

Heat Treatment Technician/Furnace Operator

QP Code: ASC/Q3901

NSQF Level: 4

Automotive Skills Development Council || Automotive Skills Development Council, Sat Paul Mittal Building, 1/6, Siri Institutional Area
August Kranti Marg (Khel Gaon Marg) New Delhi - 110049

Qualification Pack

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ASC/Q3901: Heat Treatment Technician/Furnace Operator

Brief Job Description

This role is responsible for loading of jigs/ work pieces into the furnace, maintaining process parameters as laid down in the Work Instructions/ SOPs, maintaining cycle time for different heat treatment phases , ensure proper quenching of the components and unloading the finished pieces into the designated area.

Personal Attributes

Technical knowledge of Metallurgy and heat treatment process, Reading, writing and communication skills, ability to plan and prioritize, quality consciousness, safety orientation, Dexterity, high precision, no colour blindness, ability and desire to work in difficult workplace involving high heat, ability to lift heavy work pieces.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N0006: Maintain a safe and healthy working environment](#)
2. [ASC/N0008: Conduct regular cleaning and maintenance of the equipment](#)
3. [ASC/N0021: Maintain 5S at the work premises](#)
4. [ASC/N3901: Understand the job requirements and related processes](#)
5. [ASC/N3902: Operate different furnaces and conduct the heat treatment process](#)
6. [ASC/N3903: Conduct post heat treatment processes like quenching, washing and shot blasting](#)
7. [ASC/N3904: Conduct induction hardening process for small machine components](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/8121.3701

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Minimum Educational Qualification & Experience	12th Class (Chemistry stream) with 2-3 years of experience Not applicable OR 12th Class (Chemistry stream) OR 12th Class (Chemistry stream)
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	Different types of heat treatment processes Reading and writing skills 5S & Safety ERP systems within the organization
Minimum Job Entry Age	18 Years
Last Reviewed On	10/10/2013
Next Review Date	31/03/2020
NSQC Approval Date	20/07/2015
Version	1.0

Qualification Pack

ASC/N0006: Maintain a safe and healthy working environment

Description

This NOS is about creating a Safe and Healthy work place, adhering to the safety guidelines in the working area, following practices which are not impacting the environment in a negative manner and training team members on health and safety related issues

Scope

The role holder will be responsible for

- identifying and reporting of risks
- creating and sustaining a safe, clean and environment friendly work place This NOS will be applicable to all Automotive sector manufacturing job roles

Elements and Performance Criteria

Identify and report the risks identified

To be competent, the user/individual on the job must be able to:

- PC1..** Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals, loud noise
- PC2.** Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc
- PC3.** Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/ machine during operations
- PC4.** Create awareness amongst other by sharing information on the identified risks

Create and sustain a Safe, clean and environment friendly work place

To be competent, the user/individual on the job must be able to:

- PC5..** Follow the instructions given on the equipment manual describing the operating process of the equipments
- PC6..** Follow the Safety, Health and Environment related practices developed by the organization
- PC7.** Operate the machine using the recommended Personal Protective Equipments (PPE)
- PC8. .** Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc
- PC9.** Maintain high standards of personal hygiene at the work place
- PC10.** Ensure that the waste disposal is done in the designated area and manner as per organization SOP.
- PC11.** Inform appropriately the medical officer/ HR in case of self or an employees illness of contagious nature so that preventive actions can be planned for others

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

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- KU1.** relevant standards, procedures and policies related to Health, Safety and Environment followed in the company
- KU2.** basic knowledge of Safety procedures(fire fighting, first aid) within the organization
- KU3.** knowledge of various types of PPEs and their usage
- KU4.** basic knowledge of risks/hazards associated with each occupation in the organization
- KU5.** how to safely operate various tools and machines and risks associated with the tools/ equipment
- KU6.** knowledge of personal hygiene and how an individual can contribute towards creating a highly safe and clean working environment

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** write basic level notes and observations
- GS2.** read safety instructions put up across the plant premises
- GS3.** read safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- GS4.** effectively communicate information to team members
- GS5.** inform employees in the plant and concerned functions about events, incidents & potential risks observed related to Safety, Health and Environment.
- GS6.** question operator/ supervisor in order to understand the safety related issues
- GS7.** attentively listen with full attention and comprehend the information given by the speaker during safety drills and training programs
- GS8.** use common sense and make judgments during day to day basis
- GS9.** use reasoning skills to identify and resolve basic problems
- GS10.** use common sense and make judgments during day to day basis
- GS11.** use reasoning skills to identify and resolve basic problems

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Identify and report the risks identified</i>	8	23	-	-
PC1.. Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise	3	6	-	-
PC2. Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc	2	6	-	-
PC3. Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/ machine during operations	2	6	-	-
PC4. Create awareness amongst other by sharing information on the identified risks	1	5	-	-
<i>Create and sustain a Safe, clean and environment friendly work place</i>	17	52	-	-
PC5.. Follow the instructions given on the equipment manual describing the operating process of the equipments	3	7	-	-
PC6.. Follow the Safety, Health and Environment related practices developed by the organization	3	8	-	-
PC7. Operate the machine using the recommended Personal Protective Equipments (PPE)	3	8	-	-
PC8. . Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc	2	8	-	-
PC9. Maintain high standards of personal hygiene at the work place	2	7	-	-
PC10. Ensure that the waste disposal is done in the designated area and manner as per organization SOP.	3	8	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. Inform appropriately the medical officer/ HR in case of self or an employees illness of contagious nature so that preventive actions can be planned for others	1	6	-	-
NOS Total	25	75	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0006
NOS Name	Maintain a safe and healthy working environment
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Maintenance
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/09/2013
Next Review Date	15/09/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

ASC/N0008: Conduct regular cleaning and maintenance of the equipment

Description

This NOS is about systematically arranging the equipment in proper area, cleaning the process equipment & auxiliaries on a regular basis and doing basic level maintenance of the equipment, recording any problems related to equipment working

Scope

The role holder will be responsible for

- Storing the equipment in the proper condition
- Regular cleaning and maintenance of equipment and work area

Elements and Performance Criteria

Storing equipment in proper condition

To be competent, the user/individual on the job must be able to:

- PC1..** arrange all equipment in a proper order as indicated in the equipment manual
- PC2..** store equipment auxiliaries and spare parts in proper designated areas
- PC3..** clearly tag process related equipment parts/ spare parts as per part number or serial number so that sorting of equipment becomes easy
- PC4..** cover equipment so that there is limited dust collection and moisture contact

