Petroleum Refineries

Canadian Market

Canadian Petroleum Refineries

Canada is home to about 54 companies with petroleum refinery operations that employ about 8,500 workers and generate total revenue of just under $50 billion. The country ranks 11th in the world in refining capacity. Domestic consumption accounts for the majority of Canada's refined petroleum production, although some Atlantic refineries export products. Canada is the seventh largest producer of crude oil in the world and has the world's third largest reserve of crude.

The mix of refined petroleum products varies by region. In the Atlantic provinces, furnace oil (light heating oil) is the primary source of home heating, and distillate fuels (jet fuel, diesel, stove oil, kerosene, furnace oil) make up 40% of demand; heavy fuel oil, used to generate electricity, accounts for another 24%. In Quebec, natural gas and hydroelectricity are prevalent, and distillate fuel accounts for 34% of sales, gasoline about 40%. In Ontario, gasoline sales account for more than 45% of total product demand, with distillates at less than 30%. Regional differences in product demand affect the configurations of the related refineries.

Most refineries are strategically located near major waterways, population centers, and sources of crude oil supply, which include the Western Canada Sedimentary Basin (Alberta, Saskatchewan, parts of British Columbia and Manitoba) and offshore eastern Canada. Ontario and the Northwest Territories also produce modest volumes of oil. Most Canadian refineries were built to process conventional light crude oil and not originally configured to process the growing volume of heavy crude oil extracted from the Canadian oil sands. Over time, the industry has evolved, and Canadian refineries generally run a mix of light and heavy crude oil. Firms have increasingly installed upgraders to handle the heavier crudes that have become prevalent in domestic supply.

Supply of domestic light crude continues to be limited for Atlantic Canadian refineries. While the Enbridge Line 9 pipeline connects Ontario to western Canadian light crude supply, no pipeline access exists between western Canadian light crude and Atlantic Canadian refineries, and firms must rely on imports. In Atlantic Canada, refineries primarily receive crude oil via tanker or rail.

The complexity of a refinery is a measure of secondary refining capacity or refining that goes beyond simple distillation and has the capacity for cracking, coking, and other processes used to produce a broader range of products. The Nelson index is an indicator of complexity that ranges from between two and five for simple refineries to eight and higher for more complex facilities. Canadian has primarily cracking refineries, with a Nelson index between 7 and 13, although complexity varies by region, according to a report by the Kent Group. Central and western refineries have more complex capacity compared to refineries in Atlantic Canada.

Quick Facts

- Canada had 15 full refineries and 2 asphalt refineries with a total refining capacity of 295,000 cubic metres per day or 1.9 million barrels per day in 2017, according to the National Energy Board.
- Refining capacity in Quebec and Atlantic Canada totaled 124,000 metres per day or 782,000 barrels per day; capacity in western Canada totaled 109,000 metres per day or 683,000 barrels per day; capacity in Ontario totaled 62,000 metres per day or 390,000 barrels per day.
- Key product categories include motor gasoline (39% of industry sales); diesel fuel oil (26%); aviation turbo fuel (6%); heavy fuel oil (4%); and petro-chemical feedstocks (4%). Other product categories include light fuel oil, asphalt, and still gas.
- In 2017, Canadian petroleum refineries operated at 84% capacity.
- The majority of petroleum refineries are located in Alberta (48%), followed by Ontario (15%), British Columbia (13%), Quebec (7%), and Manitoba (7%).
- The industry is characterized by medium- to large-size businesses; 19% employ more than 500 workers and 48% employ between 100 and 499 workers.
- Major firms include Imperial Oil, Shell Canada, and Suncor Energy. Most refineries in western Canada are owned by integrated oil companies that have crude oil production, refining, and product marketing operations. In addition, western refineries are able to achieve lower production costs because of their close proximity to crude supplies and connection to pipelines for crude and refined products.
- Canadian refineries process less than 30% of Canadian crude oil, due to the size of the industry relative to the resource, the location of refineries, and lack of cross country pipeline connectivity.
- Refiners own most of the primary distribution terminals in Canada – facilities that typically serve as the first point of storage and distribution after the refinery process.

Risks to Watch Out For

Petroleum refineries face the following risks:

DEPENDENCE ON LIGHT SWEET CRUDE

Canadian refineries in western Canada and Ontario have been slow to reconfigure operations to process lower cost, less desirable crude oils and have continued to rely on domestically produced, light, sweet crude oil, which is more expensive than heavier, sour crudes. Almost 50% of the crude oil processed by refiners in these areas is conventional light, sweet crude oil and 25% is high quality synthetic crude oil, which is a light crude derived by upgrading oil sands crude. Increasing supply of heavier crudes driven by growth in oil sands production and the decline in production of light sweet crude have forced refineries throughout Canada to invest in the process of refining or upgrading heavier crudes.

ENVIRONMENTAL REGULATIONS

The Canadian oil and gas sectors are the country's largest emitters of methane gas and volatile organic compounds (VOC). Concern for the environment has led to increasing governmental regulation in the industry. Federal mandates often require capital investment to bring refineries and refined products into compliance and create additional operating procedures and the need for inspections. In the past, smaller refineries have chosen to shut down because of the excessive cost of compliance. New proposed rules to reduce methane emissions from the Canadian energy sector are expected to cost an estimated $3.3 billion over the next two decades, according to the Globe and Mail.

