

Synthetic & Alternative Fuel Production and Processing

Canada has pledged to reduce its greenhouse gas emissions by 40% by 2030 (below 2005 levels), with a goal of net neutrality by 2050. Though the automotive sector, specifically light-duty vehicle manufacturing may quickly embrace a transition to electrification, heavier land, air and sea freight and transportation vehicles will transition at a much slower rate. Although Canada has access to natural resources such as coal, petroleum, and natural gas that can continue to power traditional combustion engines and other equipment, the country has the opportunity to lead in developing and generating sustainable bio, synthetic and electro fuels, such as hydrogen or biodiesel. Canada has recognized the unique potential of these fuels, and has committed 1.5 billion dollars toward a Clean Fuels Fund, to increase support and adoption of these low-carbon fuels. These alternative fuels will provide Canada an avenue to become a leader in global sustainability and a strong market force as the country continues to innovate and develop new technologies.

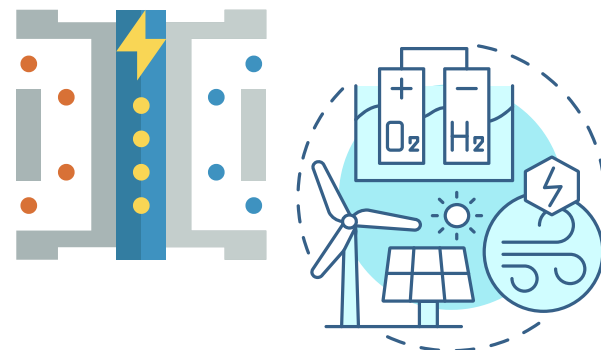
Key Sustainable Technologies

Hydrogen

Hydrogen will be a key element in the future of global sustainability. There are several methods used to produce hydrogen gas with varying degrees of carbon emissions. Methods like electrolysis, in which renewable energy is used to separate water into oxygen and hydrogen gas, result in minimal carbon emissions. Hydrogen's impact on the 2050 energy mix hinges on technology, policy, and infrastructure, with its exact global energy contribution remaining dynamic and influenced by evolving efforts. The cumulative market for hydrogen could reach up to over 11 trillion dollars by 2050.

Hydrogen as a fuel

There are several advantages to using hydrogen as a fuel as an alternative to diesel or gasoline in light, medium and heavy-duty vehicles. A primary advantage is when hydrogen gas is consumed as fuel in fuel cells, the only resulting emissions are heat and water. Not only are hydrogen electric vehicles more efficient at converting energy to power in hybrid powertrains, but per kilometer emissions can be reduced by up to 89% compared to gasoline engines, and 83% compared to diesel engines when using low carbon intensity hydrogen as a fuel source.



Opportunities in Sustainable Emerging Markets



Biofuels

Bolstered by a robust agricultural sector, Canada is well-positioned to benefit from growing demand for petroleum fuel equivalents like biofuels. Biofuels are a form of energy created from biomass, biological material which stores chemical energy through biological processes. Canada has been leveraging biofuels for over a decade, with ethanol and biodiesel fuels being blended into gasoline and diesel to reduce fuel emissions, with the goal to reduce emissions by 15% in traditional fuels by 2030. Renewable diesel is also receiving investment in Canada, with 7 facilities slated to be open by 2026, producing 4 billion liters by 2027.

Biofuels have the potential to serve as alternatives to diesel and gasoline fuels. In 2020, carbon intensity of ethanol was 54% less than gasoline, while biodiesel and hydrogenated-derived renewable diesel were 90% less carbon-intensive than diesel.

Alternative Fuel Production and Processing Key Industries

Basic Chemical Manufacturing



Petroleum and Coal Product Manufacturing



The innovators and leaders operating in synthetic and alternative fuel production are businesses with extensive know-how in chemical processes and production. Within the chemical manufacturing industry, notable sub-sectors involved in bio and synthetic fuels are industrial gas, petrochemical and other basic organic chemical manufacturers. Many organizations currently involved in oil and gas extraction and petroleum product manufacturing are diversifying their businesses by leveraging knowledge and resources in resource refinement to embrace emerging sustainable markets opportunities such as hydrogen and biofuel production.

Methodology

NAICS data were collected for industries involved in the production and processing of hydrogen and biofuels, including renewable diesel. Using census data, the NAICS codes were cross-referenced with NOCs data to determine the jobs with largest employment within these industries. Using public job posting databases and company career pages, skills, education and employment requirements were collected on occupations that were highlighted, and similar professions which were not listed under the title of a specific NOC code. The common skills and requirements were cumulated for occupations and jobs within alternative fuel production and processing.

