SEMPEO127

Carrying out composite moulding activities

Overview

This standard covers a range of basic competences that you need to produce composite mouldings, using techniques such as wet lay-up, pre-preg laminating or resin infusion techniques. It will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or it will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the composite moulding activities by obtaining all the necessary job instructions, materials, tools, equipment and any documentation that may be required.

You will be expected to obtain and check the tooling, apply release agents and prepare the composite materials. You will produce the composite mouldings, which will incorporate a range of features, using a range of application methods. The activities will also include making all necessary checks, to ensure that the mouldings meet the required specification and have an appropriate cosmetic appearance. On completion of the composite moulding activities, you will be expected to return all tools and equipment to the correct location, and to leave the work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the composite moulding activities undertaken. You will need to report any difficulties or problems that may arise with the moulding activities, and carry out any agreed actions. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate composite moulding techniques and procedures safely. You will understand the moulding/laying-up procedure, and its application, and will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the composite moulding activities, and when using the associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the

responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

At least one of the mouldings produced must combine different operations and moulding techniques.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. prepare the moulds, jigs or formers ready for the manufacturing operations
3. carry out the moulding activities, using the correct methods and techniques
4. trim/finish moulding to specification (where applicable)
5. produce composite mouldings
6. check that all the required operations have been completed to specification
7. report any difficulties or problems that may arise with the moulding activities, and carry out any agreed actions
8. leave the work area in a safe and tidy condition on completion of the moulding activities

Knowledge and understanding

You need to know and understand:

1. the health and safety precautions to be taken, and procedures to be used, when working with composite materials, tools and equipment
2. the hazards associated with using composite materials, consumables, tools and equipment, and how to minimise these in the work area
3. the protective equipment (PPE) that is needed for personal protection and, where required, the protection of others
4. the specific workshop environmental conditions the must be observed when producing composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)
5. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
6. the types of resin systems and fibres used, and their applications
7. the visual identification of both raw and finished composite materials
8. methods of preparation for patterns, moulds and tooling (including the correct use of surface sealers and release agents)
9. methods used in the application of materials to tooling surfaces (such as for tailoring and cutting materials)
10. mixing ratios for gel coats, resins and catalysts, and their associated working times
11. the methods used in the application of the resin/fibre during the moulding activity
12. the curing of mouldings, and the importance of adhering to the cure cycle
13. the tools and equipment used in the moulding activities, and their care, preparation and control procedures
14. how to recognise faults that can occur during the moulding process
15. procedures and methods used for removing mouldings from production tooling
16. the identification of defects in the composite moulding (such as de-lamination, voids, contaminants)
17. how to mark out the mouldings in preparation for the trimming activities, and the tools and equipment to be used
18. the methods and techniques used to trim mouldings, and the different types of manual and power tools used in the trimming operations

19. the care and safe handling of production tooling and composite mouldings throughout the production cycle
20. why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area
21. when to act on your own initiative and when to seek help and advice from others
22. the importance of leaving the work area in a safe and clean condition on completion of activities (such as removing and storing power leads, cleaning the equipment and removing and disposing of waste)

Scope/range related to performance criteria

1.

Carry out **all** of the following during the composite moulding activities:

1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
1.2 follow job instructions, drawings, process specifications and moulding/lay-up procedures
1.3 ensure that all equipment and tools used are in a safe and serviceable condition
1.4 return all tools and equipment to the correct location on completion of the moulding/lay-up activities

2.

Carry out **one** of the following composite moulding activities:

2.1 wet lay-up laminating
2.2 pre-preg laminating
2.3 resin infusion (flow or film)
2.4 spray lay-up laminating
2.5 hot press moulding
2.6 resin transfer moulding
2.7 pultrusion techniques
2.8 other specific moulding activity

3.

Prepare for the composite moulding activities, to include carrying out **all** of the following as applicable to the moulding process:

3.1 ensure the correct tooling is being used and check for any surface defects
3.2 correctly apply sealers/release agents
3.3 ensure the correct materials are being used for the activity, and check that they are `in life'
3.4 cut the materials to the correct size and shape
3.5 obtain the correct measure and mix of resin/catalyst
3.6 check equipment settings are correct
3.7 dispense and apply the correct measure and mix of resin/catalyst

4.

Produce composite mouldings which combine operations and include **three** of the following shape features:

4.1 internal corner
4.2 return surfaces
4.3 flanges
4.4 joggle details
4.5 external corner
4.6 double curvature

4.7 convex surface
4.8 nett edges
4.9 vertical surface
4.10 concave surface

5.

Produce composite mouldings using **three** of the following:

5.1 resin (such as polyester, epoxy, phenolic, vinyl ester, bismaleimide, cyanate ester)
5.2 fibre (such as glass, carbon, polyethylene, aramid, hybrid)
5.3 reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven)
5.4 core material (such as wood, core mat, structural foam, honeycomb)

6.

Use **one** of the following during the cure cycle: (where it is appropriate to the moulding technique used)

6.1 oven
6.2 pressure bags
6.3 heated tools/moulds
6.4 vacuum bags
6.5 autoclave
6.6 thermal mould expansion
6.7 heated press
6.8 fibre tensioning
6.9 curing lamps
6.10 infrared heating
6.11 microwave
6.12 hot bonder
6.13 electric heating
6.14 water/steam heating

7.

Use **one** of the following to apply pressure during the moulding process

7.1 pressure bags
7.2 vacuum bags
7.3 hot de–bulk
7.4 pressure de-bulk
7.5 press
7.6 autoclave
7.7 thermal mould expansion
7.8 fibre tensioning

8.

Remove the composite mouldings from the formers, and carry out **three** of the following as applicable to the moulding process:

8.1 visually check that the moulding is complete and free from defects
8.2 mark out the mouldings for trimming of excess material

8.3 cut/trim the mouldings, using appropriate tools and equipment (such as cutting wheels/discs, routers, saws)
8.4 carry out edge filling (where appropriate)
8.5 sand the mouldings, using appropriate tools and equipment (such as rubbing blocks, diamond files, disc or belt sanders, pencil grinders)
8.6 produce and finish holes in the mouldings, using appropriate tools and techniques (such as drills, hole saws, countersinks, counterbores, threading devices), where appropriate
8.7 polish the mouldings using appropriate tools and equipment (such as wet sanding, cutting compounds)
8.8 store components in the correct orientation and location

9.

Produce composite mouldings which comply with **all** of the following:

9.1 components are dimensionally accurate within specification requirements
9.2 finished components meet the required shape/geometry (such as squareness, straightness, angularity and being free from twists)
9.3 completed components are free from defects, sharp edges or slivers
9.4 components meet company standards and procedures

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

SEMPEO127

Carrying out composite moulding activities

Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2017
Indicative Review Date	31 Mar 2020
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMPEO1-27
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies
Suite	Performing Engineering Operations Suite 1
Keywords	performing engineering operations; composite moulding; wet lay-up; pre-preg laminating; resin infusion; manufacturing; moulds; jigs; formers; film; press; pultrusion; spray