Plastics and Rubber Products Manufacturing Sector Study

Training Gap Analysis

March 2011

Workforce Planning Board of Grand Erie
Commission de planification de la main-d'oeuvre de Grand Erie

Workforce Planning Board of Grand Erie

OUR VISION

A skilled, adaptable workforce contributing to a vibrant economy

OUR MISSION

The Workforce Planning Board of Grand Erie leads the development of local labour market strategies by engaging community partners and maximizing available resources.

ACKNOWLEDGEMENTS

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Executive Summary

PROJECT BACKGROUND

The plastics and rubber products manufacturing sector in Western Ontario contributes a significant number of jobs across Western Ontario (2010 TOP). The sector represents a relatively small percentage of the manufacturing sector, and in recent years has experienced a decline in production workers as a result of technology, "buy American", and off shore competition. But despite the production the industry's innovation in research and design, high quality control standards, and diverse customer markets is resulting in growing revenues and a need for skilled employees.

Employers identified that there is no shortage of people, but that there is a shortage of people who understand the manufacturing processes required. Most identified difficulty in recruiting and retaining skilled technical workers due to the lack of specific training. Most of the employers interviewed believed the skills sets within the industry so unique, that existing training and skills development programs could not meet their needs.

THE ISSUE

The sector has identified that there is a shortage of individuals who possess a basic understanding on manufacturing processes. Research has also indicated that most employers within the sector felt there were no training programs available specific to this industry.

OBJECTIVES

- Identify enterprises within the sector within the Western region
- Breakdown the industry requirements into key areas that share common training requirements (literacy, apprenticeship to be included)
- Engage industry in a comprehensive skills assessment to identify common and unique skill sets
- Identify wage and benefit scales for the industry
- Assess the industries connection with other sectors e.g. automotive, green, biotechnology
- Identify gaps in training with industry requirements.
- Identify the strength and suitability of existing programs

THE REALITY

The Plastics and Rubber Manufacturing Products Sector is comprised of a myriad of primarily Small to Medium Enterprises (SMEs) which share certain common training requirements to

maintain a competitive advantage both locally and globally. The ability to attract and retain well qualified individuals in a major challenge indentified by the sector. Increased pressure is placed upon companies due to above average on-the-job training requirements attributed to a lacked of well qualified applicants and rapidly evolving technology. There are identified limitations in training opportunities at both the high school and post secondary level. There is currently no industry specific apprenticeship available thus limits opportunities to offset a portion of training costs. Each of these areas is broken down along with key considerations and recommendations for the Plastics and Rubber.

Common Core and Foundational Manufacturing Skills:

Essential employability skills include communication, mathematical and computer skills in conjunction with critical thinking and problem solving capabilities. These skills are the foundation for success in all sectors. In an industry where significant on-the-job learning occurs the ability to communicate effectively is paramount. There is a demonstrated need for well developed interpersonal skills as well to function as a productive and effective team member. The industry would also benefit from an increased level of foundational manufacturing knowledge focusing on material properties, metrology and quality. The majority of operators are still hired with high school as the highest level of education. Foundational manufacturing skills in high school are limited to students who enroll in technology courses. A postsecondary education serves to develop both essential employability and foundational manufacturing skills.

Capacity and Size:

A large percentage of the sector is comprised of small to medium sized enterprises employing less than one hundred individuals. An increased burden is placed upon companies who rely on extensive on-the-job training models as the percentage of staff at less than peak productively limits efficiency and ultimately profitability. This is a direct result of a lack of industry specific training at the post secondary level. Implementation of new programming in the college system is contingent upon the ability to place graduates. A company requiring one or two specialists a year would be hard pressed to have a college develop a new program or augment an existing program of study. The role of Sector Councils and Local Boards as a unified voice for industry is paramount in moving forward the training agenda.

Apprenticeship:

By definition, apprenticeship training is primarily on-the-job training. The sector is already doing extensive training on the job site. Creation of industry specific apprenticeship programs would offset the cost of training and create a solid baseline of foundations skills. The apprenticeship model is simple, typically apprentices complete approximately 720 hours of in-

school training fully funded spread over a few years. This would provide an opportunity for companies to offset training costs and to also create a standard of core competencies for the sector.

Sustainability and Quality:

The Plastics and Rubber Sector is responsive to environmental concerns. Waste management is an ongoing concern as is sustainability. The sector identifies energy management as a key training area along with sustainable practice and 'Green Technology'.

Current Programs:

There are currently no solely industry specific postsecondary programs offered. This said two programs have been identified with core outcomes that address a significant number of desired sector training requirements. Chemical Production Engineering Technology is currently offered at one college in Ontario. The program provides training in a large number of outcomes related to the operation, monitoring and maintenance of process control systems. Quality assurance and control methodology is introduced but core mechanical foundational skills are not developed. The corollary to this is the Mechanical and Manufacturing Engineering programs available at most college. These programs focus on engineering drawing, metrology, material properties, production, automation and maintenance. Neither program provides extensive industry specific training related to moulding, extrusion or other processes. Industry specific training is currently available through the sector councils such at the Canadian Plastics Sector Council (CPSC) and the Rubber Manufacturer's Association (RMA).

The CPSC has developed a Certification Program to recognize and promote the skills and competencies deemed as necessary in the Plastics Industry. The Cert. PP designation is available in 27 occupations at graduated levels of proficiency.

RECOMMENDATIONS AND CONSIDERATIONS:

- Investigate local high school technology programs to determine schools which offer programs that complement industry requirements for operators as the majority of operators are high school graduates.
- Investigate Academic Upgrading programs for existing staff to further develop essential skills. These are often available through local educational institutions. Financial assistance or subsidies are often available.
- Benchmark expected levels of reading and writing comprehension, mathematical ability and computer literacy to share with employment advisors and other stakeholders.

- Leverage a combined voice by supporting and participating in Sector and Board initiatives.
- Participate in the development of occupational standards to ensure industry requirements are accurately reflected.
- Investigate existing apprenticeship trades to offset training costs and take advantage of lucrative apprenticeship tax credits. See Appendix E for details on financial incentives for hiring apprentices.
- Lobby for the development of sector specific trades recognizing there is significant overlap in a number of existing trade areas and sectors.
- Utilize the gap analysis to work with local educations institutions to enhance existing programs.
- Establish a Prior Learning Assessment and Recognition tool and process verify knowledge and skills in core areas.
- Sector Councils to partner with academic institutions to deliver industry specific training and to establish certificate level programs at the colleges to potentially offset a portion of training costs.

Plastics and Rubber Products Manufacturing Sector Study

Part 1: The Issues

Competitive advantage results in growth, prosperity and sustainability. This is true both in a local and global economy within in every sector of manufacturing. Competitive advantage centres upon a variety of factors including the ability to attract and retain a skilled and competent workforce. A skilled workforce is crucial to maintain productivity, quality and ultimately profitability. The technology found in the plastics and rubber sector expanding so rapidly that the need to well qualified individuals The focus of this study is to further refine the vision for the plastics and rubber products manufacturing sector in terms of training requirements and succession planning.

PROJECT BACKGROUND

The plastics and rubber products manufacturing sector in Western Ontario contributes a significant number of jobs across Western Ontario (2010 TOP). The sector represents a relatively small percentage of the manufacturing sector, and in recent years has experienced a decline in production workers as a result of technology, "buy American", and off shore competition. But despite the production the industry's innovation in research and design, high quality control standards, and diverse customer markets is resulting in growing revenues and a need for skilled employees.

Employers identified that there is no shortage of people, but that there is a shortage of people who understand the manufacturing processes required. Most identified difficulty in recruiting and retaining skilled technical workers due to the lack of specific training. Most of the employers interviewed believed the skills sets within the industry so unique, that existing training and skills development programs could not meet their needs.

During the consultation process it was also identified that the diverse nature of businesses within the sector results in the absence of any formal or informal network through which businesses within this industry can benefit from each other's knowledge or training.

The information obtained by the Workforce Planning Board mirrored the finding of other local boards during the consultation period. These results reinforced the findings of the Canadian Plastics Sector Council (CPSC) report titled Achieving Our Potential - The Plastics Industry to 2016. This report, published in 2007 was the end result of a labour market update project to create a snapshot of the status of the industry and a vision of the future with regards to growth and sustainability.

PROJECT SCOPE AND OUTCOMES

The Plastics and Rubber Products Manufacturing sector was identified as a priority industry by the Workforce Panning Board of Grand Erie (WPBGE)in an effort to support the training needs of employers and employed workers (job retention) in Grand Erie. The scope of this project expanded to include all 8 regions within the Western Local Board: Elgin, Middlesex, Oxford; Bruce, Grey, Huron, Perth; Grand Erie; Hamilton, Niagara; Sarnia Lambton and Windsor Essex.

Mohawk College and the Excellence in Manufacturing Consortium agreed to act a co-leads with the WPBGE on initiating a skills assessment and development project that would assist employers recognize training opportunities within existing programs.

The issue:

The sector has identified that there is a shortage of individuals who possess a basic understanding on manufacturing processes. Research has also indicated that most employers within the sector felt there were no training programs available specific to this industry.

Objectives

- Identify enterprises within the sector within the Western region
- Breakdown the industry requirements into key areas that share common training requirements (literacy, apprenticeship to be included)
- Engage industry in a comprehensive skills assessment to identify common and unique skill sets
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- Identify gaps in training with industry requirements.
- Identify the strength and suitability of existing programs

Outcomes:

- An inventory of industries within the sector will enhance the Western region's ability to consult and partner with employers within the industry

- An in-depth skills inventory tool comprised of 200-500 skills (similar tools have been used in the oil/petroleum industry in the region) will provide valuable information on skills gaps, common skills (within the industry and compared to other industry sectors). This information will serve as a foundation for:

    - Identifying existing education and training that meets the requirements of the industry

    - Evidence-based information for career profiles relevant to the western region

    - Solid career planning information for employment services (EO) and for Second Career facilitators
    - Prior learning assessment tools to help employers, employed workers, and new entrants identify transferable skills and determine training/upgrading requirements
    - Labour market information that supports the attraction, retention, and expansion of jobs within the western region
    - Identification of emerging occupations and industry trends (transition)
- An industry network will connect enterprises in the western region and will enable leveraging of skills training resources

In summary, the Plastics and Rubber Products Manufacturing Sector must take a leadership role in the development of cost effective and industry specific training models to maintain a competitive advantage. A multi-faceted approach involving liaison with local Boards of Education as well Community Colleges as well as Sector Council involvement potentially will develop a robust and flexible workforce. Opportunities exist not only in the development of entry-level employees but also in retraining existing workforce.

Plastics and Rubber Products Manufacturing Sector Study

Part 2: The Industry

Background

Plastics and Rubber Products Manufacturing (NAIC 326) is the processing of raw rubber and plastic materials into goods for both end users and manufacturers for further processing. The North American Industry Classification System (NAICS) is an industry classification system jointly developed by the United States, Canada and Mexico as part of the frame work of the North American Free Trade Agreement (NAFTA). The NAICS divides the economy into 20 key sectors then further defines activities in which businesses are involved. The coding is hierarchical in structure as follows: sectors (two-digit codes), subsectors (three-digit codes), industry groups (four-digit codes), and industries (five-digit codes). It should be noted that a revision to the NAICS is currently underway and schedule for release in 2012.

Current Status

Achieving Our Potential – The Plastics Industry to 2016 published by the Canadian Plastics Sector Council (CPSC) in 2007 provides an accurate profile of the sector. CPSC has identified seven major processes within the sector: injection, blow and rotational moulding, profile and film extrusion, thermoforming and composites. According to Industry Canada Statistics[1] the Plastic Products Industry (NAIC 3261) is a high-growth industry with a rapidly expanding range of both industrial and consumer applications. The following challenges impacting competitiveness have been indentified:

- Capacity and size
- Limited R & D capabilities
- Evolving technology and skill requirements

The Rubber Products Industry (NAIC 3262) is comprised of companies primarily engaged in the manufacture of tires and tubes, hose and belting and other rubber goods. The key factors influencing competitiveness in the industrial rubber products industry are similar to those in the plastics sector. Canadian-owned firms are a mixture of both of SMEs and large multinational corporations according to Industry Canada[2] data.

Both industries are impacted by the challenge of recycling waste. Many emerging technologies have developed as a result of these environmental issues.

This profile is accurate not only nationally but on a regional basis. The Grand Erie Industry Profile (TOP 2010) for the plastics and rubber sector indicated that 85% of businesses were classified as Small/Medium sized Enterprises (SMEs) employing less than 100 employees. Although the industry shows signs of recovery the impact of the decline in automotive manufacturing is limiting companies that have not diversified products lines. Major challenges moving forward include increasing energy costs, limited funding for Research and Development and notably the absence of readily available industry-specific education and training programs. The current post secondary education system does not provide graduates with the broad range of skills required for the rapidly emerging technology in the sector. Seventy-five percent of employers indicated a lack of industry specific training (TOP2010). There are no sector specific training programs offered locally thus offsetting the cost of training to the employer on the plant floor which ultimately limits productivity as both the trainer and trainee work through processes. The rapid expansion of technology also puts the industry at risk as existing staff must be retrained to efficiently set-up, operate and maintain new equipment. New technology also changes process for existing staff. Currently, employers have to engage in anon-the-job the training model supplemented by external training programs that are not funded. Funding incentives from various levels of government are limit because of the lack of credentialed industry specific training programs.

Plastics and Rubber Products Manufacturing Sector Study

Part 3: The Survey

In order to fully address the needs of the Plastics and Rubber Sector in terms of training requirements a comprehensive survey was developed to accomplish a number of objectives:

- Create a baseline of current training requirements within the sector
- Identify average sector salaries within the Western Region
- Establish a core skills matrix for future program development
- Determine the need for development of essential foundational skills
- Identify suitability of existing training programs both public and private
- Investigate the role of apprenticeship as a viable training mechanism
- Identify transferrable skills within sectors

Survey Design

The survey is broken down into five core component areas to aid in the collection and analysis of data as follows:

1. Company Profile including the following information:
    a. Company name
    b. Sector Classification
    c. Company Size
    d. Presence of Collective Bargain Unit
    e. Recent Hiring
    f. Salary Ranges
    g. Level of Education (Entry-level by position)
    h. Perceived Existing Program Suitability
    i. Percentage of Learning Occurring On-the-Job
    j. Perceived Need for Apprenticeship Training
    k. Current Challenges in Recruiting and Retaining Employees

2. Foundational Skills Analysis:
    a. Essential Employability Skills
        i. Communication
        ii. Mathematical
        iii. Computer
        iv. Critical Thinking
        v. Problem Solving
    b. MTCU Generic Skills[3] - Manufacturing
    c. Core Skills
        i. Physics
        ii. Chemistry
        iii. Material Properties
        iv. Metrology
        v. Blue Print Reading
        vi. GD&T
        vii. SPC/CMM

3. Review of existing postsecondary program outcomes in the following areas:
    a. Chemical Technology
    b. Laboratory Technology
    c. Process Engineering
    d. Manufacturing Engineering

4. Review industry specific training outcomes
    a. Health and Safety
    b. Engineering Drawings
    c. Material Properties
    d. Metrology
    e. Fluid Power
    f. Quality
    g. Sustainability
    h. Moulding
    i. Design

5. Apprenticeship
    a. Current Trades

b. Chemical Process Operator Apprenticeship

Note that the Ministry of Training, Colleges and Universities Provincial Program Standards were utilized to create the baseline for existing program analysis. Although programs with similar credentials may exist at various post secondary institutions the emphasis may vary from program to program. The Provincial Program Standard represents the minimum training standard by credential each institution must adhere to.

Initial survey development employed industry input via an informal interview process and an examination of similar surveys within the sector both locally and abroad. Survey distribution was accomplished via direct email blast and online via Survey Monkey. Initial requests were released January 2010 and personalized follow-up requests were sent out in March. In total over 250 invitations to participate were distributed. Excellence in Manufacturing Consortium also aided in the distribution of the survey to member companies. Approximately fifty percent of respondents requested to be identified by sub-sector as opposed to company name. The survey was set up with various exit points throughout the interview process. Approximately seventy percent of respondents who participated in the online version completed the full survey. See Appendix A for a copy of the full survey. There was no discrete distinction in the survey between sectors other than the initial identification process. It was deemed that core skill requirements would be applicable to both the plastics and rubber sectors.

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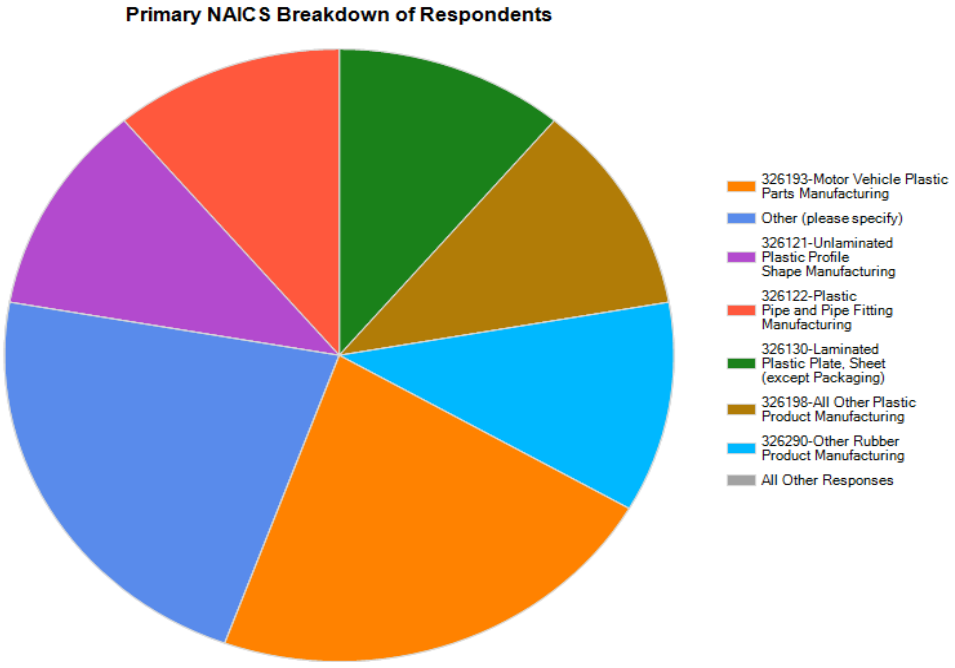
Part 4: The Results

Company Profile

The North American Industry Classification System was utilized to classify businesses by economic activity. Respondents from a variety of areas participated in the study from the following sub-sectors: motor vehicle plastic parts, plastic profile, sheet and plate, plastic pipe and fittings and rubber.



