Special Process: Heat Treat System Assessment

Facility Name: ATMOSPHERE HEAT TREAT			
Address: 30760 CENTURY DR. WIXOM MICHIGAN, 48393			
Phone Number:248.960.4700		Fax Number: 248.960.8173	
Date of Assessment:	NOV-17-2025	Date of Previous Assessment:	DEC-06-2024
Internal (Captive) Heat Treater (Y/N):	NO	Commercial Heat Treater (Y/N):	YES

Type(s) of Thermal Processing at this Facility:

Process Table A		**Process Table D**	
Carburizing	NO	Induction Heat Treating	NO
Carbonitriding	NO	**Process Table E**	
Carbon Restoration	NO	Annealing	NO
Neutral Hardening (Quench and Temper)	NO	Normalizing	**NO**
Austempering / Martempering	YES	Stress-Relieving	NO
Tempering	YES	**Process Table F**	
Precipitation Hardening / Aging	NO	Low Pressure Processing (Carburizing / Carbonitriding / Neutral Hardening)	**NO**
Process Table B		**Process Table G**	
Nitriding (Gas)	NO	Sinter Hardening	**NO**
Ferritic-Nitrocarburizing (Gas or Salt)	NO	**Process Table H**	
Process Table C		Ion Nitriding	**NO**
Aluminum Heat Treatment	NO	**Process Table I**	
		Hot Stamping	NO

Current Quality Certification(s): IATF 16949 EXPIRATION DATE: 13-MAR-2027 / ISO 9001 2015 EXPIRATION DATE: 13-MAR-2027

Date of Re-assessment (if necessary): JAN/2026

Personnel Contacted:

Name:	**Title:**	**Phone:**	**Email:**
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Auditors/Assessors:

Name:	**Company:**	**Phone:**	**Email:**
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Number of "Not Satisfactory" Findings: NONE

Number of "Needs Immediate Action" Findings: NONE

Number of "Fail" Findings in the Job Audit(s): NONE

Section 1 - Management Responsibility and Quality Planning

Please describe Objective Evidence for each Requirement

1.1 Is there a dedicated and qualified heat treat person on-site?

To ensure readily available expertise the following requirements shall be met.

Requirements	Objective Evidence	Assessment			
		N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
There shall be a dedicated and qualified full-time heat treat person on site.	AHT Plant Manager, AHT Quality/Lab Manager and AHT Production Manager, GM all have between 3 & 39 years of service with the company. Job descriptions, Organization chart has required information.				
The position shall be reflected in the organization chart.					
A job description shall exist identifying the qualifications for the positions including appropriate metallurgical and heat treat knowledge for the individuals.					
Evidence shall be available regarding the qualifications with a minimum of 5 years experience in heat treat operations or as a combination of a minimum of 5 years of formal metallurgical education and heat treat experience.					

Comments:

1.2 Does the heat treater perform advanced quality planning?

The organization shall incorporate a documented advance quality planning process. A structured system for such process with the APQP elements is recommended, samples are available in the AIAG APQP manual or other equivalent national automotive industry standards. Similar parts can be grouped into part families for this effort as defined by the organization.

Requirements	Objective Evidence	Assessment			
		N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
There shall be documented advance quality planning procedure available.	PFMEA is up to date. AHT uses generic process specific PFMEA. High RPN's have evidence of improvement. Responsibility Matrix shows cross functional employees is used including production personnel. Reviewed during Management annual review				
Feasibility studies shall be performed and internally approved for each part or group of similar parts.					
There shall be a documented system for process changes with approval by the customer.					

Comments:

1.3 Are heat treat FMEAs up to date and reflecting current processing?

Failure Mode and Effects Analysis (FMEA) for processes (PFMEA) is mandatory for the prevention of product/process failure modes and final product concerns. Examples of appropriate methods and standards include SAE J1739, AIAG & VDA FMEA Handbook.