Regular cleaning of the equipments and work area

To be competent, the user/individual on the job must be able to:

- PC5..** regularly clean the equipment and process auxiliaries to remove any dust, moisture, waste material which would have got collected on the equipment
- PC6..** regularly open the equipment and clean the internal parts of the equipment
- PC7..** regularly clean the working area under the process and create a healthy, clean and safe working environment

Conduct regular preventive maintenance of equipments

To be competent, the user/individual on the job must be able to:

- PC8..** check the working of all bearing, rollers, shafts etc and oil all moving parts of the equipment on a periodic basis
- PC9..** check the working of non moving parts and periodically conduct preventive maintenance to prevent machine failure
- PC10..** periodically check the equipment calibration and report any errors to the maintenance teams for rectification

Recording observations and preparing MIS

To be competent, the user/individual on the job must be able to:

- PC11..** prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment

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Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards and procedures followed in the company for the process of maintenance and equipment storage
- KU2.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU3.** basic level maintenance and cleaning techniques
- KU4.** various solvents, chemicals, lubricants etc. used during the maintenance processes
- KU5.** procedure for arranging the equipment and spare parts in the prescribed manner including tagging and numbering of machine parts & spares
- KU6.** safety precautions to be taken during cleaning and maintenance activities

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** note equipment part codes, name tags etc. in the prescribed formats and records for the same
- GS2.** note observations related to equipment performance, breakdown, cleaning and maintenance schedules etc. in the prescribed MIS format
- GS3.** read equipment manuals and process documents to understand the equipment and processes better
- GS4.** read instructions especially safety instructions related to equipment cleaning and maintenance
- GS5.** discuss task lists and job requirements with co-workers
- GS6.** effectively communicate information to team members
- GS7.** listen and analyse any noise and vibrations in the equipment and report the same to the maintenance team for preventive action
- GS8.** attentively listen with full attention and comprehend the information given by the speaker
- GS9.** plan and organize the work order and jobs received from the Operator
- GS10.** organize all process/ equipment manuals so that sorting/ accessing information is easy as per the part/ machine number in the specified format in the designated area
- GS11.** use common sense and make judgments during day to day basis
- GS12.** use reasoning skills to identify and resolve basic problems

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Storing equipment in proper condition</i>	7	30	-	-
PC1.. arrange all equipment in a proper order as indicated in the equipment manual	2	8	-	-
PC2. . store equipment auxiliaries and spare parts in proper designated areas	2	8	-	-
PC3.. clearly tag process related equipment parts/ spare parts as per part number or serial number so that sorting of equipment becomes easy	2	7	-	-
PC4. cover equipment so that there is limited dust collection and moisture contact	1	7	-	-
<i>Regular cleaning of the equipments and work area</i>	6	22	-	-
PC5. regularly clean the equipment and process auxiliaries to remove any dust, moisture, waste material which would have got collected on the equipment	2	8	-	-
PC6. regularly open the equipment and clean the internal parts of the equipment	2	7	-	-
PC7. regularly clean the working area under the process and create a healthy, clean and safe working environment	2	7	-	-
<i>Conduct regular preventive maintenance of equipments</i>	6	21	-	-
PC8.. check the working of all bearing, rollers, shafts etc and oil all moving parts of the equipment on a periodic basis	2	7	-	-
PC9.. check the working of non moving parts and periodically conduct preventive maintenance to prevent machine failure	2	7	-	-
PC10. periodically check the equipment calibration and report any errors to the maintenance teams for rectification	2	7	-	-
<i>Recording observations and preparing MIS</i>	1	7	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment	1	7	-	-
NOS Total	20	80	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0008
NOS Name	Conduct regular cleaning and maintenance of the equipment
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Welding
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	18/10/2016
Next Review Date	20/10/2018
NSQC Clearance Date	

Qualification Pack

ASC/N0021: Maintain 5S at the work premises

Description

This NOS is about ensuring all 5 S activities both at the shop floor and the office area to facilitate increase in work productivity

Elements and Performance Criteria

Ensure sorting

To be competent, the user/individual on the job must be able to:

- PC1..** follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and unnecessary items are not cluttering the workbenches or work surfaces.
- PC2..** ensure segregation of waste in hazardous/ non hazardous waste as per the sorting work instructions
- PC3..** follow the technique of waste disposal and waste storage in the proper bins as per sop
- PC4..** segregate the items which are labelled as red tag items for the process area and keep them in the correct places
- PC5.** sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5s guidelines/ work instructions
- PC6. .** ensure that areas of material storage areas are not overflowing
- PC7.** properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required
- PC8.** return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area
- PC9.** follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards
- PC10.** follow the proper labeling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists

Ensure proper documentation and storage (organizing , streamlining)

To be competent, the user/individual on the job must be able to:

- PC11.** check that the items in the respective areas have been identified as broken or damaged
- PC12.** follow the given instructions and check for labelling of fluids, oils, lubricants, solvents, chemicals etc. and proper storage of the same to avoid spillage, leakage, fire etc
- PC13.** make sure that all material and tools are stored in the designated places and in the manner indicated in the 5s instructions

Ensure cleaning of self and the work place

To be competent, the user/individual on the job must be able to:

- PC14.** check whether safety glasses are clean and in good condition
- PC15.** keep all outside surfaces of recycling containers are clean
- PC16..** ensure that the area has floors swept, machinery clean and generally clean. in case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards

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- PC17..** check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up
- PC18..** ensure workbenches and work surfaces are clean and in good condition
- PC19.** follow the cleaning schedule for the lighting system to ensure proper illumination
- PC20.** store the cleaning material and equipment in the correct location and in good condition
- PC21.** ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene

Ensure sustenance

To be competent, the user/individual on the job must be able to:

- PC22.** follow the daily cleaning standards and schedules to create a clean working environment
- PC23.** attend all training programs for employees on 5 s
- PC24.** support the team during the audit of 5 s
- PC25.** participate actively in employee work groups on 5s and encourage team members for active participation
- PC26.** follow the guidelines for what to do and what not to do to build sustainability in 5s as mentioned in the 5s check lists/ work instructions

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards, procedures and policies related to 5S followed in the company
- KU2.** have basic knowledge of 5S procedures
- KU3.** know various types 5s practices followed in various areas
- KU4.** understand the 5S checklists provided in the department/ team
- KU5.** have skills to identify useful & non useful items
- KU6.** have knowledge of labels , signs & colours used as indicators
- KU7.** knowledge on how to sort and store various types of tools, equipment, material etc.
- KU8.** know , how to identify various types of waste products
- KU9.** understand the impact of waste/ dirt/ dust/unwanted substances on the process/ environment/ machinery/ human body
- KU10.** have knowledge of best ways of cleaning & waste disposal
- KU11.** understand the importance of standardization in processes
- KU12.** understand the importance of sustainability in 5S
- KU13.** have knowledge of TQM process
- KU14.** have knowledge of various materials and storage norms
- KU15.** understand visual controls, symbols, graphs etc.