A review of the 'Other' response categories includes the following sub-sectors:

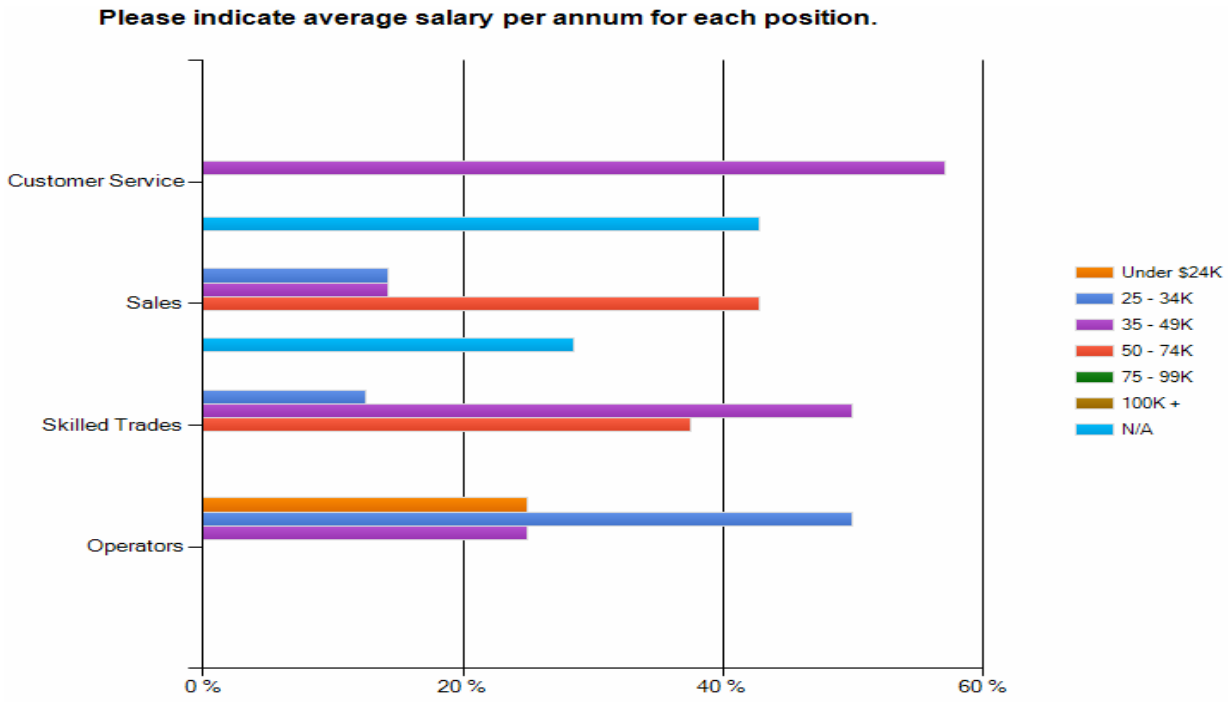
- Custom Injection Moulding
- Plastic (Vinyl) Reclaim, Recycling and Reprocessing
- Other Not Specified

Over 80% of respondents identified as SMEs with fewer than 100 employees. The existence of a large proportion of SMEs creates a challenge to advocate individually for changes to existing programs at local postsecondary institutions. The impact of a significant amount of the on-the-

job training impedes productively greatly in small to medium sized operation. Clearly, a role exists for Sector Councils and Workforce Advisory Boards to act on behalf of the sector to promote program development and revision. It is noteworthy that Motor Vehicle Parts Manufacturing still represents approximately 25% companies responding. Note that none of the companies responding were operating under a collective bargaining unit.

Salary Range:

Salary ranges were categorized into four main groups of employees: Customer Service, Sales, Skilled Trades and Operators. Respondents were then asked to indicate average salary by occupation. The graph below indicates the percentage of respondents and average salary ranges:



Note that survey data is based upon hiring within the last six months and not cumulative company averages. Data indicated as not available indicates that not all companies hired for that specific position. Customer service and sales positions were added as a reference to compare the manufacturing side of the business. Note that the only positions slated at under $24K per annum were for operators. There may be a possible correlation between the lack of qualified individuals and the entry level salary for machine operators. The range in salaries for

skilled tradespersons may be attributed to the hiring of both apprentices and certified journey persons.

Further analysis of hiring indicates that close to 80% of all respondents hired operators with a high school diploma. It should be noted that Operators were hired with a postsecondary education. This is a vital statistic as it indicates the need for secondary schools to provide the necessary training to develop core skills. It is assumed that set-up falls under the skilled trade area though not necessarily completed by a journeyperson. Approximately 20% of skilled trade hires are not apprentices/journeypersons.

Existing Training:

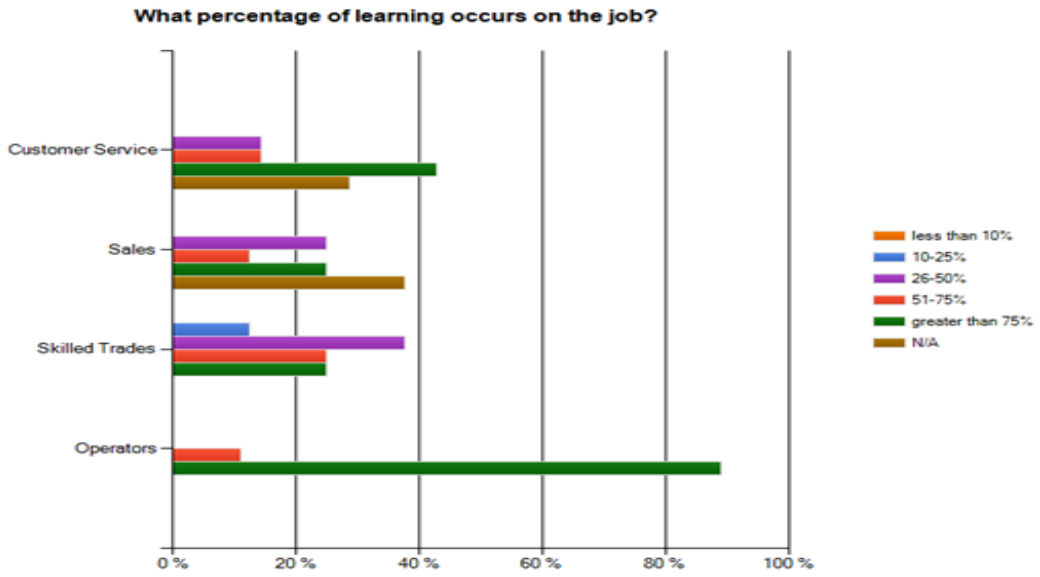
Respondents were asked to rank graduates of various post-secondary destinations in terms of meeting expectations related to skills and knowledge.

Q11. How would you rank your local post secondary educations programs in providing graduates with the skills required by your organization?

Program	Meet Expectations	Below Expectations	N/A
Apprenticeship	38%	38%	25%
College: Technician	38%	12%	50%
College: Technologist	44%	11%	44%
University: Bachelor of Science Degree	23%	22%	56%

Note that results have been rounded so they may not exactly equal 100%

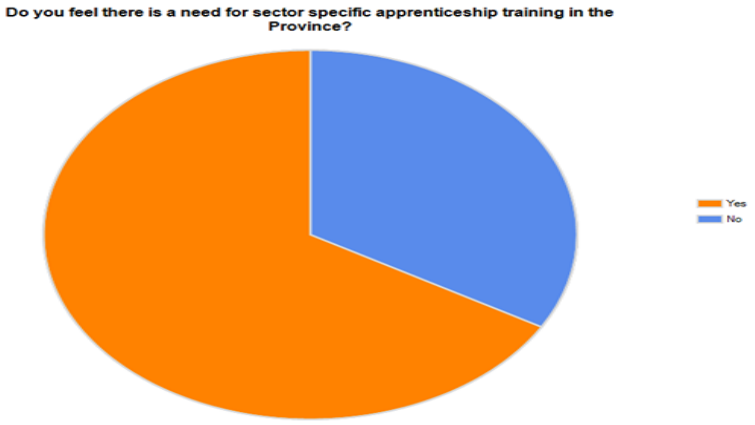
Q12. What percentage of learning occurs on the job?



A significant amount of on-the-job training is required for both skilled trades and operator positions across a range of subsectors. The common thread is that over 80% of respondents indicated that operators receive in excess of 75% of training on-the-job. With the large number of SMEs in the Plastics and Rubber Manufacturing Sector this will only serve to slow down and impede the manufacturing process. Ranges of on-the-job training are expected for skilled trades categories as they encompasses both journey persons and apprentices at varying competency levels.

Apprenticeship:

Respondents were asked if there was a need for sector specific apprenticeship training.



Two thirds (66.7%) of all respondents felt there was a need for sector specific apprenticeship training. Details as to the type of apprenticeship were addressed later in the survey.

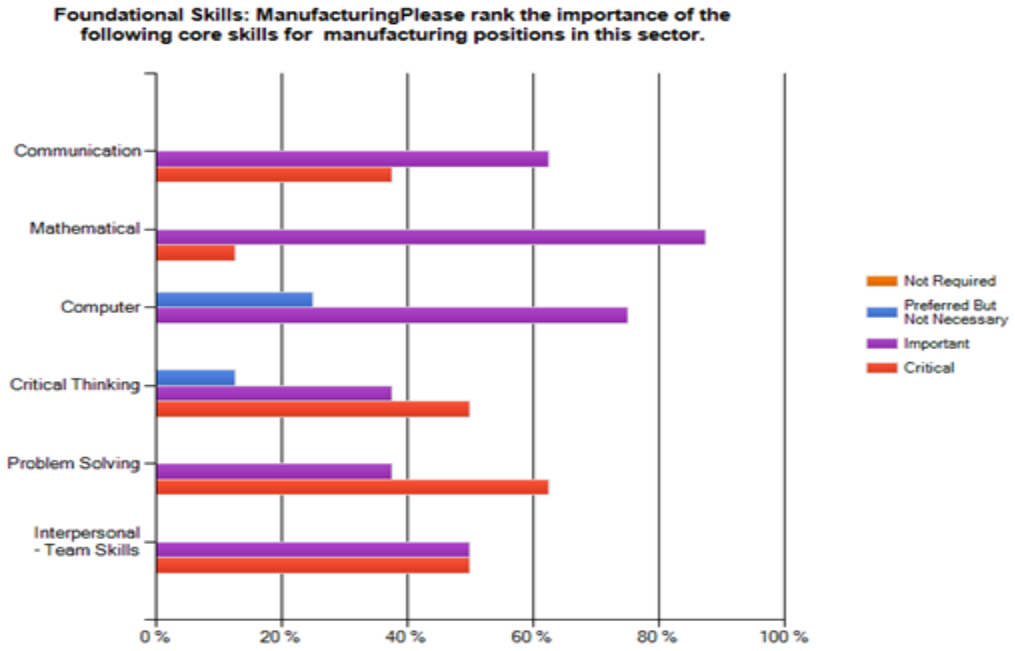
Challenges:

Respondents were invited to address the greatest challenge in recruiting and retaining employees. Approximately 80% of comments submitted focused on the lacked of skills coupled with turnover. One respondent stressed the need for core skills in math, reading/writing and application of measuring tools.

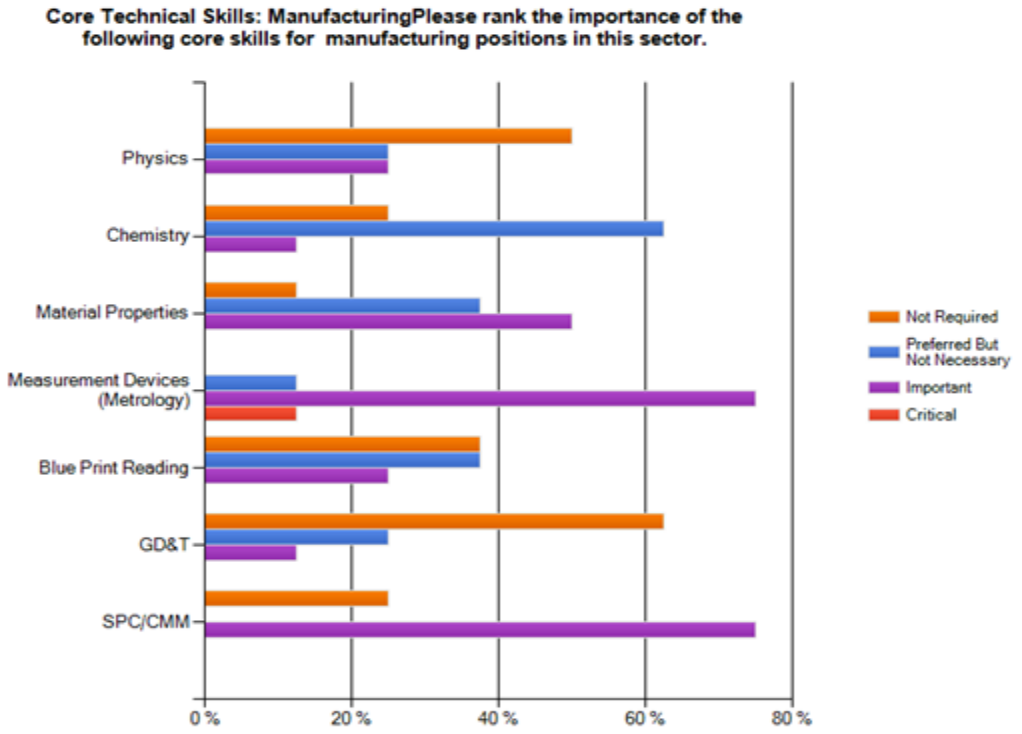
Foundational Skills Analysis:

Questions relating to essential employability skills applicable to any sector then specific to manufacturing were presented.

Q15. Foundational Skills: Manufacturing Please rank the importance of the following core skills for manufacturing positions in this sector. Results indicated by percentage of respondents:



Q17. Please rank the importance of the following core skills for manufacturing positions in this sector.



This is the point where deficiencies in existing training become move obvious. Over 70% of all respondents indicated basic metrology and quality training were important. General physics and chemistry are foundational courses in all high school programs yet not deemed important by the majority of respondents. Five of the categories: material properties, metrology, blue print reading, GD&T and SPC/CMM are core technology subjects. At the high school level, these subjects would only be introduced in a technology stream. At the college level, the core skills are honed in most Mechanical and Manufacturing programs. It was noted in a previous question that the majority of operators are hired as high school graduates. Unless applicants studied technical subjects they would not have been exposed to the five core trade areas indicated in this question. The number of high schools offering strong technical programs has been decreasing over the past decade. As such, the sector needs to focus on technical programming at the high school level to prepare students for employment post graduation as operators. Note that the five core topics are common to any manufacturing apprenticeship program in metal cutting trades or millwright and most college technician level programs.

Existing Post Secondary Programming:

Four core programs identified as having similar outcomes to sector occupational profiles were detailed on the survey. Ministry of Training, Colleges and University (MTCU) Provincial Program Standards were utilized to create common core program outcomes as they represent the minimum standard for the credential. Outcomes were presented for the following core program areas: Chemical, Laboratory, Production Engineering and Mechanical/Manufacturing Engineering Technologies. The majority of respondents focused on the Production and Manufacturing program level outcomes.

Production Engineering Technology:

Respondents ranked the importance of the following program outcomes for manufacturing positions in this sector. Results indicated by percentage of respondents. Note that some outcomes have been truncated - full outcomes are available on the Survey Document in Appendix A.

Q1. Apply mathematical, physical, and chemical concepts to the performance of assigned tasks and the analysis of problems

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Apply knowledge of the principles of general	50%	50%	0	0	0
Apply knowledge of basic organic, analytical, and	50%	50%	0	0	0
Use mathematical skills such as algebraic equations,	50%	50%	0	0	0
Apply knowledge of the principles of physics such as	100%	0	0	0	0

Q2.Perform operating procedures on various types of process plant equipment.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4	N/A
Apply knowledge of the operating principles of	100%	0	0	0	0
Perform start-up and shut-down procedures on various	100%	0	0	0	0
Operate, monitor, and control batch and continuous	100%	0	0	0	0

Q3. Analyze and operate control systems

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Analyze simple control loop behaviour	50%	0	50%	0	0
Apply the principles of multi-loop control to the	50%	50%	0	0	0
Operate and perform basic configuration procedures	50%	0	50%	0	0
Apply basic knowledge of control instruments such as	100%	0	0	0	0

Q4. Utilize analyzers to monitor change in process stream composition.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Apply knowledge of the operating principles for in-line	50%	50%	0	0	0
Operate in-line stream analyzers	50%	0	50%	0	0
Interpret sample data	100%	0	0	0	0

Q5. Apply engineering principles for sizing of basic process equipment.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Apply principles of heat transfer to the sizing of basic	50%	50%	0	0	0
Apply basic fluid mechanics to process flow problems	50%	0	50%	0	0
Apply pressure-drop principles to fluid-flow systems	50%	0	50%	0	0
Apply mass-transfer principles to process equipment	50%	0	50%	0	0

Q6. Perform routine maintenance and troubleshooting of process equipment, in-line stream analyzers, and instrumentation systems.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Follow maintenance test procedures as necessary.	100%	0	0	0	0
Record process data as necessary to support testing	100%	0	0	0	0
Interpret results of tests to confirm proper operation or	100%	0	0	0	0
Perform minor maintenance on equipment.	100%	0	0	0	0
Implement basic trouble-shooting procedures as	100%	0	0	0	0
Read process and instrument diagrams	100%	0	0	0	0
Recognize the operating principles of various types of	100%	0	0	0	0
Calibrate field instrumentation such as transmitters,	50%	0	0	50%	0
Apply knowledge of the principles underlying	100%	0	0	0	0

Q7. Apply knowledge of human interaction and team-building skills to the shift-work environment.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Adapt effectively to a shift-oriented environment.	100%	0	0	0	0
Solve problems successfully in a team-oriented	100%	0	0	0	0
Demonstrate individual initiative	100%	0	0	0	0
Communicate effectively with others in oral and written	100%	0	0	0	0

Q8. Perform statistical calculations to report the results of analyses and tests.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Calculate mean, median, mode, standard deviation,	50%	0	50%	0	0
Perform comparative analysis statistical tests such as	50%	0	50%	0	0
Use calibration and other statistical calculations to	100%	0	0	0	0

Q9. Apply computer skills relevant to the production engineering technology field.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Use software packages such as word processing,	50%	0	50%	0	0
Use software and the internet to acquire, store,	50%	0	50%	0	0
Comprehend computer programs written in high level	50%	50%	0	0	0
Use a variety of operating interfaces such personal	100%	0	0	0	0

Q10. Perform relevant Quality Assurance and Quality Control procedures.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Construct and use quality control charts	50%	0	50%	0	0
Respond appropriately to results	50%	0	50%	0	0
Follow corrective protocols	100%	0	0	0	0

Q11. Apply problem-solving skills to production engineering technology

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Recognize, identify, and define the problem	100%	0	0	0	0
Define the problem-solving sequence.	100%	0	0	0	0
Seek outside advice or data as required	100%	0	0	0	0
Recognize limitations in problem solving	50%	0	50%	0	0
Apply results of problem solving to troubleshoot as	100%	0	0	0	0
Synthesize a solution to the problem as appropriate	100%	0	0	0	0

Q12. Adhere to the ethics of Responsible Care* for the protection of employees, the community, and the environment.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Handle, use, store, and transport chemicals safely	100%	0	0	0	0
Apply relevant principles, such as Process Safety	100%	0	0	0	0
Act in accordance with relevant codes of practice,	100%	0	0	0	0
Act in accordance with an awareness of the role of the	100%	0	0	0	0

Manufacturing Engineering Technology:

Respondents ranked the importance of the following program outcomes for manufacturing positions in this sector. Results indicated by percentage of respondents. Note that some outcomes have been truncated - full outcomes are available on the Survey Document in Appendix A.

