FOCAL Initiative

CANADIAN AUTOMOTIVE SKILLS IN TRANSITION

PREPARING FOR EV PRODUCTION

MARCH 2024

The Future of Canadian Automotive Labourforce (FOCAL) Initiative, funded by the Government of Canada, is a collaboration of the Canadian Skills Training and Employment Coalition (CSTEC), the Automotive Policy Research Centre (APRC) and Prism Economics and Analysis.

The FOCAL Initiative has produced labour market information and data related to Canada's automotive manufacturing sector, examine key trends affecting the automotive labour market, and produced forecasts of supply and demand for key occupations in the broader automotive sector.

CSTEC APRC Automotive Policy Research Centre PRISM ECONOMICS AND ANALYSIS

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Canada

REPORT OVERVIEW

The automotive industry in Canada is shifting focus, along with many other industries and sectors, towards zero-emissions products and processes. The move in automotive manufacturing involves transitioning towards the production of electric vehicles (EVs), and the expansion of battery manufacturing capabilities and its supply chain. Canada's automotive manufacturing industry is the source of over 180,000 jobs across the country. It is essential with the recent investment and production announcements in EV and battery manufacturing to understand how the shift will impact automotive manufacturing jobs and their skills throughout the entire supply chain. This will enable manufacturers to prepare their existing labour force to transition smoothly into the new demands and challenges of EV and battery production, and identify what areas will require re-skilling and further training.

This report looks at three broad occupational categories within the automotive sector:

- Managers/Engineers/Technical
- Skilled Trades
- Supervisors/Production

Data from current job postings were used to determine what job skills are in demand within each of these categories. This data was used to provide to provide insights on what skills are transferable to EV manufacturing, and where the knowledge gap areas likely are.

TRANSFERABLE SKILLS

Understanding which skills are transferable to EV manufacturing highlights existing expertise and establishes a bridge between individuals' current capabilities and the future needs of the industry, facilitating a successful transition in their roles.

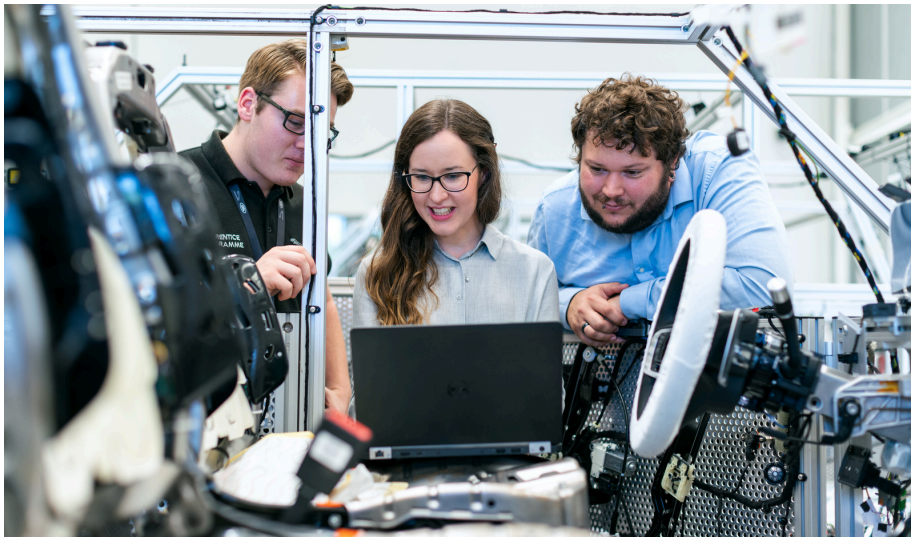
KNOWLEDGE GAP AREAS

Based on the job skills data from job postings, a broad skills gap analysis reveals what knowledge gaps may exist. Highlighting these gaps enables manufacturers and workers to prepare for training and development. Addressing these knowledge gaps aims to maintain productivity, as well as empower workers to feel competent in their roles.