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** write basic level notes and observations

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- GS2.** note down observations (if any) related to the process
- GS3.** read 5S instructions put up across the plant premises
- GS4.** effectively communicate information to team members inform employees in the plant and concerned functions about 5S
- GS5.** question the process head in order to understand the 5S related issues
- GS6.** attentively listen with full attention and comprehend the information given by the speaker during 5S training programs
- GS7.** use common sense and make judgments during day to day basis
- GS8.** use reasoning skills to identify and resolve basic problems using 5S
- GS9.** persuade co team members to follow 5 S
- GS10.** ensure that the co team members understand the importance of using 5 S tool
- GS11.** use innovative skills to perform and manage 5 S activities at the work desk and the shop floor
- GS12.** exhibit inquisitive behaviour to seek feedback and question on the existing set patterns of work
- GS13.** do what is right, not what is a popular practices
- GS14.** follow shop floor rules& regulations and avoid deviations; make 5S an integral way of life
- GS15.** ensure self-cleanliness on a daily basis
- GS16.** demonstrate the will to keep the work area in a clean and orderly manner

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Ensure sorting</i>	10	30	-	-
PC1.. follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and unnecessary items are not cluttering the workbenches or work surfaces.	1	3	-	-
PC2.. ensure segregation of waste in hazardous/ non hazardous waste as per the sorting work instructions	1	3	-	-
PC3.. follow the technique of waste disposal and waste storage in the proper bins as per sop	1	3	-	-
PC4.. segregate the items which are labelled as red tag items for the process area and keep them in the correct places	1	3	-	-
PC5. sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5s guidelines/ work instructions	1	3	-	-
PC6. . ensure that areas of material storage areas are not overflowing	1	3	-	-
PC7. properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required	1	3	-	-
PC8. return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area	1	3	-	-
PC9. follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards	1	3	-	-
PC10. follow the proper labeling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Ensure proper documentation and storage (organizing , streamlining)</i>	3	9	-	-
PC11. check that the items in the respective areas have been identified as broken or damaged	1	3	-	-
PC12. follow the given instructions and check for labelling of fluids, oils, lubricants, solvents, chemicals etc. and proper storage of the same to avoid spillage, leakage, fire etc	1	3	-	-
PC13. make sure that all material and tools are stored in the designated places and in the manner indicated in the 5s instructions	1	3	-	-
<i>Ensure cleaning of self and the work place</i>	8	24	-	-
PC14. check whether safety glasses are clean and in good condition	1	3	-	-
PC15. keep all outside surfaces of recycling containers are clean	1	3	-	-
PC16.. ensure that the area has floors swept, machinery clean and generally clean. in case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards	1	3	-	-
PC17.. check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up	1	3	-	-
PC18.. ensure workbenches and work surfaces are clean and in good condition	1	3	-	-
PC19. follow the cleaning schedule for the lighting system to ensure proper illumination	1	3	-	-
PC20. store the cleaning material and equipment in the correct location and in good condition	1	3	-	-
PC21. ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene	1	3	-	-
<i>Ensure sustenance</i>	4	12	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. follow the daily cleaning standards and schedules to create a clean working environment	1	3	-	-
PC23. attend all training programs for employees on 5 s	0.5	2	-	-
PC24. support the team during the audit of 5 s	1	3	-	-
PC25. participate actively in employee work groups on 5s and encourage team members for active participation	0.5	2	-	-
PC26. follow the guidelines for what to do and what not to do to build sustainability in 5s as mentioned in the 5s check lists/ work instructions	1	2	-	-
NOS Total	25	75	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0021
NOS Name	Maintain 5S at the work premises
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/03/2014
Next Review Date	15/03/2016
NSQC Clearance Date	

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ASC/N3901: Understand the job requirements and related processes

Description

This NOS is about understanding the job requirement, what processes need to be executed, what equipment will be used and what is the required output considering the standards specified

Scope

The Heat Treatment operator will be responsible for understanding the work order and the process requirements cleaning the furnaces, quenching machines, loading trolleys as required checking the furnace operations before the actual process escalations of any queries regarding the job The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team

- understanding the work order and the process requirements
- cleaning the furnaces, quenching machines, loading trolleys as required
- checking the furnace operations before the actual process
- escalations of any queries regarding the job

Elements and Performance Criteria

Understand the work order and the process requirements

To be competent, the user/individual on the job must be able to:

- PC1.** . understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist
- PC2.** . clearly understanding the does and donts of the manufacturing process as defined in sops/ work instructions or defined by supervisors
- PC3.** . refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output
- PC4.** . understand the process requirements in terms of temperature of the furnace, pressure, cycle time for various temperature levels & time durations during the heat treatment operations as mentioned in the work instruction/ sop/ control diagrams

Arrange for the components to be heat treated as well as the combustion material as per the process requirement

To be competent, the user/individual on the job must be able to:

- PC5..** understand the right heat treatment procedure and process to be adopted for completing the work order from the supervisor by referring the work instruction document/ sop manual
- PC6.** . note down the various heat treatment parameters like temperature, pressure, cycle time, gas flow, coolant/ water flow before starting the heat treatment process
- PC7.** . understand the material required and the equipment availability for executing the activity
- PC8.** . ensure that the required material is procured from the store before starting the heat treatment process

Clean the furnace and the components before executing the heat treatment process

To be competent, the user/individual on the job must be able to:

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- PC9.** . ensure that the internal part of the furnace used for carburizing, tempering, annealing etc. process is cleaned before the starting of the process
- PC10.** . ensure that there are not traces of oil, grease, dirt in the heat treatment process at the start
- PC11..** clean the area around the furnace for any oil, grease, combustible substances etc. so as to prevent any accident in the furnace surrounding
- PC12..** clean the components which will required to be treated so as to remove traces of greases, oil, dirt etc.

