

COSIA Innovation Opportunity

Mobilizing the world's minds and resources to improve environmental performance.



Innovative Monitoring Technologies which Detect Scaling and Fouling in Existing In Situ Oil Sands Once Through Steam Generators

SOLUTION DESCRIPTION:

COSIA Members are seeking solutions/technologies which improve the ability to monitor their Once Through Steam Generator (OTSG) boiler tubes.

CREATED: NOVEMBER 2024

All project proposals are evaluated and actioned as they are received.

INNOVATION OPPORTUNITY CHAMPION:

COSIA's Water Environment Priority Area (EPA) is championing this Innovation Opportunity.

COSIA's Water EPA is focused on water efficiency and effective monitoring of our energy production

For more information on this COSIA Innovation Opportunity please visit

www.pathwaysalliance.ca/innovation-hub/

SUBMIT YOUR IDEA [HERE](#)

Canada's Oil Sands Innovation Alliance (COSIA) is an alliance of oil sands producers, representing more than 90 percent of oil sands production, focused on collaborative action and innovation in oil sands environmental technology. COSIA Challenges are one way we articulate an actionable innovation need, bringing global innovation capacity to bear on environmental challenges and opportunities in Canada's oil sands.

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WHAT TO SUBMIT TO COSIA

COSIA requires sufficient non-confidential, non-proprietary information to properly evaluate the technology. Some items that will be especially important to present in your submission are:

- Concept and basic unit operations.
- Device accuracy over the requested measurement range and achievable reporting limits.
- Technical justification for the approach (e.g. laboratory batch or continuous experiments; pilot or demo plants; process modeling; literature precedent).
- Describe quantities and qualities of utilities and consumables that are required.
- Energy inputs – quantity and type(s).
- Disposal requirement.
- Device outputs (either analog or digital).
- Capital and operating cost estimates if available based on described capacity targets.
- Basis of cost estimation, including estimation scope, contingency, etc.
- IP status of your proposed technology.
- What operating environment restrictions might your technology face:
 - Explosive atmospheres.
 - Severe weather.
 - Power fluctuation.

FUNDING, FINANCIALS, AND INTELLECTUAL PROPERTY

COSIA Members are committed to identifying emerging technologies and funding the development of the technologies to the point of commercialization, while protecting the Intellectual Property (IP) rights of the owner of the technology.

Successful proposals can receive funding from COSIA members to develop and demonstrate the technology in an oil sands application. Multiple technologies may be funded, at the discretion of the Members.

HOW TO SUBMIT TO COSIA

Submit a summary of your solution using COSIA's Environmental Technology Assessment Portal (E-TAP) Process, available at: ETAP public submission

ETAP Idea Submission Form

Please note: ETAP is a staged submission process. The initial submission requires only a brief description and limited technical information. Upon review by COSIA, additional information may be requested. Instructions for submission are provided on the ETAP site.

All information provided is non-confidential. COSIA will respond to all submissions.

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DETAILED CHALLENGE DESCRIPTION

The COSIA Water Environmental Priority Area Steering Committee, Process Monitoring, and Steam Generation Working Groups invite proposals to improve online monitoring of fouling in their Once Through Steam Generator (OTSG) boiler tubes.

Once Through Steam Generators (OTSGs) are used to generate steam for the in situ oil extraction processes used at their Steam Assisted Gravity Drainage (SAGD) and Cyclical Steam Stimulation (CSS) facilities. The Boiler Feed Water (BFW) used is recycled produced water from the extraction processes, and thus contains impurities. These impurities can foul the steam generators and lead to reduced uptime and unplanned maintenance.

In order to minimize the effect of the impurities, it is critical to monitor the health of the OTSGs. Currently, a combination of process measurements, lab testing, and operation experience is used to monitor these steam generators. These processes take time, and do not provide adequate live health data for the OTSGs, leading to sub optimal performance. The groups would like to learn more about technologies that can be used to compliment these existing monitoring techniques in order to more accurately monitor the OTSGs in order to optimize their operations and effectively schedule maintenance.

Of particular interest are technologies that are:

- Capable of measurement outside of the main furnace
- Acoustic or Ultrasonic based measurement.
- Capable of being installed on the convection tubes in the boilers.
 - Radiant tubes are of lesser interest.

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DESIRED SOLUTION CHARACTERISTICS

COSIA is interested in physical enhancements. Devices relying on soft sensors or manipulation of data already collected are of less interest.

The successful technology will:

- Provide near real time data to operations and engineering regarding fouling in the boiler tubes.
- Detect tube wall scale/foulant thickness and/or tube temperature.
- Method may be direct or indirectly on the boiler tubes. If direct, it must be able to withstand the temperatures present in the furnace section of the OTSGs.

The following characteristics are desirable:

- Minimal calibration and maintenance
- Robust design (i.e. designed for the harsh operating environment of an oil and gas production facility).
- Easy to retrofit in existing facilities.