Requirements	Objective Evidence	Assessment			
		N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
There shall be a documented Failure Mode and Effects Analysis (FMEA) procedure with the present FMEAs updated and reflecting the current part quality status.	***PFMEA is up to date. AHT uses generic process specific FMEA. High RPN's have evidence of improvement. Cross functional team is used including production personnel.**				
FMEAs shall address all process steps from part receipt to part shipment and all the key heat treat process parameters as defined by the organization.					

All special characteristics, as defined by the organization and its customers, shall be identified, defined, and addressed in the FMEA.	****PFMEA is up to date. AHT uses generic process specific PFMEA. High RPN's have evidence of improvement. Cross functional team is used including production personnel. Responsibility Matrix is up to date**				
A cross-functional team shall be used in the development of the FMEA and shall be consistent with all associated documentation such as Control Plans, work instructions and shop travelers.					
Comments:					

1.4	**Are heat treat process control plans up to date and reflecting current processing?**				
Reference automotive industry Control Plan guidelines. The Control Plan may be specific for each part or part family or it can be process specific and written for each process. In any case it describes required controls and actions for each process step as well as periodic requirements to assure process is in control.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall incorporate the use of a documented Control Plan reflecting the current process.	Reviewed Control Plan, all key process parameters are defined. The control plan points to the Part Master for each part which defines in detail the steps needed to achieve all customer specific requirements. AHT has established and maintains documented procedures for inspection and test activities in order to verify the specified requirements are met. Control plans are reviewed and updated when changes occurs affecting product, manufacturing process, measurement, logistics, supply source or PFMEA. With any internal or external NCR PFEMAS & Control plans are reviewed. Cross the board.				
Control Plans shall address all process steps from part receipt to part shipment and identify all equipment used and all key heat treat process parameters as defined by the organization.					
A cross-functional team shall be used in the development of the Control Plan and shall be consistent with all associated documentation such as FMEAs, work instructions and shop travelers.					
All special characteristics as defined by the organization or its customers shall be identified, defined, and addressed in the applicable control plan.					
Sample sizes and frequencies for evaluation of process and product characteristics shall be addressed and shall be consistent with the minimum requirements listed in the applicable Process Table.					
Comments:					

1.5	**Are all heat treat related and referenced specifications current and available? For example: Material standards, SAE, AIAG, ASTM, General Motors, Ford, and FCA.**				
A document control system is pertinent for the handling and internal distribution of received customer specifications and to keep up to date with national or global standards related or close to heat treat processes.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall have a procedure and process to ensure the timely review, distribution and implementation of all customer and industry engineering standards/specifications and changes based on customer-required schedule.	Master Control of external documents reviewed quarterly or when there is a new customer,or when a customer sends a new one to AHT. Quality/Lab Mgr. has primary responsibility for maintaining standards. Customer specifics are reviewed and maintained.				
The organization shall have all related heat treat and customer referenced standards and specifications available for use, like but not limited to SAE, AIAG, ASTM, ISO, EN, JIS, General Motors, Ford, and FCA.					
The procedure shall include a 2-week distribution limit for cascading newly received and reviewed documents.					
Comments:					

1.6	**Is there a documented system to create process specifications for all active processes?**

A documented system for creating process specifications is necessary for operating the heat treat process within the desired, requested process parameters to reach the final product specifications. Examples of process parameters include process temperatures, cycle times, load rates, atmosphere or gas flow settings, belt speeds, quench agitation speeds, etc.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Authorization shall be defined to a responsible person (see 1.1) for establishing process specification for the heat treatment of the products with the available equipment.	HTAS Part masters are created for each part detailing all of the required process parameters. Computer system is accessible to all employees. Process sheets as Quality Alert sheets are generated for each order for reference by furnace operators. The process sheets have tolerances for each process parameter. HTAS program maintains revision with dates and names along with detaild history of all revisions				
The heat treater shall have written process specifications for all active processes and identify all steps of the process including relevant process parameters.					
Parameters shall have operating tolerances as defined by the organization in order to maintain process control.					
Process specifications shall be available in the form of work instructions, job card, computer-based recipes, or other similar documents.					
All process specification changes shall be reviewed to the extent necessary to ensure continued conformity with customer requirements for process changes.					
All process specification changes shall be documented to include the date the process specification change was implemented and the person(s) approving the change.					

