Direct Hot Water Production for an Oil Sands Mining & Extraction Process

SOLUTION DESCRIPTION:
Replace conventional hot water production approaches, which use economizers or low grade steam, in either new or existing mining operations.

CHALLENGE SPONSOR:
COSIA’s GHG EPA is sponsoring this challenge.
Our aspiration is to produce our oil with lower greenhouse gas emissions than other sources of oil.

CREATED: October 1st, 2015
All projects are evaluated and actioned as they are received.

Canada’s Oil Sands Innovation Alliance (COSIA) accelerates the pace of environmental performance improvement in Canada’s oil sands through collaborative action and innovation. COSIA Members represent more than 90 per cent of oil sands production. We bring together innovators and leading thinkers from industry, government, academia and the wider public to identify and advance new transformative technologies. Challenges are one way we articulate an actionable innovation need, bringing global innovation capacity to bear on global environmental challenges.

For more information on this COSIA Challenge please visit www.cosia.ca
WHAT TO SUBMIT TO COSIA

COSIA requires sufficient non-confidential, nonproprietary information to properly evaluate the technology.

Some items that will be especially important to present in your submission are:

- Concept and basic unit operations
- 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)
- Capital and operating cost estimates if available based on described capacity targets
- 3rd party verified comparison of your proposed technology against an MEA baseline. 3rd party verifiers should be reputable, independent engineering companies if possible
- 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 fluctuations

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


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.
DETAILED SOLUTION DESCRIPTION

The COSIA Greenhouse Gas Environmental Priority Area has identified Direct Hot Water Production as a technology which could improve the environmental performance of mineable oil sands. New technology is sought which could replace conventional hot water production approaches, which use economizers or low grade steam, in either new or existing mining operations.

The successful technology will:

• Directly produce commercial scale (5,000 – 10,000 m³/hr) of 40-90 °C hot water without using existing (or new) steam resources for heat exchange purposes;
• Target approximately a 25% reduction (for a single solution, or cumulatively through multiple solutions) in energy requirements, or CO₂ emissions, for hot water production; and
• Be amenable to retrofiting of existing operations.

Technologies at all stages of technical maturity are of interest.

BACKGROUND

Oil sands mining and extraction processes require large amounts of hot water in two separate streams: In the 40-60 °C range and the 70-90°C range. Currently this hot water is produced indirectly through contact with steam produced in natural gas fired boilers. Hot water volumes will differ between operations, but generally would be in the range of 5,000 – 10,000 m³/hr in total. Current operations use 900 -1,300 GJ/hr of energy to produce hot water in naphthenic-based froth treatment operations; and 1,000-1,900 GJ/hr for paraffinic froth treatment dependent on season and ore grade.

Heat integration and efficient use of recycle water can significantly improve overall energy efficiency of hot water generation. While use of non-conventional energy sources (like deep geothermal) or novel concepts for hot water generation has been studied, no clear technology options have emerged.

APPROACHES NOT OF INTEREST

The following approaches are currently considered to be lower priority:

• Solar hot water generation (limited days of sunshine, given northern latitudes); and
• Deep geothermal heating.

ADDITIONAL INFORMATION

The following link provides information on COSIA’s Mine Reference Facility, which includes energy and material flow diagrams for a reference oil sands mine:

ds%20Mine%20Ref.pdf
This is a generic and hypothetical mine and extraction facility developed by COSIA. While representative, it is not based on any one facility. Recovery and solvent loss is based on Alberta Energy Regulator requirements.
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