



## Partial Upgrading: Capturing More Crude Oil Value for Producers

Partial oil upgrading modifies heavy oil and bitumen so that it flows through pipelines with reduced or no diluent addition and has a higher value for producers.

To meet pipeline specifications for oil density and viscosity, heavy oil producers must presently add diluents to create a blend. The process of partial upgrading involves upgrading heavy oil and bitumen with the following goals:

- Lowering the oil's viscosity to the point where it can be transported by pipeline with less (or no) diluent addition
- Improving density and reducing sulfur, nitrogen and trace metal content, as well as the average molecular weight of the crude oil

This creates a higher value product for producers and frees up pipeline capacity, without the need to build complex and expensive upgraders.

Partial upgrading technology development has been conducted at SRC for over 35 years—surpassing many other Canadian research and technology organizations. We've tested many unique approaches,

funded primarily by heavy oil producers seeking a feasible technology path, and more recently, by small and medium-sized enterprises that engage us for piloting and demonstration-scale validation activities.

Since 1982, upgrading research has been conducted at SRC using a number of innovative concepts using:

- Multilayer fixed bed hydrocracking
- Low-pressure processes using coal-based additives
- Novel solvents
- Nanocatalysts for bitumen
- Supercritical water
- Low-residence time plasma
- Ionic liquids, particularly at low temperature
- Thermal and chemical approaches
- Electromechanical methods
- Mild hydrocracking

### **SRC experts provide the following partial upgrading services to oil producers and partial upgrading technology developers:**

- Process development
- Process optimization
  - Economics
  - Energy
  - Emissions
- Technology development and validation
  - Laboratory
  - Pilot
  - Field demonstration
- Real-world field testing support using mobile facilities
- Technology techno-economic assessments and scoping studies

### **How can SRC assist industry in increasing oil revenues in the current market?**

Research and technology development for partial upgrading is progressing towards commercial viability. SRC's expertise can be applied to develop a variety of novel, cost-effective technology solutions to improve one or more oil characteristics without the expense of upgrading to synthetic crude.

- Partial viscosity reduction decreases the amount of diluent required to meet pipeline specifications, cutting costs and adding value to the final product.
- De-asphalting is the process of removing the asphalt fraction from heavy crude oil. This reduces the downstream refinery's need to upgrade the lowest quality fraction while reducing density and viscosity.
- Novel catalysts and processes are being developed that may improve the hydrogen-to-carbon ratio of the crude, upgrading it without using a refinery hydrotreater unit.



### **SRC Overview**

SRC conducts applied research, development, design, testing, piloting, scale-up, demonstration and technology commercialization for the mining, minerals, energy, biotechnology and agriculture sectors, and the environmental considerations that are important across each.

We help clients solve technology problems, make improvements, seize opportunities, maintain competitiveness, increase productivity and develop new markets. Partial upgrading is a key offering that adds value to SRC's suite of services for producers and technology providers.