Q1.Analyze and solve complex technical problems related to manufacturing environments through the application of engineering principles.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Calculate and convert correctly in Imperial and SI	100%	0	0	0	0
Use engineering terminology correctly and accurately	100%	0	0	0	0
Identify the technical criteria necessary to design and	100%	0	0	0	0
Apply engineering principles to the analysis, design,	100%	0	0	0	0
Carry out standard procedures involving the design,	100%	0	0	0	0

Q2. Design and analyze* components, processes, and systems through the application of engineering principles* and practices.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Calculate and convert correctly in Imperial and SI	100%	0	0	0	0
Use engineering terminology correctly and accurately	100%	0	0	0	0
Identify the technical criteria necessary to design and	100%	0	0	0	0
Apply engineering principles to the analysis, design,	100%	0	0	0	0
Carry out standard procedures involving the design,	100%	0	0	0	0

Q3. Analyze and prepare graphics and other technical documents to appropriate engineering standards.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Assemble and analyze* relevant information, data,	100%	0	0	0	0
Organize and prepare documents in accordance with	100%	0	0	0	0
Employ conventional and computer-based drafting	100%	0	0	0	0
Employ freehand sketching techniques to produce	100%	0	0	0	0
Prepare, evaluate, and modify project-related	100%	0	0	0	0

Q4. Use computer hardware and software to support the engineering environment.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Use computer systems and application software to	100%	0	0	0	0
Apply file management techniques to access and	100%	0	0	0	0
Access and exchange information using electronic	100%	0	0	0	0
Use computer hardware and applications to access	100%	0	0	0	0
Use computer applications to support design and	100%	0	0	0	0

Q5. Assist in the specification of manufacturing operations and processes.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Understand processes used to manufacture	100%	0	0	0	0
Use systematic approaches to anticipate, identify, and	100%	0	0	0	0
Assess and recommend manufacturing processes	0	0	100%	0	0
Apply knowledge of computer-aided manufacturing	100%	0	0	0	0
Identify and eliminate potential hazards associated	100%	0	0	0	0

Q6. Apply knowledge of machinery, tools, and other equipment in manufacturing and assembling components.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Assess the performance characteristics, limitations,	100%	0	0	0	0
Use machinery, tools, and other equipment to	0	0	100%	0	0
Program computer-aided machinery to manufacture	0	0	100%	0	0
Apply knowledge of fabrication, joining, finishing, and	100%	0	0	0	0

Q7. Specify, coordinate, and conduct quality control and quality assurance procedures.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Review the specifications applicable to a	100%	0	0	0	0
Observe, record, assess, and report compliance with	100%	0	0	0	0
Perform or arrange to have quality-assurance	100%	0	0	0	0
Design and analyze* reports concerning statistical	0	0	100%	0	0
Interpret and use the results of quality-assurance	0	0	100%	0	0
Inspect components using appropriate measuring	100%	0	0	0	0
Apply principles of statistical process control to the	0	0	0	100%	0

Q8. Recognize the environmental, economic, legal, safety, and ethical implications of manufacturing projects.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Consider the interrelationships among technology,	0	0	100%	0	0
Support the provision of a healthy and safe workplace	100%	0	0	0	0
Apply ethical principles to own work	100%	0	0	0	0
Meet legal responsibilities to adhere to relevant	100%	0	0	0	0
Understand employer-employee contractual	0	100%	0	0	0
Promote equity and cooperation within the diversity of	0	0	100%	0	0

Q9,Use and maintain documentation, inventory, and records systems.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Use and maintain a paper-based and electronic	100%	0	0	0	0
Maintain current, clear, and accurate project-related	100%	0	0	0	0
Use project-related records and inventories to	100%	0	0	0	0

Q10 Participate in the management of a manufacturing project.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Participate in the information management, cost	100%	0	0	0	0
Identify the stages of a manufacturing project and	100%	0	0	0	0
Monitor expenditures and maintain cost effective	100%	0	0	0	0
Schedule, coordinate, and monitor a manufacturing	100%	0	0	0	0
Participate in long- and short-term planning	100%	0	0	0	0
Review, interpret, and prepare various elements of	100%	0	0	0	0
Train others where appropriate	0	0	100%	0	0
Contribute to the follow-up audit of a manufacturing	100%	0	0	0	0

Q11. Develop strategies and plans to improve job performance and work relationships.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Solicit constructive feedback to one's own	0	0	100%	0	0
Identify opportunities for ongoing professional	100%	0	0	0	0
Assume responsibility and accountability for own	100%	0	0	0	0
Keep abreast of technological changes	0	0	100%	0	0

Industry Specific Outcomes:

Respondents ranked the importance of the following program outcomes for manufacturing positions in this sector. Results indicated by percentage of respondents. Outcomes are drawn from sector specific training programs and seminars. Note that some outcomes have been truncated - full outcomes are available on the Survey Document in Appendix A.

Q1. Training in the following aspects related to Health & Safety

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Identify and discuss the regulations as applicable to	80%	0	20%	0	0
Identify and describe safety procedures and practices	100%	0	0	0	0
Identify and follow fire emergency procedures	100%	0	0	0	0
Apply all machinery and equipment lock-out and de-	80%	0	0	0	0
Demonstrate proper use and care of required safety	100%	0	0	0	0
Comply with confined space safety procedures,	80%	0	0	20%	0
Report all hazards and accidents to co-workers and	100%	0	0	0	0
Apply correct body mechanics when bending, lifting or	100%	0	0	0	0

Note line item four was skipped by one respondent.

Q2. Training in the following aspects related to Engineering Drawings.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Discuss types and formats of engineering drawings	40%	40%	20%	0	0
Identify and describe dimensional terminology and	60%	20%	20%	0	0
Interpret and describe the principle views of	40%	20%	40%	0	0
Sketch to scale an isometric/pictorial view from a fully	40%	20%	20%	0	20%
Identify and describe layout procedures, techniques,	60%	0	40%	0	0

Q3. Training in the following aspects related to Material Properties.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Identify, classify, and describe characteristics of	80%	0	0	20%	0
Describe the manufacturing processes to produce	80%	0	0	20%	0
Identify and describe the physical properties of	80%	0	0	20%	0
Identify and describe identification systems	80%	0	0	20%	0

Q4. Training in the following aspects related to Precision Measuring Equipment (Metrology).

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Identify and describe fundamentals of dimensional	40%	20%	40%	0	0
Identify and describe industrial end standards of	40%	20%	40%	0	0
Identify and describe terms and features used in	80%	0	20%	0	0
Describe the operational principles of measuring,	100%	0	0	0	0
Demonstrate measuring techniques using	100%	0	0	0	0
Identify and describe direct reading angular	60%	0	20%	20%	0
Identify and describe inspection and checking gauges	80%	0	20%	0	0
Identify and describe indicating gauges and	80%	0	20%	0	0

Q5. Training in the following aspects related to Fluid Power

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Read and interpret symbols for all pneumatic	60%	20%	0	0	20%
Build and troubleshoot pneumatic systems using	60%	20%	0	0	20%
Apply safety procedures when working on hydraulic	80%	0	0	0	20%
Apply the basic principles of fluid mechanics including	60%	20%	0	0	20%
Read and interpret symbols for all hydraulic	40%	20%	20%	0	20%
Assemble and troubleshoot hydraulic systems using	60%	20%	0	0	20%
Select the various sizes and types of piping, tubes	60%	20%	0	0	20%
Inspect, replace or maintain packing and mechanical	80%	0	0	0	20%
Identify and select pipe, tubing and valves for specific	60%	20%	0	0	20%
Select hangers and brackets to specifications	60%	20%	0	0	20%
Select specialized fittings, and screwed, welded,	60%	20%	0	0	20%
Select, cut, and fit gaskets	60%	20%	0	0	20%
Select expansion joints for specific applications	40%	20%	20%	0	20%
Select valves for specific applications	60%	20%	0	0	20%
Inspect and maintain pressure gauges, by-pass set-	80%	0	0	0	20%

Q6.Training in the following aspects related to Quality.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Introduction to Total Quality Management (TQM)	100%	0	0	0	0
Managing Teams	60%	20%	20%	0	0
Project Management	60%	20%	0	20%	0
Exemplary Customer Service	40%	20%	40%	0	0
ISO Quality Audits	100%	0	0	0	0
Lean Enterprise	60%	0	0	20%	20%
Six Sigma	40%	20%	0	20%	20%
Green Belt	20%	20%	20%	20%	20%
Black Belt	20%	40%	0	20%	20%

Q7. Training in the following aspects related to Sustainability.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Environment Responsibility	60%	20%	20%	0	0
Fiscal Responsibility	20%	20%	40%	0	20%
Social Responsibility	40%	20%	40%	0	0
ISO 26000	20%	40%	20%	0	20%
Carbon Footprint	20%	40%	20%	0	20%
Energy Management	60%	20%	0	0	20%
Green Technology	20%	40%	0	20%	20%

Q8. Training in the following aspects related to Injection Moulding.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Practice safe work habits and good housekeeping	40%	0	0	0	60%
Setup injection moulding machines	40%	0	0	0	60%
Perform start up and shut down procedures	40%	0	0	0	60%
Operate injection moulding machines	40%	0	0	0	60%
Discuss polymer classification criteria	40%	0	0	0	60%
Outline the three phases of the moulding process	40%	0	0	0	60%
Discuss typical defects and potential cause	40%	0	0	0	60%
Describe methods of mould construction and mould	40%	0	0	0	60%
Explain the use and application of gates and runners	40%	0	0	0	60%
Outline routine preventative maintenance procedures	40%	0	0	0	60%
Read and interpret data and graphs	40%	0	0	0	60%
Maintain proper process documentation	40%	0	0	0	60%
Troubleshoot machinery with a variety of problem	40%	0	0	0	60%
Explain the principles of open and closed loop control	40%	0	0	0	60%
Outline processing characteristics of different types of	40%	0	0	0	60%
Compete root cause analysis to determine cause of	40%	0	0	0	60%
Outline the die setting process	40%	0	0	0	60%
Differentiate between hydraulic and electric moulding	40%	0	0	0	60%
Outline process optimization strategies	40%	0	0	0	60%
Discuss the impact of shrinkage and warpage	40%	0	0	0	60%
Discuss the importance of meld and weld lines	40%	0	0	0	60%
Outline preventative and predictive maintenance	40%	0	0	0	60%

Q9. Training in the following aspects related to Blow Moulding.

Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Outline the blow moulding extrusion process	20%	0	0	0	80%
Identify components of blow moulding machines	20%	0	0	0	80%
Utilize blow moulding terminology accurately	20%	0	0	0	80%
Material properties of resin	20%	0	0	0	80%
Outline closed loop control of blow moulding process	20%	0	0	0	80%
Review design concepts to ensure quality	20%	0	0	0	80%
Discuss calibration procedures	20%	0	0	0	80%

Q10.Training in the following aspects related to Design.

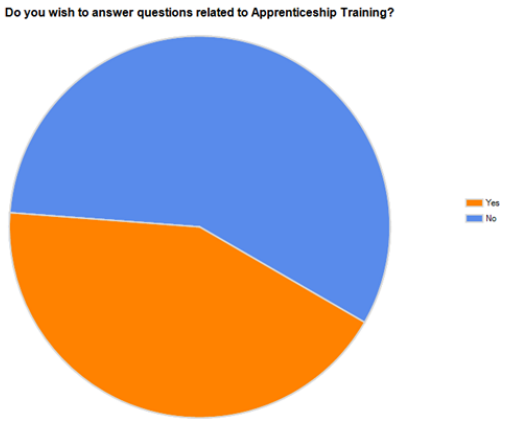
Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Identify key stages in product design and	20%	0	20%	0	60%
Utilize computer simulation software	20%	0	20%	0	60%
Describe rapid prototyping	20%	0	20%	0	60%
Interpret stress/strain curves	20%	0	0	20%	60%
Explain the importance of weld and gate lines	20%	0	0	20%	60%
Discuss assembly and disassembly consideration	20%	0	0	20%	60%
Discuss bonding applications and techniques	40%	0	0	20%	40%

Q11. Training in the following aspects related to Mould Making.

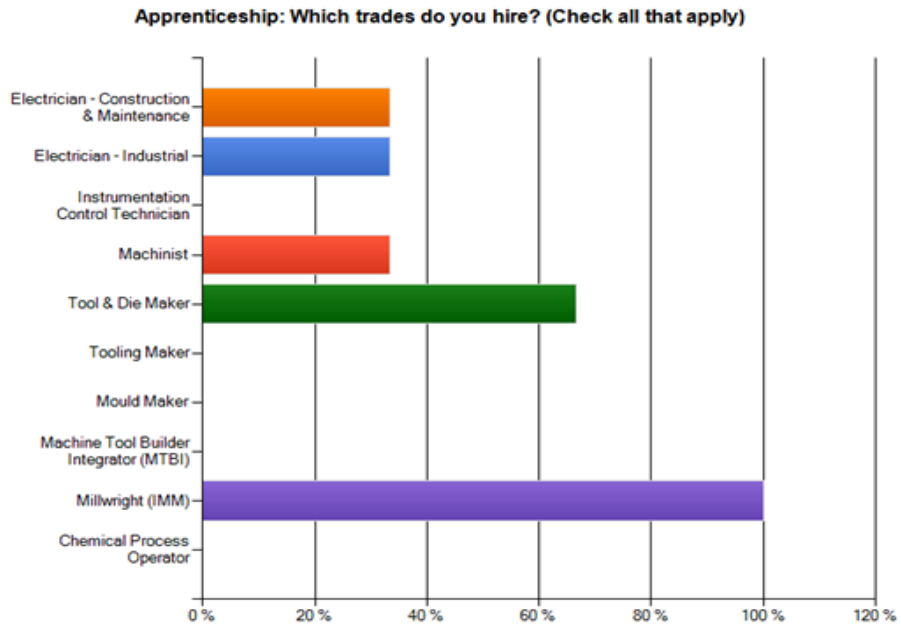
Answer Options	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Design consideration for injection mould	40%	0	0	0	60%
Select appropriate material per application	60%	0	0	0	40%
Machine using convention lathe, milling machine and	60%	0	0	0	40%
Operate CNC milling machine, lathe and surface	60%	0	0	0	40%
Outline the operation of EDM (both sinking and wire)	40%	0	0	0	60%
Detail the use and application of 2-Plate, 3-Plate and	40%	0	0	0	60%
Discuss various heat treating methods	60%	0	0	0	40%
Discuss methods for venting and cooling	60%	0	0	0	40%

Apprenticeship:

Respondents indicate hiring in specific traditional skilled trades areas. MTCU launched a new trade five years ago, Process Operator. The trade was designed with three distinct sectors in mind, Chemical, Food Processing and Power. Participants were presented with the opportunity to review the relatively new curriculum outcomes to assess suitability to lobby to expand the trade to the Plastics and Rubber Products Manufacturing Sector. Fewer than 50% of respondents (43%) opted to answer questions related to apprenticeship training.



Sample of Current Skilled Trades Hiring By Respondent by Percentage



Analysis of the results of the Process Operator apprenticeship survey indicates that the majority of the core outcomes provide no significant value to the Plastics and Rubber Manufacturing Sector as a whole. The following outcomes were deemed as required skills for the sector.