Applying anti carburizing paste on surface which is not to be hardened

To be competent, the user/individual on the job must be able to:

- PC13.** . wash the components which need to be heat treated using an organic solvent
- PC14.** . ensure that all the oil which is present in the components is removed
- PC15..** uniformly apply anti carburizing paste on the area which is not to be carburized
- PC16.** . ensure that the applied paste dries within the timelines mentioned in the work instructions
- PC17.** . ensure that the components are picked up and placed in the proper trolley and are ready to be heat treated

Check furnace auxiliaries for operations

To be competent, the user/individual on the job must be able to:

- PC18..** ensure that the gas flow and water flow valves are operating without any hindrances and the pipes carrying gas and water are free from any roadblocks
- PC19..** ensure that the furnace cover can be opened and closed whenever required
- PC20.** . ensure that the furnace loading and unloading mechanism is in order and working properly

Escalations of queries on the given job

To be competent, the user/individual on the job must be able to:

- PC21..** refer the queries to supervisor/ metallurgist if they cannot be resolved by the operator
- PC22.** . confirm self - understanding to the supervisor/ metallurgist once the query is resolved so that all doubts & queries can be resolved before the actual process execution

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards and procedures followed in the company
- KU2.** different types of products manufactured by the company
- KU3.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU4.** different types of heat treatment processes and associated equipment
- KU5.** different types of furnaces and process nuances for each type of heat treatment process
- KU6.** basic knowledge of the metallurgical properties of the material
- KU7.** relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process
- KU8.** how to handle solvents and anti-carburizing paste

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- KU9.** basic principles of geometry and drawing
- KU10.** safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** note down observations (if any) related to heat treatment process and share the same with the supervisor/ metallurgist
- GS2.** note down the production data for the respective shifts in the log sheets/ online ERP as per applicability in the organization
- GS3.** read and interpret engineering drawing and sketches
- GS4.** read and interpret symbols and measurements instruments
- GS5.** read equipment manuals and process documents to understand the equipment and processes better
- GS6.** read internal information documents send by internal customers (other functions within the organization)
- GS7.** discuss task lists, schedules and activities with the supervisor
- GS8.** effectively communicate with the team members
- GS9.** question the supervisor/ metallurgist in order to understand the nature of the problem and to clarify queries
- GS10.** attentively listen with full attention and comprehend the information given by the speaker
- GS11.** plan and organize the work order and jobs received from the supervisor
- GS12.** organize all process/ equipment manuals so that sorting/ accessing information is easy
- GS13.** support the supervisor in scheduling tasks for helper grade
- GS14.** ability to visualize the final job product after understanding the given drawing/ sketches
- GS15.** co relate the type of job output required ability to identify the strengths and weakness of various heat treatment related process
- GS16.** use common sense and make judgments during day to day basis
- GS17.** use reasoning skills to identify and resolve basic problems
- GS18.** use intuition to detect any potential problems which could arise during operations
- GS19.** follow instructions and work on areas of improvement identified
- GS20.** complete the assigned tasks with minimum supervision
- GS21.** complete the job defined by the supervisor within the timelines and quality norms
- GS22.** detect problems in day to day tasks
- GS23.** support supervisor in using specific problem solving techniques and detailing out the problems
- GS24.** discuss possible solution with the supervisor for problem solving
- GS25.** make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understand the work order and the process requirements</i>	6	13	-	-
PC1. . understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist	1	3	-	-
PC2. . clearly understanding the does and donts of the manufacturing process as defined in sops/ work instructions or defined by supervisors	1	3	-	-
PC3. . refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output	2	4	-	-
PC4. . understand the process requirements in terms of temperature of the furnace, pressure, cycle time for various temperature levels & time durations during the heat treatment operations as mentioned in the work instruction/ sop/ control diagrams	2	3	-	-
<i>Arrange for the components to be heat treated as well as the combustion material as per the process requirement</i>	7	11	-	-
PC5.. understand the right heat treatment procedure and process to be adopted for completing the work order from the supervisor by referring the work instruction document/ sop manual	2	3	-	-
PC6. . note down the various heat treatment parameters like temperature, pressure, cycle time, gas flow, coolant/ water flow before starting the heat treatment process	2	3	-	-
PC7. . understand the material required and the equipment availability for executing the activity	1	3	-	-
PC8. . ensure that the required material is procured from the store before starting the heat treatment process	2	2	-	-
<i>Clean the furnace and the components before executing the heat treatment process</i>	5	12	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. . ensure that the internal part of the furnace used for carburizing, tempering, annealing etc. process is cleaned before the starting of the process	2	3	-	-
PC10. . ensure that there are not traces of oil, grease, dirt in the heat treatment process at the start	1	3	-	-
PC11.. clean the area around the furnace for any oil, grease, combustible substances etc. so as to prevent any accident in the furnace surrounding	1	3	-	-
PC12.. clean the components which will required to be treated so as to remove traces of greases, oil, dirt etc.	1	3	-	-
<i>Applying anti carburizing paste on surface which is not to be hardened</i>	6	16	-	-
PC13. . wash the components which need to be heat treated using an organic solvent	1	3	-	-
PC14. . ensure that all the oil which is present in the components is removed	1	3	-	-
PC15.. uniformly apply anti carburizing paste on the area which is not to be carburized	2	3	-	-
PC16. . ensure that the applied paste dries within the timelines mentioned in the work instructions	1	3	-	-
PC17. . ensure that the components are picked up and placed in the proper trolley and are ready to be heat treated	1	4	-	-
<i>Check furnace auxiliaries for operations</i>	3	12	-	-
PC18.. ensure that the gas flow and water flow valves are operating without any hindrances and the pipes carrying gas and water are free from any roadblocks	1	4	-	-
PC19.. ensure that the furnace cover can be opened and closed whenever required	1	4	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. . ensure that the furnace loading and unloading mechanism is in order and working properly	1	4	-	-
<i>Escalations of queries on the given job</i>	3	6	-	-
PC21. .. refer the queries to supervisor/ metallurgist if they cannot be resolved by the operator	1	3	-	-
PC22. . confirm self - understanding to the supervisor/ metallurgist once the query is resolved so that all doubts & queries can be resolved before the actual process execution	2	3	-	-
NOS Total	30	70	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N3901
NOS Name	Understand the job requirements and related processes
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	10/10/2013
Next Review Date	10/10/2015
NSQC Clearance Date	

Qualification Pack

ASC/N3902: Operate different furnaces and conduct the heat treatment process

Description

This NOS is about loading the charge (Components) into the relevant treatment furnace and operate the furnace to heat treat the components and improve their metallic properties as well as relieve any metallurgical stresses created during machining process

Scope

The Heat Treatment operator will be responsible for loading the charge material in the furnace conducting the carburizing process and the tempering process monitoring the process parameters The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team

- loading the charge material in the furnace
- conducting the carburizing process and the tempering process
- monitoring the process parameters

Elements and Performance Criteria

Load the Charge into the Furnace

To be competent, the user/individual on the job must be able to:

- PC1.** . open the furnace cover and check the furnace internally for any impurities/ material from the previous heat treatment process
- PC2.** . ensure that the furnace checking is done using a torch and not using any combustible material like match stick, fire etc.
- PC3.** . once the furnace is inspected, load the furnace with the charge material (components to be heat treated) using hoists, conveyors etc.

