SEMFWE326

Heat treating materials for fabrication activities

Overview

This standard identifies the competencies you need to heat treat ferrous and non-ferrous materials in order to assist with the fabrication activities in accordance with approved procedures. You will be required to identify and use the appropriate materials, apply the appropriate processes and use tools and equipment based on the information presented to you to achieve the required condition. The heat treatment processes will include hardening, tempering, annealing, normalising and stress relieving and can be applied to the fabricator's tools such as punches, chisels and scribers or the component/materials to be worked on.

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

Your underpinning knowledge will provide a good understanding of your work, and provide a sound approach to applying the heat treatment procedures. You will understand the principles of heat treatment, and their application, and will know about the effects on the structure of the materials and their characteristics in sufficient depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the process is carried out to the required specification. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities 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. ensure the materials to be processed are suitably prepared for the processing operations to be carried out
3. check and monitor that the processing equipment is set up and maintained at satisfactory operating conditions throughout the processing operations
4. carry out the process in accordance with operating procedures and the workpiece specification requirements
5. ensure that the processed workpiece achieves the required characteristics and meets the processing specification
6. deal promptly and effectively with problems within your control and report those that you cannot solve
7. dispose of waste and excess materials in line with agreed organisational procedures
8. shut down the processing equipment to a safe condition on completion of the processing activities

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken and safe working practices to be employed when carrying out the heat treatment of materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
2. the personal protective clothing and equipment that needs to be worn when working on heat treatment processes (such as gloves, eye/ear protection)
3. the handling precautions and correct methods of moving materials, particularly when hot
4. the hazards associated with heat treatment processes and fabrication and how they can be minimised (such as handling sheet/fabricated components, handling hot materials, overheating quenching oils)
5. reasons for heat treating materials
6. the various heat treatment processes, methods and procedures that may be applied
7. the type of equipment that can be used to carry out the various heat treatment processes (such as furnaces, blacksmiths hearth, gas torches)
8. 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)
9. handling techniques for hot metal components
10. how the materials need to be prepared in readiness for the heat treatment operations
11. the type of materials that can be heat treated and the processes that may be applied
12. materials and their characteristics and how their structure can be modified
13. the various cooling and quenching techniques that are applied to the processes and why it is important to use the correct process (such as water, oil, sand, air)
14. the use of quenching oils and the need to maintain the oil temperature below the oil flash point
15. information sources on heat treatment temperatures, tempering colours, soak times required and quenching/cooling mediums to be used
16. the various testing techniques that can be used to check the correct condition

has been achieved (such as simple file tests to check hardening or annealing has been achieved, the use of hardness testing equipment)

17. ways of limiting distortion during the heat treatment process
18. quality control procedures and recognition of defects
19. limitations of the various heat treatment processes
20. the problems that can occur when heat treating materials, and how these can be avoided
21. organisational procedures for disposing of and recycling of waste
22. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1.

Carry out **all** the following during the heat treatment activities:

- 1.1 use the correct heat treatment procedure and quality documentation
- 1.2 follow relevant COSHH and risk assessment procedures
- 1.3 apply the required heat treatment processes safely and correctly
- 1.4 ensure the safety of self and others while carrying out the processes
- 1.5 leave the work area in a safe condition on completion of the activities

2.

Carry out **two** of the following heat treatment processes/techniques:

- 2.1 hardening
- 2.2 tempering
- 2.3 annealing
- 2.4 pre/post heating
- 2.5 normalising/stress relieving
- 2.6 carburising
- 2.7 case hardening

3.

Carry out heat treatment processes using **two** of the following types of equipment

- 3.1 furnace
- 3.2 induction heating
- 3.3 blacksmiths hearth
- 3.4 gas torch
- 3.5 electrical resistance heating
- 3.6 other specific heat process

4.

Carry out the heat treatment process using **two** of the following cooling/quenching techniques:

- 4.1 water
- 4.2 oil
- 4.3 sand
- 4.4 air
- 4.5 brine
- 4.6 other specific technique

5.

Apply the appropriate heat treatment process to **two** of the following::

- 5.1 ferrous components/sections
- 5.2 ferrous high carbon tools (punches, chisels, scribes)
- 5.3 hot steel rivets
- 5.4 non-ferrous sheet or plate
- 5.5 titanium

6.

Carry out heat treatment processes to **all** the following quality and accuracy standards:

6.1 tools are of the correct hardness for the application and where appropriate suitably tempered
6.2 hardened materials are free from cracks
6.3 materials/components are suitably treated to permit working
6.4 stresses are relieved and distortion is limited and controlled

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

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