Comments:

1.7	**Has the heat treat process been validated initially and after process equipment has been relocated, or had a major rebuild or modification?**

To demonstrate each heat treat process is capable of yielding acceptable product, the organization shall perform process validation as part of the initial validation of each process, after relocation of any process equipment or heat treat location change, and after a major rebuild of any equipment. Each process line may include a combination of equipment that is integrated in the performance of a heat treat process, e.g. hardening, quenching and tempering.
(Heat treat process validation consists of robust heat treat equipment, rigorous process controlling and monitoring requirements and calibrations, appropriate test equipment calibrations, and strategic product sampling techniques.)

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall define what constitutes a major rebuild or modification that may impact product characteristics.	*Major rebuild -adding new tech, adding onto a furnace. All equipment is original install. Annual Capability studies Hardness capability Study's completed - on going process study's are done on furnace atmosphere, rinse tanks and rust inhibitor tanks. All process charts demonstrate capability				
Process validation shall be performed on full production load, or production run, with production intended fixturing and load configuration.					
An action plan shall exist if process control parameters or any of the product characteristics fall outside of the control tolerance limits or the heat treater does not conform to the respective Process Table.					

The heat treater shall demonstrate that all parts in the heat treat process (heat treat batch or production run) will meet customer specifications. Samples for these tests shall be selected that best represent the entire production load population. • An acceptable guideline for test sample locations is to use those loading locations prescribed for temperature uniformity surveys. • An acceptable guideline for induction hardening is to show a representative number of parts produced at the extremes of process parameter's tolerances meet customer specifications. Standard process capability indices may also be used to show compliance.	*Furnace #2 - a 5th zone was added. And complete in 1st Q of 2025 *All other equipment is original install. Annual Capability studies. *Hardness capability Study's completed - on going process study's are done on furnace atmosphere, rinse tanks and rust inhibitor tanks. All process charts demonstrate capability *Unifomity studies will be complteted.				
Comments:					

1.8	**Does the heat treater collect and analyze data over time, and react to this data?**				
The analysis of product characteristics (e.g. tensile strength) and processes parameters (e.g. temperature) over time can yield vital information for defect prevention efforts. Examples include but are not limited to product property trend charts, scrap trends, and variation in process parameter recordings.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall have a system to collect, analyze, and react to product or process data over time.	HTAS computer system contains individual part processing history, including historical hardness trend data. Furnace process parameter trend data maintained on computer process monitoring system. All data is collected and maintained indefinitely				
Methods of analysis shall include ongoing trend or historical data analysis of product characteristics or process parameters.					
The organization shall determine which parameters are included in such analysis.					
Comments:					

1.9	**Is the heat treat monitoring system reviewed by Qualified Personnel?**				
This review is intended to be a second level review in addition to those performed by the heat treat operators. This review would be performed by qualified personnel as defined per question 1.17. The heat treat monitoring system includes but is not limited to temperature strip charts, atmosphere strip charts, computer data logs, furnace and operator logs, etc.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Qualified Personnel shall review the furnace monitoring systems at intervals not to exceed 24 hours.	three monitors that display the process parameters of the furnaces for AHT. Alarms are displayed when they occur. An alarm automatically initiates a non-conformance; a supervisor or quality technician initiates the resolution of the non-conformance. It should be noted that the process parameters are monitored 24 hours by a supervisor or				
The process of reviewing the furnace data shall be documented. This requirement also applies to computerized data.					
This second level review shall include detection and reaction to out of control conditions or alarms. This reaction shall be documented.					
Comments:					

1.10	Are internal assessments being completed on an annual basis, at a minimum, using AIAG HTSA?

The internal assessment includes a completed job audit and process table for each applicable process.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall conduct internal assessments on an annual basis, at a minimum, using the current revision of the AIAG HTSA.	IATF 16949:2016: Implemented in 2009 QMS INTERNAL AUDIT completed November 2025. NSF scheduled for january , 2026. NSF 2025 QMS IATF audit No major issues found. Process map - Internal Audit Process as been followed.				