HARD/SOFT SKILLS

This section focuses on both hard and soft skills. For soft skills, the list includes an overview of in-demand soft skills which are non-technical, interpersonal traits, and behaviours that dictate one's approach to work.

MANAGERS/ENGINEERS/ TECHNICAL



TRANSFERABLE SKILLS

Product Development: Crucial for creating innovative, market-ready products, this skill involves design, testing, and refining EV components and products to meet consumer needs and industry standards.

Electrical Engineering: As EVs are fundamentally reliant on electrical systems, this expertise is essential for developing efficient vehicles.

Manufacturing Processes: Understanding of modern manufacturing techniques is transferable and crucial to efficiently produce high-quality EVs.

Automation Skills: Proficiency in automation is vital in EV manufacturing, due to the high-tech nature of production lines that require precision and efficiency. Skills in setting up and managing automated processes are essential for maintaining quality and performance in this advanced sector.

Systems Engineering: The ability to design and analyze complex systems is critical in EVs, which are more than just mechanical vehicles—they are integrated systems involving advanced electronics and software.

Computer-Aided Design (CAD): CAD skills are necessary for designing EV components and systems, enabling precision and efficiency in the development process.

Software Development: As EVs include advanced software for battery management, navigation, and more, software development skills are increasingly valuable.

Data Analysis: In the context of EVs, data analysis is used for optimizing battery performance, understanding consumer behavior, and improving vehicle design.

KNOWLEDGE GAPS

Electric Powertrain Design and Integration: Designing and integrating electric motors, inverters, and other components of the electric drivetrain requires specialized knowledge that goes beyond traditional automotive engineering.

Regenerative Braking Systems: Understanding the nuances of regenerative braking technology, which is unique to EVs, may be lacking.

Electric Vehicle Software and Firmware: Proficiency in software and firmware that control EV functions, battery management, and user interfaces can be a gap, as traditional vehicles rely less on software-driven components.

EV Specific Standards and Regulations: Familiarity with EV-specific standards such as those related to emissions, energy consumption, and battery safety (e.g., ISO 26262 for functional safety) may not be as strong among traditional automotive engineers.

High-Voltage Systems Training: Engineers and managers may lack specific training in high-voltage systems unique to EVs, which is essential for safety and efficiency.

Embedded Systems and IoT Integration: As EVs become more connected and integrated with IoT devices, knowledge of embedded systems and IoT platforms is becoming increasingly important.

EV Product Lifecycle Management: Managing the lifecycle of an EV from design to end-of-life is different due to the evolving technology and faster pace of innovation.

EV Supply Chain and Procurement: Understanding the unique components and materials sourcing for EVs.

HARD & SOFT SKILLS

HARD SKILLS

Analytical Skills
Advanced Product Quality Planning
Automation
Computer Engineering
Computer-Aided Design (CAD)
Data Analysis
Electrical Engineering
Electronics
Engineering Design Process
Failure Mode And Effects Analysis
Industrial Engineering
Manufacturing Engineering & Processes
Mechanical Engineering
Mechanical Systems
New Product Development
Product Design
Quality Control
Root Cause Analysis
Software Development
Supply Chain Management
System Testing
Systems Engineering

SOFT SKILLS

Accountability
Auditing
Communication Skills
Coordination
Customer Service
Innovation
Investigation
Leadership
Management
Mentorship
Planning
Problem Solving
Project Management
Research
Self-Motivation

SKILLED TRADES

TRANSFERABLE SKILLS

Welding: While the types of materials may differ, welding is crucial in assembling various metal components in EVs, including aluminum frames and battery enclosures.

Machining: The ability to operate and program CNC (computer numerical control) machines and other more tranditional machinery to fabricate metal parts with high precision. Machining skills are crucial for creating custom parts used in EVs and their batteries.