Process Operator Core Outcomes Overlapping with Plastics and Rubber Sector Requirements	Required	Would Be Nice
Training Related to Operations Safety & Hygiene		
Apply personal protective equipment properly	*	
Check, replace and maintain personal respiratory equipment	*	
Apply WHMIS and proper procedures when handling designated substances	*	
Follow company fire and emergency response procedures	*	
Follow company first aid procedures	*	
Follow company incident reporting procedures	*	
Conduct pre-operational safety checks of equipment	*	
Follow company lock out and tagging procedures	*	
Be familiar with OHSA and other government regulations	*	
Describe the fundamentals of fire science, and outline fire protection procedures employed in a typical plant	*	
Follow company confined space entry procedures		*
Check and maintain gas testing equipment		*

Process Operator Core Outcomes Overlapping with Plastics and Rubber Sector Requirements	Required	Would Be Nice
Training Related to Plant Communications		
Read and interpret technical documentation and written instructions	*	
Write job related reports and documentation	*	
Fill daily log books with pertinent and accurate information for shift continuity	*	
Interact appropriately verbally, and in writing, with other workers and supervisors	*	
Training Related to Operational Controls		
Monitor and optimize processes from various types of industries		*
Interpret control loops using ISA symbols and letters from a P & ID.		*
Define the characteristics of a process that are related to process control		*
Define two position and on off control and applications		*
Describe the operation of the proportional, integral, and derivative control actions used on a typical PID controller.		*
Training Related to Instrumentation		
Explain the operating principles of common types of pressure, level, flow, and temperature measurement devices		*
Identify the common types of control valves, and understand control valve terminology and applications.	*	
Explain the application and operation of different types of control valve actuators including pneumatic, electric, and hydraulic		*
Describe the application of process analysis types of instrumentation including gas chromatography, density, pH, conductivity ORP, clarity, humidity, and moisture analysis		*
Describe purging systems and applications		*
Discuss types of panel instruments, indicators and recorders commonly used		*
Training Related to Instrumentation		
Demonstrate an understanding of common chemical bond properties.		*
Perform basic material balance		*
Discuss solutions and concentrations		*
Identify acids and bases		*
Review the common flow chart symbols for instruments and vessels.		*
Completely label flow diagrams from petroleum industry processes and define the principal products and usage		*
Demonstrate an understanding of various polymer processes		*
Training Related to Physics		
Define units of measurement for applicable variables	*	
Explain and solve problems involving motion in one and two dimensions.		*
Solve vector problems of forces	*	
Explain and apply mathematically the concepts of heat energy and heat expansion	*	
Training Related to Process Operations		
Record process data as necessary to support operations and testing	*	
Interpret process data to make decisions on operating changes in a unit	*	
Monitor process equipment following proper procedures	*	

Process Operator Core Outcomes Overlapping with Plastics and Rubber Sector Requirements	Required	Would Be Nice
Training Related to Process Operations		
Recognize, identify, interpret labels of, and protect one-self from hazardous materials as described by WHMIS.	*	
Respond effectively at the "awareness level" to incidents involving the transportation of dangerous goods.	*	
Perform minor maintenance on equipment as permitted under plant procedures		*
Describe different types of process piping, valves and connection techniques.		*
Describe types of pipe supports, and insulation and heat tracing of piping systems		*
Describe the construction, operation, rating, and application of various types of safety valves and rupture disks.	*	
Understand the application and importance of various materials related to Operating Engineering including the TSSA Act, Operating Engineering regulations and Director's Orders, CSA B51 and B52, and the ASME code		*
State the purpose of standard plant operating equipment including pumps, compressors, turbines, mixers, heat exchangers, tanks, and vessels, and explain application in various types of process plants.		*
Explain the principles of pump dynamic head and net positive suction head		*
Perform standard pump priming procedures for centrifugal pumps	*	
Explain the principles of air compression, and understand the components and operation of the various types of air compressors.		*
Detail startup and shutdown procedures on process equipment including pumps, compressors, turbines and engines	*	
Work in teams to perform lab based plant-operating procedures pertaining to pumps, compressors and turbines, following plant safety practices.	*	
Explain the operation of various types of building heating and cooling systems, as well as other building services	*	
Perform Statistical Process Control calculations, and determine when process variables deviate from desired limits	*	
Identify flowsheet symbols and terminology for various processes		*
Explain the principles of heat transfer, and discuss the types of heat exchange equipment available		*
Operate heat transfer equipment		*
Discuss the operation and maintenance of filtering and screening equipment	*	
Load finished products and unload raw materials from tank trucks, rail cars, and other containers following proper grounding and other procedures		*
Training Related to Sampling Methods		
Complete required documentation for samples	*	
Package sample appropriately if they are to be transferred to a main lab	*	
Training Related to Shutdown Planning		
Participate in planning shutdown activities by identifying appropriate sequences and timeframes	*	

Identified Sector Core Outcomes:

A significant number of industry specific training outcomes were identified via the training analysis process. These outcomes were identified as required from existing postsecondary programs and specific sector occupational requirements. See Appendix B for a summary of these outcomes.

Plastics and Rubber Products Manufacturing Sector Study

Part 5: The Reality

The Plastics and Rubber Manufacturing Products Sector is comprised of a myriad of primarily Small to Medium Enterprises (SMEs) which share certain common training requirements to maintain a competitive advantage both locally and globally. The ability to attract and retain well qualified individuals in a major challenge indentified by the sector. Increased pressure is placed upon companies due to above average on-the-job training requirements attributed to a lacked of well qualified applicants and rapidly evolving technology. There are identified limitations in training opportunities at both the high school and post secondary level. There is currently no industry specific apprenticeship available thus limits opportunities to offset a portion of training costs. Each of these areas is broken down along with key considerations and recommendations for the Plastics and Rubber.

Common Core and Foundational Manufacturing Skills:

Essential employability skills include communication, mathematical and computer skills in conjunction with critical thinking and problem solving capabilities. These skills are the foundation for success in all sectors. In an industry where significant on-the-job learning occurs the ability to communicate effectively is paramount. There is a demonstrated need for well developed interpersonal skills as well to function as a productive and effective team member. The industry would also benefit from an increased level of foundational manufacturing knowledge focusing on material properties, metrology and quality. The majority of operators are still hired with high school as the highest level of education. Foundational manufacturing skills in high school are limited to students who enroll in technology courses. A postsecondary education serves to develop both essential employability and foundational manufacturing skills.

Capacity and Size:

A large percentage of the sector is comprised of small to medium sized enterprises employing less than one hundred individuals. An increased burden is placed upon companies who rely on extensive on-the-job training models as the percentage of staff at less than peak productively limits efficiency and ultimately profitability. This is a direct result of a lack of industry specific training at the post secondary level. Implementation of new programming in the college system is contingent upon the ability to place graduates. A company requiring one or two specialists a year would be hard pressed to have a college develop a new program or augment an existing program of study. The role of Sector Councils and Local Boards as a unified voice for industry is paramount in moving forward the training agenda.

Apprenticeship:

By definition, apprenticeship training is primarily on-the-job training. The sector is already doing extensive training on the job site. Creation of industry specific apprenticeship programs would offset the cost of training and create a solid baseline of foundations skills. The apprenticeship model is simple, typically apprentices complete approximately 720 hours of in-school training fully funded spread over a few years. This would provide an opportunity for companies to offset training costs and to also create a standard of core competencies for the sector.

Sustainability and Quality:

The Plastics and Rubber Sector is responsive to environmental concerns. Waste management is an ongoing concern as is sustainability. The sector identifies energy management as a key training area along with sustainable practice and 'Green Technology'.

Current Programs:

There are currently no solely industry specific postsecondary programs offered. This said, two programs have been identified with core outcomes that address a significant number of desired sector training requirements. Chemical Production Engineering Technology is currently offered at one college in Ontario. The program provides training in a large number of outcomes related to the operation, monitoring and maintenance of process control systems. Quality assurance and control methodology is introduced but core mechanical foundational skills are not developed. The corollary to this is the Mechanical and Manufacturing Engineering programs available at most college. These programs focus on engineering drawing, metrology, material properties, production, automation and maintenance. Neither program provides extensiveindustry specific training related to moulding, extrusion or other processes. Industry specific training is currently available through the sector councils such at the Canadian Plastics Sector Council (CPSC) and the Rubber Manufacturer's Association (RMA).

The CPSC has developed a Certification Program to recognize and promote the skills and competencies deemed as necessary in the Plastics Industry. The Cert. PP designation is available in 27 occupations at graduated levels of proficiency. The following occupations are available for certification:

- Blow Moulding - Blow Moulder (3 levels of competencies)
- Blow Moulding - Extrusion - Blow Moulder (3 levels of competencies)

- Blow Moulding - Injection - Operator (2 levels of competencies)
- Blow Moulding - Injection - Processing Technician (2 levels of competencies)
- Blow Moulding - Injection - Setup Technician (2 levels of competencies)
- Blow Moulding - Injection Stretch - Operator (2 levels of competencies)
- Blow Moulding - Injection Stretch - Processing Technician (2 levels of competencies)
- Blow Moulding - Injection Stretch - Setup Technician (2 levels of competencies)
- Composites - Closed Mould Technician (3 levels of competencies)
- Composites- Open mould Technician (3 levels of competencies)
- Fabrication/Bonded Structures Retail Fabrication (2 levels of competencies)
- Fabrication/Structural Welding Industrial Fabrication (3 levels of competencies)
- Film Extrusion Operator (3 levels of competencies)
- Injection Moulding Line Operator (1 levels of competencies)
- Injection Moulding Machine Setup technician (2 levels of competencies)
- Injection Moulding Processing Technician (2 levels of competencies)
- Profile Extrusion - Operator (2 levels of competencies)
- Profile Extrusion - Processing Technician (2 levels of competencies)
- Profile Extrusion - Setup Technician (2 levels of competencies)
- Quality Assurance Technician (2 levels of competencies)
- Quality Control Technician (1 levels of competencies)
- Rotational Moulding Operator (3 levels of competencies)
- Stretch Blow Moulding - Operator (2 levels of competencies)
- Stretch Blow Moulding - Processing Technician (2 levels of competencies)
- Stretch Blow Moulding - Setup Technician (2 levels of competencies)
- Thermoforming Operator (3 levels of competencies)
- Thermoforming Technician (2 levels of competencies)

These training courses provide a conduit to link existing postsecondary curriculum to industry requirements.

Plastics and Rubber Products Manufacturing Sector Study

Part 6: The Recommendations and Considerations

Recommendations and Considerations:

1. Investigate local high school technology programs to determine schools which offer programs that complement industry requirements for operators as the majority of operators are high school graduates.
2. Investigate Academic Upgrading programs for existing staff to further develop essential skills. These are often available through local educational institutions. Financial assistance or subsidies are often available.
3. Benchmark expected levels of reading and writing comprehension, mathematical ability and computer literacy to share with employment advisors and other stakeholders.
4. Leverage a combined voice by supporting and participating in Sector and Board initiatives.
5. Participate in the development of occupational standards to ensure industry requirements are accurately reflected.
6. Investigate existing apprenticeship trades to offset training costs and take advantage of lucrative apprenticeship tax credits. See Appendix E for details on financial incentives for hiring apprentices.
7. Lobby for the development of sector specific trades recognizing there is significant overlap in a number of existing trade areas and sectors.
8. Utilize the gap analysis to work with local educations institutions to enhance existing programs.
9. Establish a Prior Learning Assessment and Recognition tool and process verify knowledge and skills in core areas.
10. Sector Councils to partner with academic institutions to deliver industry specific training and to establish certificate level programs at the colleges to potentially offset a portion of training costs.

Appendix A: The Survey

Sector Skills Gap Analysis – Plastics & Rubber

1. Company Profile

1. Please provide the following information about your company.

Name:

Company:

Address 1:

Address 2:

City/Town:

Province:

Postal Code:

Email Address:

Phone Number:

2. It is the intent of this study to publish results to provide information regarding the current status and emerging needs of the Plastics and Rubber Sector related to training. May we include your data in the final report?

- ○ Yes. Identify my company along with the results
- ○ Yes. Identify by sector but not by company name.
- ○ No. Please do not identify my company or sector
- ○ Other

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Sector Skills Gap Analysis – Plastics & Rubber

3. Please select primary North American Industry Classification System (NAICS) description.

- ○ 326111-Plastic Bag and Pouch Manufacturing
- ○ 326114-Plastic Film and Sheet Manufacturing
- ○ 326121-Unlaminated Plastic Profile Shape Manufacturing
- ○ 326122-Plastic Pipe and Pipe Fitting Manufacturing
- ○ 326130-Laminated Plastic Plate, Sheet (except Packaging)
- ○ 326140-Polystyrene Foam Product Manufacturing
- ○ 326150-Urethane and Other Foam Product (except Polystyrene) Manufacturing
- ○ 326160-Plastic Bottle Manufacturing
- ○ 326191-Plastic Plumbing Fixture Manufacturing
- ○ 326193-Motor Vehicle Plastic Parts Manufacturing
- ○ 326196-Plastic Window and Door Manufacturing
- ○ 326198-All Other Plastic Product Manufacturing
- ○ 326210-Tire Manufacturing
- ○ 326220-Rubber and Plastic Hose and Belting Manufacturing
- ○ 326290-Other Rubber Product Manufacturing
- ○ Other (please specify)

4. Number of employees?

- ○ 1 - 4
- ○ 5 - 19
- ○ 20 - 99
- ○ 100 - 249
- ○ 250 - 499
- ○ 500+

Sector Skills Gap Analysis – Plastics & Rubber

5. Does your company operate within a collective bargaining agreement?

- ○ Yes
- ○ No

If Yes, please specify which Union Local

6. Have you hired for the following positions in the last six months? (Select all that apply)

- ☐ Management
- ☐ Administration
- ☐ Customer Service
- ☐ Sales
- ☐ Research & Development
- ☐ Skilled Trades
- ☐ Operators

Other (please specify)

7. Please rank the difficulty in attracting qualified candidates for each type of position.

	Level of skills and knowledge exceed expectations	Level of skills and knowledge met expectations	Level of skills and knowlege was below expectations	Difficult to find qualified applicant	N/A
Management	○	○	○	○	○
Administration	○	○	○	○	○
Customer Service	○	○	○	○	○
Sales	○	○	○	○	○
Research & Development	○	○	○	○	○
Skilled Trades	○	○	○	○	○
Operators	○	○	○	○	○
Shipping & Receiving	○	○	○	○	○

Additional Comments

Page 3

Sector Skills Gap Analysis – Plastics & Rubber

8. Please indicate average salary per annum for each position.

	Under $24K	25 - 34K	35 - 49K	50 - 74K	75 - 99K	100K +	N/A
Management	○	○	○	○	○	○	○
Administration	○	○	○	○	○	○	○
Customer Service	○	○	○	○	○	○	○
Sales	○	○	○	○	○	○	○
Research & Development	○	○	○	○	○	○	○
Skilled Trades	○	○	○	○	○	○	○
Operators	○	○	○	○	○	○	○
Shipping & Receiving	○	○	○	○	○	○	○

Additional Comments

9. Please indicate typical education level for each position.

	High School Graduate	Apprentice Journeyperson	College	Universtiy	Varies with Expelence	N/A
Management	○	○	○	○	○	○
Administration	○	○	○	○	○	○
Customer Service	○	○	○	○	○	○
Sales	○	○	○	○	○	○
Research & Development	○	○	○	○	○	○
Skilled Trades	○	○	○	○	○	○
Operators	○	○	○	○	○	○
Shipping & Receiving	○	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

10. Do graduates from the following programs posses the technical skills required by your company?

	Apprenticeship	Career College	Community College	University	N/A
Chemical Engineering Technology	○□	○□	○□	○□	○□
Laboratory Technology	○□	○□	○□	○□	○□
Production Engineering Technology	○□	○□	○□	○□	○□
Manufacturing Engineering Technology	○□	○□	○□	○□	○□
Undergraduate Degree in Chemistry	○□	○□	○□	○□	○□
Undergraduate Degree in Process Control/Automation	○□	○□	○□	○□	○□
Electrical/Mechanical Technology	○□	○□	○□	○□	○□
Maintenance	○□	○□	○□	○□	○□

11. How would you rank your local post secondary educational programs in providing graduates with the skills required by your organization?

	Exceed Expectations	Meet Expectations	Below Expectations	N/A
Apprenticeship	○□	○□	○□	○□
Community College - Technician	○□	○□	○□	○□
Community College - Technologist	○□	○□	○□	○□
University - BSc	○□	○□	○□	○□
University - MSc	○□	○□	○□	○□

Additional Comments

12. What percentage of learning occurs on the job?

	less than 10%	10-25%	26-50%	51-75%	greater than 75%	N/A
Management	○□	○□	○□	○□	○□	○□
Administration	○□	○□	○□	○□	○□	○□
Customer Service	○□	○□	○□	○□	○□	○□
Sales	○□	○□	○□	○□	○□	○□
Research & Development	○□	○□	○□	○□	○□	○□
Skilled Trades	○□	○□	○□	○□	○□	○□
Operators	○□	○□	○□	○□	○□	○□
Shipping & Receiving	○□	○□	○□	○□	○□	○□

Sector Skills Gap Analysis – Plastics & Rubber

13. Do you feel there is a need for sector specific apprenticeship training in the Province?

- ○ Yes
- ○ No

If Yes, please indicate area of speciality.

14. Please indicate the greatest challenge your organization encounters in recruiting and retaining employees.

2. Foundational Skills Analysis

This portion of the survey is divided into core areas of training from foundational to specialized skills. Initially, each area will be ranked followed by core outcomes by topic. You may complete those modules which you feel apply to your organization now and into the future.

1. Foundational Skills: Manufacturing

Please rank the importance of the following core skills for manufacturing positions in this sector.

	Not Required	Preferred But Not Necessary	Important	Critical
Communication	○	○	○	○
Mathematical	○	○	○	○
Computer	○	○	○	○
Critical Thinking	○	○	○	○
Problem Solving	○	○	○	○
Interpersonal - Team Skills	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

2. Foundational Skills: Manufacturing

Please rank the importance of the following essential skills for manufacturing positions in this sector.

Source: MTCU Program Standard: Generic Skills Learning Outcomes
http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/techno/CheEngT6.html#syno

	Not Required	Preferred But Not Necessary	Important	Critical
Communicate clearly, concisely, and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of audiences.	○	○	○	○
Reframe information, ideas, and concepts using the narrative, visual, numerical, and symbolic representations which demonstrate understanding.	○	○	○	○
Apply a wide variety of mathematical techniques with the degree of accuracy required to solve problems and make decisions.	○	○	○	○
Use a variety of computer hardware and software and other technological tools appropriate and necessary to the performance of tasks.	○	○	○	○
Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.	○	○	○	○
Evaluate her or his own thinking throughout the steps and processes used in problem solving and decision making.	○	○	○	○
Collect, analyze, and organize relevant and necessary information from a variety of sources.	○	○	○	○
Evaluate the validity of arguments based on qualitative and quantitative information in order to accept or challenge the findings of others.	○	○	○	○
Create innovative strategies and/or products that meet	○	○	○	○

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Sector Skills Gap Analysis – Plastics & Rubber

Identified needs.				
Manage the use of time and other resources to attain personal and/or project-related goals.	○	○	○	○
Take responsibility for her or his own actions and decisions.	○	○	○	○
Adapt to new situations and demands by applying and/or updating her or his knowledge and skills.	○	○	○	○
Represent her or his skills, knowledge, and experience realistically for personal and employment purposes	○	○	○	○

Additional Comments

3. Core Technical Skills: Manufacturing

Please rank the importance of the following core skills for manufacturing positions in this sector.