Comments:

1.11	Does the heat treater have a documented procedure for the rework/reprocessing of parts?

Rework/Reprocessing of heat treated components can have a significant impact on the performance of the component. Reworking/Reprocessing in some cases is an acceptable practice. A rework/reprocessing procedure is key to identifying the rework/reprocessing practice. To be approved for rework/reprocessing, either on a case by case basis or pre-approved in the PPAP, the heat treater shall meet the following requirements.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Any change or addition to the rework/reprocessing procedure shall require notification and approval in accordance with the AIAG PPAP process. Any rework/reprocessing not previously approved and identified in the rework/reprocessing procedure is not allowed.	Process for reprocessing is detailed control plan Non-conforming product is tagged and quarantined in the Disposition area and a NCR is entered. Quality reviews the product and contacts the customer. Rework, if authorized, is performed using new process sheet. Reprocessed work must be approved by the Quality Manager or Quality Technician. (Form QA 430) Re-work of any order is only done with the customers writen apptoval				
The OEM shall be notified by the Tier 1 supplier prior to rework/reprocessing product utilizing an unapproved process. If not Tier 1, the customer shall be notified.					
The rework/reprocessing procedure shall be referenced in the heat treater's PPAP approved PFMEA and process control plan.					
The rework/reprocessing procedure shall include the following: • A description of product characteristics for which rework/reprocessing is allowed and those characteristics for which rework/reprocessing is not permissible. • A requirement that all rework/reprocessing activity have a new process control sheet issued by qualified personnel; this new process control sheet shall include the heat treat parameter modifications. • A requirement that there is a record or log of all rework/reprocessing work. • A description of the sampling plan. • A requirement that the Quality Manager or a designee shall authorize the release of rework/reprocessed product.					

Comments:

1.12	Does the Quality Department review, address, and document customer and internal concerns?

	Assessment

Requirements	Objective Evidence	N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
The quality management system shall include a process for documenting, reviewing, and addressing customer concerns and any other concerns internal to the organization.	Customer concerns are input into the HTAS computer system. 8D format is utilized. Concerns are analyzed at Management Review Meetings. Along with customer report cards				
A disciplined problem-solving approach shall be used.					
Comments:					

1.13	Does the organization have a Continual Improvement Plan (CIP)?

Continual improvement is an ongoing effort in the organization to improve processes, services, or products. These efforts may seek incremental improvement over time or breakthrough improvement all at once. A CIP identifies specific continual improvement items, responsibilities and estimated completion dates. Downtime reports, scrap reports, preventive maintenance reports, energy consumption, use of medias, etc., may be used to develop a CIP.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall have continual improvement plan(s).	Continual improvement is a topic in Management Review Meetings. Action list maintained throughout year. *daily production meeting *once a week maintenace meetings				
The CIP shall have specific action items, identify responsibilities and target completion dates for each action item.					
The organization shall show evidence of program execution.					
Comments:					

1.14	Does the organization have a documented procedure for the control of nonconforming material?

This practice is the responsibility of the manufacturers' quality management organization and their included personnel. The procedure should best describe the complete process with the handling of nonconforming or suspect products, beginning with detection and the authorization/obligation to quarantine those products up to the final decision and disposition in quarantine status.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The documented procedure shall specify the responsibilities for handling segregation and disposition of suspect or non-conforming products.	Disposition is made by the Quality Manager, taking into consideration inputs from other functions and/or the customer as necessary. If the process to manufacture or rework the product differs from that approved at PPAP, customer approval must be obtained prior to shipping.				
The organization shall keep records showing evidence of process being followed.					
Comments:					

1.15	Are there procedures or work instructions available to the heat treat personnel that define the heat treating process?