Carburise the charge loaded in the furnace

To be competent, the user/individual on the job must be able to:

- PC4.** . once the loading is completed and the furnace thoroughly checked, close the door of the furnace
- PC5.** . select the right program from the list for the carburizing process/ tempering process as per the instructions given in the sop manual/ work instructions
- PC6.** . switch on the furnace and ensure that the furnace temperature reaches the desired temperature as per the sops/ work instructions
- PC7.** . ensure that the cycle time for furnace temperature is maintained throughout the process. the cycle time for each process is mentioned in the process work instructions
- PC8.** . ensure that the furnace fan operations is in the on mode and air circulation is as per requirement
- PC9.** . once the temperature in the furnace reaches the desired value, switch on the carburizing valve and ensure the flow of the carburizing fluid within the furnace

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- PC10..** regularly monitor the temperature of the furnace and the gas composition
- PC11..** once the cycle time is completed, ensure that the carburising valve of the furnace is closed
- PC12. .** ensure that the material is carefully removed from the furnace and unload the material in the tray for the quenching process

Temper the charge in the tempering furnace

To be competent, the user/individual on the job must be able to:

- PC13..** once the loading is completed and the furnace thoroughly checked, close the door of the furnace
- PC14. .** switch on the furnace and ensure that the furnace temperature reaches the desired temperature as per the sops/ work instructions
- PC15..** maintain the furnace temperature and the furnace cycle time as per the process chart/ work instructions/ sops

Monitor the Heat Treatment process

To be competent, the user/individual on the job must be able to:

- PC16. .** ensure constant monitoring of temperature indicators, flow meters, heat exchangers, display panels for process operations
- PC17. .** periodically monitor the flame pipe, gas outlets, water inlets and water outlets for proper operations
- PC18. .** periodically monitor the carbon potential % during the heat treatment process
- PC19. .** periodically take readings at various intervals (as per the cycle time) in the format as mentioned in the work instructions/ internal guidelines
- PC20..** periodically monitor the furnace of any vibrations during operations
- PC21..** inform the maintenance team of any issues observed in the furnace operations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards and procedures followed in the company
- KU2.** different types of products manufactured by the company
- KU3.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU4.** different types of heat treatment processes and associated equipment
- KU5.** different types of furnaces and process nuances for each type of heat treatment process
- KU6.** basic knowledge of the metallurgical properties of the material
- KU7.** relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process
- KU8.** how to read displays on the computer monitor and understand the information being displayed
- KU9.** understand various alarms and signals in the furnace and the action required for each type of alarm
- KU10.** methods for lifting and loading/unloading the metal components in the furnace

Qualification Pack

- KU11.** basic troubleshooting techniques for the furnaces
- KU12.** basic principles of geometry and drawing
- KU13.** safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** document information from the sketches and engineering drawings
- GS2.** prepare draft drawings for the final output product
- GS3.** note down observations (if any) related to the heat treatment process
- GS4.** write information documents to internal departments/ internal teams or enter the information in online ERP systems under guidance of the supervisor
- GS5.** read and interpret engineering drawing and sketches
- GS6.** read and interpret symbols and measurements used in the drawings
- GS7.** read equipment manuals and process documents to understand the equipment and processes better
- GS8.** read internal information documents sent by internal teams
- GS9.** discuss task lists, schedules and activities with the supervisor
- GS10.** effectively communicate with the team members
- GS11.** question the supervisor in order to understand the nature of the problem and to clarify queries
- GS12.** attentively listen with full attention and comprehend the information given by the speaker
- GS13.** plan and organize the work order and jobs received from the operator
- GS14.** organize all process/ equipment manuals so that sorting/ accessing information is easy
- GS15.** support the supervisor in scheduling tasks for helper and assistant operator
- GS16.** use common sense and make judgments during day to day basis
- GS17.** use reasoning skills to identify and resolve basic problems
- GS18.** use intuition to detect any potential problems which could arise during operations
- GS19.** follow instructions and work on areas of improvement identified
- GS20.** complete the assigned tasks with minimum supervision
- GS21.** complete the job defined by the supervisor within timelines and quality norms
- GS22.** detect problems in day to day tasks
- GS23.** support supervisor in using specific problem solving techniques and detailing out the problems
- GS24.** discuss possible solution with the supervisor for problem solving
- GS25.** make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Load the Charge into the Furnace</i>	5	11	-	-
PC1. . open the furnace cover and check the furnace internally for any impurities/ material from the previous heat treatment process	2	4	-	-
PC2. . ensure that the furnace checking is done using a torch and not using any combustible material like match stick, fire etc.	1	3	-	-
PC3. . once the furnace is inspected, load the furnace with the charge material (components to be heat treated) using hoists, conveyors etc.	2	4	-	-
<i>Carburise the charge loaded in the furnace</i>	11	28	-	-
PC4. . once the loading is completed and the furnace thoroughly checked, close the door of the furnace	1	3	-	-
PC5. .. select the right program from the list for the carburizing process/ tempering process as per the instructions given in the sop manual/ work instructions	2	3	-	-
PC6. . switch on the furnace and ensure that the furnace temperature reaches the desired temperature as per the sops/ work instructions	1	3	-	-
PC7. . ensure that the cycle time for furnace temperature is maintained throughout the process. the cycle time for each process is mentioned in the process work instructions	1	3	-	-
PC8. .. ensure that the furnace fan operations is in the on mode and air circulation is as per requirement	1	3	-	-
PC9. . once the temperature in the furnace reaches the desired value, switch on the carburising valve and ensure the flow of the carburizing fluid within the furnace	1	3	-	-
PC10. .. regularly monitor the temperature of the furnace and the gas composition	2	4	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. .. once the cycle time is completed, ensure that the carburising valve of the furnace is closed	1	3	-	-
PC12. . ensure that the material is carefully removed from the furnace and unload the material in the tray for the quenching process	1	3	-	-
<i>Temper the charge in the tempering furnace</i>	3	10	-	-
PC13. .. once the loading is completed and the furnace thoroughly checked, close the door of the furnace	1	3	-	-
PC14. . switch on the furnace and ensure that the furnace temperature reaches the desired temperature as per the sops/ work instructions	1	3	-	-
PC15. .. maintain the furnace temperature and the furnace cycle time as per the process chart/ work instructions/ sops	1	4	-	-
<i>Monitor the Heat Treatment process</i>	10	22	-	-
PC16. . ensure constant monitoring of temperature indicators, flow meters, heat exchangers, display panels for process operations	1	3	-	-
PC17. . periodically monitor the flame pipe, gas outlets, water inlets and water outlets for proper operations	2	4	-	-
PC18. . periodically monitor the carbon potential % during the heat treatment process	2	4	-	-
PC19. . periodically take readings at various intervals (as per the cycle time) in the format as mentioned in the work instructions/ internal guidelines	2	4	-	-
PC20. .. periodically monitor the furnace of any vibrations during operations	2	4	-	-
PC21. .. inform the maintenance team of any issues observed in the furnace operations	1	3	-	-
NOS Total	29	71	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N3902
NOS Name	Operate different furnaces and conduct the heat treatment process
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	10/10/2013
Next Review Date	10/10/2015
NSQC Clearance Date	

