SEMCOMP207

Using resin film infusion techniques to produce composite mouldings

Overview

This standard identifies the competences you need to produce composite mouldings (such as moulds, components, splashes, jigs) using resin film infusion techniques, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and documentation to produce various mouldings, using the approved resin film infusion production techniques.

You will produce a range of composite mouldings, incorporating a variety of features and using a range of techniques and processes. Mouldings produced will include laminates and sandwich structures, using a range of resin, fibre and core materials.

Your responsibilities will require you to comply with organisational policy and procedures for the production activities undertaken and to report any problems with the production activities, equipment or materials that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions under supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying resin film infusion techniques and procedures. You will understand the production techniques used and their application, in adequate depth to provide a sound basis for carrying out the activities and ensuring the work output is to the required specification.

You will understand the safety precautions required when carrying out the 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.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety, environmental and other relevant regulations, directives and guidelines
2. follow the correct component drawing or any other related documentation for the component to be produced
3. confirm what has to be produced and how this will be achieved
4. carry out any preparation activities required on the tooling, equipment and materials
5. carry out the moulding activities using the correct methods and techniques
6. produce mouldings to the required specification
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. complete relevant documentation
9. leave the work area in a safe and appropriate condition on completion of the activities

Knowledge and understanding

You need to know and understand:

1. the health and safety precautions to be taken and procedures used, when working with composite materials, consumables, tools and equipment in the specific work area
2. the hazards associated with carrying out resin film infusion techniques and with the composite materials, consumables, tools and equipment used, and how to minimise these and reduce any risks
3. the protective equipment (PPE) that is needed for personal protection and where required, the protection of others
4. the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables
5. the specific environmental conditions the must be observed when producing composite mouldings (such as temperature, humidity, fume/dust extraction systems and equipment)
6. how to identify and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken
7. how to interpret drawings/lay-up manuals, systems of measurement, workpiece reference/datum points and system of tolerancing
8. the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification) and the completion of such documents
9. the basic conventions and terminology used for resin film infusion techniques (such as material orientation, material identification, material templates, ply lay-up, pressure plates, vacuum bagging, cure cycles, exotherm)
10. the function resins, reinforcement, catalysts, accelerators and additives play in the production of mouldings
11. the function fibre materials, fabrics, orientation, their combinations play in the production of mouldings
12. how to build up laminates (including orientation and balance of plies) to minimise spring and distortion in composite mouldings
13. the function core, insert and filler materials play in the production of mouldings
14. how to identify raw and finished composite materials

15. how to Identify materials by product codes
16. the type of production tooling used for producing composite mouldings
17. the identification of common defects in production tooling
18. how to prepare patterns, moulds and tooling, including the correct selection and use of surface sealers and release agents
19. the correct methods of storage, thawing and handling of resin film infusion materials (including monitoring temperature, storage life and out-life)
20. the methods used in the application of resin film infusion materials to tooling surfaces (including methods of tailoring and cutting)
21. the correct methods of storage and handling of ancillary and consumable materials
22. how to use ancillary and consumable materials (such as release films, breather fabrics, bagging films, tapes) to meet performance requirements (such as temperature and compatibility)
23. the tools and equipment used in the resin film infusion activities, and their care, preparation and control procedures
24. the common problems that can occur during the lay-up process (including modifications to the ply lay-up, and defects such as contamination and distortion)
25.
how defects can be prevented during the resin film infusion activity
26.
the cure cycles (including temperature and pressure ramps, dwell times, post curing)
27. the need to monitor the cure cycle (using thermocouples, probes, chart recorders and data logs)
28. the procedures and methods used for removing mouldings from production tooling
29. the identification of defects in the composite moulding (such as de-lamination, voids, contaminants)
30. the care and safe handling of production tooling and composite mouldings throughout the production cycle
31. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
32. the documentation to be completed during and/or on completion of the moulding activity

Scope/range related to performance criteria

1.

Carry out all of the following during the moulding activities:

1.1 use the appropriate documentation (such as job instructions, drawings, material data sheets, specifications, planning and quality control documentation)
1.2 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.3 maintain a safe working environment for the moulding activities
1.4 check that all tools and equipment to be used are correct for the operation to be carried out and are in a safe and usable condition
1.5 follow safe practice/approved moulding techniques at all times
1.6 return all tools and equipment to the correct location on completion of the moulding activities
1.7 segregate and dispose of waste materials using the correct procedure

2.

Carry out three of the following activities when preparing production tooling:

2.1 check that tooling is correct and complete
2.2 clean tooling and remove resin build-ups
2.3 check for surface defects
2.4 correctly apply sealers/release agents
2.5 clean and store tooling suitably after use

3.