Injection Molding: Essential for producing plastic components in EVs, such as interior panels and housings for electronic components. This technique involves operating and maintaining specialized molding equipment and understanding polymer properties.

Electronics Assembly: Ability to assemble complex electronic systems which involve soldering, circuit board assembly, and electronic testing.

Robotics and Automation: Skills in operating robotic systems and automated production lines, which are increasingly common in modern EV manufacturing plants.

Quality Testing and Inspection: Skills in using instruments and techniques to test and inspect parts to ensure they meet specifications and quality standards. This includes using micrometers, calipers, and electronic inspection tools.

Mechanical Repair: Skills in repairing and maitaining mechanical systems which can aid in the assembly and maintenance of mechanical parts of EVs.

KNOWLEDGE GAPS

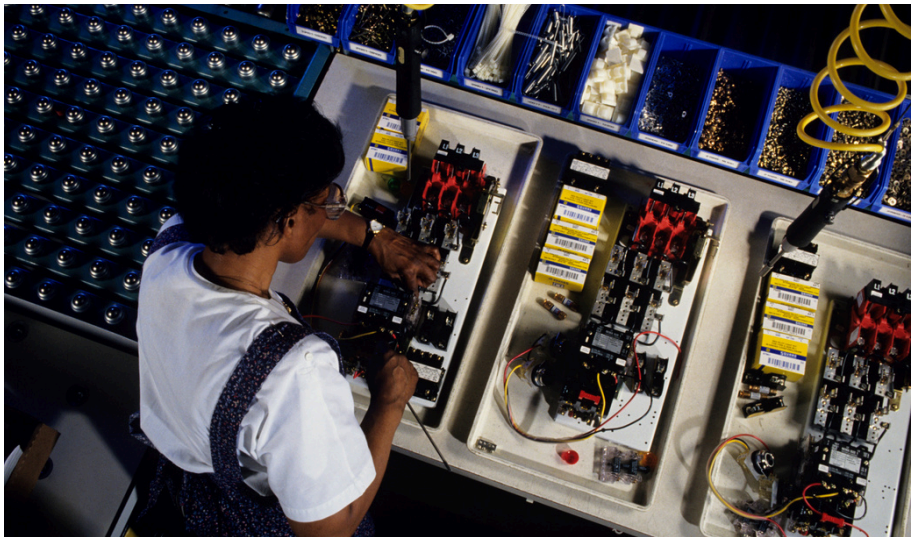
High-Voltage Electrical Systems: Skilled trades such as electricians and technicians will need to understand high-voltage systems unique to EVs for safe and effective work, including a battery's safety (e.g., ISO 26262 for functional safety).

Battery Technology: Those involved in vehicle assembly and maintenance must become familiar with the specifics of EV battery packs, including their assembly, maintenance, and safety procedures.

Electric Drive Units: As EVs replace traditional engines with electric drive units, understanding the components and how they integrate with the vehicle's systems is crucial.

Thermal Management for Battery Systems: Workers skilled in HVAC systems may need to adapt to the specific requirements of battery cooling systems in EVs.

EV-Specific Welding and Fabrication: The welding trades will need to adjust to new materials and techniques required for lightweight EV structures and battery enclosures.



Automotive Electronics: A deeper knowledge of electronics, including the ability to work with complex electronic control units, sensors, and infotainment systems, will be essential.

Charging Infrastructure Installation and Maintenance: Electricians and technicians will need to install, maintain, and repair EV charging stations.

Power Electronics: Understanding power electronic devices such as inverters and converters, which are fundamental to EVs, is a gap that needs to be addressed.

Diagnostics for EVs: Mechanics and technicians should be able to troubleshoot and repair EV-specific issues.