Qualification Pack

ASC/N3903: Conduct post heat treatment processes like quenching, washing and shot blasting

Description

This NOS is about conducting post heat treatment processes like Quenching, Washing and Shot Blasting to cool down the charge material and also remove any impurities/ surface imperfections which are a result of the heat treatment process

Scope

The Heat Treatment operator will be responsible for quenching the material which has been carburized removing impurities using alkaline washing process removing surface imperfections using shot blasting technique loading and unloading of parts The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team

- quenching the material which has been carburized
- removing impurities using alkaline washing process
- removing surface imperfections using shot blasting technique
- loading and unloading of parts

Elements and Performance Criteria

Quench the Carburized material

To be competent, the user/individual on the job must be able to:

- PC1.** . understand the quenching technique which is to be used free quenching, plug quenching, press quenching as mentioned in the work instructions/ departmental sop
- PC2.** . arrange the carburized material in the jig tray of the quenching machine as per the work instructions/ sop
- PC3.** . check the physical properties of the oil which is used for the quenching process oil viscosity, colour etc and compare with standard oil properties before the quenching process begins
- PC4.** . inform the metallurgist about any changes in the oil properties
- PC5.** . dip the hot metal components in the oil in quenching machine as per the process instructions/ work instructions
- PC6.** . ensure that the quenching process is carried out as per the timelines and instructions given in the work instructions/ sop
- PC7.** . ensure that the agitator motor switched on during free quenching and press quenching to ensure uniform flow of oil in the quenching tank
- PC8.** . in case water or any other coolant is used of the quenching process, ensure that the water flow uniformly across the carburised/ hardened surface
- PC9.** . ensure that there is no leakage/ spillage of oil during the quenching process

Remove impurities from the hardened material using alkaline washing

To be competent, the user/individual on the job must be able to:

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- PC10.** . load the washing machine with chemicals for washing the heat treated components
- PC11.** . ensure that the solvent (charge carrier) prepared for washing meets the composition criteria as prescribed in the work instructions/ sop
- PC12.** . load all the quenched parts in the washing machine along with the washing charge carrier
- PC13..** switch on the washing machine and ensure that the water circulation pump and the charge carrier circulation pump are in on position
- PC14..** rotate the charge carrier in the machine and ensure that the quenched components are properly washed and traces of oil are removed from the components
- PC15.** . ensure removal of charge carrier by flushing plain water on the components
- PC16..** close the pump for chemical circulation and water circulation
- PC17..** carefully remove the material from the washing machine and unload the material in the tray for the shot blasting process

Remove surface imperfections using Shot Blasting technique

To be competent, the user/individual on the job must be able to:

- PC18..** clean the shot blasting machine using air pressure blast to remove any dust particles and any unwanted material
- PC19..** load the components and the shots in the chamber of the shot blasting machine
- PC20..** ensure that the door of the shot blasting machine is tightly closed
- PC21.** . switch on the shot blasting machine and ensure that all auxiliary motors are in the on position
- PC22..** keep the machine in the moving position till the cycle time prescribed in the work instructions/ sop manual
- PC23.** . switch off the machine and inspect the parts. turn the parts into the opposite side. ensure that all the parts in the current position are completely turned in the opposite direction
- PC24..** keep the machine moving till the prescribed cycle time is achieved. ensure that the cycle time get completed for both the cycles
- PC25..** open the shot blasting machine and carefully remove the components from the machine and load them into the designated trolley
- PC26.** . ensure that the machine is again cleaned using an air blasting machine

Inspect the final product and maintain records of production & rejection

To be competent, the user/individual on the job must be able to:

- PC27..** check the hardness of the components using the hardness testing machines and ensure that the component pieces meet the conformance standards as specified in the work instructions/ sops
- PC28..** measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers and any other inspection equipment and compare with the parameters given in the work order
- PC29..** check the completed pieces for any deformation, change in colour, cracks, rough surfaces in the final product
- PC30.** . inspect the dimensions of the work pieces - spline fit, face parallelism, face tapering etc. as per the product requirement and departmental sops/ work instructions
- PC31..** note down the observations of the basic inspection process and identify pieces which are ok and also not meeting the specified standards

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- PC32.** . separate the defective pieces into two categories pieces which can be repaired/ modified and pieces which are beyond repair
- PC33..** discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework
- PC34..** record all observations in the log book as per the internal guidelines and processes
- PC35..** maintain records of production and rejected material as per the internal guidelines

Unload the Finished Goods

To be competent, the user/individual on the job must be able to:

- PC36..** clamp the product and lift the output object using suitable equipment like hoist, lifts, crane etc.
- PC37..** ensure that there is no damage to the lifted work pieces
- PC38..** carry the output product to the designated area using hangars, conveyor belts, cranes, forklifts etc.