	Not Required	Preferred But Not Necessary	Important	Critical
Physics	○	○	○	○
Chemistry	○	○	○	○
Material Properties	○	○	○	○
Measurement Devices (Metrology)	○	○	○	○
Blue Print Reading	○	○	○	○
GD&T	○	○	○	○
SPC/CMM	○	○	○	○

Additional Comments

4. Do you wish to answer questions related to Chemical training requirements?

○ Yes

○ No

3. Chemical Engineering Technology

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Sector Skills Gap Analysis – Plastics & Rubber

1. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply basic* mathematical, physical, and chemical concepts to the performance of assigned tasks.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use mathematical skills such as algebraic equations, functions, factors, ratios, conversions, and linear regressions to perform analyses	○	○	○	○	○
Apply knowledge of the principles of physics such as heat, sound, light, electricity, and mechanics	○	○	○	○	○
Apply knowledge of the principles of general chemistry such as nomenclature, acid/base theory, stoichiometric calculations, and redox reactions	○	○	○	○	○
Apply knowledge of organic, inorganic, analytical, and physical chemistry to the applicable tasks	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

2. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Conduct basic* manual and instrumental quantitative and qualitative analyses* and tests accurately using prescribed laboratory procedures.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Use prescribed techniques for the collection, preparation, and analysis of samples	○	○	○	○	○
Use standard laboratory equipment to perform laboratory operations	○	○	○	○	○
Prepare solutions and dilutions using appropriate concentration units and conversions	○	○	○	○	○
Report quantitative and qualitative results in the required format	○	○	○	○	○
Perform physical testing on chemicals and materials	○	○	○	○	○
Use time, equipment and materials in a cost-effective manner	○	○	○	○	○
Perform procedural calculations	○	○	○	○	○
Use spectrometric, electrometric, and chromatographic instrumental techniques and their associated data reduction systems	○	○	○	○	○
Perform basic* calculations related to instrumental analysis	○	○	○	○	○
Recognize unexpected results according to specified guidelines	○	○	○	○	○
Use computer/instrument interface	○	○	○	○	○
Contribute to routine maintenance and troubleshooting* of instruments	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

3. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Prepare organic and inorganic compounds using standard synthetic* and purification procedures.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Follow established synthetic* procedures	○	○	○	○	○
Use standard separation and purification methods such as distillation, crystallization, preparatory chromatography, and extraction	○	○	○	○	○
Confirm the purity and identity of product(s) using established/stated procedures	○	○	○	○	○
Calculate the yield of the process	○	○	○	○	○

Additional Comments

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4. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform routine statistical calculations to report the results of analyses and tests.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Follow established synthetic* procedures	○	○	○	○	○
Use standard separation and purification methods such as distillation, crystallization, preparatory chromatography, and extraction	○	○	○	○	○
Confirm the purity and identity of product(s) using established/stated procedures	○	○	○	○	○
Calculate the yield of the process	○	○	○	○	○

Additional Comments

5. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform routine Quality Assurance and Quality Control procedures.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Construct and use quality control charts	○	○	○	○	○
Make referrals according to established criteria	○	○	○	○	○

Additional Comments

6. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply basic* computer skills relevant to the chemical engineering technology field.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use current software packages such as word processing, spreadsheets, and databases to express and manipulate chemical engineering technology information	○	○	○	○	○
Monitor computers associated with laboratory automation	○	○	○	○	○
Use software to acquire, store, retrieve, process, and present information	○	○	○	○	○
Use process control software	○	○	○	○	○

Additional Comments

7. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Assist in the application of design principles to industrial chemical systems.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Perform mass and energy balances	○	○	○	○	○
Assist in the selection of equipment for common unit operations including equilibrium contacting, evaporation, heat transfer, phase separation, and chemical reactors	○	○	○	○	○
Assist in the selection of equipment for liquid and solids handling including pumps, valves, and pipes	○	○	○	○	○
Assist in the selection of process control equipment	○	○	○	○	○

Additional Comments

8. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Assist in the analysis of the operation of industrial chemical processes.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Obtain operational data such as sampling and maintenance records	○	○	○	○	○
Assist in analyzing operational data	○	○	○	○	○
Assist in troubleshooting" operational processes such as distillation columns, heat exchangers, and filter presses	○	○	○	○	○

Additional Comments

9. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Operate chemical processes.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Start up chemical process equipment	○	○	○	○	○
Run chemical process equipment safely and efficiently	○	○	○	○	○
Shut down chemical process equipment	○	○	○	○	○

Additional Comments

10. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply problem-solving skills to routine chemical engineering technology problems.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify and define the problem	○	○	○	○	○
Define the problem-solving sequence	○	○	○	○	○
Seek outside advice or data as required	○	○	○	○	○
Recognize limitations in problem solving	○	○	○	○	○
Apply results of problem solving to assist in troubleshooting" as required	○	○	○	○	○

Additional Comments

11. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Use interpersonal and communication skills appropriate to the chemical engineering technology environment.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Work well in a team environment	○	○	○	○	○
Respond appropriately to feedback from supervisors	○	○	○	○	○
Communicate well with others in oral and written formats	○	○	○	○	○
Research, gather, and use information from appropriate chemical and related literature	○	○	○	○	○
Compile, organize, prepare, and present scientific and technical data and results	○	○	○	○	○
Use appropriate terminology	○	○	○	○	○

Additional Comments

12. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform all assigned work in compliance with relevant occupational health, safety, and environmental law, legislation, and regulations; established policies and procedures; and in accordance with ethical principles.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Adhere to specific industrial practices such as good manufacturing practice (GMP), good laboratory practice (GLP), and International Organization for Standardization (ISO)	○	○	○	○	○
Comply with environmental, health, and safety legislation and their related regulations such as the Workplace Hazardous Materials Information System (WHMIS) and the Occupational Health and Safety Act (OHSA)	○	○	○	○	○
Perform all procedures in accordance with the established workplace safety protocols	○	○	○	○	○
Recognize the influence that chemical engineering technology has on society in terms of the environment, health, and safety	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

13. Chemical Engineering Technician: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Develop a plan for continued professional growth.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify strategies for continued professional development	○	○	○	○	○
Be prepared to work in a variety of practice locations and types	○	○	○	○	○
Keep up-to-date by reading relevant literature	○	○	○	○	○
Develop plans to upgrade skills as required by technological change	○	○	○	○	○
Be aware of the role of professional associations and certification	○	○	○	○	○
Apply self-knowledge of strengths, weakness, and goals to improve own professional competence	○	○	○	○	○

Additional Comments

14. Do you wish to answer questions related to Chemical Laboratory Technology requirements?

○ Yes

○ No

4. Laboratory Technology

Sector Skills Gap Analysis – Plastics & Rubber

1. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply mathematical, physical, and chemical concepts to tasks, such as the analysis and synthesis of chemical compounds and samples and to develop approaches and techniques for the solution of problems.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use mathematical skills such as algebraic equations, functions, factors,ratios, conversions, and linear regressions to perform analyses	○	○	○	○	○
Apply knowledge of the principles of physics such as heat, sound, light, electricity and mechanics	○	○	○	○	○
Apply knowledge of the principles of general chemistry such as nomenclature, acid/base theory, stoichiometric calculations, and redox reactions	○	○	○	○	○
Apply knowledge of organic, inorganic, analytical, and physical chemistry to the applicable tasks	○	○	○	○	○

Additional Comments

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2. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Conduct and interpret accurately manual* quantitative and qualitative analyses using prescribed laboratory procedures.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use prescribed techniques for collection, preparation, and analysis of samples	○	○	○	○	○
Use standard laboratory equipment and materials, such as pH meters, spectrophotometers, balances, and laboratory glassware to perform laboratory operations	○	○	○	○	○
Prepare solutions and dilutions using appropriate concentration units and conversions	○	○	○	○	○
Interpret and report results of quantitative and qualitative analysis in the required format	○	○	○	○	○
Perform physical testing on chemicals and materials	○	○	○	○	○
Use time, equipment, and materials in a cost-effective manner	○	○	○	○	○
Perform the mathematical calculations applicable to laboratory processes	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

3. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Prepare organic and inorganic compounds using standard synthetic* and purification procedures.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Follow established synthetic procedures*	○	○	○	○	○
Use standard separation and purification methods such as distillation, crystallization, preparatory chromatography, and extraction	○	○	○	○	○
Confirm the purity and identity of the products using established/stated procedures	○	○	○	○	○
Calculate the yield of the process	○	○	○	○	○

Additional Comments

4. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform statistical calculations to report and evaluate the results of analyses.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Calculate mean, median, mode, standard deviation, and coefficient of variation	○	○	○	○	○
Perform comparative statistical tests such as the t-test and the F-test	○	○	○	○	○
Use calibration and other statistical calculations to meet quality assurance and quality control requirements and criteria	○	○	○	○	○

Additional Comments

5. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform instrumental chemical analysis and interpret, evaluate, and report the quantitative/qualitative results.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply knowledge of instrumental theory to the performance of chemical analyses	○	○	○	○	○
Use basic spectrometric, electrometric, and chromatographic instrumental techniques and their associated data reduction systems	○	○	○	○	○
Perform calculations related to the sample analysis	○	○	○	○	○
Recognize abnormal results according to specified guidelines and respond appropriately	○	○	○	○	○
Use computer/instrument interface	○	○	○	○	○

Additional Comments

6. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply computer skills relevant to the chemical laboratory technology field.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use current software packages such as word processing, spreadsheets, and databases to express and manipulate chemical technology information	○	○	○	○	○
Use computers associated with the set up and monitoring of laboratory automation	○	○	○	○	○
Use software to acquire, store, retrieve, process, and present data and/or information	○	○	○	○	○
Use relevant software to monitor laboratory quality assurance and quality control	○	○	○	○	○

Additional Comments

7. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Maintain and troubleshoot* laboratory equipment according to the manufacturers' guidelines.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Recognize when troubleshooting* is necessary	○	○	○	○	○
Perform prescribed routine maintenance of equipment	○	○	○	○	○
Select and use standard testing equipment	○	○	○	○	○
Use a variety of references to complete troubleshooting	○	○	○	○	○

Additional Comments

8. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform relevant Quality Assurance and Quality Control procedures to ensure that processes remain within designated limits.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply knowledge of a variety of relevant quality control/quality assurance programs such as International Organization for Standardization (ISO) 9000, ISO 14000, and ISO Guide 25	○	○	○	○	○
Construct, use, and interpret quality control charts	○	○	○	○	○
Respond to test results by following appropriate corrective protocols	○	○	○	○	○

Additional Comments

9. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Use interpersonal and communication skills to facilitate project management in the chemical laboratory technology environment.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Work well in a team environment	○	○	○	○	○
Respond appropriately to feedback from supervisors	○	○	○	○	○
Communicate well with others in oral and written formats	○	○	○	○	○
Compile, organize, prepare, and present scientific and technical data and results	○	○	○	○	○
Research, gather, and use information from appropriate chemical and related literature	○	○	○	○	○
Organize, write, and produce letters, memos, and scientific, technical, and business documents and reports	○	○	○	○	○
Plan, organize, and deliver oral presentations of technical information using appropriate terminology and visuals	○	○	○	○	○
Follow prescribed protocols	○	○	○	○	○

Additional Comments

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10. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Ensure that all assigned work is performed in compliance with relevant occupational health, safety, and environmental law, legislation, and regulations; established policies and procedures; and in accordance with ethical principles.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Ensure adherence to specific industrial practices including good manufacturing practice (GMP), good laboratory practice (GLP), and International Organization for Standardization (ISO)	○	○	○	○	○
Ensure compliance to environmental, health, and safety legislation and their related regulations such as the Workplace Hazardous Materials Information System (WHMIS) and the Occupational Health and Safety Act (OHSA)	○	○	○	○	○
Perform all procedures in accordance with the established workplace safety protocols	○	○	○	○	○
Recognize the influence that chemical laboratory technology has on society in terms of the environment, health, and safety	○	○	○	○	○
Follow ethical guidelines for professional work	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

11. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply problem-solving skills to chemical laboratory technology problems.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Recognize and define the problem	○	○	○	○	○
Define the problem-solving sequence	○	○	○	○	○
Seek outside advice or information as required	○	○	○	○	○
Recognize limitations in problem solving	○	○	○	○	○
Apply the results of problem solving as required	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

12. Chemical Laboratory Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Develop a plan for continued professional growth.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify strategies for continued professional development	○	○	○	○	○
Be prepared to work in a variety of practice locations and types	○	○	○	○	○
Keep up-to-date by reading relevant literature	○	○	○	○	○
Develop plans to upgrade skills as required by technological change	○	○	○	○	○
Be aware of the role of professional associations and certification	○	○	○	○	○
Apply self-knowledge of strengths, weakness, and goals to improve own professional competence	○	○	○	○	○

Additional Comments

13. Do you wish to answer questions related to Production Engineering Technology requirements?

○ Yes

○ No

5. Production Engineering Technology

Sector Skills Gap Analysis – Plastics & Rubber

1. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply mathematical, physical, and chemical concepts to the performance of assigned tasks and the analysis of problems

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply knowledge of the principles of general chemistry such as nomenclature, acid/base theory, stoichiometric calculations, redox reactions, and gas laws	○	○	○	○	○
Apply knowledge of basic organic, analytical, and applied physical chemistry to the applicable tasks	○	○	○	○	○
Use mathematical skills such as algebraic equations, functions, factors, ratios, conversions, calculus, and linear regressions to perform analyses	○	○	○	○	○
Apply knowledge of the principles of physics such as heat, sound, light, mechanics, mass and heat balance, thermodynamics, mass and heat transfer, and electricity	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

2. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform operating procedures on various process plant equipment.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply knowledge of the operating principles of process plant equipment including pumps, compressors, turbines, boilers, fired heaters, distillation columns, absorber columns, flare systems, reactors, heat exchangers, and extruders	○□	○□	○□	○□	○□
Perform start-up and shut-down procedures on various types of process plant equipment	○□	○□	○□	○□	○□
Operate, monitor, and control batch and continuous processes	○□	○□	○□	○□	○□

Additional Comments

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3. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Analyze and operate control systems

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Analyze simple control loop behaviour	○	○	○	○	○
Apply the principles of multi-loop control to the operation of advanced control strategies	○	○	○	○	○
Operate and perform basic configuration procedures on a distributed control system	○	○	○	○	○
Apply basic knowledge of control instruments such as process sensors	○	○	○	○	○

Additional Comments

4. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Utilize analyzers to monitor change in process stream composition.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply knowledge of the operating principles for in-line analyzers such as gas chromatographs and pH monitors	○	○	○	○	○
Operate in-line stream analyzers	○	○	○	○	○
Interpret sample data	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

5. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply engineering principles for sizing of basic process equipment.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Apply principles of heat transfer to the sizing of basic process equipment	○	○	○	○	○
Apply basic fluid mechanics to process flow problems	○	○	○	○	○
Apply pressure-drop principles to fluid-flow systems	○	○	○	○	○
Apply mass-transfer principles to process equipment	○	○	○	○	○

Additional Comments

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6. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform routine maintenance and troubleshooting of process equipment, in-line stream analyzers, and instrumentation systems.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Follow maintenance test procedures as necessary.	○	○	○	○	○
Record process data as necessary to support testing	○	○	○	○	○
Interpret results of tests to confirm proper operation or to hypothesize as to defects	○	○	○	○	○
Perform minor maintenance on equipment.	○	○	○	○	○
Implement basic trouble-shooting procedures as specified in manufacturers' guidelines	○	○	○	○	○
Read process and instrument diagrams	○	○	○	○	○
Recognize the operating principles of various types of instrumentation such as flow, level, temperature, and pressure measuring devices	○	○	○	○	○
Calibrate field instrumentation such as transmitters, transducers, and control valves	○	○	○	○	○
Apply knowledge of the principles underlying pneumatic, analog electrical, and digital electrical signals	○	○	○	○	○

Additional Comments

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7. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply knowledge of human interaction and team-building skills to the shift-work environment.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Adapt effectively to a shift-oriented environment.	○	○	○	○	○
Solve problems successfully in a team-oriented environment	○	○	○	○	○
Demonstrate individual initiative	○	○	○	○	○
Communicate effectively with others in oral and written formats	○	○	○	○	○

Additional Comments

8. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform statistical calculations to report the results of analyses and tests.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Calculate mean, median, mode, standard deviation, and coefficient of variation	○	○	○	○	○
Perform comparative analysis statistical tests such as t-test and F-test	○	○	○	○	○
Use calibration and other statistical calculations to meet Quality Assurance/Quality Control requirements/criteria	○	○	○	○	○

Additional Comments

9. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply computer skills relevant to the production engineering technology field.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use software packages such as word processing, spreadsheets, databases, heat/material balance software to express and manipulate information	○	○	○	○	○
Use software and the Internet to acquire, store, retrieve, process, and present information	○	○	○	○	○
Comprehend computer programs written in high level languages such as C	○	○	○	○	○
Use a variety of operating interfaces such personal computers (PC) and programmable logic controllers (PLC) process screens	○	○	○	○	○

Additional Comments

10. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Perform relevant Quality Assurance and Quality Control procedures

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Construct and use quality control charts	○	○	○	○	○
Respond appropriately to results	○	○	○	○	○
Follow corrective protocols	○	○	○	○	○

Additional Comments

11. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply problem-solving skills to production engineering technology

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Recognize, identify, and define the problem	○	○	○	○	○
Define the problem-solving sequence.	○	○	○	○	○
Seek outside advice or data as required	○	○	○	○	○
Recognize limitations in problem solving	○	○	○	○	○
Apply results of problem solving to troubleshoot as appropriate	○	○	○	○	○
Synthesize a solution to the problem as appropriate	○	○	○	○	○

Additional Comments

12. Production Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Adhere to the ethics of Responsible Care* for the protection of employees, the community, and the environment.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Handle, use, store, and transport chemicals safely	○	○	○	○	○
Apply relevant principles, such as Process Safety Management" (PSM), to ensure that a facility is maintained and operated safely	○	○	○	○	○
Act in accordance with relevant codes of practice, such as those based upon the principles of "product life cycle management"	○	○	○	○	○
Act in accordance with an awareness of the role of the industry in the community and society	○	○	○	○	○

Additional Comments

13. Do you wish to answer questions related to Manufacturing Engineering Technology requirements?

○ Yes

○ No

6. Manufacturing Engineering Technology

Source MTCU MCU Code 67000

Sector Skills Gap Analysis – Plastics & Rubber

1. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Analyze* and solve complex technical problems* related to manufacturing environments through the application of engineering principles.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Calculate and convert correctly in Imperial and SI measurement units using both manual methods and electronic technology	○	○	○	○	○
Use engineering terminology correctly and accurately in written and oral communication	○	○	○	○	○
Identify the technical criteria necessary to design and construct components, processes, and systems	○	○	○	○	○
Apply engineering principles to the analysis, design, and implementation of manufacturing projects	○	○	○	○	○
Carry out standard procedures involving the design, implementation, monitoring, and reporting of manufacturing processes	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

2. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Design and analyze* components, processes, and systems through the application of engineering principles* and practices.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Review the tolerances and materials specifications to design manufacturing processes	○	○	○	○	○
Apply knowledge of conventional and other technologies to design and analyze* components, manufacturing processes, and systems, including automated methods	○	○	○	○	○
Identify properties of materials and assess their responses in an engineering environment	○	○	○	○	○
Analyze technical drawings and other technical documents* used in the design of components, processes, and systems	○	○	○	○	○
Apply principles of method analysis and work measurement, mechanics, pneumatics, fluid mechanics, thermodynamics, and hydraulics to analyze* and develop manufacturing processes and automated systems	○	○	○	○	○
Apply principles of plant layout and materials handling to analyze* and solve problems related to manufacturing processes and to optimize the sequence of manufacturing components	○	○	○	○	○
Apply basic* principles of control systems	○	○	○	○	○
Apply basic* knowledge of electricity and electronics	○	○	○	○	○
Take into account ergonomic considerations	○	○	○	○	○

