



Chemical Engineer

Bio-economy Skills At-a-Glance



Building skills for Canada's bio-economy

About BioTalent Canada™

Helping Canada's Bio-economy thrive globally

Canada is a world leader in biotechnology—the application of living organisms to industrial, agricultural, medical and other processes and products. To maintain and build on this leadership, the sector needs highly skilled, job-ready people.

By acting as a national hub and central resource for employers, job seekers, students, educators and government agencies, BioTalent Canada helps make this happen.



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About the Bio-economy

The bio-economy involves the research, development, manufacturing and commercialization of technologies and products for such areas as:

- Agriculture
- Aquaculture
- Bioenergy
- Bioinformatics
- Bioproducts
- Biosciences
- Environment
- Food Processing
- Forestry
- Genomics
- Human and Animal Health
- Industrial
- Life Sciences
- Medical Devices
- Natural Resources
- Nanotechnology
- Nutraceuticals
- Pharmaceuticals

Components of the Bio-economy Skills At-a-Glance

The *Bio-economy Skills At-a-Glance* are built around *Key Competencies*. They are not complete *Bio-economy Skills Profiles*. They capture the key hard and soft skills required to successfully function in this position. Those key competencies require specific tasks be accomplished in order to attain the desired outcome. More often than not, those key activities are functional in nature and require the application of specific knowledge acquired by education, training or practical experience. In bio-economy companies, those functional competencies may be very broad and diversified, encompassing both scientific and business expertise. Some may refer to functional competencies as hard skills of the position.

The *Bio-economy Skills At-a-Glance* have been developed through secondary research and have NOT been validated by industry. As a result, industry feedback will be greatly appreciated. Please send any feedback to portfolios@biotalent.ca.

The *Bio-economy Skills-At-a-Glance* are useful for such activities as recruiting, professional development, coaching, self-assessment, and many other purposes.

Occupational Description

Chemical engineers design equipment and processes for large-scale manufacturing, plan and test methods of manufacturing products and treating by-products, and supervise production. They apply the principles of chemistry, physics, mathematics, and mechanical and electrical engineering to solve problems involving the production or use of chemicals and other products.

Potential Professional Background and Education/Bio-economy or Relevant Experience

Education/Certification

- University degree, chemical engineering (Some employers will accept an advanced degree in engineering).
- Professional engineering licence (P.Eng.) as required.

Professional Experience

- 5 - 8 years experience.
- Project management experience.
- Industry related experience.
- Experience with engineering computer programs.
- Experience with current Good Manufacturing Practices.

Competencies and Tasks

A Chemical Engineer must be able to:

A. Gather information

TASKS
1. Research new technologies, processes, regulations and legislation
2. Review production information reports / shift logs
3. Conduct technical feasibility studies
4. Conduct economic feasibility studies
5. Conduct risk analysis and hazard reviews

TASKS
6. Conduct time studies
7. Use control algorithms to model chemical reactions

B. Analyze data or information

TASKS
1. Analyze production costs
2. Analyze machinery and equipment and make recommendations
3. Forecast production capacity
4. Perform detailed engineering calculations (e.g., heat transfer, thermodynamics, static/kinetic machine design, electromagnetics)
5. Interpret schematics

C. Evaluate results

TASKS
1. Evaluate commercial viability
2. Evaluate production capacity and capabilities
3. Evaluate production efficiency and effectiveness

D. Report information

TASKS
1. Report on new technologies, processes, regulations and legislation
2. Prepare written production reports
3. Provide regular and complete progress reports
4. Prepare feasibility reports

E. Develop new concepts and constructs

TASKS
1. Develop manufacturing systems
2. Develop maintenance programs
3. Develop a continuous testing system

F. Document structures, devices, parts, and equipment

TASKS
1. Design plant and facility layouts
2. Determine production specifications
3. Develop maintenance standards
4. Develop process drawings
5. Develop preliminary process flow sheets

G. Monitor processes, materials, or surroundings

TASKS
1. Monitor industry trends
2. Monitor budgets
3. Monitor production schedules
4. Monitor and manage timelines

H. Comply with policies and procedures

TASKS
1. Develop policies and procedures
2. Develop work instructions
3. Implement policies and procedures
4. Implement quality standard procedures
5. Implement experiments and test methods
6. Maintain policies and procedures
7. Maintain regulatory compliance
8. Enforce safety protocols
9. Follow current Good Manufacturing Practices (cGMP)

I. Coordinate the work of others

TASKS
1. Coordinate cross-functional teams

2. Coordinate project design work (e.g., site planning, design calculations, mechanical flow sheets, equipment layouts, piping, electrical, structural, insulation, instrumentation)
3. Coordinate the installation and commissioning of production equipment
4. Plan, organize and supervise equipment training
5. Supervise equipment design
6. Implement process development strategies
7. Support regulatory submission process

J. Determine compliance with standards

TASKS
1. Perform test method validation
2. Perform verification and validation activities
3. Support process-related validation studies
4. Monitor adherence to quality assurance standards and regulations
5. Monitor output quality

K. Schedule work and activities

TASKS
1. Schedule work assignments
2. Create production schedules
3. Develop maintenance schedules

L. Staff organizational units

TASKS
1. Recruit employees
2. Develop and maintain organizational chart
3. Discipline employees
4. Terminate employees' employment

M. Perform administrative activities

TASKS
1. Procure materials and supplies
2. Approve engineering drawings
3. Prepare supply and service requisitions

N. Coach and develop others

TASKS
1. Provide leadership
2. Mentor staff
3. Train staff
4. Encourage continuous learning and development of staff

O. Use computers

TASKS
1. Use email software as appropriate
2. Use Microsoft Office as appropriate
3. Use database software as appropriate
4. Use computer-assisted design (CAD) software as appropriate
5. Use ERP (SAP) computer software as appropriate
6. Use simulation and modelling software as appropriate
7. Use statistical analysis software as appropriate
8. Use the Internet as appropriate

P. Demonstrate personal competencies

TASKS
1. Lead with confidence
2. Demonstrate teamwork
3. Exhibit sensitivity to cultural and social diversity
4. Be customer service focused

TASKS
5. Work in a fast-paced environment
6. Follow company's policies and procedures
7. Demonstrate time management skills
8. Manage stress
9. Be a quick learner
10. Communicate effectively and clearly
11. Demonstrate professional attributes
12. Continuously update skills

Strong Board of Directors

The Board of Directors is composed of experts in the field of HR, CEOs, CFOs and CSOs from across Canada with extensive financial and industry experience representing companies and organizations in Canada's bio-economy. BioTalent Canada is not a membership organization and therefore relies on the guidance provided by its dedicated volunteer Board of Directors.

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