ALBERTA INNOVATES

CLEAN RESOURCES

ADVANCED HYDROCARBONS

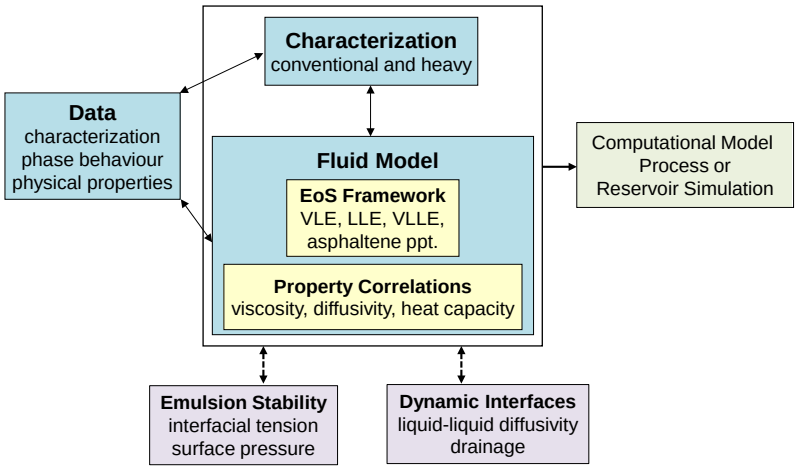
INNOVATIVE HYDROCARBON PRODUCTS – PARTIAL UPGRADING

FUNDING DETAILS

Industry Research Program in Heavy Oil Properties and Processing

The Industrial Research Program in Heavy Oil Properties and Processing provides data and models necessary to simulate the phase behaviour and physical properties of heavy oil and bitumen processes. The aim is to enable the development of *in situ* and surface technologies including solvent assisted heavy oil recovery, visbreaking, partial deasphalting, and emulsion treatment.

The direct outcomes are new apparatus/procedures, data, correlations, models, and methodologies. Indirect outcomes are more efficient processes with lower GHG emissions. The program will also train 8 graduate students for industrial and/or academic engineering positions in the heavy oil area.



RECIPIENT:
University of Calgary - Dr. Harvey Yarranton

PARTNERS:
NSERC, Suncor Energy, CNRL, VMG-Schlumberger

TOTAL BUDGET:
$2,000,000

AI FUNDING:
$250,000

PROJECT DATES:
MAR 2020 – FEB 2025

PROJECT TRL:
Start: 1-3
End: 3

APPLICATION

The proposed research is intended to de-risk solvent-based technologies such as steam-solvent *in situ* recovery processes and partial upgrading. The end users are oil and gas operators including sponsors (CNRL and Suncor) and other operators such as Cenovus, Husky, Imperial Oil, and MEG. Simulation plays a key role in the design of these processes hence additional end users are simulation software providers including a sponsor (VMG-Schlumberger) and others such as Aspen-HYSYS and CMG.

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PROJECT GOALS

- The key goals of the project are to provide data and develop models and correlations in the following areas:
  - The phase behavior of heavy oil, solvent, and steam systems
    - non-condensable solvents
    - condensable solvents
  - Properties of products from combined visbreaking and deasphalting processes
    - stability versus asphaltene precipitation
    - density and viscosity
  - The fundamentals of gravity drainage processes in porous media at reservoir conditions
  - Oil sands water-in-oil emulsion stability

BENEFITS TO ALBERTA

- The potential economic benefits for the industry after 10 years with no discounting are (share of contribution attributed to HOPP program is in brackets):
  - Avoidance of a failed in situ project: $250 million ($3 million)
  - Additional 50,000 bbl/d of capacity: $5700 million ($57 million)
  - Reduced in situ operating cost: $1200 million ($12 million)
  - Improved upgrader design: $700 million ($7 million)
  - De-risking upgraded bitumen: $2400 million ($24 million)
- In addition, the potential GHG reduction versus thermal methods from the in situ activities is 2100 metric tonnes per day (21 t/d attributed to HOPP). The potential reduction from improved upgrading is 910 t/d (9.1 t/d attributed to HOPP).

20 Publications

7 Students Trained

2 Project Jobs

1 Future Job

8 kT/yr Future GHGs Reduced

CURRENT STATUS

APRIL 2020

The project started in March 2020. Data collection has started on the phase behavior of heavy oil and non-condensable gases such as methane. Data collection has also started for a visbroken partially deasphalted bitumen. Four new graduate students were hired but due to the coronavirus outbreak have not been allowed to come to Canada and start their projects.