

NSERC Investments

# Oil Sands and Heavy Oil



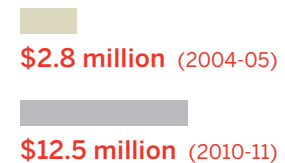
## \$12.5 million

NSERC Investments in Oil Sands and Heavy Oil (2010-11)

## \$1 billion

Government of Canada Investments through NSERC (2010-11)

NSERC  
Investments in  
Oil Sands and Heavy Oil



The Natural Sciences and Engineering Research Council of Canada (NSERC) is a federal agency that helps make Canada a country of discoverers and innovators for all Canadians. NSERC maximizes the value of the Government of Canada's investments in research by promoting **research-based innovation**, university-industry partnerships and the **training of people** with the scientific knowledge and business skill set to create wealth from **new discoveries in science and engineering**.

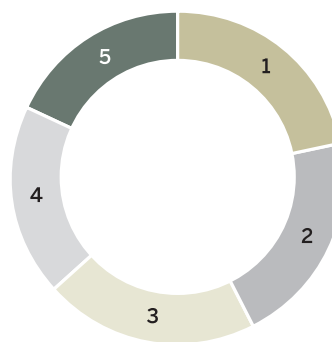
Canada's oil sands are one of the world's largest accessible reserves of hydrocarbon fuel-energy. Bringing these resources into large-scale production has been one of the great achievements of Canadian innovation. Increasing their value now depends on making the mining and refining as efficient and green as possible. For this reason, the Government of Canada has made research on the oil sands a strategic national priority.

## \$816.6 million

NSERC Investments in all Priority Areas of Canada's S&T Strategy (2010-11)

### Breakdown of Investments

- 1 | Information and Communications Technologies  
22%
- 2 | Manufacturing  
21%
- 3 | Health and Related Life Sciences and Technologies  
21%
- 4 | Environmental Sciences and Technologies  
18%
- 5 | Natural Resources and Energy  
18%



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# Oil Sands and Heavy Oil



## Impact and Investments

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### Oil Sands Research — an Albertan and Canadian Priority

Alberta's universities are a major source of innovation for the province's burgeoning multi-billion dollar oil sands industry. They have contributed new technologies that improve the industry's process efficiencies and reduce its environmental footprint.

Many of Alberta's leading university experts in oil sands maintain active partnerships with the industry through NSERC's Industrial Research Chairs. Supported by approximately 50 companies, 13 NSERC Chairs focus on virtually every facet of the industry's development, from mining to land reclamation. The Chairs have trained hundreds of highly skilled postgraduate students in a wide array of fields, including aqueous and non-aqueous bitumen extraction, upgrading, multi-phase pipeline transport, separation technologies, petroleum microbiology, petroleum thermodynamics, power generation, process control and construction engineering. Last year, industry partners contributed about **\$4 million** to Chair activities, with NSERC supplying **\$3.2 million**. The top industrial sponsors included Syncrude Canada Ltd., Suncor Energy Inc., Imperial Oil Limited and Shell Canada.

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### Using Oil Sands and Waste to Create Clean Energy

**Catalysts — substances that speed up chemical reactions — could help get more oil from Alberta's oil sands and create a new source of clean energy.**

Much of the oil in the oil sands is too deep to mine. As Canada Research Chair in Hydrogen and Catalysis, University of Calgary chemical engineer Josephine Hill is working to develop new technologies to access and use these natural resources in an environmentally responsible manner. She is investigating ways that catalysts could refine the raw resource by offering a source of cost-effective, environmentally friendly hydrogen. In a separate project, she is leading a research team that will explore how natural catalysts in dead trees could be used to improve gasification — a promising source of clean energy. NSERC and industrial partners Nexterra Energy Corporation and Process Simulations Ltd. are investing **\$632,300** in the project. As well, NSERC will contribute **\$650,000** over five years to Dr. Hill's Chair and Discovery Grant research programs.

**127**

NSERC-funded Professors

**42**

Industrial Partners

**\$5.5 million**

Industrial Contributions

**316**

NSERC Awards to Students and Fellows

**14**

NSERC-supported Research Chairs

# Oil Sands and Heavy Oil



## After the Oil Sands Mining Ends

In oil sands surface mining, soil and subsoil are stripped off and set aside, often for a decade or more. When the mining ends and the covering is restored, so much time has elapsed that the soil's natural capacity to support trees is exhausted.