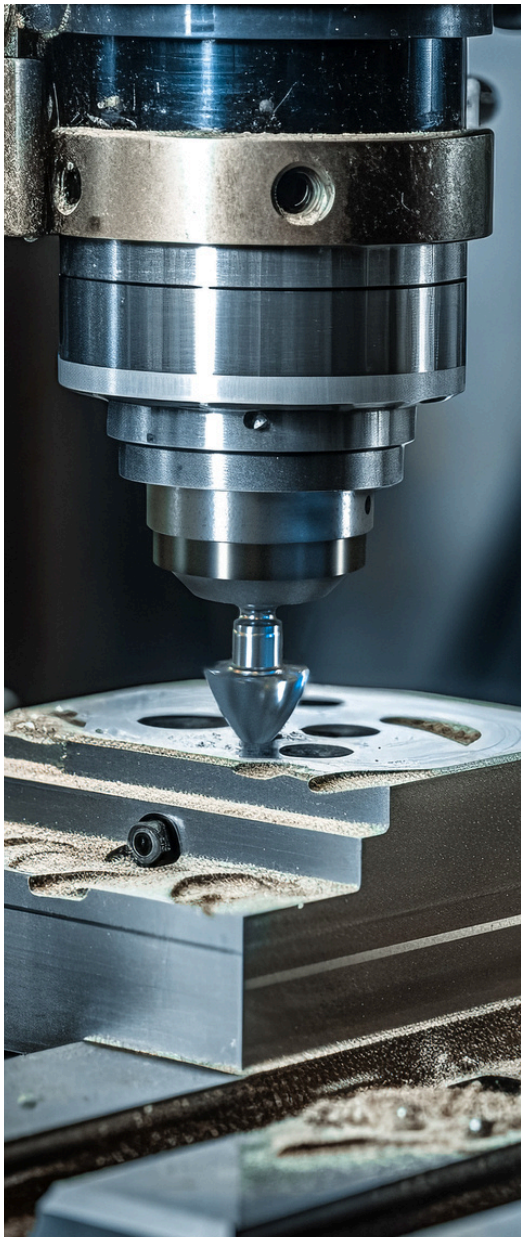
SKILLED TRADES

HARD SKILLS

Analytical Skills
Automation
Chemistry
Computer-Aided Design (CAD) Proficiency
Design & Schematic Reviews
Diagnostic and Troubleshooting
Equipment Maintenance
Fabrication
Functional Safety
Heavy Machinery Operation
Industrial Electrical & Electronic Systems
Inventory Management
Logistics Management
Machining
Mathematics
Mechanical Repair
Metal Forming
Molding
Precision Machining
Quality Control
Tooling
Welding Techniques

SOFT SKILLS

Accountability
Communication Skills
Coordinating
Customer Service
Detail-Oriented
Innovation
Leadership
Planning
Problem Solving
Project Management
Self-Motivation
Team Supervision



SUPERVISORS/PRODUCTION

TRANSFERABLE SKILLS

Machinery Operation: The ability to operate different types of machinery is directly transferable as it's a common requirement in both traditional and EV manufacturing settings.

Hand Tools Use: Proficiency with hand tools is essential for assembly and fitting work in EV production, especially for installing battery modules and other components.

Robotics and Automation Interaction: Familiarity with working alongside automated systems and robots that are commonly used in modern EV production lines.

Health and Safety: Knowledge of specific health and safety standards related to EV manufacturing, such as those pertaining to the handling of hazardous materials and high-voltage systems (e.g., ISO 26262 for functional safety).

Standard Operating Procedure (SOP): Understanding and adhering to SOPs ensures consistent output, which is crucial for the complex assembly processes involved in EV manufacturing.

Diagnostics and Troubleshooting: Skills in diagnosing issues and troubleshooting problems with EV components during the manufacturing process.

Quality Assurance: Skills in conducting quality checks and inspections to ensure that EV components meet stringent industry standards.

Attention to Detail: Precision and attention to detail are critical in ensuring the reliability and safety of electric vehicles.

Teamwork and Collaboration: Since EV manufacturing often involves complex assembly processes, the ability to work effectively in a team is important for ensuring a smooth production flow.

