



**Canadian Natural**

# 2013 STEWARDSHIP REPORT TO STAKEHOLDERS

| Health and Safety | Asset Integrity | Environment | Community |



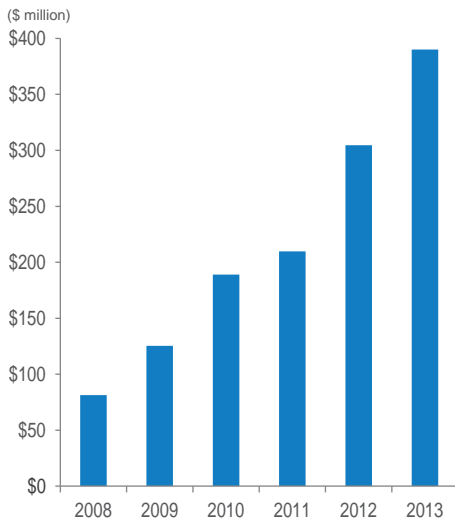
**OUR PEOPLE**

CREATING GROWTH THROUGH INNOVATION AND CONTINUED IMPROVEMENT



# RESEARCH and DEVELOPMENT

## Research & Development Investment



Note: Sourced from Company internal reports and RESEARCH Infosource Inc.

To get better at what we do year after year, we focus on advancing technology at all our operations. Canadian Natural is employing technology to improve resource recovery, achieve operating efficiencies, reduce our environmental footprint, and ultimately, to create value. In 2013, Canadian Natural invested approximately \$390 million into Research and Development (R&D), making us Canada's largest oil and gas investor as well as in the top 10 of R&D investors in the country across all industries.

"To be able to be nimble in our ever changing world of price, regulations and social expectations, we need to be continuously improving to ensure we are effective and efficient operators," says Joy Romero, Vice-President, Technology Development at Horizon. "We are so fortunate as a company that innovation is just part of our culture."

Our R&D investment dollars went towards a wide range of projects and initiatives across multiple areas, including advancements in enhanced oil recovery, improved efficiencies in oil sands mining and in situ production, and improved environmental performance. Some of our 2013 technology and development projects are highlighted in this section.

**Over \$390 million invested in R&D**

## ACHIEVING OPERATING EFFICIENCIES THROUGH THE MATERIALS AND RELIABILITY IN OIL SANDS PROGRAM

The Materials and Reliability in Oil Sands (MARIOS) program is an industry-directed consortium created to tackle industry-wide maintenance and reliability issues. The goal of MARIOS is to develop knowledge and validate technologies to significantly reduce downtime, and improve operational reliability and productivity in the oil sands industry.

To date, we have achieved more than a ten to one return on our MARIOS investment from changes we implemented through learnings from pilot projects, trials, and knowledge sharing between peer company participants. Specifically, by participating in the Lean Six Sigma Project: Topography & Material Optimization of Tailing Pipelines, we reduced the wear rate of our

tailings pipelines by 73 per cent per year which results in a saving that equates to \$4.8 million a year or \$0.12/bbl of oil produced.

The program was formed in 2009 by Alberta Innovates – Technology Futures (AITF). It allows materials and equipment suppliers, fabricators, applicators, and engineering firms to share manufacturing and fabrication expertise at the project level. AITF manages the overall program along with specific research activities. Currently the program is focusing on the following key areas: Wear Resistant Overlays, Welding, Slurry Pipeline Systems, and Corrosion within in situ operations.

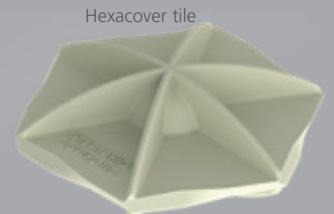
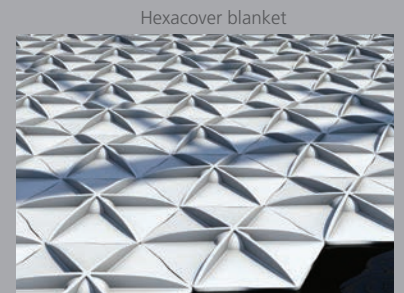
**Achieved over 10:1 return on investment**

## CONSERVING ENERGY AND REDUCING EMISSIONS WITH HEXACOVER BLANKETS

Due to the viscosity of produced heavy oil, we need to heat our storage tanks to 80°C in order to liquefy the oil for transport. Our goal was to reduce the amount of fuel consumed to maintain the temperature in our heavy oil production tanks. The

storage tanks are already insulated but a void space exists between the top of the oil and the top of the storage tank where heat rises and escapes. In order to prevent heat loss and improve cost effectiveness, Canadian Natural and a joint venture partner created and tested the installation of a floating blanket that insulates the oil and contains the heat. This floating blanket consists of several hundred polymer, hexagonal interlocking tiles. Implementation of this floating blanket created a fuel savings of approximately 20 per cent. By consuming less fuel, we expect to avoid over 27kt CO<sub>2</sub>e/year of emissions over the 10-year life of the project.

To date, Canadian Natural has installed these floating blankets in over 1,100 heavy oil wells and intends to continue installing them in most of our heavy oil production tanks.



All graphics courtesy of vendor partner Greatario