SEMAER224

Producing aircraft components by injection moulding

Overview

This standard identifies the competences you need to produce aircraft components by injection moulding, in accordance with approved procedures. You will be required to check that the injection-moulding machine is ready for the operations to be performed, and that all the required materials and consumables are available. You will be expected to check that the mould tools are free from damage, which could impair the quality of the mouldings produced, and that all services required to operate the machine are fully operational.

You will be required to operate the injection moulding machine, in line with safe working practices and approved procedures, and to continuously monitor the moulding operations, making any necessary adjustments to settings in order to ensure that the work output is to the required quality and accuracy.

Your responsibilities will require you to comply with organisational policy and procedures for the injection moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and you must complete all necessary job/task documentation accurately and legibly.

You will be expected to work either with a high level of supervision or as a member of a team, and you will take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will provide an informed approach to applying the appropriate injection moulding techniques and procedures. You will understand the moulding procedures and techniques used, and will know about the tools and techniques, in adequate 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 injection moulding activities, and when using the associated tools and equipment. You will be

required to demonstrate safe working practices throughout. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Setting up of the plastic injection-moulding machine, its tooling and associated delivery/collection mechanisms, is the subject of another standard.

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 follow the correct component drawing or any other related specifications for the component to be produced

P3 determine what has to be done and how this will be achieved

P4 obtain and prepare the appropriate tools, equipment and materials for the plastic injection moulding activities

P5 carry out the moulding or laying-up activities using the correct methods and techniques

P6 produce components to the required specification

P7 check that all the required operations have been completed to specification

P8 deal with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

K2 the emergency procedures that are in place to deal with a machine malfunction when operating injection moulding machines

K3 the safety mechanisms on the machine, and the procedure for checking that they function correctly

K4 operation of the machine controls in both hand and power modes, and how to stop the machine in an emergency

K5 the COSHH regulations relating to the materials used in the injection moulding activities

K6 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy

K7 how to obtain the necessary job instructions for the production operations, and how to interpret the information

K8 the basic parts and functions of plastic injection moulding machines and moulds

K9 the various types of mould tools that are used, and their typical applications

K10 why it is important to check the moulds for damage or other non-conformance, prior to starting up the injection moulding machine

K11 the different types of component delivery/collection systems that are used on plastic injection moulding machines

K12 the various machine operating parameters that may require adjusting during the injection moulding activities and how these are achieved

K13 the effects that changes to these settings will have on the quality of the components produced

K14 the different types of materials used in the plastic injection moulding process

K15 preparations to be carried out on the materials in order to ensure that the completed components meet the required specification

K16 the temperature range of the material being moulded and the mould being used

K17 methods of checking the finished mouldings to ensure that they are to the required specification

K18 identification of moulding defects, their causes, and methods of prevention

K19 how to make adjustments to machine settings to deal with such things as flashing, short shot, distortion and colour issues

K20 the quality control procedures used and inspection checks to be carried out on the mouldings produced, and the equipment that will need to be used

K21 the issues that can occur with the injection moulding activities, and how these can be overcome

K22 why it is important to keep the injection moulding equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area

K23 the procedure for the safe disposal of waste materials

K24 the production documentation to be completed for the injection moulding activities undertaken

K25 the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

Scope/range related to performance criteria

1. Prepare for the plastic injection moulding operations, to include carrying out all of the following:
    1.1 ensure that you have the correct documentation for the injection moulding operations (such as drawings, job instructions, aircraft standards)
    1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
    1.3 use the correct tools and equipment for the activity, and ensure that they are safe to use
    1.4 check that there are sufficient raw materials available, and that they meet the component specification
    1.5 apply safe and appropriate working practices and procedures at all times
    1.6 dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures
    1.7 return all tools and equipment to the correct location on completion of the activities
    1.8 leave the work area in a safe condition and free from foreign object debris
2. Check the injection moulding machine, to include carrying out all of the following:
    2.1 checking that the correct mould tool is located in the machine and is complete, clean and free from damage
    2.2 ensuring that mould surfaces are clean and free from damage
    2.3 checking that secondary mould tool components are clean and free from damage
    2.4 checking that all moulding parameters have been set correctly (such as temperature, pressure, speed/time, distance)
    2.5 checking that component delivery/collection mechanisms are working correctly (such as robots, conveyors, separators and collection chutes)
    2.6 ensuring that all guards, screens and safety mechanisms are in place and in good working order
    2.7 checking that all services are connected, and that all connections are in good order (such as water, electrical, pneumatic, hydraulic)
    2.8 checking that all machine controls are operational
3. Produce plastic injection mouldings, using two of the following types of mould tools:
    3.1 two-plate tools
    3.2 combination/composite tools
    3.3 unscrewing tools
    3.4 three-plate tools
    3.5 split tools
4. Produce injection mouldings from two of the following types of material:
    4.1 acrylonitrile-butadiene-styrene (ABS)
    4.2 polycarbonate
    4.3 acetal
    4.4 nylon

4.5 polypropylene
4.6 polyethylethylketone
4.7 polystyrene
4.8 polyarylene sulphide
4.9 polyethylene
4.10 short fibre reinforced polymers up to % by volume
4.11 other specific material

5. Produce a range of components with two of the following features:
5.1 flat planks/test pieces
5.2 multi faceted
5.3 double curvatures
5.4 internal cavities
5.5 female shapes
5.6 male shapes
5.7 other specific features

6. Carry out a visual inspection and segregation of the mouldings, according to company procedures, to include two of the following:
6.1 mouldings which meet the required specification
6.2 mouldings which have defects
6.3 mouldings that require further investigation

7. Monitor the moulding operations, and make adjustments to the machine settings to deal with two of the following:
7.1 flashing
7.2 burning
7.3 short shot
7.4 colour deviation
7.5 distortion

8. Complete the relevant documentation, to include one of the following:
8.1 production documentation
8.2 quality control documentation
8.3 records of machine settings
8.4 other specific records

9. Produce plastic injection mouldings which comply with one of the following standards:
9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
9.2 Ministry of Defence (MoD)
9.3 Military Aviation Authority (MAA)
9.4 Aerospace Quality Management Standards (AS)
9.5 Federal Aviation Authority (FAA)
9.6 BS, ISO or BSEN standards and procedures
9.7 customer standards and requirements
9.8 organisational standards and procedures
9.9 manufacturers standards and procedures

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