
APS1012 Management of Innovation – Final Team Projects, Spring 2013 (online class)**Energy – Oil Sands Innovation**

This report looks at oil and oil sands from a historic perspective. The drilling of oil began as early as 347 A.D. in China. Historically, oil's main role was in replacing vegetable oil and whale oil by kerosene lamps. Oil also went through a decline in consumption when electricity was invented, but demand had picked up later when diesel engines were commercializing. Canadian Aboriginals had discovered bitumen in natural formations where it flows into the Athabasca River, and had used it to coat boats to prevent leaks. The government of Alberta funded applied research to develop this resource, as the use of solvents for extraction of bitumen from oil sands was well known but not at a commercial scale. The research resulted in a patent by Dr. Clark; he found a way to process oil sands on a commercial scale using the right quantity of reagent and temperature.

The report focuses on technology innovations affecting natural bitumen, 10 API (highly viscous). The Canadian Oil Sands make up 70% of the world reserves of natural bitumen. The other type of oil sands is extra heavy oil sands (less viscous), the largest deposit of which is in Venezuela. This report finds that by using technology huge advancements are being made to reduce the environmental impact of oil sands. Greenhouse Gas (GHG) emissions from oil sands is just 5-15% higher than conventional oil. And GHG emissions during production have been reduced by up to 30%. Land disturbance is quite small with only 0.004% of the boreal forest that was disturbed for clearing. The new in-situ process has reduced the land requirement to 1/8th that of surface mining. Water seems to be the most affected and has the highest impact on the local environment. The water taken from the Athabasca River is difficult to monitor as there are natural formations where bitumen flows into the river. Through new technology, companies are recycling up to 95% of the water used and one company is even trying to achieve zero discharge.

Hence, while assessing the oil sands the reader should be aware that technology in its early phase of development is always inefficient and prone to generate pollution. This happened with our current 'conventional' oil technology as well. In the 1860s, conventional oil was considered as unconventional fuel, which could never substitute coal. At that time price of oil was high and supply was uncertain compared to coal.

Knowing that water had the highest impact on the local environment we focused on new government regulation to reduce tailings and studied an oil companies innovation response to the regulation. The companies developed the World's largest Floating Process Water Pumping Facility and were able to reduce the number of tailings ponds as well as the overall cycle time from initial mining of the ore to full remediation of the operational areas. The directive not only forced innovation but also ensured that Oil Sands Companies focus on the Environment and the impact their industry has on it. Hence, it is recommended that the government continue to promote such directives.

Decreasing Triple Bottom Line, Environmental, Social, Economic and the fact that Oil is a Strategic Resource are factors driving innovation in the oil sands. One of the ways in which companies are tackling this is through collaboration, something unseen in this traditional industry. We find that at every gap in commercializing an innovation, there are new organizations/collaborations formed to reduce them. Governments created many support networks, organizations and innovation chairs at universities for technology development. Though there are barriers to collaboration for innovation, oil industry being a global industry and a very competitive one has made many collaborations and networks. In general, we see increasing integration and interdependence within the industry, with industry, government and stakeholders. Technologies are being aimed at increasing integration for greater efficiency. For example, the integrated monitoring of air, water, and land by provincial, central government and the industries. We see most companies are pursuing innovations but these tend to be incremental innovations on radical innovations that first originated within government organizations or government funded research.

To conclude, the report is optimistic about the resource and the fact that it can be developed in a manner that causes the least possible harm to the environment and provides the most benefit to humans. For this we need governments and industries to continue collaborating on innovation, continued government support for environment-aimed innovations and finally the continued demand from citizens of Canada for environmentally friendly resource exploitation.

Conclusions and Recommendations

- The Athabasca Oil Sands are a huge asset for Canada that are being used to make the Country one of the largest producers of crude oil in the World.
- It took one innovation to make the Canadian Oil Sands possible. Without the work conducted by Dr. Karl Clark, none of it would be possible.
- Dr. Carl Klark's patent for the Canadian Oil Sands was a true break through innovation, taken from research in to full mass scale production.
- Government legislation and environmental pressure is being used to force Oil Sand Companies to Innovate, develop and change technology at an unprecedented rate.
- Innovation is happening constantly throughout the Oil Sands companies. Profits are such that the Companies can afford to continually reinvest in initiatives aimed at improving environmental impacts, improving company images and increasing profits.
- Through collaborations such as the Canadian Oil Sands Innovation Alliance, Oil Sands Companies are finding new and Innovative ways to adapt in order to implement the changes that is being forced upon them.
- As a result of Government Directive 074, the World's largest Floating Process Water Pumping Facility was developed and one Oil Sands Company was able to reduce the number of tailings ponds as well as the overall cycle time from initial mining of the ore to full remediation of the operational areas.
- This particular Government directive forced Oil Sands Companies to take action to reduce tailings and find methods to reclaim land.
- The directive not only forced innovation but also ensured that Oil Sands Companies focus on the Environment and the impact their industry has on it.
- Directive 074 was only one such example.
- The Government should continue to implement such directives in order to ensure that Oil Sands Companies continue to Innovate. Not only will this ensure that environmental impacts from crude oil extraction are reduced, it will help the Oil Sands Companies to increase efficiency and increase profits. After all, these companies only exist to make profit for their shareholders!