Increasing oil production and reducing greenhouse gas emissions

Weyburn project overview
Cenovus Energy’s oil production near Weyburn, Saskatchewan is playing an important role in the world’s largest research project involving the underground storage of carbon dioxide.

One of Canada’s largest crude oil reservoirs

Cenovus operates the 215-square-kilometre Weyburn field in southeastern Saskatchewan, and has a 62 percent ownership stake. When it was discovered in 1954, the Weyburn field contained one of the largest medium-sour crude oil reservoirs in Canada, with approximately 1.4 billion barrels of oil in place. The main productive zones in the Weyburn field are about 1,450 metres underground.

The Weyburn field has benefited from a series of innovative developments that Cenovus has applied to produce more oil from the reservoir. These include flooding the reservoir with non-potable, saline water; drilling multi-leg horizontal wells; and applying enhanced oil recovery methods using carbon dioxide (CO₂) as a flooding agent. These efforts have significantly increased the amount of oil recovered and extended the productive life of the maturing field. To date, Cenovus has safely sequestered about 22 million tonnes of CO₂ deep underground.

A world-class research project

Since 2000, Weyburn has been host to the International Energy Agency Greenhouse Gas Weyburn-Midale CO₂ Monitoring and Storage Project, which studies Cenovus’s CO₂ flood operations. This independent applied research initiative is managed by the Petroleum Technology Research Centre (PTRC) in Regina, Saskatchewan, and was one of the first research projects on CO₂ sequestration endorsed by the International Energy Agency (IEA).

Research to date has been undertaken in two phases. The first phase ran from 2000-2004 and demonstrated the suitability of the reservoir at Weyburn for safe, long-term storage of CO₂. The second phase, completed in 2012, achieved advances in monitoring technologies, field testing for wellbore integrity, and environmental assessment. Cenovus’s partnership with industry and government over 12 years of work with international researchers through the PTRC led to the 2012 publication, *Best Practices for Validating CO₂ Geological Storage*. This work, although developed in the context of the Weyburn CO₂ enhanced oil recovery operations, has many recommendations applicable to alternative CO₂ geological storage scenarios, including deep saline aquifer formations.

A triumph for business and the environment

The success of the Weyburn CO₂ flood has demonstrated that CO₂ injection is an important technology that could be employed in other reservoirs to maximize recovery of already limited oil reserves while reducing greenhouse gases released into the atmosphere. Cenovus’s commitment to operational excellence, coupled with collaborative relationships between governments, researchers and industry, helps sites like Weyburn to be productive and environmentally responsible.
Leading innovation yields creative solutions

In 1964, after a decade of operation, water injection was introduced at Weyburn to stimulate more production. Injecting non-potable, saline water into the reservoir (waterflood) allowed Cenovus to recover more of the oil.

As the oil field matured, an additional method of enhancing recovery was needed. Carbon dioxide injection (CO₂ flood) was introduced in 2000. When CO₂ contacts oil at high pressure, it essentially acts as a solvent, making the oil thinner and causing it to swell. This makes it easier for oil to flow to nearby producing wells.

Today, Weyburn is one of Canada’s largest CO₂ enhanced oil recovery operations and the site of the largest geological greenhouse gas sequestration project in the world. Cenovus and its working interest partners produce about 25,000 barrels of oil per day at Weyburn – about 13,500 barrels per day more than what would have been produced without the CO₂ flood. It also injects about two million tonnes of CO₂ underground each year for storage – the equivalent of taking about 476,000 cars off the road for one year. The Weyburn field is an ideal site for CO₂ injection because of its size, geology, the characteristics of the oil, existing infrastructure in the field, and a successful history of waterflood.

Since 2000, Cenovus has purchased CO₂ from Dakota Gasification Company’s Great Plains Synfuels Plant in Beulah, North Dakota. About 125 million cubic feet of CO₂ per day is transported by pipeline 323 kilometres north to the Weyburn field.

Cenovus and its working interest partners have invested more than $1 billion to upgrade the Weyburn facility for CO₂ flood. The improvements include additional pipelines to increase CO₂ injection and oil production, as well as compression capability to recycle the CO₂ produced during operations.

The CO₂ flood is expected to extend the life of the Weyburn field by about 30 years and possibly longer with improved technology. It is projected that about 30 million tonnes of CO₂ will be stored over that time. According to the IEA, the reservoir is capable of storing as much as 55 million tonnes of CO₂.

In 2012, Cenovus secured an additional supply of CO₂ from SaskPower’s Boundary Dam Power Station near Estevan, Saskatchewan. Cenovus built a 66 kilometre pipeline to transport up to 57 million cubic feet of CO₂ per day to the Weyburn field. Cenovus expects to begin receiving CO₂ in mid-2014.

A pattern of success

Typically, CO₂ floods involve injecting gas and/or water simultaneously, or in an alternating pattern depending on the characteristics of a reservoir. Generally, CO₂ and water are injected into the reservoir from vertical and horizontal injection wells and combine with the natural reservoir pressure to push oil and recycled water to producer wells to be brought to the surface. The CO₂ and water are then recycled. Cenovus expands its CO₂ flood in phases of several patterns which now cover more than 60 percent of the reservoir. The company applies 4-D, time-lapse seismic technology to monitor the movement of CO₂ injected in the reservoir and to better pinpoint locations for new wells.
New ideas, new approaches

Cenovus Energy is a Canadian integrated oil company. We’re committed to applying fresh, progressive thinking to safely and responsibly unlock energy resources the world needs. Our operations include oil sands projects in northern Alberta, which use specialized methods to drill and pump the oil to the surface. As well, we have established natural gas and oil production in Alberta and southern Saskatchewan. We also have 50 percent ownership in two U.S. refineries.

Cenovus at-a-glance

• Canadian oil company
• About 5,000 people
• Committed to implementing new ideas and new approaches, safely and responsibly
• Proven track record of low-cost operations and environmental leadership
• Superior financial position with a strong balance sheet and free cash flow streams from established assets
• 93 billion barrels of estimated discovered bitumen initially-in-place
• Significant opportunity for oil sands production growth at Foster Creek and Christina Lake, and at our emerging projects in northern Alberta
• A 50 percent interest in our Foster Creek, Christina Lake and Narrows Lake oil sands assets with ConocoPhillips
• A 50 percent interest in the Wood River Refinery (Illinois) and the Borger Refinery (Texas) with Phillips 66
• Significant near-term growth opportunities in conventional oil production
• Canada’s largest CO2 enhanced oil recovery operation and the world’s largest geological greenhouse gas storage project located at our Weyburn oil field
• Access to a predictable and reliable stream of internally-generated cash flow from our established natural gas properties to fund our oil growth
• Committed to strengthening our communities by supporting learning, safety and well-being, and helping sustain the communities where we live and work

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Advisory

This publication contains forward-looking statements identified by the words “opportunity” and “estimated.” Readers are cautioned that actual results could differ materially from those expressed or implied as a result of changes to Cenovus’s plans and the impact of events, risks and uncertainties discussed in Cenovus’s current Annual Information Form, annual and quarterly reports to shareholders and other documents filed with regulatory authorities, which are available on cenovus.com.

Discovered bitumen initially-in-place estimates include unrecoverable volumes and are not an estimate of the volumes of the substances that will ultimately be recovered. There is no certainty that it will be commercially viable to provide any portion of the estimate. For further information regarding our bitumen initially-in-place estimates and all subcategories thereof, please see our July 24, 2013 news release available at cenovus.com.