

CO2CEPTS: An Innovative cloud-based tool for evaluation of new technologies in SAGD facilities

New technologies are continuously being developed to improve the economic and environmental performance of Steam Assisted Gravity Drainage (SAGD) Central Processing Facilities (CPF) in Oil Sands extraction. Some have promise; many are too expensive or impractical. The important question facing producers and technology providers alike is: how to evaluate these new technologies in an efficient manner to identify the best ones and screen the “not so good” options?

Traditionally, process simulation tools are used to evaluate the effect of introducing new technologies on the economics and environmental footprint of the process. However, these process simulation tools are not the best for this purpose given that:

- No universal model is accepted by all producers and technology vendors.
- Models are too detailed for screening technologies.
 - TBP of the bitumen, valves, pumps, coolers and heaters are not necessarily required for high-level evaluation of technologies.
- Economic and environmental metrics of the process are not integrated into the simulator and should be calculated in separate spreadsheets.
 - The assumptions and the parameters for evaluating such metrics are not clearly stated and are different across different organizations.
- All the SAGD process units cannot be modeled in the process simulation tools and would require custom process units.
- Models would require expert users who need to ensure the adjusts and the recycles typically found in SAGD simulations are properly converged.
- All the potential users for the tool would require a valid license, which can be expensive to obtain.

In order to address these issues and establish a common ground for evaluation of new technologies in a SAGD CPF, Canada's Oil Sands Innovation Alliance (COSIA) developed a series of static excel templates which provided the heat and material balance for the most common configurations of a SAGD CPF. The developed static templates provided a common ground for the evaluation of technologies, however it had many shortcomings especially the fact that the templates were not interactive and users were not able to modify the predefined specifications or configurations.

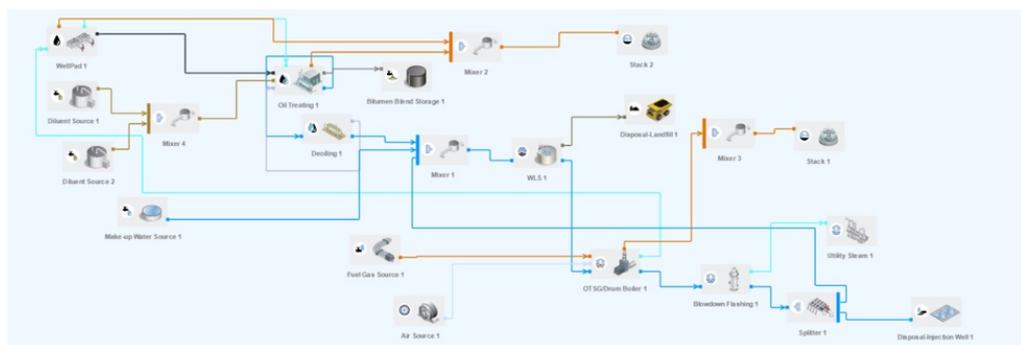
To extend the functionality of the static templates, COSIA contracted Process Ecology to develop

CO2CEPTS. CO2CEPTS is a web-based process simulator for performing mass and energy balances and perform economic evaluations for SAGD plants at the block-flow diagram level. CO2CEPTS has the following features which make it superior to process simulation tools for evaluation of technologies:

- Delivered via web-browser; therefore no installation required.
- Fast and accurate. All the parameters in CO2CEPTS are initialized to default values which are based on feedback from Joint Industry Partner (JIP) Industry members. Users can override the default numbers.
- Supports the efficient evaluation of greenhouse gas emissions reduction technologies for CPF.
- Based on high-level engineering calculations, users can quickly evaluate the environmental and economic impacts of technology changes.
- Integrates cost correlations and GHG calculations.
- Includes detailed economic analysis of the CPF to calculate important financial metrics such as Cash Flow, Net Present Value (NPV), and Internal Rate of Return (IRR).
- Includes validation to guide the user in building the CPF flowsheet.

The process blocks in CO2CEPTS are divided into the following categories:

- **Sources:** Source blocks represent material sources into the flowsheet (Wellpad, Diluent, Make-up Water, Combustion Air, and Fuel Gas).
- **Sinks:** There is a set of blocks that represent material “sinks” (Landfill, Injection Well, Product Storage, Stack (ambient), and Utility Steam).
- **Process Blocks:** These include the set of process blocks usually found in SAGD CPFs (Oil Treating, Evaporation, Blowdown Flashing, Deoiling, Lime Softening, and Glycol System).
- **Steam Generation:** Steam generation options are separately displayed in the user interface. These include options for OTSG/Drum Boiler or cogeneration as Gas Turbine/HRSG.
- **GHG Control:** These blocks involve the technologies of interest to reduce GHG emissions from in situ oil sands production. In the current version these blocks include Flue Gas Condensation, CO2 capture, CO2 Compression, CO2 sequestration, and Air Separation Unit (to model oxyfuel options).
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The software tool is available through the portal www.co2cepts.com and is accessible for members and associate members of COSIA.

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