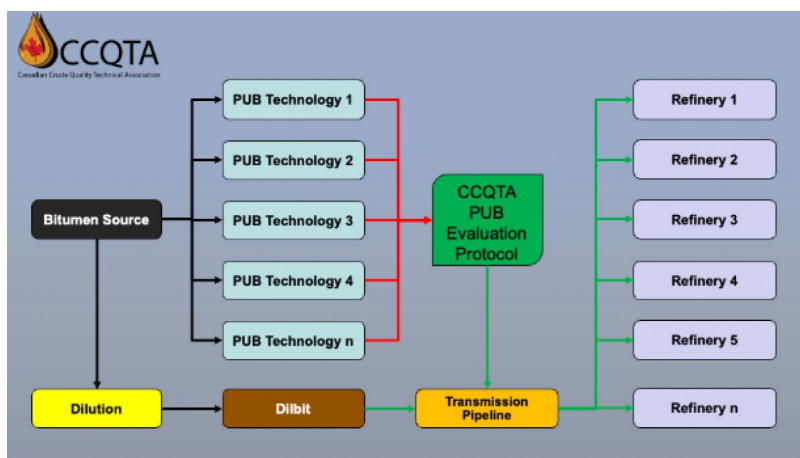


Evaluation of Physical and Chemical Properties Impacting Partially Upgraded Bitumen (PUB) for Transportability and Processability

This project was initiated to evaluate PUB materials for risks to transportation and refinery processes. The composition of PUB materials is different from other oil sands products in their content of heavy components that have been altered by reactions at over 380°C. Diluted bitumen does not undergo such high-temperature treatment, and in synthetic crude oils these components have been removed. The project is focused on developing standardized test protocols to allow comparison of PUB materials produced via different technologies/conditions. Through multiple surveys of refiners, a list of potential refinery issues and their associated priority has been developed.

**RECIPIENT:**

**Canadian Crude
Quality Technical
Association**

**TOTAL BUDGET:**

\$185,950

**PROJECT DATES:**

**SEP 2023 –
MAY 2025**

**AI FUNDING:**

\$92,975

**PROJECT TRL:**

**Start: 8
End: 8**

APPLICATION

The development of a standardized testing and evaluation protocol for PUB material will allow any refiners (North America and/or internationally) to evaluate the risk of varying PUB technologies to their operations considering using PUB in their crude slate. The availability of these tests, and the results of this study, will increase the number of refineries willing to buy Alberta PUB and reduce potential price discounts by eliminating unknown risks to refinery operation.

ALBERTA INNOVATES CLEAN ENERGY

ADVANCED HYDROCARBONS PARTIAL UPGRADING

PROJECT GOALS

- The goal of the project is improved market access for PUB by de-risking the processing of PUBs at the refinery. Providing a comparative test protocol allowing refiners to assess risk will provide a roadmap for new PUB technologies to gain market access.
- The commercialization of partial upgrading of bitumen in Alberta supports economic diversification by improving the product value of our bitumen resource. New commercial opportunities will be realized as additional facilities will be built alongside existing in-situ facilities and near existing upgraders and refineries.
- Improved market access will be achieved by eliminating the import and export of diluent.

BENEFITS TO ALBERTA

- Significant job creation opportunities will occur with commercial implementation of partial upgrading. A 2016 study by Fellows et al. at the School of Public Policy at University of Calgary showed that a single commercial partial upgrading plant with a capacity of 100,000-barrel-a-day would give an average annual increase to Alberta's GDP of \$505 million, and as many as 179,000 person-years of employment created (assuming a 40.5-year operating period).
- Broader adoption of partial upgrading technologies would give much larger benefits than the first plant.



1 Publication



**1 Practice
Informed**



**10 Collaborating
Organizations**



**4 End Users
Participating**

CURRENT STATUS

MAY 2025

The full test program was completed on four partially upgraded bitumen (PUB) samples and three reference crude oils. PUB samples gave slightly higher fouling in standard tests than reference heavy crudes. Blends of PUB and heavy oil gave fouling that was in between the two crude oils by themselves. Emulsion-forming tendency was comparable to other bitumen blends. Apart from the expected sulfur compounds, no significant migration of other species from the residue into the distillates was detected.