Process Design considerations

- Assume CSA general purpose electrical area classification. Indicate option to install in an electrically classified (e.g. explosion proof) area.
- Assume device will be installed indoors (building temperature range: 5-40°C)
 - Physical sensors may need to be exposed to process conditions such as high temperature produced water, or inside of boiler furnaces.
- Prior to sealed installation, device will require an Alberta CRN (Canadian Registration Number) or an exemption (if applicable, e.g. low pressure)

For the technology proposal, COSIA would like to know:

- Mode of action.
- Example use cases, industrial preferred.
- Estimated operational and capital costs.
- Operational temperature and pressure ranges.
- Viability for retrofitting.
- Technology readiness level.
- Consumables associated with the technology.
- Installation requirements for sensor and end device.

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BACKGROUND

The most common recovery process employed for producing oil from deep oil sands reservoirs (geological formations) is known as Steam Assisted Gravity Drainage (SAGD). In this process, steam is generated at a Central Processing Facility (CPF), transported to well pads, and injected into a horizontal well bore within the formation. The heat supplied by the steam warms the heavy oil in the reservoir, allowing it to flow via gravity into a second well bore that captures the oil water mixture and produces it to the surface with the hydrocarbon at temperatures of over 180°C, and high levels of impurities, including salts, metals, silica and organic compounds. Because of the large water requirements, recycling and reusing the produced water recovered are mandatory, both to protect the environment and to minimize costs.

APPROACHES NOT OF INTEREST

The following approaches are not of interest:

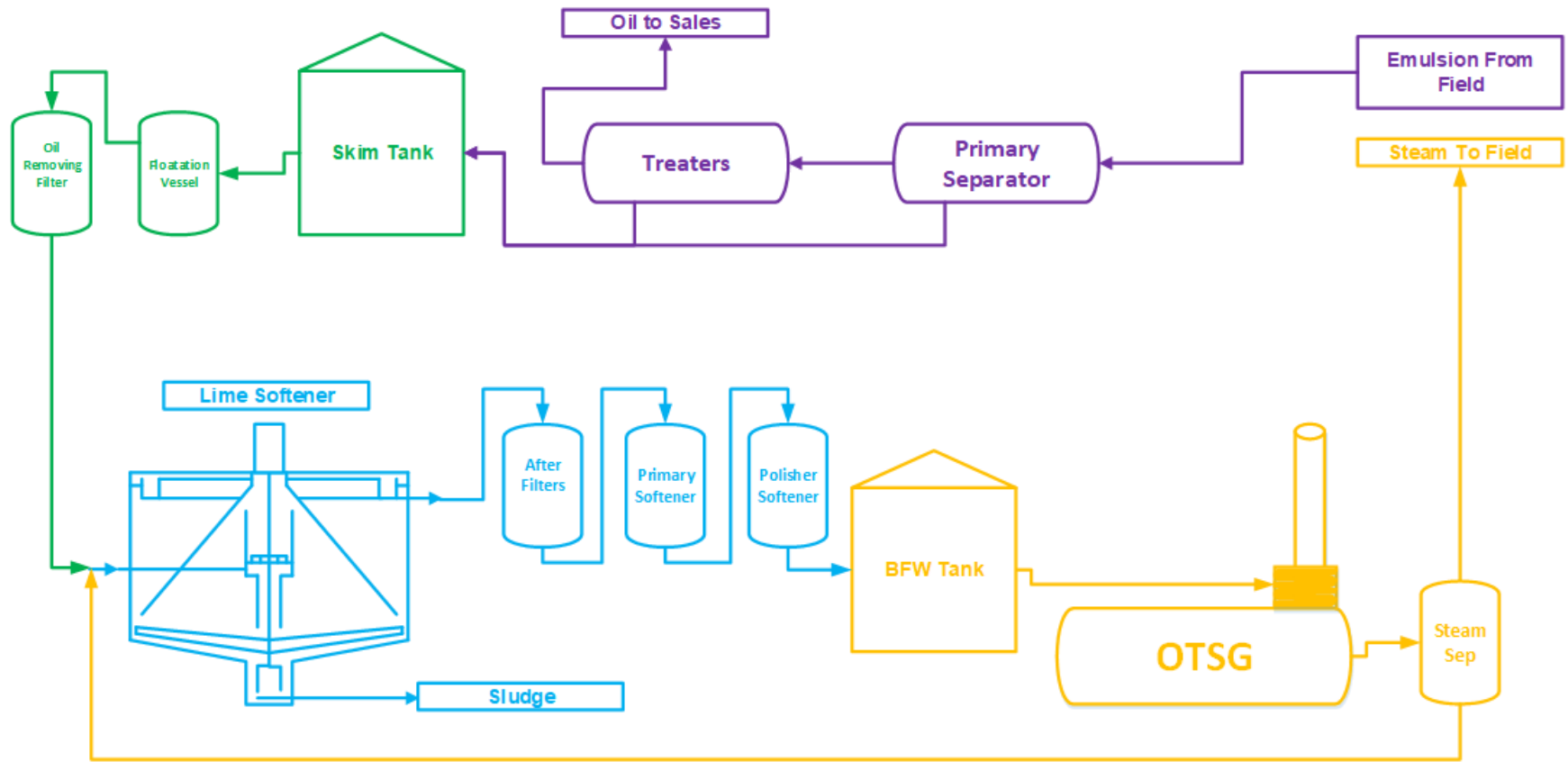
- Approaches that have not demonstrated proof of concept.
- Approaches required significant reengineering or modification of the OTSGs.

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Typical Bitumen Production Process Schematic



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Typical Once Through Steam Generator Schematic