Assess vendor capabilities, lead times, and costs	○□	○□	○□	○□	○□

Additional Comments

3. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Analyze* and prepare graphics* and other technical documents* to appropriate engineering standards.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Assemble and analyze* relevant information, data, and materials	○□	○□	○□	○□	○□
Organize and prepare documents in accordance with recognized standards (e.g., company standards, CSA, ISO, etc.)	○□	○□	○□	○□	○□
Employ conventional and computer-based drafting techniques to produce graphics for manufacturing projects	○□	○□	○□	○□	○□
Employ freehand sketching techniques to produce graphics	○□	○□	○□	○□	○□
Prepare, evaluate, and modify project-related documents including technical reports	○□	○□	○□	○□	○□

Additional Comments

4. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Use computer hardware and software to support the engineering environment.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use computer systems and application software to resolve technical problems	○	○	○	○	○
Apply file management techniques to access and store data	○	○	○	○	○
Access and exchange information using electronic technology	○	○	○	○	○
Use computer hardware and applications to access and organize information and produce technical documents within an engineering environment	○	○	○	○	○
Use computer applications to support design and analysis within an engineering environment	○	○	○	○	○

Additional Comments

5. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Assist in the specification of manufacturing operations and processes.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Understand processes used to manufacture components	○	○	○	○	○
Use systematic approaches to anticipate, identify, and resolve technical problems in the manufacture of components and systems	○	○	○	○	○
Assess and recommend manufacturing processes taking into consideration the cost, economies of scale, use, and life of the component	○	○	○	○	○
Apply knowledge of computer-aided manufacturing techniques to assist in the specification of manufacturing processes	○	○	○	○	○
Identify and eliminate potential hazards associated with the manufacturing process	○	○	○	○	○

Additional Comments

6. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Apply knowledge of machinery, tools, and other equipment in manufacturing and assembling components.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Assess the performance characteristics, limitations, potential, and safety aspects of machinery, tools, and other equipment	○	○	○	○	○
Use machinery, tools, and other equipment to manufacture basic components to required specifications	○	○	○	○	○
Program computer-aided machinery to manufacture components to required specifications	○	○	○	○	○
Apply knowledge of fabrication, joining, finishing, and assembly processes to manufacture products from their components	○	○	○	○	○

Additional Comments

7. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Specify, coordinate, and conduct quality control and quality assurance procedures.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Review the specifications applicable to a manufacturing project and develop procedures where applicable	○	○	○	○	○
Observe, record, assess, and report compliance with appropriate quality assurance procedures and specifications	○	○	○	○	○
Perform or arrange to have quality-assurance sampling and testing done	○	○	○	○	○
Design and analyze" reports concerning statistical data	○	○	○	○	○
Interpret and use the results of quality-assurance sampling and testing to make adjustments or changes to manufacturing processes	○	○	○	○	○
Inspect components using appropriate measuring instruments as required	○	○	○	○	○
Apply principles of statistical process control to the manufacturing process	○	○	○	○	○

Additional Comments

8. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Recognize the environmental, economic, legal, safety, and ethical implications of manufacturing projects.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Consider the interrelationships among technology, society, the environment, politics, the economy, and manufacturing projects	○	○	○	○	○
Support the provision of a healthy and safe workplace environment	○	○	○	○	○
Apply ethical principles to own work	○	○	○	○	○
Meet legal responsibilities to adhere to relevant legislation in the workplace	○	○	○	○	○
Understand employer-employee contractual obligations within collective agreements	○	○	○	○	○
Promote equity and cooperation within the diversity of work groups	○	○	○	○	○

Additional Comments

9. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Use and maintain documentation, inventory, and records systems.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Use and maintain a paper-based and electronic system to store and retrieve information and to plan activities	○	○	○	○	○
Maintain current, clear, and accurate project-related documents in accordance with appropriate organizational practices	○	○	○	○	○
Use project-related records and inventories to prepare reports and plan activities	○	○	○	○	○

Additional Comments

10. Manufacturing Engineering Technology: Manufacturing

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Participate in the management of a manufacturing project.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Participate in the information management, cost control, and materials management of a project	○	○	○	○	○
Identify the stages of a manufacturing project and determine criteria necessary for the timely completion of the project	○	○	○	○	○
Monitor expenditures and maintain cost effective practices	○	○	○	○	○
Schedule, coordinate, and monitor a manufacturing project	○	○	○	○	○
Participate in long- and short-term planning	○	○	○	○	○
Review, interpret, and prepare various elements of estimates	○	○	○	○	○
Train others where appropriate	○	○	○	○	○
Contribute to the follow-up audit of a manufacturing project to assess if goals were met	○	○	○	○	○

Additional Comments

11. Manufacturing Engineering Technology: Manufacturing
Please rank the importance of the following program outcomes for manufacturing positions in this sector

Develop strategies and plans to improve job performance and work relationships.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Solicit constructive feedback to one's own performance, strengths, and limitations	○	○	○	○	○
Identify opportunities for ongoing professional development (e.g., professional associations, continuing education courses, and trade shows)	○	○	○	○	○
Assume responsibility and accountability for own competence	○	○	○	○	○
Keep abreast of technological changes	○	○	○	○	○

Additional Comments

12. Do you wish to answer questions related to Industry Specific Training requirements?

○ Yes

○ No

7. Industry Specific Training Requirements

Sector Skills Gap Analysis – Plastics & Rubber

1. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Health & Safety

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify and discuss the regulations as applicable to the Occupational Health and Safety Act(OHSA) and Workplace Hazardous Material Information System (WHMIS)	○	○	○	○	○
Identify and describe safety procedures and practices required when setting up and using machines, equipment, tools, coolants/lubricants, and cleaning agents	○	○	○	○	○
Identify and follow fire emergency procedures	○	○	○	○	○
Apply all machinery and equipment lock-out and de-energizing procedures (mechanical, electrical, hydraulic and pneumatic) before commencing maintenance and overhaul procedures	○	○	○	○	○
Demonstrate proper use and care of required safety clothing and equipment	○	○	○	○	○
Comply with confined space safety procedures, including the use of the breathing apparatus prior to and while working	○	○	○	○	○
Report all hazards and accidents to co-workers and supervisory personnel, and complete all paper work in compliance with company procedures and government regulations	○	○	○	○	○
Apply correct body mechanics when bending, lifting or moving heavy objects/equipment	○	○	○	○	○

Additional Comments

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2. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Engineering Drawings.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Discuss types and formats of engineering drawings	○	○	○	○	○
Identify and describe dimensional terminology and practices	○	○	○	○	○
Interpret and describe the principle views of orthographic projection to identify component features	○	○	○	○	○
Sketch to scale an isometric/pictorial view from a fully dimensioned orthographic drawing	○	○	○	○	○
Identify and describe layout procedures, techniques, and equipment	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

3. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Material Properties

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify, classify, and describe characteristics of plastic and rubber	○	○	○	○	○
Describe the manufacturing processes to produce plastic and rubber	○	○	○	○	○
Identify and describe the physical properties of polymers	○	○	○	○	○
Identify and describe identification systems	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

4. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Precision Measuring Equipment (Metrology)

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Identify and describe fundamentals of dimensional metrology	○	○	○	○	○
Identify and describe industrial end standards of length	○	○	○	○	○
Identify and describe terms and features used in measurement techniques	○	○	○	○	○
Describe the operational principles of measuring, checking, and gauging equipment	○	○	○	○	○
Demonstrate measuring techniques using direct/indirect reading linear measuring equipment	○	○	○	○	○
Identify and describe direct reading angular equipment	○	○	○	○	○
Identify and describe inspection and checking gauges	○	○	○	○	○
Identify and describe indicating gauges and comparators	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

5. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Fluid Power

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Read and interpret symbols for all pneumatic components using both ANSI and ISO systems	○□	○□	○□	○□	○□
Build and troubleshoot pneumatic systems using drawings and test instruments	○□	○□	○□	○□	○□
Apply safety procedures when working on hydraulic systems	○□	○□	○□	○□	○□
Apply the basic principles of fluid mechanics including properties of fluids, flow patterns, pipe losses and Bernoulli's Principle	○□	○□	○□	○□	○□
Read and interpret symbols for all hydraulic components using both ANSI and ISO systems	○□	○□	○□	○□	○□
Assemble and troubleshoot hydraulic systems using circuit drawings	○□	○□	○□	○□	○□
Select the various sizes and types of piping, tubes and hoses available for specific hydraulic systems	○□	○□	○□	○□	○□
Inspect, replace or maintain packing and mechanical seals	○□	○□	○□	○□	○□
Identify and select pipe, tubing and valves for specific applications and to specifications	○□	○□	○□	○□	○□
Select hangers and brackets to specifications	○□	○□	○□	○□	○□
Select specialized fittings, and screwed, welded, cemented and bolted flanges	○□	○□	○□	○□	○□
Select, cut, and fit gaskets	○□	○□	○□	○□	○□
Select expansion joints for specific applications	○□	○□	○□	○□	○□
Select valves for specific	○□	○□	○□	○□	○□

applications

Inspect and maintain pressure gauges, by-pass set-ups and pipe systems	○	○	○	○	○

Additional Comments

6. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Quality

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Introduction to Total Quality Management (TQM)	○	○	○	○	○
Managing Teams	○	○	○	○	○
Project Management	○	○	○	○	○
Exemplary Customer Service	○	○	○	○	○
ISO Quality Audits	○	○	○	○	○
Lean Enterprise	○	○	○	○	○
Six Sigma	○	○	○	○	○
Green Belt	○	○	○	○	○
Black Belt	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

7. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Sustainability

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Environment Responsibility	○	○	○	○	○
Fiscal Responsibility	○	○	○	○	○
Social Responsibility	○	○	○	○	○
ISO 26000	○	○	○	○	○
Carbon Footprint	○	○	○	○	○
Energy Management	○	○	○	○	○
Green Technology	○	○	○	○	○

Additional Comments

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8. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Injection Moulding.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Practice safe work habits and good housekeeping around injection moulding machines	○	○	○	○	○
Setup injection moulding machines	○	○	○	○	○
Perform start up and shut down procedures	○	○	○	○	○
Operate injection moulding machines	○	○	○	○	○
Discuss polymer classification criteria	○	○	○	○	○
Outline the three phases of the moulding process	○	○	○	○	○
Discuss typical defects and potential cause	○	○	○	○	○
Describe methods of mould construction and mould configuration	○	○	○	○	○
Explain the use and application of gates and runners	○	○	○	○	○
Outline routine preventative maintenance procedures for injection moulding machines	○	○	○	○	○
Read and interpret data and graphs	○	○	○	○	○
Maintain proper process documentation	○	○	○	○	○
Troubleshoot machinery with a variety of problem solving methods	○	○	○	○	○
Explain the principles of open and closed loop control systems	○	○	○	○	○
Outline processing characteristics of different types of polymers	○	○	○	○	○
Compete root cause analysis to determine cause of defects	○	○	○	○	○
Outline the die setting process	○	○	○	○	○
Differentiate between hydraulic and electric	○	○	○	○	○

moulding machines					
Outline process optimization strategies	○	○	○	○	○
Discuss the impact of shrinkage and warpage	○	○	○	○	○
Discuss the importance of meld and weld lines	○	○	○	○	○
Outline preventative and predictive maintenance techniques for injection moulding machines	○	○	○	○	○

Additional Comments

9. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Blow Moulding.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Outline the blow moulding extrusion process	○	○	○	○	○
Identify components of blow moulding machines	○	○	○	○	○
Utilize blow moulding terminology accurately	○	○	○	○	○
Material properties of resin	○	○	○	○	○
Outline closed loop control of blow moulding process	○	○	○	○	○
Review design concepts to ensure quality	○	○	○	○	○
Discuss calibration procedures	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

10. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Design.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify key stages in product design and development	○	○	○	○	○
Utilize computer simulation software	○	○	○	○	○
Describe rapid prototyping	○	○	○	○	○
Interpret stress/strain curves	○	○	○	○	○
Explain the importance of weld and gate lines	○	○	○	○	○
Discuss assembly and disassembly consideration	○	○	○	○	○
Discuss bonding applications and techniques	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

11. Industry Specific:

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Mould Making.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Design consideration for injection mould	○	○	○	○	○
Select appropriate material per application	○	○	○	○	○
Machine using convention lathe, milling machine and surface grinder	○	○	○	○	○
Operate CNC milling machine, lathe and surface grinder	○	○	○	○	○
Outline the operation of EDM (both sinking and wire)	○	○	○	○	○
Detail the use and application of 2-Plate, 3-Plate and Hot Runner Moulds	○	○	○	○	○
Discuss various heat treating methods	○	○	○	○	○
Discuss methods for venting and cooling	○	○	○	○	○

Additional Comments

12. Do you wish to answer questions related to Apprenticeship Training?

○ Yes

○ No

8. Apprenticeship

1. Apprenticeship:

Do you hire apprentices and/or journey persons?

○ Yes

○ No

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

9. Current Apprenticeship Hiring

1. Apprenticeship:
Which trades do you hire? (Check all that apply)

- ☐ Electrician - Construction & Maintenance
- ☐ Electrician - Industrial
- ☐ Instrumentation Control Technician
- ☐ Machinist
- ☐ Tool & Die Maker
- ☐ Tooling Maker
- ☐ Mould Maker
- ☐ Machine Tool Builder Integrator (MTBI)
- ☐ Millwright (IMM)
- ☐ Chemical Process Operator

Other

2. Do you wish to review the program level outcomes for the Chemical Process Operator apprenticeship to determine if they are suitable for the Plastics and Rubber Sector?

- ○ Yes
- ○ No

10. Chemical Process Operator Apprenticeship

Sector Skills Gap Analysis – Plastics & Rubber

1. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Operations Safety and Hygiene

.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Apply personal protective equipment properly	○	○	○	○	○
Check, replace and maintain personal respiratory equipment	○	○	○	○	○
Apply WHMIS and proper procedures when handling designated substances	○	○	○	○	○
Follow company fire and emergency response procedures	○	○	○	○	○
Follow company first aid procedures	○	○	○	○	○
Follow company incident reporting procedures	○	○	○	○	○
Conduct pre-operational safety checks of equipment	○	○	○	○	○
Follow company lock out and tagging procedures	○	○	○	○	○
Follow company confined space entry procedures	○	○	○	○	○
Check and maintain gas testing equipment	○	○	○	○	○
Be familiar with OHSA and other government regulations	○	○	○	○	○
Describe the fundamentals of fire science, and outline fire protection procedures employed in a typical plant	○	○	○	○	○
Describe various types of potential pollutants from an industrial facility, and how environmental impact is reduced	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

2. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Plant Communications

.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Read and interpret technical documentation and written instructions	○	○	○	○	○
Write job related reports and documentation	○	○	○	○	○
Fill daily log books with pertinent and accurate information for shift continuity	○	○	○	○	○
Interact appropriately verbally, and in writing, with other workers and supervisors	○	○	○	○	○

Additional Comments

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3. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Operational Controls.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Operate a control system panel from a central control room or field location	○	○	○	○	○
Monitor and optimize processes from various types of industries	○	○	○	○	○
Describe boiler control components, flame failure detectors, low-water cutoffs, steam high pressure limit controls, and combustion controls.	○	○	○	○	○
To explain the differences in single element, two-	○	○	○	○	○
element, and three-	○	○	○	○	○
element boiler drum water	○	○	○	○	○
level controls.	○	○	○	○	○
Interpret control loops using ISA symbols and letters from a P & ID.	○	○	○	○	○
Define the characteristics of a process that are related to process control	○	○	○	○	○
Define two position and on off control and applications	○	○	○	○	○
Interpret information from control systems to make informed decisions with respect to corrective action	○	○	○	○	○
Describe the operation of the proportional, integral, and derivative control actions used on a typical PID controller.	○	○	○	○	○
Tune a PID controller for satisfactory results, using the appropriate method.	○	○	○	○	○
Describe Programmable Logic Controller systems, and state applications	○	○	○	○	○

Additional Comments

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Sector Skills Gap Analysis – Plastics & Rubber

4. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Instrumentation.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Explain the operating principles of common types of pressure, level, flow, and temperature measurement devices	○□	○□	○□	○□	○□
Calibrate and configure pressure, level, flow, and	○□	○□	○□	○□	○□
temperature devices for specified applications	○□	○□	○□	○□	○□
Identify the common types of control valves, and understand control valve terminology and applications.	○□	○□	○□	○□	○□
Explain the application and operation of different types of control valve actuators including pneumatic, electric, and hydraulic	○□	○□	○□	○□	○□
Describe the application of process analysis types of instrumentation including gas chromatography, density, pH, conductivity ORP, clarity, humidity, and moisture analysis	○□	○□	○□	○□	○□
Identify and explain the operation of the types of	○□	○□	○□	○□	○□
instrumentation specific to power boilers.	○□	○□	○□	○□	○□
Explain how instrument signals are installed from the field devices, to the junction points, to the control room	○□	○□	○□	○□	○□
Differentiate between conventional analog devices, smart devices, field bus devices and other types of analog or digital devices	○□	○□	○□	○□	○□
Describe purging systems and applications	○□	○□	○□	○□	○□
Describe explosion proof wiring systems, and state	○□	○□	○□	○□	○□

components and application					
Describe intrinsically safe wring systems, and state components and application	○	○	○	○	○
Discuss types of panel instruments, indicators and recorders commonly used	○	○	○	○	○

Additional Comments

Sector Skills Gap Analysis – Plastics & Rubber

5. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Chemistry.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Name and write the formula of chemical species	○	○	○	○	○
Use the Gas Laws in calculations	○	○	○	○	○
Demonstrate an understanding of the concepts concerning the arrangements of electrons in atoms.	○	○	○	○	○
Predict the properties of elements and compounds based on the inherent structure of the Periodic Table	○	○	○	○	○
Demonstrate an understanding of common chemical bond properties.	○	○	○	○	○
State Dalton's atomic theories and their connection to the three basic laws of chemistry.	○	○	○	○	○
Use the equation given for molarity to calculate various quantities in the equation.	○	○	○	○	○
Perform basic material balance	○	○	○	○	○
Discuss reaction rates, catalysts, equilibrium reactions, chemical reactions	○	○	○	○	○
Discuss solutions and concentrations	○	○	○	○	○
Understand oxidation numbers	○	○	○	○	○
Identify acids and bases	○	○	○	○	○
Perform basic chemical equation balancing	○	○	○	○	○
Review the common flow chart symbols for instruments and vessels.	○	○	○	○	○
Completely label flow diagrams from petroleum industry processes and	○	○	○	○	○

define the principal products and usage					
Demonstrate an understanding of various petroleum and chemical processes	○	○	○	○	○
Demonstrate an understanding of various polymer processes	○	○	○	○	○