KNOWLEDGE GAPS

Electrical Skills for EV Production: Many production workers will need to understand the basics of working with electrical systems, a shift from conventional engine-focused manufacturing.

Battery Assembly and Maintenance: Specific knowledge of battery pack assembly, maintenance, and safety is critical in EV production and may be a new area for traditional production workers.

High-Voltage Training: Understanding and safely handling high-voltage components are essential skills that many current production workers may not possess.

EV-Specific Quality Assurance: Familiarity with the quality standards and testing procedures for EVs, which differ from those for internal combustion vehicles.

Use of Advanced Manufacturing Technologies: Proficiency with new manufacturing technologies such as robotics and advanced materials may be limited among traditional production workers.

Thermal Management Assembly: Assembly skills related to the cooling systems of EV batteries and electronics are a niche area that requires specialized knowledge.

Charging System Knowledge: Production workers should understand the assembly and testing of EV charging systems, which is a unique aspect of EVs not present in traditional automotive manufacturing.

Sustainable Production Practices: As the EV market is closely tied to sustainability, knowledge of environmentally friendly production practices and materials may be necessary.

PRODUCTION WORKERS

HARD SKILLS

Adaptability and Learning
Attention to Detail
Blueprint Reading
Diagnostics and Troubleshooting
Fabrication
Hand Tools Use
Health and Safety Standards
Lean Manufacturing
Machinery and Power Tool Operation
Machining
Manufacturing Processes
Mechanical Assembly
Packaging and Labeling
Painting
Quality Assurance
Robotics and Automation Interaction
Teamwork and Collaboration
Technical Documentation

SOFT SKILLS

Critical Thinking
Customer Service
Detail-Oriented
Flexibility
Influencing Skills
Innovation and Creativity
Operations
Organizational Skills
Planning
Problem Solving
Production Management
Scheduling
Self-Motivation
Teamwork
Time Management
Troubleshooting
Willingness to Learn

METHODOLOGY

This report analyzes how currently in demand job skills within the automotive manufacturing sector are relevant to the future job skills required by EV manufacturing. Three occupational categories were used to provide detailed insight into specific skills sets and demands of Engineers/Managers, Skilled Trades, and Production Worker. Each job category included job skills from a a variety of job types in order to reflect the scope of each category.

DATA COLLECTION

Job skills for a variety of jobs Job skills data were collected from Google Job postings using SerpAPI to scrape to job descriptions for jobs relevant to each occupational category. The categories included the following occupations:

Managers/Engineers/Technical
Engineering managers
Database analysts
Software engineers and designers
Mechanical engineers
Electrical and electronics engineers
Industrial and manufacturing engineers

Skilled Trades
Machinists and machining and tooling inspectors
Tool and die makers
Welders and related machine operators
Electricians (except industrial and power system)
Industrial electricians
Manufacturing Managers

Production Workers
Machining tool operators
Motor vehicle assemblers, inspectors, and testers
Mechanical assemblers and inspectors
Plastic products assemblers, finishers and inspectors
Industrial painters, coaters and metal finishing process operators
Other labourers in processing, manufacturing and utilities

To extract job skills from job descriptions, each post was fed through the Lightcast Open Skills API using python script.

METHODOLOGY

ANALYSIS

Based on existing jobs within EV manufacturing as well as the processes involved in EV production, the top skills that were most transferable were selected for each category.

The skills gap analysis that identified knowledge gaps was conduced through a systematic evaluation of the current job skills required within the auto sector, based on our data, and those anticipated for the future of EV manufacturing. The skills gap analysis focused on “hard” rather than “soft” skills, the definitions of each are below.

Hard Skills: specific, teachable abilities or skill sets that are easily quantifiable, typically acquired through formal education, training programs, or on-the-job experience.

Soft Skills: non-technical, interpersonal traits and behaviours that relate to how you work and interact with others.

Finally, the top skills for each category were identified and sorted into hard and soft skills.