Australian Government
Department of Education, Employment and Workplace Relations

PMBPROD384A Operate multi-axis router

Revision Number: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

PMBPROD384A Operate multi-axis router

Modification History

Not applicable.

Unit Descriptor

Unit descriptor
This competency unit covers the set-up and operation of multi-axis routers. It applies to two axis routers used to cut out shapes from polymer sheets, through to three, four or five axis routers used to trim thermally formed sheet products and CNC routers or similar CNC machining centres. It also applies to the use of multi-axis routers for making 3D moulds used in the polymer industry.

Application of the Unit

Application of this unit
This competency applies to advanced operators who are required to apply knowledge of materials, product purposes and processes to the operation of multi-axis routers. The key factors are the setting up and making of products to meet quality standards and workplace requirements.
The operator will:

- read and interpret drawings or specifications
- set-up the multi-axis router
- select and install tooling, jigs and fixtures
- set up programming (including sub-programs, parametrics, data files or CAM functions)
- check settings and adjustments
- check router operation and report process variations
- check materials for quality and conformity to product requirements
- perform emergency shut down of equipment.

Note that this competency is based on the unit *LMFFM3031A Set up, operate and maintain CNC machining and processing centres*, adapted for the plastics industry.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites
This unit has no prerequisites.

Employability Skills Information

Employability Skills
The required outcomes described in this unit contain applicable Employability Skills. The Employability Skills Summary of the qualification(s) in which this unit is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

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ELEMENT	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
1. Prepare for work.	1.1 Work instructions are used to determine job requirements, including: design, quality, materials, equipment and quantities. 1.2 Workplace health and safety requirements, including personal protection needs, are observed throughout the work. 1.3 Material for machining is selected and inspected for appropriate quality. 1.4 Procedures are determined for minimising waste material. 1.5 Procedures are identified for maximising energy efficiency while completing the job.
2. Set up for machining and processing.	2.1 Program is set to job requirements. 2.2 Safety equipment, including emergency stops, gauges, guards and controls are checked. 2.3 Machining and processing settings and adjustments are made in accordance with job requirements and machining and processing and tool manufacturer instructions. 2.4 Machining and processing, cutting tools and jigs are checked for safe and effective operation. 2.5 Trial runs are conducted to check machining and processing operation and quality of finished work. 2.6 Final adjustments are made to programs and equipment according to workplace procedures.
3. Operate machining and processing centres.	3.1 Machining and processing centres are operated and monitored to ensure product quality and output. 3.2 Waste quantities are checked and minimised. 3.3 Problems with the required work are identified and reported to appropriate persons. 3.4 Items that do not meet quality requirements are repaired, recycled or discarded according to workplace procedures. 3.5 Any authorised changes in working procedures are followed.

ELEMENT ELEMENT	**PERFORMANCE CRITERIA** Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
4. Clean up work area and maintain equipment.	4.1 Material that can be reused is collected and stored. 4.2 Waste and scrap are removed following workplace procedures. 4.3 Equipment and work area are cleaned and inspected for serviceable condition in accordance with workplace procedures. 4.4 Operator maintenance is completed in accordance with manufacturer specifications and site procedures. 4.5 Unserviceable equipment is tagged and faults identified in accordance with workplace. 4.6 Equipment and tooling is maintained in accordance with workplace procedures.
5. Anticipate and solve problems.	5.1 Recognise a problem or a potential problem. 5.2 Determine problems needing priority action. 5.3 Refer problems outside area of responsibility to appropriate person, with possible causes. 5.4 Seek information and assistance as required to solve problems. 5.5 Solve problems within area of responsibility. 5.6 Follow through items initiated until final resolution has occurred.