Opportunities in Biofuel Production and Processing

Opportunities exist at multiple levels of skill for biofuel and hydrogen production and processing. There is currently a strong demand for high skills workers, including professional scientists and skilled trade workers, and this job profile focuses on those two skill levels. Below are two examples of occupations that exist within these industries.

Minimum Requirements: Instrumentation and Electrical Technicians in biofuel facilities are usually required to possess red seal certification as an Industrial Electrician or Instrumentation Technician or Mechanic. Some positions may require certification in both practices.

Additional Certification: Some positions may require a valid class G, Class 5 or 7 license.

Training and Experience: Experience in oil and gas production facilities is highly transferable and desirable.

Key Responsibilities: Carry out maintenance, repair and installation of electrical and mechanical instruments responsible for process control and other core functions in plant operation. May assist engineering team in electrical design and health and safety protocol.

Desirable Skills and Traits: Experience with programmable logic controllers, distributed control systems and human machine interfaces are very desirable. Must be knowledgeable of health and safety to ensure facility compliance. Experience with computerized tools such as AutoCAD may be an asset.

Other Skills Highlight: Administrative reporting and recordkeeping, physical coordination and manual dexterity, problem solving skills, computer literacy, job site hazard identification.

Skilled Trades Workers Instrumentation and Electrical Technicians



Professional Engineers

Biofuel Process Engineers



Minimum Education: Bachelor's degree of college diploma in chemical or mechanical engineering. Some positions may require post graduate education.

Additional Certification: Most positions require registration, or ability to register with a provincial board of engineers.

Training and Experience: Experience in advanced chemical manufacturing and oil and gas is an asset. Usually requires several years of experience.

Key Responsibilities: Design, monitor and provide insight on continuous improvement to processes within plants and facilities involved in biofuel processing and production. May provide insight and assistance in health and safety, maintenance and production activities.

Desirable Skills and Traits: Experience in working with, and interpreting computer-aided designs (CADwork), process flow, block flow, and piping and instrumentation diagrams. The ability to coordinate activity with a team and effectively communicate is important. Monitoring and analyzing continuous operations requires excellent quality control and observational skills.

Opportunities in Sustainable Emerging Markets

Opportunities in Hydrogen Production and Processing

Minimum Education: An associate degree or diploma, or bachelor of applied science or engineering.

Training and Experience: Experience in manufacturing environments and experience in quality control is desirable.

Additional Certification: Some positions may require travel, requiring a class G or class 5 or 7 license.

Key Responsibilities: Specialists perform quality control and risk assessment functions to ensure product compliance with health and safety regulations. They coordinate with engineering teams and clients to resolve issues.

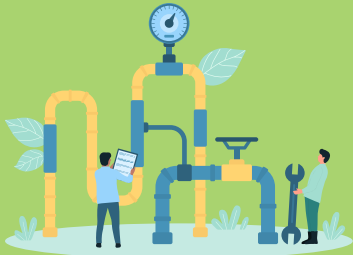
Desirable Skills and Traits: Enterprise resource planning software, quality management systems, ability to perform statistical analysis, capable of performing troubleshooting and using precision measuring equipment.

Professional Scientists
Hydrogen Cell Quality Control Specialists



Professional Engineers

Hydrogen Infrastructure and System Design Engineers



Minimum Education: Bachelor's degree in mechanical, mechatronic engineering or a related discipline. Postgraduate education is an asset.

Additional Certification: Most positions require registration with a provincial board of engineers. Some positions may require a valid class G or class 5 or 7 license.

Training and Experience: Experience working in a process plant, and working with thermal, reacting and/or fluid systems is an asset.

Key Responsibilities: Develop, design, and prototype new, and optimize and analyze existing hydrogen infrastructure and systems within production environments. Develop standardized processes and procedures, and ensure facilities meet health and safety standards.

Desirable Skills and Traits: Software and programming skills (MATLAB, Python etc.), ability to communicate and collaborate, strong problem solving skills, computer-aided design, experience working with programmable logic controllers, human machine interfaces and distributed control systems.

Future of Work in Alternative Fuel Production and Processing

Great investment is needed in sustainable alternatives for fuel and energy in order for Canada to reach the target of carbon neutrality by 2050. As hydrogen production and electric vehicles become increasingly important in Canada, energy demands are expected to rise 47% above current levels by 2050. Alternative and synthetic fuels are not only practical solutions, but areas of opportunity for Canadian's to explore careers in sustainability. Hydrogen is expected to create more than 350,000 jobs in Canada by 2050, and provide 30% of the country's energy. The biofuel sector is also expected to see growth, with an additional 12,600 jobs created by 2030, nearly doubling its current employment.



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