

Vacuum forming composite materials

Overview

This standard identifies the competences you need to vacuum form components, in accordance with approved procedures. You will be required to follow the appropriate instructions, drawings and specifications, to produce the various types of components from thermoplastic sheet, fibre reinforced thermoplastic sheet and structural foam. This will require you to use a range of air circulating ovens, vacuum forming machines, trimming equipment and various types of tooling. The components produced will have a range of features, including male shapes, female shapes, double curvatures and stiffened mouldings.

Your responsibilities will require you to comply with organisational policy and procedures for the vacuum forming activities undertaken, and to report any problems with the vacuum forming activities, equipment, materials or consumables that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, 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 be sufficient to provide an understanding of your work, and will provide an informed approach to applying vacuum forming procedures. You will have an understanding of the vacuum forming procedures used, and their application, and will know about the vacuum forming techniques, materials, tooling and consumables used, in adequate depth to provide a sound basis for carrying out the activities, recognising faults and ensuring the work output is to the required specification.

You will understand the safety precautions required when carrying out the vacuum forming operations 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.

Vacuum forming composite materials

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. confirm that the equipment is set up correctly and is ready for use
3. operate the machine controls safely and correctly in line with operational procedures
4. produce components to the required specification
5. carry out quality sampling checks at suitable intervals
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. shut down the equipment to a safe condition on conclusion of the machining activities
8. complete relevant production documentation

Vacuum forming composite materials

Knowledge and understanding

You need to know and understand:

1. the specific safety practices and procedures that you need to observe when working with vacuum forming equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the work area where you are carrying out the activities, and the responsibility these requirements place on you
3. the protective equipment (PPE) that you need to use for both personal protection and, where appropriate, protection of others
4. the hazards associated with carrying out vacuum forming activities, and with the tools and equipment used, and how to minimise these and reduce any risks in the work area
5. the application of COSHH regulations in relation to the storage, use and disposal of materials and consumables used in the vacuum forming process
6. how to extract and use information from engineering drawings, and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to the work undertaken
7. how to interpret imperial and metric systems of measurement
8. the methods of sheet trimming and sheet cleaning, prior to forming
9. the preparation methods and procedures applied to the moulding surface
10. the identification of the correct male/female mould tooling
11. the methods and techniques of loading and aligning materials into the mould tooling
12. the methods and techniques for carrying out the de-moulding procedures
13. how to recognise vacuum forming defects (such as misalignment, distortion, damage, contamination and surface defects)
14. the importance of adhering to the vacuum forming cycle
15. the quality control procedures to followed during the vacuum forming operations
16. the tools and equipment used in the vacuum forming activities, and their care, preparation and control procedures
17. the problems that can occur with the vacuum forming operations, and how these can be overcome
18. the production documentation to be completed for the vacuum forming activities undertaken
19. the extent of your own authority and to whom you should report if you have problems that you cannot resolve

Scope/range related to performance criteria

1. Carry out **all** of the following during the vacuum forming activities:
 1. obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation, material data sheets)
 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
 3. obtain the correct tools and equipment for the activity and ensure they are safe to use
 4. use the correct materials and consumables, as specified in the production documentation (such as colour, size, composition)
 5. apply safe and appropriate vacuum forming techniques and working practices at all times
 6. keep the work area in a safe and suitable condition
2. Use **two** of the following types of equipment:
 1. air circulating ovens
 2. wood tooling
 3. vacuum forming machines
 4. trimming equipment
 5. composite tooling
 6. metal tooling
 7. other specific equipment
3. Carry out **three** of the following operations:
 1. bubble blowing to minimize webbing
 2. positioning of robbers
 3. cleaning tooling
 4. temperature control
 5. trimming techniques
 6. drying of sheet
 7. use of intensifiers
 8. sheet cleaning
4. Produce a range of components with **two** of the following features:
 1. double curvatures
 2. female shapes
 3. male shapes
 4. stiffened mouldings

Vacuum forming composite materials

5. Produce a range of components using **one** the following materials:

1. thermoplastic sheet (such as polycarbonate, polysulphone, acrylic, polyvinyl chloride, ABS)
2. fibre-reinforced thermoplastic sheet
3. structural foams (such as polyvinyl chloride (PVC), polymethate)

6. Produce components which comply with **one** of the following standards:

1. BS, ISO or BSEN standards and procedures
2. customer standards and requirements
3. company standards and procedures
4. specific material/vacuum forming requirements

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