Carry out three of the following activities to prepare materials for production:

3.1 obtain correct materials for the activity
3.2 thaw material removed from freezer storage
3.3 identifying defects in resin film materials
3.4 confirm that materials are fit for purpose and in life
3.5 check availability of ancillary materials required
3.6 cut materials to correct shape and orientation
3.7 check materials when provided in kit form
3.8 identify and protect materials in the work area

4.

Produce a range of mouldings, using two of the following types of tooling:

4.1 pattern
4.2 mandrels
4.3 metal
4.4 tooling block
4.5 wet lay-up
4.6 infused tooling
4.7 glass pre-preg

4.8 carbon pre-preg
4.9 female tooling
4.10 male tooling
4.11 multi-part tools
4.12 matched tooling
4.13 closed tooling

5.

Produce a range of mouldings incorporating two of the following in the lay-up:

5.1 butt joins
5.2 overlap joins
5.3 staggered joins
5.4 orientated plies
5.5 inverted plies
5.6 inserts
5.7 balancing plies
5.8 fixtures
5.9 other (to be specified)

6.

Produce a range of mouldings incorporating two of the following shape features:

6.1 internal corners
6.2 external corners
6.3 vertical surface
6.4 double curvature
6.5 concave surface
6.6 horizontal surface
6.7 convex surfaces
6.8 return surfaces
6.9 joggle details
6.10 nett edges
6.11 other specific feature

7.

Produce a range of mouldings using one of the following methods:

7.1 production of ply templates
7.2 nesting of ply templates
7.3 material cutting & kitting
7.4 shaped locators
7.5 joining boards
7.6 loose tooling
7.7 intensifiers
7.8 vacuum de-bulk
7.9 moulded datum features
7.10 placement jigs
7.11 laser projection placement
7.12 video feedback placement

8.

Produce a range of mouldings using one type of resin from:

8.1 bio resin
8.2 thermoplastic
8.3 epoxy
8.4 phenolic
8.5 bismaleimide
8.6 cyanate ester
8.7 vinyl ester
8.8 other (to be specified)

9.

Produce a range of mouldings using techniques for one type of fibre from:

9.1 natural fibre
9.2 thermoplastic
9.3 glass
9.4 aramid
9.5 carbon
9.6 hybrid
9.7 other (to be specified)

10.

Produce a range of mouldings using one type of reinforcement from:

10.1 continuous
10.2 uni-directional
10.3 tapes
10.4 tissues/veils
10.5 woven
10.6 braids
10.7 multi-axis

11.

Produce a range of mouldings using one type of core material (where applicable to the Sector or process):

11.1 solid timber
11.2 end grain balsa
11.3 thermoplastic core
11.4 syntactic core
11.5 rigid foam
11.6 expanding core
11.7 fibrous honeycomb
11.8 aluminium honeycomb
11.9 other (to be specified)

12.

Use one of the following methods if using core materials (where applicable to the Sector or process)::

12.1 core templates
12.2 pre-shaping core

12.3 core chamfers
12.4 core splicing
12.5 peel plies
12.6 bonding paste
12.7 edge filling
12.8 adhesive/resin films
12.9 potting/filler compound
12.10 single stage curing
12.11 multi-stage curing

13.

Use one of the following for applying temperature during the cure cycle:

13.1 oven
13.2 autoclave
13.3 heated tools/moulds
13.4 heat mats
13.5 heated press
13.6 curing lamps
13.7 infrared heating
13.8 electro-magnetic inductance
13.9 micro-wave
13.10 other (to be specified)

14.

Use one of the following for applying pressure to consolidate the moulding:

14.1 vacuum bags
14.2 pressure bags
14.3 thermal mould expansion
14.4 fibre tensioning
14.5 press
14.6 autoclave

15.

Where vacuum bags are used, use two of the following processes/methods:

15.1 check vacuum integrity
15.2 surface bagging
15.3 envelope bagging
15.4 multi-part envelope bags
15.5 internal bagging
15.6 through-tube bagging
15.7 pleats and tucks
15.8 reusable bagging
15.9 use of reusable vacuum fittings

16.

Produce a range of mouldings which comply with one of the following standards:

16.1 BS, ISO or BSEN standards and procedures
16.2 customer standards and requirements
16.3 company standards and procedures

16.4 recognised compliance agency/body standards

17.

Complete the relevant documentation, to include one of the following:

17.1 production documentation
17.2 quality control documentation
17.3 job cards

Behaviours

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

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