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit.
Application of knowledge of the materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example selection of the appropriate router bit or tool for the job.
Knowledge of organization procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards.
Application of the knowledge of managing risks using the hierarchy of controls applied to the machining process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and clean-up. Use of materials safety management systems, hazardous substances and dangerous goods are also covered.
Knowledge as a basis for solving processing and material problems, including:

- types, characteristics, uses and limitations of multi-axis routers
- program and machine theory, practices and techniques
- reading and interpreting drawings
- selecting and installing tooling, setting jigs and fixtures
- programming skills (sub-programs and parametrics)
- performance of CAM functions as relevant
- downloading and storage of data to complete detailed profiling and other specified operations
- effect of tool speed and tool movement speed on product quality and production output
- characteristics of materials used and uses of products produced
- waste management and importance of non-conforming materials.

Competence also includes the ability to:

- plan own work, including predicting consequences and identifying improvements
- maintain output and product quality using appropriate instruments, controls, test information and readings
- identify and describe own role and role of others involved directly in the machining process
- identify factors which may affect product quality or production output and appropriate remedies
- identify when assistance is required to solve problems.

Language, **literacy and numeracy requirements**
This unit requires the ability to read and interpret typical product specifications, job sheets and material labels as provided to operators.
Writing is required to the level of completing workplace forms and production reports.
Basic numeracy is required, eg to interpret specifications and make dimensional checks of the finished product, estimate materials quantities and compute input data.

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the assessment guidelines for this training package.

Overview of assessment

A holistic approach should be taken to the assessment.

Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to:

- identify critical materials properties and machining process characteristics in relation to the process requirements and the end product
- make adjustments to the process as required
- identify and take appropriate action on problems and potential problems.

Consistent performance should be demonstrated. For example, look to see that:

- machining production quality and output standards are met consistently the process runs consistently and smoothly, with the minimum need for human intervention
- all safety procedures are adhered to.

Assessment method and context

Assessment will occur on an industrial multi-axis router and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- using an appropriate, industrial router
- in a situation allowing for the generation of evidence of the ability to recognise, anticipate and respond to problems
- by using a suitable simulation and/or a range of case studies/scenarios
- through a combination of these techniques.

In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment. Assessors need to be aware of any cultural issues that may affect responses to questions.

Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Specific resources for assessment

This section should be read in conjunction with the Range Statement for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts. Where reference is made to industry codes of practice and/or Australian/international standards, the latest version must be used.

Context

This competency applies to all work environments and sectors within the plastics, rubber and cablemaking industry. It includes the operation of all relevant ancillary equipment where that equipment is integral to the machining process.

Procedures

All operations are performed in accordance with procedures.

Procedures include all relevant workplace procedures, work instructions, temporary instructions, job sheets, cutting lists, plans drawings, designs, manufacturer specifications and relevant industry and government codes and standards.

Tools and equipment

This competency includes use of equipment and tools such as:

- multi axis router (includes CNC controlled router, two, three, four or five axis routers, moving bed or moving bridge)
- stand-alone or integral computing systems
- work clamps, jigs and fixtures (includes vacuum tables)
- machine specific tools
- relevant personal protective equipment
- measuring devices.

Materials

Typical materials, include:

- thermally formed sheet un-finished products (eg. polyester or vinyl ester sheets)
- mould materials (eg solid timber, MDF, ply, other plastics)
- other moulded, cast or fabricated products requiring multi-axis routing to produce the required final shape.

Programming

Programming includes:

- converting a computer aided design to data points for separate loading to the router's controller
- downloading or passing computer design data (CAD or CAM data) to the machining centre
- digitising directly using a 'teach pendant'
- other computer programming process.

Hazards

Typical hazards include:

- dusts/vapours
- slip and fall (such as due to swarf)

- temperature (such as due to operating tools)
- hazardous materials, including decomposing polymer machining
- moving equipment (such as bridges, table, tools and components)
- manual handling hazards
- equipment operations.

Problems
'Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures.
Typical routine faults include:

- machine settings, including tool speed and travel
- work clamps, jigs and fixtures.

Non-routine faults, which may have multiple causes include:

- material degradation
- tool selection and design
- intermittent faults.

Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person.
Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.
Variables
Key variables to be monitored include:

- speeds, including tool speed and travel
- surface finish and appearance
- output rate
- product integrity and general conformance to specification/sample.
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Unit Sector(s)

Not applicable.