	Assessment

Requirements	Objective Evidence	N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
There shall be procedures or work instructions available to all employees involved in heat treating and inspection of heat treated product.	Furnace operator manual, Work instruction 3QP160 contains required information. A manual is located at each furnace work station. Emergency procedures are posted in foreman's office time clock, breakroom, front office, and maintenace area				
These procedures or work instructions shall include methods of addressing potential emergencies (such as power failure), equipment start-up, equipment shut-down, product segregation (See 2.8), product inspection, and general operating procedures.					
Comments:					

1.16	Is management providing employee training for heat treating?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall provide employee training (including follow up and ongoing training) for all heat treating and inspection operations, including backup and temporary employees.	Records maintained on Form QA 150 Training Log. All employees receive OTJ training and regulatory training. Additional training is provided for new job positions or advancement. Training effectiveness is a topic at Management Review Meetings. Newer and addtional training is being performed on-line using software modules				
Management shall define the qualification requirements for each function.					
Documented evidence of training and training effectiveness shall be maintained.					
Operators shall be trained in material handling, containment action, and product segregation in the event of an equipment emergency including power failure.					
Comments:					

1.17	Are all key management and supervisory functions (in regards to Heat Treatment) performed by qualified personnel?

Key management and supervisory functions, in regards to heat treatment, are critical to ensure both process stability and product quality. This can be accomplished in several different ways. Some examples to consider are a responsibility matrix, the organizational chart, job descriptions, or incorporation into other similar system documentation.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall define and document, key management and supervisory functions in regards to heat treatment.	Responsibility and authority have been defined using the quality system procedures and the Organizational Chart. The Organizational Chart and Job Descriptions define the interrelation of personnel and some general responsibilities and authorities. Responsibility Matrix is up to date				
This documentation shall clearly identify both primary and secondary (backup) personnel.					
This information shall be readily available to appropriate personnel.					
Comments:					

1.18	Is there a preventive maintenance program? Is maintenance data being utilized to form a predictive maintenance program?

Preventive maintenance is essential to ensure equipment, machines and tools are kept in appropriate condition for the manufacturing of products at desired quality and capacity levels. The organization shall comply with the following requirements.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The organization shall have a documented preventive maintenance program for all heat treat process equipment.	Preventative maintenance program Maintenance and setup. Daily PM Checklist, 500 hour PM and 8000 hour PM Daily Report (HTAS System) used for equipment and operator problem reporting. Limble software start-up 2nd Q 2026 Furnace/Generator burn out not needed due to strictly neutral hardening. Reviewed PM activity for AHT. The planning of maintenance is established at the AHT. Maintenance mgr is responsible for ensuring that the planned maintenance is performed per the maintenance checklist. All is reviewed during the MRM.				
The program shall be a closed-loop process that tracks maintenance efforts from request to completion to assessment of effectiveness.					
Equipment operators shall have the opportunity to report problems, and the problems shall be handled in a closed-loop manner.					
The company data (e.g. downtime, quality rejects, first-time-through capability, recurring maintenance work orders, and operator-reported problems) shall be used to improve the preventive maintenance program.					
Maintenance data shall be collected and analyzed as part of the defined predictive maintenance program.					
Comments:					

1.19	**Has the Heat Treater developed a critical spare part list and are the parts available to minimize production disruptions?**

The critical spare parts list and available inventory is typically comprised of long lead time components such as (but not limited to) burners, fans, rolls, belts and other alloy parts. Availability of spare parts may be maintained on-site or off-site (for example, consignment) as identified by the heat treater.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall develop and maintain a critical spare parts list.					
The heat treater shall ensure the availability of critical spare parts to minimize production disruptions.	Critical spare part list is maintained by Maintenance Department. Critical parts are stored in house, and the manufacturer of the furnace lines is located less than 1 mile away **new softwear to trak inventory (Limble)				
Comments:					

1.20	**Is material from different heat lots which may preclude achieving the specified metallurgical properties prevented from being processed together?**

Batch to batch variation may have an adverse effect on metallurgical properties. This variation may require that batches be processed separately.