Additional Comments

6. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Physics.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Define units of measurement for applicable variables	○	○	○	○	○
Explain and solve problems involving motion in one and two dimensions.	○	○	○	○	○
Describe and apply Newton's three laws of motion.	○	○	○	○	○
Apply conceptually and mathematically the law of	○	○	○	○	○
Conservation of Energy, relating work, energy, and	○	○	○	○	○
power.	○	○	○	○	○
Solve vector problems of forces	○	○	○	○	○
Describe and apply Pascal's, Archimedes' and	○	○	○	○	○
Bernoulli's principles to liquid processes	○	○	○	○	○
Explain and apply mathematically the concepts of	○	○	○	○	○
heat energy and heat expansion.	○	○	○	○	○
Explain modes of heat transfer	○	○	○	○	○
Describe and apply the concepts of vibrations and waves	○	○	○	○	○
Describe the nature,	○	○	○	○	○

behaviour and propagation of sound and light and perform mathematical applications

Additional Comments

7. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Process Operations.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Record process data as necessary to support operations and testing	○	○	○	○	○
Interpret process data to make decisions on operating changes in a unit	○	○	○	○	○
Monitor process equipment following proper procedures	○	○	○	○	○
Perform minor maintenance on equipment as permitted under plant procedures	○	○	○	○	○
Implement troubleshooting strategy to solve plant operating problems	○	○	○	○	○
Recognize, identify, interpret labels of, and protect one-self from hazardous materials as described by WHMIS.	○	○	○	○	○
Respond effectively at the "awareness level" to incidents involving the transportation of dangerous goods.	○	○	○	○	○
Describe different types of process piping, valves and connection techniques.	○	○	○	○	○
Describe types of pipe supports, and insulation and heat tracing of piping systems	○	○	○	○	○
Describe the construction, operation, rating, and application of various types of safety valves and rupture disks.	○	○	○	○	○

Describe the need for, operating principle of, and rating of various steam trap designs, for various process applications.	○□	○□	○□	○□	○□
Describe lubrication techniques as applied to process equipment.	○□	○□	○□	○□	○□
Understand the need for and techniques used in the treatment water for use in industrial steam boilers.	○□	○□	○□	○□	○□
Understand mechanical drawing fundamentals including various views and drawing instruments.	○□	○□	○□	○□	○□
Understand the application and importance of various materials related to Operating Engineering including the TSSA Act, Operating Engineering regulations and Director's Orders, CSA B51 and B52, and the ASME code	○□	○□	○□	○□	○□
State the purpose of standard plant operating equipment including pumps, compressors, turbines, mixers, heat exchangers, tanks, and vessels, and explain application in various types of process plants.	○□	○□	○□	○□	○□
Explain the principles of pump dynamic head and net positive suction head	○□	○□	○□	○□	○□
Perform thermodynamic calculations using steam table and other fluid properties	○□	○□	○□	○□	○□
Differentiate between different types of pumps, pump components, and pump seals, and understand the operation of typical pumps	○□	○□	○□	○□	○□
Perform standard pump priming procedures for centrifugal pumps	○□	○□	○□	○□	○□
Explain the principles of air compression, and understand the components and operation of the various types of air compressors.	○□	○□	○□	○□	○□

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Explain the components and operation of the steam turbines and combustion gas turbines	○□	○□	○□	○□	○□
Explain the operating principles of spark ignition and compression ignition internal combustion eng.	○□	○□	○□	○□	○□
Detail startup and shutdown procedures on process equipment including pumps, compressors, turbines and engines	○□	○□	○□	○□	○□
Work in teams to perform lab based plant-operating procedures pertaining to pumps, compressors and turbines, following plant safety practices.	○□	○□	○□	○□	○□
Partially disassemble specific process equipment including pumps, compressors, and turbines, and identify and state the condition of the components	○□	○□	○□	○□	○□
Explain the construction details, ratings, principle of operation, controls, application, operating procedures, code requirements and maintenance of various types of refrigeration systems	○□	○□	○□	○□	○□
Explain the construction details, ratings, principle of operation, controls, application, operating procedure, code requirements and maintenance of various types of high-pressure steam boiler systems	○□	○□	○□	○□	○□
Perform operational and maintenance procedures on refrigeration and boiler systems.	○□	○□	○□	○□	○□
Perform all pre-start checks and inspections on a boiler unit	○□	○□	○□	○□	○□
Startup and shutdown a firetube and watertube boiler unit	○□	○□	○□	○□	○□
Perform water analysis and	○□	○□	○□	○□	○□

treat boiler feedwater with the appropriate chemicals					
Explain the operation of various types of building heating and cooling systems, as well as other building services					
Perform Statistical Process Control calculations, and determine when process variables deviate from desired limits					
Identify flowsheet symbols and terminology for various processes					
Explain the principles of operation of a distillation unit					
Operate a pilot scale distillation unit including all associated equipment including vacuum operated units and evaporators					
Optimize the operation of a pilot plant distillation unit					
Sketch and describe the operation of a crude unit and debutanizer unit, stating the function of all process equipment					
Perform Start-up and Shutdown of crude unit simulation, and distillation simulation					
React in the appropriate manner to upset conditions and failures in distillation plants and crude unit					
Work individually or in teams to perform lab-based plant operating procedures pertaining to distillation and associated processes, following plant safety practices					
Explain the principles of heat transfer, and discuss the types of heat exchange equipment available					
Operate heat transfer equipment					
Discuss the operation and maintenance of filtering and screening equipment					
Load finished products and unload raw materials from					

tank trucks, rail cars, and other containers following proper grounding and other procedures					
Inspect, clean, and prepare vessels for storage, mixing, blending, decanting, and other purposes	○	○	○	○	○
Understand chemical reactor principles	○	○	○	○	○
Discuss types of chemical reactors including stirred tanks, tubular, and catalytic bed reactors	○	○	○	○	○

Additional Comments

8. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Sampling Methods.

	Required	Not Required	Would Be Nice	Anticipate Need in 2 - 4 Years	N/A
Understand sampling connections, and how to open and close them safely in accordance with proper procedures	○	○	○	○	○
Collect process samples in liquid of gaseous form using the appropriate containers, procedures, and handling methods	○	○	○	○	○
Run basic lab samples on products including but not limited to pH, conductivity, turbidity, and injection gas chromatography	○	○	○	○	○
Complete required documentation for samples	○	○	○	○	○
Package sample appropriately if they are to be transferred to a main lab	○	○	○	○	○

Additional Comments

9. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Electrical.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Identify the units of measurement used in the SI system. Be able to convert between various sets of units.	○	○	○	○	○
Using the standard model of an atom, be able to describe the characteristics of conductors, insulators, and semiconductors.	○	○	○	○	○
Calculate voltages, currents, and resistances for series, parallel, and series-parallel resistive circuits	○	○	○	○	○
For a sine wave, recognize the relationship between frequency, and period. Calculate average and Rms values	○	○	○	○	○
Explain the accepted magnetic theory and conventions and use the various hand rules to describe the magnetic field around a current carrying conductor and coil	○	○	○	○	○
Use Lenz's and Faraday's laws to explain magnetic induction, self induction, mutual induction and the factors governing inductance	○	○	○	○	○
Discuss the development of the mechanical forces that are caused by the interaction of magnetic fields and which form the basis for all motor and generator action	○	○	○	○	○
Discuss the operating principles and characteristics of direct current generators	○	○	○	○	○
Discuss the operating principles and characteristics of direct	○	○	○	○	○

current motors					
Discuss the operating principles and characteristics of three-phase synchronous alternators	○	○	○	○	○
Discuss the operational aspects of single-phase, three-phase, and instrument transformers	○	○	○	○	○
Discuss the operation and control of three-phase induction motors	○	○	○	○	○
Sketch and describe power distribution systems including locations of breakers and switches	○	○	○	○	○

Additional Comments

10. Apprenticeship: Chemical Process Operator

Please rank the importance of the following program outcomes for manufacturing positions in this sector

Training in the following aspects related to Shutdown Planning.

	Required	Not Required	Would Be Nice	Anticipate Need In 2 - 4 Years	N/A
Shut down, isolate, and prepare process units or production equipment for maintenance and repair in accordance with company procedures and standards	○	○	○	○	○
Perform lock out and tagging operations to render equipment and piping systems safe for maintenance work	○	○	○	○	○
Participate in planning shutdown activities by identifying appropriate sequences and timeframes	○	○	○	○	○

Additional Comments

Appendix B: Identified Sector Core Outcomes

Identified Core Outcomes	Chemical Production Engineering Technology	Mechanical/ Manufacturing Engineering Technology	Industry Specific Training
Apply knowledge of the principles of physics such as heat, sound, light, mechanics, mass and heat balance, thermodynamics, mass and heat transfer, and electricity	X	X	
Apply knowledge of the principles of physics such as heat, sound, light, mechanics, mass and heat balance, thermodynamics, mass and heat transfer, and electricity	X	X	
Apply knowledge of the operating principles of process plant equipment including pumps, compressors, turbines, boilers, fired heaters, distillation columns, absorber columns, flare systems, reactors, heat exchangers, and extruders	X		
Perform start-up and shut-down procedures on various types of process plant equipment	X		
Operate, monitor, and control batch and continuous processes	X		
Apply basic knowledge of control instruments such as process sensors	X		
Interpret sample data	X	X	
Follow maintenance test procedures as necessary.	X	X	
Record process data as necessary to support testing	X		
Interpret results of tests to confirm proper operation or to hypothesize as to defects	X	X	
Perform minor maintenance on equipment.	X	X	
Implement basic trouble-shooting procedures as specified in manufacturers' guidelines	X	X	
Read process and instrument diagrams	X	X	
Recognize the operating principles of various types of instrumentation such as flow, level, temperature, and pressure measuring devices	X	X	
Calibrate field instrumentation such as transmitters, transducers, and control valves	X	X	
Apply knowledge of the principles underlying pneumatic, analog electrical, and digital electrical signals	X	X	
Adapt effectively to a shift-oriented environment.	X		
Solve problems successfully in a team-oriented environment	X	X	

Demonstrate individual initiative	X	X	
Communicate effectively with others in oral and written formats	X	X	
Use a variety of operating interfaces such personal computers (PC) and programmable logic controllers (PLC) process screens	X	X	
Follow corrective protocols	X	X	
Recognize, identify, and define the problem	X	X	
Define the problem-solving sequence.	X	X	
Seek outside advice or data as required	X	X	
Handle, use, store, and transport chemicals safely	X	X	
Apply relevant principles, such as Process Safety Management* (PSM), to ensure that a facility is maintained and operated safely	X	X	
Act in accordance with relevant codes of practice, such as those based upon the principles of "product life cycle management"	X	X	
Act in accordance with an awareness of the role of the industry in the community and society	X	X	
Calculate and convert correctly in Imperial and SI measurement units using both manual methods and electronic technology		X	
Use engineering terminology correctly and accurately in written and oral communication	X	X	
Identify the technical criteria necessary to design and construct components, processes, and systems		X	
Apply engineering principles to the analysis, design, and implementation of manufacturing projects		X	
Review the tolerances and materials specifications to design manufacturing processes		X	X
Identify properties of materials and assess their responses in an engineering environment			
Analyze technical drawings and other technical documents* used in the design of components, processes, and systems		X	
Apply principles of method analysis and work measurement, mechanics, pneumatics, fluid mechanics, thermodynamics, and hydraulics to analyze* and develop manufacturing processes and automated systems		X	
Apply principles of plant layout and materials handling to analyze* and solve problems related to manufacturing processes and to optimize the sequence of manufacturing components		X	
Apply basic* principles of control systems	X	X	
Apply basic* knowledge of electricity and electronics		X	
Take into account ergonomic considerations		X	

Assemble and analyze relevant information, data, and materials	X	X	
Organize and prepare documents in accordance with recognized standards (e.g., company standards, CSA, ISO, etc.)	X	X	
Employ conventional and computer-based drafting techniques to produce graphics for manufacturing projects		X	
Employ freehand sketching techniques to produce graphics		X	
Prepare, evaluate, and modify project-related documents including technical reports	X	X	
Use computer systems and application software to resolve technical problems	X	X	
Apply file management techniques to access and store data		X	
Access and exchange information using electronic technology		X	
Use computer hardware and applications to access and organize information and produce technical documents within an engineering environment		X	
Use computer applications to support design and analysis within an engineering environment		X	
Understand processes used to manufacture components		X	
Use systematic approaches to anticipate, identify, and resolve technical problems in the manufacture of components and systems		X	
Apply knowledge of computer-aided manufacturing techniques to assist in the specification of manufacturing processes		X	X
Identify and eliminate potential hazards associated with the manufacturing process		X	X
Assess the performance characteristics, limitations, potential, and safety aspects of machinery, tools, and other equipment		X	X
Apply knowledge of fabrication, joining, finishing, and assembly processes to manufacture products from their components		X	
Review the specifications applicable to a manufacturing project and develop procedures where applicable		X	
Observe, record, assess, and report compliance with appropriate quality assurance procedures and specifications	X	X	X
Perform or arrange to have quality-assurance sampling and testing done	X	X	X
Support the provision of a healthy and safe workplace environment	X	X	X
Apply ethical principles to own work	X	X	X
Meet legal responsibilities to adhere to relevant legislation in the workplace	X	X	X
Use and maintain a paper-based and electronic		X	

system to store and retrieve information and to plan activities			
Maintain current, clear, and accurate project-related documents in accordance with appropriate organizational practices		X	X
Use project-related records and inventories to prepare reports and plan activities		X	
Participate in the information management, cost control, and materials management of a project		X	
Identify the stages of a manufacturing project and determine criteria necessary for the timely completion of the project		X	X
Monitor expenditures and maintain cost effective practices		X	
Schedule, coordinate, and monitor a manufacturing project		X	
Participate in long- and short-term planning		X	
Identify opportunities for ongoing professional development (e.g., professional associations, continuing education courses, and trade shows)		X	
Assume responsibility and accountability for own competence	X	X	X
Apply all machinery and equipment lock-out and de-energizing procedures (mechanical, electrical, hydraulic and pneumatic) before commencing maintenance and overhaul procedures	X	X	X
Demonstrate proper use and care of required safety clothing and equipment	X	X	X
Comply with confined space safety procedures, including the use of the breathing apparatus prior to and while working	X	X	X
Report all hazards and accidents to co-workers and supervisory personnel, and complete all paper work in compliance with company procedures and government regulations	X	X	X
Apply correct body mechanics when bending, lifting or moving heavy objects/equipment	X	X	X
Describe the operational principles of measuring, checking, and gauging equipment		X	X
Demonstrate measuring techniques using direct/indirect reading linear measuring equipment		X	X
Describe Total Quality Management (TQM)	X	X	X
Outline the ISO Audit Process			x

The outcomes list readily identifies gaps and overlap in core competencies. Note that sub-sector specific outcomes such as blow moulding or extrusion have not been included as the goal is to develop a sector specific training framework.

Appendix C: List of Identified Programs

Contributing Program	Institution	Level of Training
Chemical Production Engineering Technology	Lambton College,Sarnia, ON	Technologist
Mechanical Technician	Canadore College,North Bay, ON	Technician
Mechanical Engineering Technician	Conestoga College,Kitchener, ON	Technician
Manufacturing Engineering Technology	Conestoga College,Kitchener, ON	Technologist
Mechanical Engineering Technology	Conestoga College,Kitchener, ON	Technologist
Mechanical Engineering Technician	Confederation College,Thunder Bay, ON	Technician
Mechanical Engineering Technician	Fanshawe College,London, ON	Technician
Manufacturing Engineering Technician	Fanshawe College,London, ON	Technologist
Mechanical Technician	Humber College,Etobicoke, ON	Technician
Mechanical Technician	Lambton College,Sarnia, ON	Technician
Manufacturing Engineering Technician	Loyalist College,Belleville, ON	Technician
Manufacturing Engineering Technician	Mohawk College,Hamilton, ON	Technician
Mechanical Engineering Technician	Mohawk College,Hamilton, ON	Technician
Mechanical Engineering Technology	Mohawk College,Hamilton, ON	Technology
Mechanical Engineering Technician	Niagara College,Welland, ON	Technician
Mechanical Engineering Technology	Niagara College,Welland, ON	Technology
Mechanical Engineering Technician	St. Clair College,Windsor, ON	Technician
Mechanical Engineering Technician	Sault College,Sault Ste. Marie, ON	Technician

Appendix D: List of Companies

CompanyName	City	PR	Website
A.C. Vinyl Windows Ltd.	Niagara Falls	ON	www.acvinyl.com
A.P. Plasman - Windsor Plant 1	Windsor	ON	www.applasman.ca
A.P. Plasman Corporation	Windsor	ON	www.applasman.ca
Aar-Kel Moulds Ltd.	Wallaceburg	ON	www.aarkel.com
Accuflex Industrial Hose Ltd.	Guelph	ON	kuritec.com
Advanced Industrial Systems	Sarnia	ON	www.theaisteam.com
Adventec Manufacturing Inc.	Ancaster	ON	www.adventec.com
Agri-Plastics Manufacturing	Grassie	ON	www.agri-plastics.net
AirBoss Rubber Compounding	Kitchener	ON	www.airbossrubbercompounding.com
Al-Mar Vinyl Products Ltd.	Exeter	ON	www.almarvinyl.ca
AlphaGary Canada Limited	Stoney Creek	ON	www.alphagary.com
Anderson Tire & Treads Inc.	Hamilton	ON	www.andersontire.ca
Arcor Windows & Doors Inc.	Dundas	ON	www.arcorwindowsanddoors.com
Armtec Limited	Orangeville	ON	www.armtec.com
Armtec Limited	Forest	ON	www.armtec.ca
Armtec Limited	Woodstock	ON	www.armtec.com
Armtec Limited Partnership	Walkerton	ON	www.armtec.com
Armtec Limited Partnership	Dresden	ON	www.armtec.com
Associated Packaging	Cambridge	ON	www.aptechnologies.com
AZ Automotive Corp.	London	ON	www.azautomotive.com
B.U.W.W. Coverings Corp.	St Thomas	ON	www.buww.com
Barwood Marketing	Dundas	ON	
Bayshore Plastics Corp.	London	ON	
Bayshore Plastics Corp.	London	ON	
Bazflex Canada Ltd.	Cambridge	ON	
Belcorr Packaging (2005) Inc.	Cambridge	ON	www.belcorrpackaging.com
Belform Insulation Ltd.	London	ON	www.belform.com
Bell Plastiform Industries	Kingsville	ON	
Bi-Ax International Inc.	Wingham	ON	www.biaxinc.com
BockPPL Inc.	Cambridge	ON	
Boshart Industries Inc.	Milverton	ON	www.boshart.com
Boyes Flexible Packaging Inc.	London	ON	www.boyespackaging.com
Caml-Tomlim	Waterloo	ON	www.camltomlin.com
Camtac	Guelph	ON	www.linamar.com
Canada Coaster Inc.	Dundas	ON	www.canadacoaster.com
Can-Am Recycling Co.	Windsor	ON	www.pazner.com
Canuck Industries Inc.	Hamilton	ON	www.canuckindustries.com
Centoco Plastics Limited	Windsor	ON	www.centoco.com
Central Plastic Sales	Cambridge	ON	www.centralplastics.ca
CL4 Inc.	London	ON	www.cl4fire.com
Classic Designs	Cambridge	ON	www.classicdesignsltd.ca
Clearpak Inc.	Grimsby	ON	www.clearpak.com
Clorox Company of Canada	Orangeville	ON	www.clorox.com