FEWER, LARGER REFINERIES

The number of Canadian petroleum refineries has decreased significantly over time. The total number of refineries dropped from a high of 45 to just 17 between 1958 and 2017, according to Oil Sands Magazine. The oil price shocks in the 1970s, combined with weak economic conditions in the early 1980s resulted in a significant number of closures. Three refineries closed between 2005 and 2013, moves that coincided with new regulations that lowered the annual average sulphur content of gasoline. Until 2017, no new refineries had been built in Canada for 30 years. Although many smaller, less efficient refineries have shut down, the expansion of large complex facilities has compensated for the loss in production.

Industry Trends

Petroleum refineries are seeing the following trends:

CAPACITY REMAINS STEADY

Despite the decreasing number of Canadian refineries, average capacity has remained stable over the last decade, indicating that consolidation has created larger refineries with greater efficiency. Canadian refining capacity increased just 0.2% between 2006 and 2016, ranging from 1.9 billion barrels per day to 2.05 billion barrels per day annually, according to Oil Sands Magazine, while the number of refineries decreased from 19 to 17. In late 2017, the Sturgeon Refinery in northeast Edmonton, the first Canadian refinery built in 30 years, commenced operations and is expected to produce 80,000 barrels of diesel per day.

CRUDE IMPORTS FALL

Canadian petroleum refineries have reduced their reliance on imported crude oil over time. While annual changes varied, total crude imports decreased 28.7% between 2007 and 2017, while total domestic crude receipts rose 14.7%. The shift away from imported crude started in 2005 and became more pronounced in 2010 as the difference between the cost of North American crude and offshore crude became more significant, according to the National Energy Board. The closure of refineries in central and Atlantic Canada, increased use of rail to transport discounted domestic crude, and the re-reversal of the Line 9 pipeline also contributed towards increased use of domestic crude.

PRODUCTION GROWTH

Canadian refined petroleum product (RPP) production has grown over the last three years, after falling the previous two years. Total production rose 6.4% in 2017, 1.8% in 2016, and 2.3% in 2015, after decreasing 5.1% in 2014 and 1.8% in 2013. Production of motor gasoline showed similar trends, increasing 4.6% in 2017, 5.3% in 2016, and 6.5% in 2015, after dropping 1.6% in 2014 and 2.0% in 2013. Diesel fuel oil production increased 10.0% in 2017 but fell between 0.3% and 2.3% annually between 2013 and 2016. Canadian refineries primarily operate to meet domestic needs, with some exports.

Call Prep Questions

WHAT TYPES OF PRODUCTS DOES YOUR COMPANY PRODUCE?

Key product categories include motor gasoline (39% of industry sales); diesel fuel oil (26%); aviation turbo fuel (6%); heavy fuel oil (4%); and petro-chemical feedstocks (4%). Other product categories include light fuel oil, asphalt, and still gas. The mix of refined petroleum products varies by region.

WHAT TYPES OF CRUDE DOES YOUR COMPANY PROCESS?

Most Canadian refineries were built to process conventional light crude oil and not originally configured to process the growing volume of heavy crude oil extracted from the Canadian oil sands. Over time, the industry has evolved, and Canadian refineries generally run a mix of light and heavy crude oil.

WHAT TYPES OF REFINING OPERATIONS DO YOUR COMPANY'S FACILITIES OFFER?

The complexity of a refinery is a measure of secondary refining capacity or refining that goes beyond simple distillation and has the capacity for cracking, coking, and other processes used to produce a broader range of products.

WHAT IS YOUR COMPANY'S CAPACITY UTILIZATION?

In 2017, Canadian petroleum refineries operated at 84% capacity.

HOW HAS YOUR COMPANY ADAPTED TO THE SHIFT IN SUPPLY TOWARDS HEAVIER CRUDE OIL?

Canadian refineries in western Canada and Ontario have been slow to reconfigure operations to process lower cost, less desirable crude oils and have continued to rely on domestically produced, light, sweet crude oil, which is more expensive than heavier, sour crudes.

HOW IS YOUR COMPANY ADDRESSING INCREASED ENVIRONMENTAL REGULATION?

The Canadian oil and gas sectors are the country's largest emitters of methane gas and volatile organic compounds (VOC).

HOW HAS THE TREND TOWARDS FEWER, LARGER REFINERIES AFFECTED YOUR COMPANY'S OPERATIONS?

The number of Canadian petroleum refineries has decreased significantly over time.

HOW HAS YOUR COMPANY'S FOOTPRINT AND CAPACITY CHANGED OVER TIME?

Despite the decreasing number of Canadian refineries, average capacity has remained stable over the last decade, indicating that consolidation has created larger refineries with greater efficiency.

HOW DEPENDENT IS YOUR COMPANY ON FOREIGN CRUDE AS A SOURCE OF SUPPLY?

Canadian petroleum refineries have reduced their reliance on imported crude oil over time.

HOW HAS YOUR COMPANY'S REFINED PRODUCT MIX CHANGED OVER TIME?

Canadian refined petroleum product (RPP) production has grown over the last three years, after falling the previous two years.

Web Links

Canadian National Energy Board

Statistics

Canadian Association of Petroleum Producers

News, trends, statistics, and regulatory updates

Oil Sands Magazine

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