



Australian Government

Department of Education, Employment and Workplace Relations

PMBPROD392B Produce composites using pultrusion

Revision Number: 1

PMBPROD392B Produce composites using pultrusion

Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers preparation and operations for forming composite products using pultrusion processes and the solving of problems.

Application of the Unit

Application of this unit

This competency is typically performed by advanced operators applying knowledge of materials, product purpose and process in the production of composite products by pultrusion equipment. This competency also requires the use of a range of well developed skills, requiring some discretion and judgement to recognise and resolve a range of problems. The operator will:

- start up pultrusion equipment.
- identify and plan own work requirements from production requests.
- set up equipment, pullers, dies and formers
- monitor equipment operation
- make appropriate adjustments to correct materials, equipment or process variations.
- deal with non-conforming products, waste and scrap
- solve routine and non-routine composites forming equipment and process problems, seeking guidance where necessary or appropriate.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit has the prerequisite of *PMBPROD292B Operate pultrusion equipment*.

Employability Skills Information

Employability Skills

This unit contains employability skills.

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

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.
1. Plan own work requirements.	1.1 Identify the most appropriate equipment and processes to be used for production process and upstream and downstream operations from production plan or request. 1.2 Identify and check materials required, including additives. 1.3 Implement measures to control identified hazards in line with procedure and duty of care. 1.4 Identify requirements for materials, quality, production and equipment checks.
2. Start up pultrusion process to procedures.	2.1 Identify process settings required for products. 2.2 Set process to required settings. 2.3 Check materials, resins and fibres are correct. 2.4 Set up date, batch and materials markings to specifications, as required. 2.5 Complete pre-start checks. 2.6 Start up pultrusion process.
3. Operate and make adjustments to the pultrusion process to procedures.	3.1 Operate pultrusion process noting key variables. 3.2 Monitor controls/displays/terminals for production and process data. 3.3 Take samples as required and identify product out of specification. 3.4 Monitor product/process quality. 3.5 Make adjustments to remedy faults and nonconformity to standard as required. 3.6 Establish a stable pultrusion process. 3.7 Adjust process to minimise scrap and waste. 3.8 Clean, adjust and lubricate equipment as required.
4. Shut down machine to procedures.	4.1 Determine type of shut down. 4.2 Select appropriate cleaning method. 4.3 Clean efficiently and adequately as required. 4.4 Leave machine in appropriate condition and with appropriate locks, tags or notices. 4.5 Complete relevant documentation.

ELEMENT	PERFORMANCE CRITERIA
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.
	4.6 Ensure area is clean and clear after shutdown, in readiness for the next start-up.
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 problem 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.

Knowledge of organization procedures, quality requirements at each production stage and relevant regulatory requirements and 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 pultrusion process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup.

Knowledge as a basis for solving processing and material problems including:

- characteristics of materials and behaviour in relation to heat, pressure, flow rate and time
- properties of the materials required to form a composite structure of the required strength and surface finish
- function and operating principles of equipment, machine components and ancillary equipment
- adjustments to bring process on line
- impact of machine speed, temperature, pressure, on product quality and production output
- nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation and product development
- impact of variations in raw materials and equipment operation in relation to final product
- changes to materials at various stages of production
- waste management and importance of non-conforming materials
- polymer properties and their interactions with process conditions
- relationships between polymer properties and process conditions
- changes to polymer properties to better suit process requirements
- product problems related to polymer properties
- product problems related to process conditions
- adjustments to process conditions to meet polymer and product requirements.

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 process
- identify factors which may affect product quality or production output and appropriate remedies
- identify when assistance is required to solve problems
- set up dies, pullers or formers
- use composites materials including release agents, resins and fibre reinforcement
- use of surface finishing equipment
- operation of equipment including PLC controls
- curing of products including application of wraps, heat or pressure.

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, quality assurance records and production reports.

Numeracy is required to the level of determining required weights/volumes of materials in a resin mix for different circumstances (using a data sheet), number of layers of impregnated matrix required to yield the required product laminate thickness, and similar activities.

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.

Where the assessee does not currently possess evidence of competency in *PMBPROD292B Operate pultrusion equipment*, it may be co-assessed with this unit.

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 pultrusion composites 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:

- the process runs consistently and smoothly with the minimum need for human intervention
- all safety procedures are always followed.

Assessment method and context

Assessment will occur on an industrial pultrusion machine(s) equipment and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- using an appropriate, operating plant requiring demonstration of start-up, operation and shutdown procedures
- 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 the production of composite products by pultrusion processes. It includes the operation of all relevant additional equipment where that equipment is integral to the composites forming process.

Procedures

All operations are performed in accordance with procedures.

Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Tools and equipment

This competency includes use of equipment and tools such as:

- dies, formers
- hand tools, eg knives, cutters
- equipment for pultrusion and curing
- relevant personal protective equipment.

Hazards

Typical hazards include:

- spills
- dust/vapours
- slip and fall
- hazardous substances (including resins and catalyst)

- manual handling hazards
- moving equipment
- temperature (such as hot equipment or product)
- 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 *i*) do not have a known solution, *ii*) a solution recorded in the procedures.

Typical process and product problems may include:

- die/tooling problems such as cracks, dents or imperfections
- variations in materials, colour, consistency or mix
- adjustment and settings of the equipment
- curing conditions
- variations in material properties and/or contamination of materials
- variation in material flow rates
- processing problems.

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:

- operating temperatures
- speed
- colour and uniformity
- cycle time
- output rate
- product weight
- product integrity and general conformance to specification/sample.
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Unit Sector(s)

Not applicable.