CompanyName	City	PR	Website
Comprehensive Plastic Tech	Oldcastle	ON	
Concept Plastics Limited	Brantford	ON	www.koolatron.com
Concept/Vacform Plastics	Brantford	ON	www.concept-plastics.com
Conestoga Contact Wheel Inc.	Cambridge	ON	conarubber.com
Coni-Marble Manufacturing Inc.	Thorndale	ON	www.avian.on.ca
Cooper Standard Auto - Plant 3	Stratford	ON	www.cooperstandard.com
Cooper Standard Automotive	Stratford	ON	www.cooperstandard.com
Cooper Standard Automotive Cda	Mitchell	ON	www.cooperstandard.com
Cordex Ltd.	Strathroy	ON	www.cordex.on.ca
Coronado Solid Surface Corp.	Waterloo	ON	www.coronadocorp.com
Country Estate Fence Inc.	Ilderton	ON	www.formafence.com
Creative F.R.P. Inc.	Kitchener	ON	
Crescent Supply Ltd.	Waterloo	ON	
Cryo-Vision Inc.	Woodstock	ON	www.norwichplastics.com
CT Innovation	London	ON	www.innov8.ca
Custom Co-Ex Technologies Inc.	Cambridge	ON	www.ccx1.ca
Custom Foam Systems Ltd.	Kitchener	ON	www.customfoam.com
Custom Orthotics & Footwear	Simcoe	ON	www.doctorbruce.ca
Dacol Plastics Limited	Kitchener	ON	www.dacolplastics.com
Dayside Industries Ltd.	Brantford	ON	www.dayside.ca
Direct Plastics Group Ltd.	Orangeville	ON	www.directplasticsgroup.com
Ducana Windows & Doors Ltd	Tilbury	ON	www.ducana.com
Duralon Plastics Limited	Guelph	ON	www.duralonplastics.com
E. Hofmann Plastics Inc.	Orangeville	ON	www.hofmannplastics.com
Edge EDM Technologies Inc.	Sombra	ON	
Elastochem Specialty Chemicals	Brantford	ON	www.elastochem-ca.com
ElringKlinger Canada, Inc.	Leamington	ON	www.elringklinger.ca
EM Precision Tool Ltd.	Stoney Creek	ON	www.korver.ca
Embee Plastics Ltd.	Linwood	ON	www.embeeplastics.com
EMF Containers	Brantford	ON	www.emfcontainers.com
Entropex	Sarnia	ON	www.entropex.com
Enviroshake	Chatham	ON	www.enviroshake.com
Ershigs, Inc. Sarnia	Sarnia	ON	www.ershigs.com
Exi-Plast Custom Moulding Ltd.	Huron Park	ON	www.exiplast.on.ca
Express Molding International	Windsor	ON	www.expressmolding.ca
Faber Compounders Inc.	Cambridge	ON	
Farley Manufacturing Inc.	Guelph	ON	www.thefarleygroup.com
Fazio Fiberglass Limited	Fort Erie	ON	
Feher Machine & Manufacturing	Sarnia	ON	
Fibre Laminations Ltd.	Hamilton	ON	www.fibre-lam.com
Five Slider	Lucknow	ON	www.5slider.com
Floraplast Inc.	Chatham	ON	
Gentek Building Products	London	ON	www.gentek.ca

CompanyName	City	PR	Website
GMA Cover Corp.	Guelph	ON	www.gmacover.com
Green Processing Company Inc.	Windsor	ON	www.green-processing.com
Greenway Plastics Inc.	Tilbury	ON	www.greenwayinc.ca
Growers Greenhouse Supplies	Vineland Station	ON	www.ggs-greenhouse.com
GX Packaging Canada Ltd.	London	ON	
H.Q.N. Industrial Fabrics Inc.	Sarnia	ON	www.hqnfabrics.com
Hale Packaging	Hamilton	ON	www.halepkg.com
Hamilton Feed Systems Inc.	Hamilton	ON	www.hamiltonfeedsystems.com
Hamilton Plastic Fabricators	Stoney Creek	ON	www.hamiltonplastic.com
Hawk Plastics Ltd.	Windsor	ON	www.hawkplastics.com
Henniges Automotive	Welland	ON	
Henry Company Canada Inc.	Petrolia	ON	www.bakor.com
Hergott Plastics Limited	Waterloo	ON	www.hergottplastics.ca
High Point Awards & Ribbons	Shelburne	ON	www.highpointawards.com
I G B Automotive Ltd.	Windsor	ON	www.igbauto.com
Ideal Pipe	Thorndale	ON	www.idealpipe.ca
IMBC Blowmolding Inc.	Orangeville	ON	www.imbcblowmolding.com
Integrated Packaging Film Inc.	Ayr	ON	esdpackaging.com
Integrity Tool & Mold Inc.	Oldcastle	ON	www.integritytoolandmold.com
IPEX Inc.	London	ON	www.ipexinc.com
ITML Horticultural Products	Brantford	ON	www.itml.com
J T Plastics Inc.	Thorndale	ON	
J.K. Counter Tops Ltd.	Hamilton	ON	
James Packaging Ltd.	London	ON	www.jamespackaging.com
JFJ Mold Processors (1988)	Oldcastle	ON	www.jfjmold.com
Jokey Plastics North America	Goderich	ON	www.jokey.com
Jolliffe Signs	London	ON	www.jolliffesigns.com
Kautex Corporation	Windsor	ON	www.kautex-textron.com
Kaycan Ltd.	Kitchener	ON	www.kaycan.com
Kentain Products Limited	Kitchener	ON	www.kentain.com
Ketchie's Plastic/Woodworking	Millgrove	ON	www.ketchies.com
Ketron Moulded Products Ltd.	London	ON	
Knott Auto Body	London	ON	
Kromet International Inc.	Cambridge	ON	www.kromet.com
Kwik Lok Ltd.	Cambridge	ON	www.kwiklok.com
L & M Fiberglass Inc.	Sarnia	ON	www.lmfiberglass.com
Lakeside Plastics Limited	Oldcastle	ON	www.lakesideplastics.com
Leisure Manufacturing Inc. -	Grimsby	ON	www.sunrisespas.com
Lens Tool & Mould Ltd.	Windsor	ON	www.lenstool.com
Libby Manufacturing Lim	Morpeth	ON	
Lindsay Rubber Products Ltd.	St Catharines	ON	www.lindsayrubber.com
Listowel Technology Inc.	Listowel	ON	www.listech.on.ca
Lite-Form	Grand Bend	ON	www.okewoodsmith.com
London Tarp Inc.	London	ON	
M.M. Products Ltd.	Stoney Creek	ON	www.mmproducts.ca

CompanyName	City	PR	Website
Main Plastics & Prototypes Ltd	Cambridge	ON	www.mainplastics.com
Maljohn Company Ltd.	Hannon	ON	www.maljohn.com
Maple City Marble Inc.	Chatham	ON	www.maplecitymarble.com
Maple Ridge Plastics Inc.	Dundalk	ON	
Mitten Inc.	Paris	ON	www.mittenvinyl.com
Mold Services International	Windsor	ON	www.msiinc.ca
Montel Plastics Ltd.	Oldcastle	ON	www.montelplastics.com
Multi Fittings Corporation	London	ON	www.ipexinc.com
Musashi Auto Parts Canada Inc.	Arthur	ON	
Mustang Drinkware Inc.	London	ON	www.mustangdrinkware.com
MYE Canada Inc.	Brantford	ON	www.myerslawnandgarden.com
Naturpack Ltd.	Wheatley	ON	
Nedlaw Living Roofs Inc.	Breslau	ON	www.nedlaw.ca
Newdon Industries Ltd.	Fergus	ON	www.newdon.ca
NGF CANADA Limited	Guelph	ON	www.ngfcanada.com
Norcon Contractors	Cambridge	ON	www.norconcontractors.ca
Norray Marble Products	Port Colborne	ON	
North Star Mfg. (London) Ltd.	St Thomas	ON	www.northstarwindows.com
Northfork Industries Inc.	Ripley	ON	
Northvile Metals	Waterloo	ON	www.leggettandplatt.com
Norwich Plastics	Cambridge	ON	www.norwichplastics.com
Norwich Recycling Inc.	Woodstock	ON	www.norwichplastics.com
Nova Chemicals (Canada) Ltd.	Corunna	ON	www.novachemicals.com
Onward Cluthe Hardware	Kitchener	ON	www.onwardcluthe.com
Opportunity Plastic Packaging	London	ON	
Otron Tech Inc.	Wallaceburg	ON	www.otron.com
Oxford Plastics Inc.	Embro	ON	www.oxfordplastics.inc.com
Oxi Vinyls Canada Inc.	Niagara Falls	ON	www.oxyvinyls.com
P & A Plastics Inc.	Hamilton	ON	www.paplastics.com
Pail-Mate Inc.	St Catharines	ON	www.pailmate.com
Pano Cap (Canada) Ltd.	Kitchener	ON	www.panocap.com
Papp Plastics & Distributing	Windsor	ON	www.pappplastics.com
Papp Plastics & Distributing	Windsor	ON	
Parker Plastics Ltd.	London	ON	www.parkerplastics.ca
Peninsula Plastics Ltd.	Fort Erie	ON	www.penplast.com
Performance Polymers Inc.	Cambridge	ON	www.ppi-engproducts.com
Pioneer Balloon Canada Ltd.	Hamilton	ON	www.qualatex.com
Plasco Welding & Fabrication	Thorndale	ON	www.plascowelding.com
Plasponics Inc.	Leamington	ON	www.plasponics.com
Plastics Plus Ltd.	Hamilton	ON	www.plasticsplus.ca
Plasti-Fab Ltd.	Kitchener	ON	www.plastifab.com
Plastiflex Canada Inc.	Orangeville	ON	www.plastiflex.com
Plastruct Canada Inc.	Vineland	ON	www.polyzone.com
PM Plastics Ltd.	Windsor	ON	www.pmplastics.ca
Poly Disposables (2004) Ltd.	Kitchener	ON	www.polydisposables.com

CompanyName	City	PR	Website
Polycorp Ltd.	Elora	ON	www.poly-corp.com
Polyfab Industrial Services	Kitchener	ON	www.polyfabindustrial.com
Polyflex Inc.	Waterloo	ON	
Precision Plastics	Amherstburg	ON	
Preston Plastics Reprocessing	Cambridge	ON	www.norwichplastics.com
Pro Insul Limited	Stoney Creek	ON	www.proinsul.com
Pro Insul Limited	Sarnia	ON	www.proinsul.com
Promat Inc.	Woodstock	ON	www.promatinc.com
Proplastex Industries Inc.	Guelph	ON	www.proplastex.com
Publi-Air (Canada) Ltd.	Stratford	ON	www.inflatablesolutions.ca
PurePlast Inc.	Cambridge	ON	www.pureplast.com
Quadrant Plastics Composites	Guelph	ON	www.quadrantcomposites.com
Quantofill Inc.	Windsor	ON	
R. Beckman Cellulose Inc.	Cambridge	ON	
Rescraft Plastic Products Inc.	Paris	ON	www.rescraft.com
Rescraft Plastic Products Inc.	Paris	ON	www.rescraft.com
Ridge Quality Plastics Inc.	Chatham	ON	www.ridgequalityplastics.com
Rivenco Industries Ltd.	Erin	ON	www.rivenco.com
Robert Soper Ltd.	Hamilton	ON	www.sopers.com
Röchling Engineering Plastics	Orangeville	ON	www.roechling-plastics.ca
Roll-Tite Corp.	Norwich	ON	www.roll-tite.com
Roto Molded Tech Solutions	St Clements	ON	www.rtscompaniesinc.com
Royalthane Inc.	Fergus	ON	
Safety Seal Plastics Inc.	Hamilton	ON	www.safetyseal.ca
Sarnia Insulation Supply	Sarnia	ON	www.glasscellisofab.com
Scott-Douglas Plastics Ltd.	Ingersoll	ON	www.sdplastics.on.ca
Seaton Sunrooms	Windsor	ON	www.seatonsunrooms.com
Shirlon Plastics	Cambridge	ON	www.shirlonplastics.com
Shotz Canada	Niagara Falls	ON	www.shotzcanada.com
Silicone Rubber Canada	Guelph	ON	
Sle-Co Plastics Inc.	London	ON	www.sleco.com
Solowave	Waterloo	ON	
Southwest Countertops	Stratford	ON	
SPI Industries Inc.	Shallow Lake	ON	www.spiplastics.com
Standard Tool & Mold Inc.	Windsor	ON	www.standard-mold.com
Starlim North America Corp.	London	ON	www.starlim.com
Stone Straw Limited	Brantford	ON	www.stonestraw.com
Stoney Creek Mould Inc.	Hamilton	ON	
Strassburger Windows & Doors	Kitchener	ON	www.strassburger.net
Stratford Plastic Components	Stratford	ON	www.stratfordplastic.com
Stratus Plastics International	Windsor	ON	www.stratusplastics.com
Sundance Signs, Pylons	Owen Sound	ON	www.sundanceawnings.com
T & H Plastics Inc.	Ingersoll	ON	
Taliscor Plastics Inc.	Port Colborne	ON	
TG Minto Corp.	Palmerston	ON	

CompanyName	City	PR	Website
The Align-Right Pillow Company	Kitchener	ON	www.alignright.com
The Brave Brown Bag	Cambridge	ON	www.bravebrownbag.com
Thompson Mold & Pattern Ltd.	Owen Sound	ON	
Til-Mech Enterprises Inc.	Tilbury	ON	
Tracker Tool & Mold Inc.	Windsor	ON	
Transparent Packaging Inc.	Cambridge	ON	www.transparentpkg.com
Tri-City Packaging Ltd.	Waterloo	ON	www.tricitypackaging.com
Trident Extrusion Systems	Waterloo	ON	www.trident-extrusion.com
Trimco	London	ON	www.trimco.info
Trim-Gard Company Limited	London	ON	www.trim-gard.com
Truckliner 2000 Inc.	Essex	ON	
Turkstra Industries Inc.	Stoney Creek	ON	www.turkstralumber.com
Ultra Manufacturing Limited	Waterloo	ON	www.ultramanufacturing.com
United Plastic Components Inc.	Exeter	ON	www.upcinc.com
Veyance Technologies Canada	Owen Sound	ON	www.goodyearep.com
Victory Manufacturing Ltd.	Waterloo	ON	www.victorymanufacturing.ca
Vinyl Works Canada	Port Colborne	ON	www.vinylworkscanada.com
W. Martin Plastics Ltd.	Mount Forest	ON	www.martinrollenbau.com
Waterville TG Inc.	Petrolia	ON	www.wtg.ca
White Boards Are Us	Elora	ON	www.whiteboardsareus.com
Windsor Barrel & Drum Ltd.	Windsor	ON	
Windsor Industrial Services	Oldcastle	ON	www.windsorindustrial.com
Windsor Mold Group Inc.	Windsor	ON	www.windsormoldgroup.com
Wolverine Plastics Mfg.	Windsor	ON	www.wolverineplastics.com
Woodbridge Foam Corporation	Tilbury	ON	www.woodbridgegroup.com
Woodbridge Foam Corporation	Kitchener	ON	www.woodbridgegroup.com
Xact Pattern & Fixture Inc.	Windsor	ON	www.xactpattern.com
Yeadon Fabric Structures Ltd.	Guelph	ON	www.yeadondomes.com

Appendix E: Apprenticeship Financial Incentives

Program	Benefit	Value
Apprenticeship Job Creation Tax Credit	If you hire an apprentice, you can receive a tax credit equal to 10% of their salary.	Max $2000 per year
Apprenticeship Training Tax Credit	Credit is based upon salaries and wages paid to an apprentice. The maximum credit for each apprenticeship is $10,000 per year.	The maximum credit available over the first 48-month period of the apprenticeship is $40,000.
Apprenticeship Employer Signing Bonus (AESB)	Payable to employers who hire, register and train apprentices	$2000 Total
OYAP Ontario Youth Apprenticeship Program	Students are eligible as of grade 11 and ratios are exempted during placement	
	Contact Information: **www.apprenticesearch.com** **(905) 634-2575 x 20**	

Appendix E: Bibliography

Canadian Plastics and Rubber Council Certification Website
http://www.cpsc-ccsp.ca/pages/certification/occupations.php

Employer Information Apprenticesearch.com
http://apprenticesearch.com/Resources/Employers

Industry Canada Website: Industry Profile – Canadian Plastics Industry
http://www.ic.gc.ca/eic/site/plastics-plastiques.nsf/eng/pl01383.html

Industry Canada Website: Industry Profile – Industrial Rubber Products
http://www.ic.gc.ca/eic/site/rubber-caoutchouc.nsf/eng/h_ru01206.html

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http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/index.html

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(2007) *Achieving Our Potential – The Plastics Industry to 2016*

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Workforce Planning Boards of Ontario

The Western Local Boards serve their communities as leaders in local labour market planning. The boards deliver authoritative research, identifying employment trends, targeting workforce opportunities and bringing people together to act on solutions. The boards conduct annual research on the trends, opportunities and priorities impacting the local labour market. They release regular updates, reports and an annual publication that captures strategic actions to address key labour market priorities.

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