	Assessment

Requirements	Objective Evidence	N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
Where appropriate, the heat treater shall have a material product flow management system to prevent the processing of mixed batches.	HTAS computer system contains individual part processing characteristic *Computer controlled system - auto gapping - Discharge end alarm to change container.				
Comments:					

Section 2 - Floor and Material Handling Responsibility

Please describe Objective Evidence for each Requirement

2.1 Does the heat treat responsible organization ensure that customer data entered in the process tracking system matches the customer order?

It is critical that all customer requirements and lot identification be adequately transferred to internal heat treat documents. This also applies to captive heat treaters and their internal material flow.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall establish a documented product tracking system (e.g. shop travelers, work orders, etc.) which supports the heat treatment with relevant product and process information.	HTAS computer system contains mistake proofing that will not allow shippers to made if customer requirements do not match. The Planning Process is the main control activity used to process customer orders. Customer parts that are received without a Part Mast cannot be processed. Process Sheets cannot be generated, labels cannot be created, Material Certifications cannot be generated.				
The heat treat organization shall establish a system to detect and resolve discrepancies on received products and corresponding customer information.					
Comments:					

2.2 Is product clearly identified and staged throughout the heat treat process?

Product identification, process status and location of products with their process status are important to prevent incorrect processing or mixing of lots.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
There shall be a procedure for part and container identification to avoid incorrect processing or mixing of lots.	Identification maintained according to procedures. There are separate staging areas for green, in process, and finished work. Each container is identified with a container tag. Colored tags are used to show status of job. Colored container tags are used for lot control.				
Non-heat treated, in-process, and finished product shall be properly segregated in clearly identified locations.					
Comments:					

2.3	Is lot traceability and integrity maintained throughout all processes?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Lot traceability shall be maintained throughout the entire process.	For the purpose of traceability, Atmosphere Heat Treating uses the work order number to link specific Shippers, Process Control Charts, Hardness Certifications, Part Numbers, Production Runs and Part Numbers. Also by entering the product ID and shipper or lot numbers into the Heat Treat Administration system, we can trace the customer shipper number to the processes, process control charts, and operators that manufactured them. The charts identify process equipment, time of processing, and provide process performance data.				

Comments:

2.4	Are procedures adequate to prevent movement of non-conforming product into the production system?

The control of suspect or non-conforming product is necessary to prevent inadvertent shipment or contamination of other lots.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Procedures shall exist addressing proper disposition, product identification, and tracking of material flow in and out of the hold area.	Nonconforming material is controlled as detailed on Process Map. Nonconforming product identified with Pink tags, stored in segregated fenced hold area. NCR stays with suspect order for ID of concern				
A non-conforming hold area shall be clearly designated to maintain segregation of such material.					

Comments:

2.5	Is there a system to identify trap points in the entire heat treat process to reduce risk of mixed parts (inappropriate, non-heat treated, or improperly heat treated parts)?

Heat-treating furnaces and other processing equipment (including but not limited to baskets, conveyors, chutes, etc.) contain areas that have a risk of trapping or holding parts. Such trapping of parts can lead to damage, improperly processed parts or lot mixing/contamination.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall have procedures to identify and monitor trap points for each process/equipment.	Trap points are monitored and cleaned as part of the daily preventative maintenance program. HTAS Computer system identifies parts that may stick in conveyors. Operators are instructed to clean these trap points every part changeover. These trap points are located mostly at the loading and unloading ends of the furnaces. *work instruction 3QP 150 trap points of containers and furnace line & trap point training program.				
Monitoring of potential trap points shall occur for every lot changeover.					
Comments:					

