SEMAUT3082

Producing motorsport composite mouldings using resin infusion laminating techniques

Overview

This standard identifies the competences you need to produce motorsport composite mouldings (such as moulds, wings, body panels, ductwork, fairings, jigs) using resin infusion laminating techniques, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and documentation to produce various mouldings, using the correct resin infusion laminating production techniques.

You will be expected to prepare a range of tooling, apply release agents, and prepare composite materials. 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 that are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of 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 infusion laminating 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, correcting faults, and ensuring that 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 and other relevant regulations, directives and guidelines
2. follow the correct component drawing or any other related specifications for the component to be produced
3. obtain and prepare the appropriate tools, equipment and materials
4. carry out the moulding or resin infusion activities using the correct methods and techniques
5. produce components to the required specification
6. check that all the required operations have been completed to specification
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. ensure that work records are completed, stored securely and available to others, as per organisational requirements
9. leave the work area in a safe condition on completion the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to current industry standards and codes of practice)
6. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
7. quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and the completion of such documents
8. conventions and terminology used for resin infusion laminating techniques (material orientation, material identification, distribution media, resin viscosity, flow paths, ply lay-up, vacuum bagging, resin and fibre weights/volumes, gel times, exotherm, bleed plies)
9. different types of resin systems, fibres, reinforcements, and their merits
10. the visual identification of both raw and finished composite materials
11. different types of production tooling used for producing composite mouldings
12. building up laminates, including orientation and balance of plies, to minimise spring and distortion in composite mouldings
13. different core and insert materials, and their merits
14. different types of resin distribution media, and their merits
15. the identification and rectification of defects in production tooling
16. methods of preparation for patterns, moulds and tooling (such as the correct selection and use of surface sealers and release agents)
17. methods for handling, preparation and application of the reinforcing fibres and fabrics
18. correct methods of storage and handling of ancillary and consumable materials
19. the methods used in the positioning and application of the resin distribution media
20. mixing ratios for resins and catalysts, and the associated working times for two-part resin systems

21. cure cycles (including temperature and pressure ramps and dwell times) for pre-catalysed resin films
22. tools and equipment used in the resin infusion laminating activities, and their care, preparation and control procedures
23. problems that can occur during the resin infusion process (including defects such as contamination, incomplete wet out, vacuum leaks, flow restrictions)
24. procedures and methods used for removing mouldings from production tooling
25. the identification of defects in the composite moulding (de-lamination, voids, contaminants)
26. the care and safe handling of production tooling and composite mouldings throughout the production cycle
27. the production controls used in the work area, and actions to be taken for unaccounted items
28. how the composite moulding relates to its own quality documents and the production tooling used
29. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
30. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Carry out all of the following during the resin infusion moulding activities:
    1. obtain and use the appropriate documentation (such as job instructions, drawings, material data sheets, planning and quality control documentation, material data sheets, specifications)
    2. adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
    3. provide and maintain a safe working environment for the resin infusion moulding activities
    4. obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition
    5. follow safe practice/approved resin infusion moulding techniques and procedures at all times
    6. return all tools and equipment to the correct location on completion of the resin infusion moulding activities
    7. dispose of waste materials in accordance with approved procedures
    8. leave the work area in a safe and appropriate condition on completion of the activities
2. Prepare the tooling for production, to include carrying out all of the following:
    1. check that tooling is correct and complete
    2. correctly apply sealers/release agents
    3. clean tooling and remove resin build-ups
    4. clean and store tooling suitably after use
    5. check for surface defects
3. Prepare the materials for production, to include carrying out all of the following:
    1. obtain correct materials for the activity
    2. cut materials to correct shape and orientation
    3. either thaw material removed from freezer
    4. check availability of ancillary materials required storage or check the correct measure and mix of resin/catalyst
    5. identify and protect materials in the work area
    6. obtain the correct infusion media and layout for the activity
    7. check materials are fit for purpose and in life

4. Produce motorsport composite mouldings, using resin infusion laminating techniques, to include eight of the following:

    1. floor/diffuser
    2. wings
    3. bumpers
    4. fairings/shrouds
    5. splitters
    6. nose cones
    7. brake ducts
    8. seats
    9. body panels
    10. floor trays
    11. air intakes
    12. trim panels
    13. side pods
    14. fuel tank housings
    15. radiator ducts
    16. moulds/jigs
    17. engine covers
    18. wing endplates
    19. dash panels

5. Produce motorsport composite mouldings, using two of the following resin infusion methods:

    1. interlaminar distribution
    2. surface distribution
    3. core channel distribution
    4. pre-catalysed resin films and applying three of the following techniques:
    5. trial runs/tracking
    6. repairs
    7. vacuum regulation
    8. full scale runs
    9. dry area rectification
    10. resin flow regulation

6. Produce motorsport composite mouldings incorporating four of the following in the lay-up:

    1. feathered joins
    2. overlap joins
    3. orientated plies
    4. inserts
    5. butt joins
    6. staggered joins
    7. inverted plies

8. fixtures

7. Produce motorsport composite mouldings incorporating five of the following shape features:

    1. internal corners
    2. double curvature
    3. convex surfaces
    4. joggle details
    5. external corners
    6. concave surface
    7. return surfaces
    8. nett edges

8. Produce motorsport composite mouldings, using techniques for two types of resin from:

    1. polyester
    2. vinyl ester
    3. epoxy
    4. phenolic
    5. bismaleimide
    6. cyanate ester

9. Produce motorsport composite mouldings, using techniques for two types of fibre from:

    1. polyethylene
    2. glass
    3. aramid
    4. carbon
    5. hybrid

10. Produce motorsport composite mouldings, using techniques for three types of reinforcement from:

    1. uni-directional
    2. woven
    3. knitted
    4. braids
    5. chopped strand
    6. multi-axis
    7. tapes

11. Produce motorsport composite mouldings, using techniques for two types of core materials from:

    1. wood
    2. foam
    3. coremat

4. syntactic core

12. Produce motorsport composite mouldings using techniques for six types of resin distribution media:

    1. interlaminar
    2. peel ply
    3. braid
    4. networks
    5. channelled core
    6. perforated hose
    7. flow channels
    8. bleed plies
    9. meshes
    10. spiral wrap
    11. manifolds
    12. breather fabric
    13. mats/fabrics

13. Use six of the following vacuum bagging processes/methods:

    1. check vacuum integrity
    2. internal bagging
    3. leak rectification
    4. use of vacuum fittings
    5. pleats and tucks
    6. catch pots/tanks
    7. surface bagging
    8. reusable bagging
    9. localised resin injection
    10. envelope bagging
    11. leak detection
    12. release and breather plies

14. Check motorsport composite mouldings which comply with one of the following:

    1. industry standards, codes of practice and legislation
    2. customer standards and requirements
    3. company standards and procedures
    4. recognised compliance agency/body's standards

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