples of TRO lifts in the laboratory as compared to those of tailings.

The longer-term objectives of this research are to predict geochemical stability and the extent to which the microbial community in TRO reverts to what is present in soil.

## STREAM C: OSPW Analysis and Treatment

15:50 - 16:20

### BREAKOUT 1.C

Room #: Salon 10

## PRINCIPAL COMPONENT ANALYSIS ON THE DATA MINING OF HIGH RESOLUTION DATASETS

YUAN CHEN

UNIVERSITY OF ALBERTA

The main objective of this research was to detect the most significant changes (i.e. decrease, increase, or formation) of organic compounds in OSPW during AOPs treatments by applying (1) analytical chemistry techniques such as High Resolution Mass Spectrometry (HRMS) to detect all the organic compounds present in AOPs-treated samples and (2) statistic tool such as Principal Component Analysis (PCA) to manage HRMS datasets.

16:25 - 16:55

### BREAKOUT 2.C

Room #: Salon 10

## ANOXIC-AEROBIC MEMBRANE BIOREACTORS FOR OIL SANDS PROCESS-AFFECTED WATER TREATMENT

JINKAI XUE

UNIVERSITY OF ALBERTA

The objectives of this research were: to investigate the feasibility of an anoxic-aerobic membrane bioreactor (MBR) system in treating raw and ozonated OSPWs; to optimize the operating conditions of the anoxic-aerobic MBR system treating raw and ozonated OSPWs; and to study the membrane biofouling in MBR reactors.



# DELIVERING ENVIRONMENTAL PERFORMANCE

COSIA is an alliance of oil sands producers focused on accelerating the pace of improvement in environmental performance in Canada's oil sands through collaborative action and innovation. We have developed a series of bold Aspirations to create a shared vision among COSIA members and supporters.

## TAILINGS

We will strive to transform tailings from waste into a resource that speeds land and water reclamation.

## WATER

We will strive to be world leaders in water management, producing Canadian energy with no adverse impact on water.

## LAND

We will strive to be world leaders in land management, restoring the land and preserving biodiversity of plants and animals.

## GREENHOUSE GASES

We will strive to produce our oil with lower greenhouse gas emissions than other sources of oil.

## MONITORING

We will provide a single point of contact on matters relating to oil sands monitoring issues on behalf of COSIA member companies.

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