Restoring that life-giving capacity and bringing back the forest are the goals of University of Alberta forest ecologist Simon Landhäusser who, with support from NSERC and four energy and oil sands partners, is seeking the best approaches to restoring a natural system. Landhäusser's Industrial Research Chair initially focusses on a natural front-runner in forest regrowth, the trembling aspen, because many forest plant and animal species need continuous tree cover to establish themselves and thrive. A fast-growing native of the boreal forest, the aspen has the potential to promote the rapid development of a self-sustaining closed forest canopy that can support other plants and animals. The researchers will identify the most desirable seedling stock, along with the best site, growing conditions and planting techniques. NSERC is investing more than **\$924,000** in his his Chair program, with industry partners contributing more than **\$1.5 million**.

**"It is hard to underestimate the importance of the role that NSERC has played as a catalyst and promoter of research linkages between universities and industry."**

**Jim E.C. Carter**

Former President and Chief Operating Officer Syncrude Canada Ltd. Corporate Director for EPCOR Utilities Inc. and several other Albertan companies

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## Making Oil Sands Production More Efficient and Sustainable

Ergun Kuru, a petroleum engineer at the University of Alberta, is researching better methods for removing drilled solids from horizontal wells that are commonly used for oil sands production.

Drilled solids must be removed from the well or they could cause costly problems such as mechanical pipe sticking, excessive torque and drag, or difficulties in casing. In an effort to develop effective cleaning strategies, Dr. Kuru is investigating how turbulence could lift and transport particles. Improvements in the solids-transport process could benefit Western Canadian heavy-oil production, which extensively employs horizontal wells where sand production, deposition and accumulation hinder recovery. This fundamental research could improve the industry's capacity to operate safely and economically. To enhance this work, NSERC recently awarded Dr. Kuru an Accelerator Supplement that will raise his total discovery research funding to **\$240,000** over the next three years.

# Oil Sands and Heavy Oil



## Separating the Oil from the Sand More Efficiently

An ingenious process-control technique developed by an NSERC partnership will produce significant new revenue for oil sands operators and cut the amount of bitumen flowing into tailings ponds by more than 50 percent.

The improvement affects Suncor Energy Inc.'s huge bitumen separation cells, which contain roiling influxes and outflows of water, air and oil sand. Until the advance, operators followed the rise and fall of the bitumen-rich froth at the top of the tanks and set the level of skimmers to capture the most oil. University of Alberta Professor Sirish Shah and his graduate student Phanindra Jampana worked with Suncor Energy to automate the process. The team collected video data to measure the changing boundary levels. Partner Honeywell Process Solutions (formerly Matrikon) then moved their concepts into working hardware and software to control the skimmers. Honeywell Process Solutions and Suncor Energy jointly sponsor Shah's NSERC Industrial Research Chair in Computer Process Control at the University of Alberta.

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## Reducing Canada's Carbon Footprint

Developing cheaper, more energy-efficient methods of extracting oil and gas from Alberta's oil sands is key to Canada meeting its goal of becoming an energy superpower.

As one of 19 top international researchers attracted to Canada by the new Canada Excellence Research Chairs Program, Thomas Thundat from the University of Tennessee brought his world-class expertise in molecular engineering to the University of Alberta. He is developing new detection and extraction technologies by unravelling the complex interaction among water and bitumen, and sand and clay. His work in Alberta augments the province's considerable presence in nano-technology, biomedical engineering, information communications technologies and natural-resource and energy-resource management. He and his new colleagues are pioneering more energy-efficient extraction processes that use less water and reduce greenhouse gas emissions. These more sustainable techniques for oil extraction and refining will reduce the oil industry's carbon footprint and help meet Canada's emission reduction targets. NSERC is contributing up to **\$10 million** to his Chair program. NSERC is also providing a Discovery Grant of **\$200,000** over the next five years.

## Some of NSERC's Partners in Oil Sands and Heavy Oil (2010-11)

Aramco Services Company  
Athabasca Oil Sands Corp.  
Baker Petrolite Canada  
Canadian Natural Resources Limited  
Champion Technologies Ltd.  
Chevron Energy Technology Company  
Computer Modelling Group Ltd.  
ConocoPhillips Canada Resources Corp.  
Devon ARL Corporation  
Diamond QC Technologies Inc.  
Flottec Inc.  
Husky Energy Inc.  
Imperial Oil Ltd.  
Imperial Oil Resources Ltd.  
Japan Canada Oil Sands Limited (JACOS)  
Kemira Water Solutions Canada Inc.  
Laricina Energy Ltd.  
Nalco Canada  
Nexen Inc.  
Outotec (Canada) Ltd.  
Petro-Canada  
Repsol YPF  
SGS Lakefield Research Limited  
Shell Canada Ltd.  
Statoil Canada Ltd.  
Suncor Energy Inc.  
Syncrude Canada Ltd.  
Total E&P Canada Ltd.

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