Remaining competitive in a low carbon economy: direct decarbonization of oil

June 14, 2021 6:47 AM BOE Report Staff

20,000 bpd commercial SELEX-Asp facility (Well Resources)

The COVID-19 pandemic has allowed governments from around the world to hit the 'reset' button and incorporate aggressive green initiatives as part of their economic recovery plans. In addition, civil society and investment communities are increasingly calling on corporations to prioritize environmental, social, and governance factors in their day-to-day operations.

To combat climate change, governments and corporations are implementing decarbonization strategies with the ultimate goal of achieving carbon neutrality by 2050. In Canada, the recently updated $15-billion climate action plan aims to reduce greenhouse gas emissions to 32-40% below 2005 levels by 2030. A cornerstone of that plan includes revising the price of carbon: the current federally mandated carbon price of $40/tonne will increase by $10/tonne until 2022, and then by $15/tonne per year starting in 2023, rising

to $170/tonne in 2030. Further, pending clean fuel regulations and a proposed greenhouse gas offset credit system are intended to incentivize the industry to develop alternative energy production pathways that reduce atmospheric carbon.

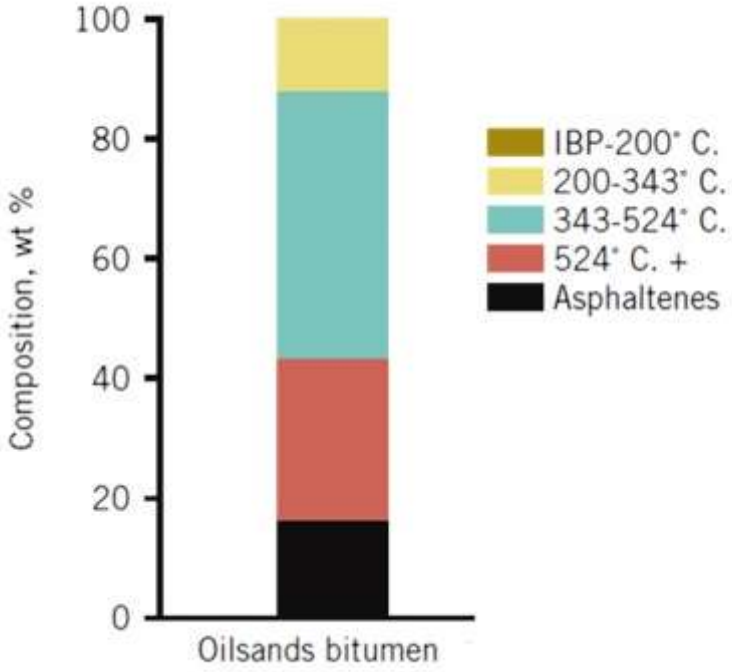
TECHNOLOGY IS THE PATH FORWARD

New technology adoption will be crucial for achieving Canada's long-term climate action targets. Technologies that allow users to tackle carbon at the source are promising because they provide immediate carbon cost savings in addition to cascading benefits throughout the lifecycle of a fuel.

The Selective Extraction of Asphaltenes (SELEX-Asp) technology is a simple and proven solvent-based separation process for directly removing carbon from petroleum feedstocks. Based on the decaffeination process, SELEX-Asp allows a user to selectively remove undesirable, carbonaceous asphaltene materials in a natural and granular form. The granular asphaltenes pictured below are stable, safe to handle, and can be stored as fixed carbon. Meanwhile, the decarbonized, deasphalted oil produced from SELEX-Asp is a premium, upgraded refinery feedstock.