Store the finished goods

To be competent, the user/individual on the job must be able to:

- PC39.** . post inspection process, tag the right quality pieces for future identification
- PC40..** carry the tagged pieces to the storage areas using manual/ automatic means
- PC41..** keep a record of the finished goods along with the storage identification numbers for easy sorting

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards and procedures followed in the company
- KU2.** different types of products manufactured by the company
- KU3.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU4.** different types of heat treatment processes, quenching and associate equipment
- KU5.** different types of furnaces and process nuances for each type of heat treatment process
- KU6.** operating norms for shot blasting machines and quenching machines
- KU7.** basic knowledge of the metallurgical properties of the material relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process
- KU8.** how to read displays on the computer monitor and understand the information being displayed
- KU9.** understand various alarms and signals in the furnace and the action required for each type of alarm
- KU10.** methods for lifting and loading/unloading the metal components in the furnace
- KU11.** basic troubleshooting techniques for the furnaces and quenching machines
- KU12.** the Quality Management System followed in the organization
- KU13.** basic principles of geometry and drawing

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- KU14.** safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** document information from the sketches and engineering drawings
- GS2.** note measurements, equipment panel readings for various process parameters in the required reporting formats
- GS3.** read and interpret engineering drawing and sketches
- GS4.** read equipment manuals and process documents to understand the equipment and processes better
- GS5.** read internal information documents send by internal customers (other functions within the organization)the equipment in the plant area
- GS6.** read parameter reading on various types of monitoring panels
- GS7.** discuss task lists, schedules and activities with the operator and supervisor
- GS8.** effectively communicate with the team members Question the operator/ supervisor in order to understand the nature of the problem and to clarify queries
- GS9.** attentively listen with full attention and comprehend the information given by the speaker
- GS10.** plan and organize the jobs received from theOperator
- GS11.** organize all process/ equipment manuals so that sorting/ accessing information is easy
- GS12.** visualize the final job product after understanding the given drawing/ sketches
- GS13.** co relate the type of job output required with themethodology to be used
- GS14.** detect problems in day to day tasks
- GS15.** support supervisor in using specific problem solving techniques and detailing out the problems
- GS16.** discuss possible solution with the supervisor for problem solving
- GS17.** make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)
- GS18.** use common sense and make judgments during day to day basis
- GS19.** use reasoning skills to identify and resolve basic problems

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Quench the Carburized material</i>	8	15	-	-
PC1. . understand the quenching technique which is to be used free quenching, plug quenching, press quenching as mentioned in the work instructions/ departmental sop	1	2	-	-
PC2. . arrange the carburized material in the jig tray of the quenching machine as per the work instructions/ sop	1	2	-	-
PC3. . check the physical properties of the oil which is used for the quenching process oil viscosity, colour etc and compare with standard oil properties before the quenching process begins	1	2	-	-
PC4. . inform the metallurgist about any changes in the oil properties	1	1	-	-
PC5. . dip the hot metal components in the oil in quenching machine as per the process instructions/ work instructions	1	2	-	-
PC6. . ensure that the quenching process is carried out as per the timelines and instructions given in the work instructions/ sop	1	1	-	-
PC7. . ensure that the agitator motor switched on during free quenching and press quenching to ensure uniform flow of oil in the quenching tank	1	1	-	-
PC8. . in case water or any other coolant is used of the quenching process, ensure that the water flow uniformly across the carburised/ hardened surface	1	2	-	-
PC9. . ensure that there is no leakage/ spillage of oil during the quenching process	-	2	-	-
<i>Remove impurities from the hardened material using alkaline washing</i>	3	16	-	-
PC10. . load the washing machine with chemicals for washing the heat treated components	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. . ensure that the solvent (charge carrier) prepared for washing meets the composition criteria as prescribed in the work instructions/ sop	-	2	-	-
PC12. . load all the quenched parts in the washing machine along with the washing charge carrier	-	2	-	-
PC13.. switch on the washing machine and ensure that the water circulation pump and the charge carrier circulation pump are in on position	1	2	-	-
PC14.. rotate the charge carrier in the machine and ensure that the quenched components are properly washed and traces of oil are removed from the components	1	2	-	-
PC15. . ensure removal of charge carrier by flushing plain water on the components	-	2	-	-
PC16.. close the pump for chemical circulation and water circulation	-	2	-	-
PC17.. carefully remove the material from the washing machine and unload the material in the tray for the shot blasting process	1	2	-	-
<i>Remove surface imperfections using Shot Blasting technique</i>	6	14	-	-
PC18.. clean the shot blasting machine using air pressure blast to remove any dust particles and any unwanted material	1	2	-	-
PC19.. load the components and the shots in the chamber of the shot blasting machine	1	2	-	-
PC20.. ensure that the door of the shot blasting machine is tightly closed	1	1	-	-
PC21. . switch on the shot blasting machine and ensure that all auxiliary motors are in the on position	-	2	-	-
PC22.. keep the machine in the moving position till the cycle time prescribed in the work instructions/ sop manual	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. . switch off the machine and inspect the parts. turn the parts into the opposite side. ensure that all the parts in the current position are completely turned in the opposite direction	-	1	-	-
PC24.. keep the machine moving till the prescribed cycle time is achieved. ensure that the cycle time get completed for both the cycles	1	2	-	-
PC25.. open the shot blasting machine and carefully remove the components from the machine and load them into the designated trolley	1	2	-	-
PC26. . ensure that the machine is again cleaned using an air blasting machine	-	1	-	-
<i>Inspect the final product and maintain records of production & rejection</i>	8	17	-	-
PC27.. check the hardness of the components using the hardness testing machines and ensure that the component pieces meet the conformance standards as specified in the work instructions/ sops	1	1	-	-
PC28.. measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers and any other inspection equipment and compare with the parameters given in the work order	1	2	-	-
PC29.. check the completed pieces for any deformation, change in colour, cracks, rough surfaces in the final product	1	2	-	-
PC30. . inspect the dimensions of the work pieces - spline fit, face parallelism, face tapering etc. as per the product requirement and departmental sops/ work instructions	1	2	-	-
PC31.. note down the observations of the basic inspection process and identify pieces which are ok and also not meeting the specified standards	1	2	-	-
PC32. . separate the defective pieces into two categories pieces which can be repaired/ modified and pieces which are beyond repair	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC33.. discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework	-	2	-	-
PC34.. record all observations in the log book as per the internal guidelines and processes	1	2	-	-
PC35.. maintain records of production and rejected material as per the internal guidelines	1	2	-	-
<i>Unload the Finished Goods</i>	3	5	-	-
PC36.. clamp the product and lift the output object using suitable equipment like hoist, lifts, crane etc.	1	2	-	-
PC37.. ensure that there is no damage to the lifted work pieces	1	1	-	-
PC38.. carry the output product to the designated area using hangars, conveyor belts, cranes, forklifts etc.	1	2	-	-
<i>Store the finished goods</i>	2	3	-	-
PC39. . post inspection process, tag the right quality pieces for future identification	1	1	-	-
PC40.. carry the tagged pieces to the storage areas using manual/ automatic means	-	1	-	-
PC41.. keep a record of the finished goods along with the storage identification numbers for easy sorting	1	1	-	-
NOS Total	30	70	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N3903
NOS Name	Conduct post heat treatment processes like quenching, washing and shot blasting
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	10/10/2013
Next Review Date	10/10/2015
NSQC Clearance Date	