2.6	**Are containers free of inappropriate material or free of heat treated parts mixed with non-heat treated parts?**

The purpose of the requirement is to reduce the risk of contaminating the finished lot with nonconforming parts or inappropriate material. Containers used for the transport of parts to be heat treated are often used for the same material after completion of the heat treat process. It is critical that the finished lot is not contaminated with non-heat treated parts or other inappropriate material remaining in the container.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
There shall be a procedure that addresses the inspection of containers used for transporting non-heat treated and heat treated parts.	Daily layered audits included operator checking containers. Operators inspect tubs for foreign material after emptying and prior to use. Two sign-off inspection of each container. *as of 11/16/2025 all layered audits are emialed to the QC manager & GM				
The procedure shall include the inspection of containers after emptying and immediately before re-using to ensure that all parts and inappropriate material have been removed.					
The source of inappropriate material shall be identified and addressed.					
Comments:					

2.7	**Is furnace loading specified, documented and controlled?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**

Furnace loading parameters shall be specified, documented, and controlled (including but not limited to the following examples: feed rate, belt speed, number of parts per fixture, load weight, etc.).	Furnace parameters are stored in the HTAS computer system. Process sheets are generated for each order. Furnaces are automated, and set up is verified by furnace operators. Conforms to process table Sec. 3.0				
Comments:					

2.8	**Is there a procedure for material handling, containment action, and product segregation in the event of an equipment emergency including power failure?**				
Unplanned or emergency downtime greatly increases the risk of improper processing.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
There shall be a procedure for material handling, containment action, and product segregation in the event of an equipment emergency including power failure.	Operator are trained in Emergency Procedures Reviewed procedure 3QP 270 and training matrix and check sheet, all employees are up to date. Material is segregated - loading table/furnace/quench/rinse tanks				
The procedure shall address containment actions related to all elements of the heat-treating process, e.g. loading, austenitizing, quenching, tempering.					
The procedure shall define when this emergency plan is to be implemented.					
Comments:					

2.9	**Is the handling, storage and packaging adequate to preserve product quality?**				
Some equipment includes conveyors and other moving components that may not be able to handle all part configurations. Other practices such as stacking of overloaded containers can also increase the risk of part damage.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Handling, storage, and packaging shall be adequate to preserve product quality.	Part handling uses vibrator feeding systems and hand loading of furnace depending on part requirements for dimensional control. Dimensional concerns are addressed in feasibility review and noted on quote form. Special handling include auto loading, table loading, hand racking, hand sprinkle and random loading.				
The heat treater's furnace loading system, in-process handling, and shipping process shall be assessed for risk of part damage or other quality concerns.					
Comments:					

2.10	**Are plant cleanliness, housekeeping, environmental, and working conditions conducive to control and improve quality?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Plant cleanliness, housekeeping, environmental, and working conditions shall be conducive to controlling and improving quality.	Daily layerd audits include housekeeping. The shop floor was well organized. All containers were labeled with Container Tag and Process Sign off Sheet. Monthly Doc Audits performed. Quarterly Saftey Meeting address House Cleaning.				
A housekeeping policy shall be clearly defined and executed.					
The facility shall be reviewed for conditions that are detrimental to quality processing such as loose parts on floor, oil around quench tanks, inadequate plant lighting, smoke, etc.					
Comments:					

2.11	**Are parts free from contaminants that would be detrimental to the heat treatment process?**

Oils, coatings and other contaminants or residues may adversely affect the heat treatment process or subsequent processes. Pre/Post wash or other methods of contamination removal may be required by customer or mandatory for process function.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
If applicable, cleaning parameters shall be monitored and documented.	Pre-wash not applicable. Parts inspected for rust or other contaminates during receiving inspection. All quotes to customers state - Parts should be thoroughly cleaned before heat treat, see Quote form QA 060. