

# CLEAN RESOURCES

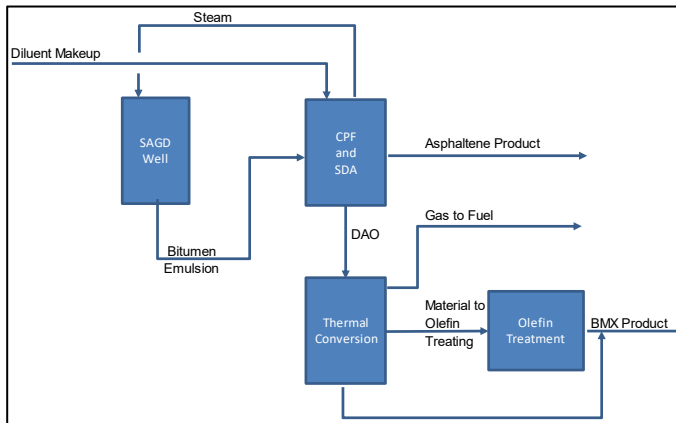
## INNOVATIVE HYDROCARBON PRODUCTS

### BITUMEN PARTIAL UPGRADING

## FUNDING DETAILS

## BituMax – CNOOC’s Partial Upgrading Technology

Partial upgrading can maximize the benefits of bitumen commercialization. CNOOC’s partial upgrader includes three distinct processing steps: 1) Partial oil/water separation followed by (paraffinic) solvent deasphalting of the water-in-oil emulsion and asphaltenes-water slurry processing; 2) High-conversion thermal cracking designed to achieve viscosity and gravity specifications without the need for more expensive processes such as delayed coking or residue hydrocracking; 3) Olefin-aromatic alkylation that reduces olefins without employing conventional hydrotreating. BituMax integrates these various technologies in a unique manner while minimizing investment, minimizing operating costs, improving overall yield and quality of the upgraded oil, minimizing GHG emissions and eliminating hydrogen use.



CNOOC’s BituMax partial upgrading technology - process schematic



**RECIPIENT:**  
CNOOC Petroleum  
North America



**PARTNERS:**  
Canmet ENERGY  
(NRCan) University  
of Alberta



**TOTAL BUDGET:**  
\$4,500,000



**AI FUNDING:**  
\$1,400,000



**PROJECT DATES:**  
NOV 2016 –  
MAR 2023



**PROJECT TRL:**  
Start: 3  
End: 6

## APPLICATION

CNOOC’s BituMax process is a simplified upgrader with the most expensive parts removed - no hydrogen generation or hydrotreating and no conventional bottoms processing. In a preferred case, the process is integrated with the Central Processing Facility (i.e. SAGD CPF), resulting in significant cost reduction. With the combined effect of diluent cost avoidance, reduced transportation costs, and improved value of the final product versus dilbit, BituMax can greatly improve the economics for oil sands projects.



ALBERTA INNOVATES

# CLEAN RESOURCES

## INNOVATIVE HYDROCARBON PRODUCTS

### BITUMEN PARTIAL UPGRADING

### PROJECT GOALS

- Investigate certain technical aspects of BituMax in detail by testing individual sub-components on a barrel-per-day scale in the laboratory before proceeding to the engineering design of a demonstration facility.
- Consolidate CNOOC’s previous work in the area through the conduction of pilot plant work at a larger scale, which would provide tools for decision-making and directing the next stage of the technology towards the development of a commercial application.

### BENEFITS TO ALBERTA

The University of Calgary conducted a Public-Interest Benefit Evaluation of Partial Upgrading Technology in 2017, its findings were:

- A 100,000 BBL/day partial upgrader facility in Alberta, over a 48 years project, would generate a total of 140,080 person-years of direct and indirect jobs
- Additionally, this same facility would be able to increase Alberta’s GDP up to \$ 66 billion if considering the indirect and induced economic effects.



**1 New  
Product/Service**



**20 Students  
Trained**



**10-15 Project  
Jobs**



**400-500 Future  
Jobs**



**500 kT/yr Future  
GHGs Reduced**

### CURRENT STATUS

#### MAR 2023

CNOOC, in partnership with AI and NRCAN, intended to advance its BituMax Partial Upgrading technology a step closer to demonstration readiness. During this project, two of the three main components of BituMax were tested in a continuous pilot plant operation, under a wide range of operational conditions. The results from these tests aimed to demonstrate that these units can achieve product specification while operating steadily and continuously. The Final Public Report will be available on Oct. 16, 2024.