CASE STUDY: TREATING BITUMEN WITH SELEX-ASP

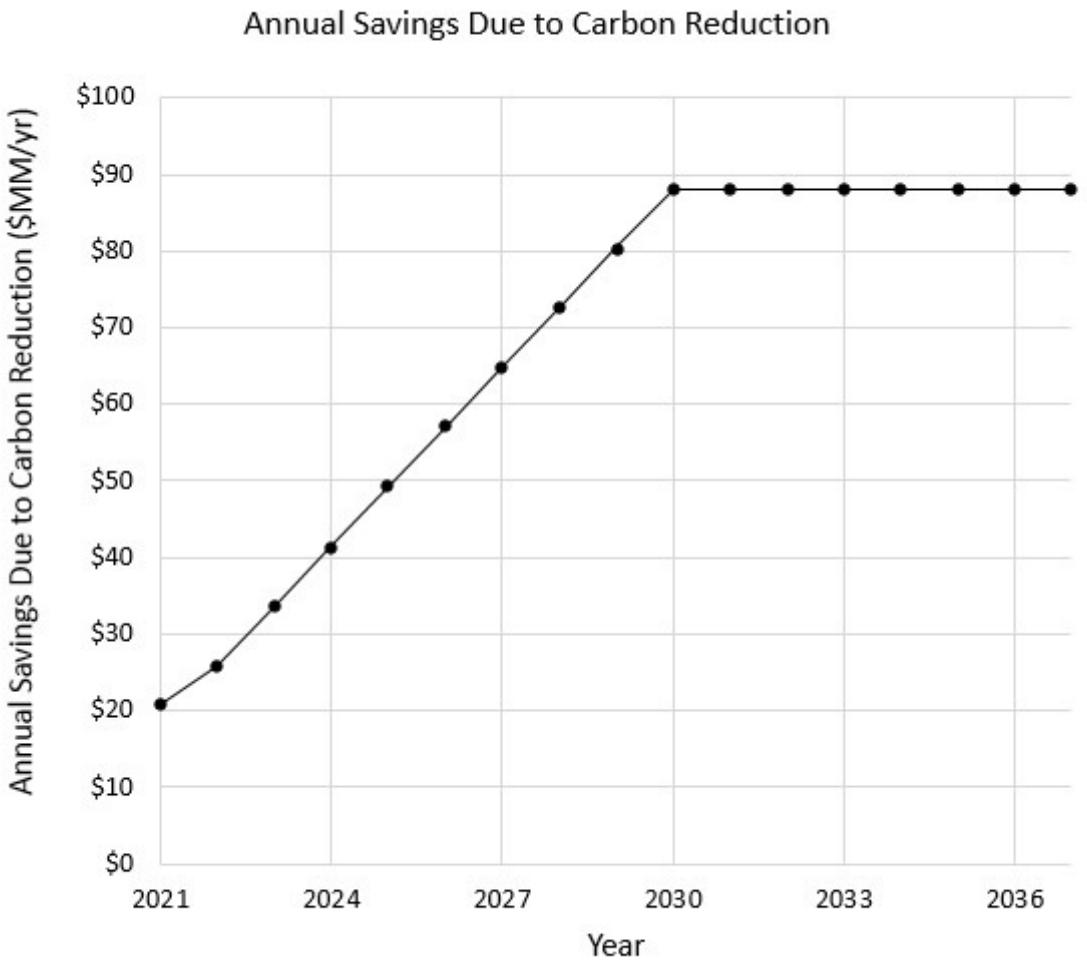
Treating oilsands bitumen with SELEX-Asp presents a large-scale decarbonization opportunity. In Alberta, oilsands production accounts for 85% of total crude oil production, and bitumen is comprised of 15-18% asphaltenes by weight.



A 10,000 bpd SELEX-Asp unit was considered for treating oilsands bitumen-derived residue – equivalent to 28,000 bpd of dilbit. The following table summarizes the carbon removal opportunity for the project:

	Unit	Value
Asphaltene removal	t/d	474.3
Carbon removal	t/d	387.6
CO_2 equivalent	t/d	1,420.1
Annual CO_2 emissions reduction	t/yr	518,348.7

When the federally mandated cost of carbon is considered, the SELEX-Asp project presents an attractive environmental investment opportunity, as shown in the following figure:



ADDED BENEFITS

In addition to the significant savings due to carbon reduction, SELEX-Asp provides the following benefits:

- Improve transportation efficiency: selective asphaltene removal significantly improves the quality of the remaining decarbonized oil by providing a 5-7° API uplift. During pipeline transportation, diluent requirements can be reduced by as much as 60%. When both carbon removal and diluent reductions are considered, up to 30% additional capacity can be liberated in the existing pipeline infrastructure.
- Improve processing efficiency: asphaltene-free decarbonized oil can be used in conventional refinery processes, bypassing the requirement for costly and energy-intensive units such as cokers or ebullated bed hydrocrackers. Bypassing these units lowers processing costs and allows for the reduction or elimination of refinery waste streams, such as petroleum coke.
- Contaminant removal: contaminants such as sulfur, nickel, and vanadium are concentrated in the asphaltene fraction and are non-leachable. Decarbonized oil can be subjected to lower intensity

decontamination processes, which significantly reduces a refiner's catalyst and hydrogen consumption.
- Expand the market for heavy oil: the current practice is to process bitumen only in select refineries fitted with specialized equipment to handle asphaltene-rich feeds. Decarbonized oil becomes a generic feedstock that can be processed in conventional, low complexity refineries, thereby expanding the market opportunity for heavy oil and improving the commodity pricing.

TECHNOLOGY FEATURES

- Maximize liquid yield from petroleum residue
- Low energy intensity process
- Carbon steel processing equipment
- Low solvent requirement utilizing a readily available light paraffin solvent
- Customizable asphaltene grain size
- TRL 9 technology, largest commercial unit to date: 20,000 bpd

ABOUT WELL RESOURCES

Well Resources is an Alberta-based technology company with local offices in Calgary and Edmonton. Its areas of focus are in the energy and life sciences sectors, where Well Resources develops and licenses green technologies that promote effective resource utilization. Well Resources is the worldwide technology licensor for the SELEX-Asp process.

Interested in learning more? Visit www.wellresources.ca or reach out to an expert at info@wellresources.ca.