Qualification Pack

ASC/N3904: Conduct induction hardening process for small machine components

Description

This NOS is about conducting the Induction Hardening process for small components like struts, connecting rods, shockers, monitoring the process parameters and conducting quality check on the final output product

Scope

The Heat Treatment operator will be responsible for conducting the induction hardening process monitoring the process parameters The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team

- conducting the induction hardening process
- monitoring the process parameters

Elements and Performance Criteria

Pre Induction Hardening process

To be competent, the user/individual on the job must be able to:

- PC1.** . understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist
- PC2.** . refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output
- PC3.** . ensure that the correct values of voltage, current and frequency are chosen as per the process requirement and as per the work instructions/ sops

Induction Hardening Process

To be competent, the user/individual on the job must be able to:

- PC4.** . ensure alignment of the work parts to the axis of the induction coil
- PC5.** . ensure that the work part does not touch the surface of the induction coil
- PC6.** . move the component part through the induction field and keep it under the field for the time specified in the sops
- PC7.** . ensure flow of coolant/ cooling water/ quenching oil on the part to dissipate the heat and harden the component material
- PC8.** . in case cooling water is used for the purpose of cooling, ensure that the chiller machine is on
- PC9.** . monitor the panels for various process parameters like voltage, current, frequency and adjust the same as per process requirement

Post Induction Hardening Process

To be competent, the user/individual on the job must be able to:

- PC10.**.. check the hardness of the treated parts as per the given instructions in the sop/ work instruction

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- PC11.** . measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order
- PC12..** check the completed work pieces for any deformation, change in colour, cracks, rough surfaces pc13. separate the defective pieces into two categories pieces which can be repaired/ modified and pieces which are beyond repair
- PC14..** discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework
- PC15..** record all observations in the log book as per the internal guidelines and processes

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards and procedures followed in the company
- KU2.** different types of products manufactured by the company
- KU3.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU4.** basic knowledge of the metallurgical properties of the material relationship between various process parameters like induction coil temperature, Magnetic induction, pressure, Cycle time for heating during the hardening process
- KU5.** how to read displays on the computer monitor and understand the information being displayed
- KU6.** understand various alarms and signals in the furnace and the action required for each type of alarm
- KU7.** methods for lifting and loading/unloading the metal components in the furnace KB5. basic troubleshooting techniques for the furnaces and quenching machines
- KU8.** understanding of the Quality Management Systems of the organization
- KU9.** basic principles of geometric and drawing
- KU10.** safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** document information from the sketches and engineering drawings
- GS2.** note measurements, equipment panel readings for various process parameters in the required reporting formats
- GS3.** read process and equipment manuals to understand the working of the equipment
- GS4.** read measuring instruments reading to identify any deviations from the dimensions given in the product engineering drawing
- GS5.** discuss task lists and job requirements with co-workers
- GS6.** effectively communicate information to team members
- GS7.** question supervisor in order to understand the nature of the problem

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- GS8.** attentively listen with full attention and comprehend the information given by the speaker
- GS9.** plan and organize the work order and jobs received from the supervisor
- GS10.** organize all process/ equipment manuals so that sorting/ accessing information is easy
- GS11.** visualize the final job product after understanding the given drawing/ sketches
- GS12.** co relate the type of job output required with the methodology to be used
- GS13.** use common sense and make judgments during day to day basis
- GS14.** use reasoning skills to identify and resolve basic problems

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Pre Induction Hardening process</i>	6	15	-	-
PC1. . understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist	2	5	-	-
PC2. . refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output	2	5	-	-
PC3. . ensure that the correct values of voltage, current and frequency are chosen as per the process requirement and as per the work instructions/ sops	2	5	-	-
<i>Induction Hardening Process</i>	12	29	-	-
PC4. . ensure alignment of the work parts to the axis of the induction coil	2	5	-	-
PC5. . ensure that the work part does not touch the surface of the induction coil	2	5	-	-
PC6. . move the component part through the induction field and keep it under the field for the time specified in the sops	2	5	-	-
PC7. . ensure flow of coolant/ cooling water/ quenching oil on the part to dissipate the heat and harden the component material	2	5	-	-
PC8. . in case cooling water is used for the purpose of cooling, ensure that the chiller machine is on	1	3	-	-
PC9. . monitor the panels for various process parameters like voltage, current, frequency and adjust the same as per process requirement	3	6	-	-
<i>Post Induction Hardening Process</i>	12	26	-	-
PC10. .. check the hardness of the treated parts as per the given instructions in the sop/ work instruction	3	6	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. . measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order	3	6	-	-
PC12.. check the completed work pieces for any deformation, change in colour, cracks, rough surfaces pc13. separate the defective pieces into two categories pieces which can be repaired/ modified and pieces which are beyond repair	3	6	-	-
PC14.. discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework	1	3	-	-
PC15.. record all observations in the log book as per the internal guidelines and processes	2	5	-	-
NOS Total	30	70	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N3904
NOS Name	Conduct induction hardening process for small machine components
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	10/10/2013
Next Review Date	10/10/2015
NSQC Clearance Date	

Qualification Pack

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Recommended Pass % aggregate for QP : 70

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N0006.Maintain a safe and healthy working environment	25	75	-	-	100	20
ASC/N0008.Conduct regular cleaning and maintenance of the equipment	20	80	-	-	100	10
ASC/N0021.Maintain 5S at the work premises	25	75	-	-	100	10

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National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N3901.Understand the job requirements and related processes	30	70	-	-	100	10
ASC/N3902.Operate different furnaces and conduct the heat treatment process	29	71	-	-	100	20
ASC/N3903.Conduct post heat treatment processes like quenching, washing and shot blasting	30	70	-	-	100	15
ASC/N3904.Conduct induction hardening process for small machine components	30	70	-	-	100	15
Total	189	511	-	-	700	100

Qualification Pack

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Qualification Pack

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

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Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.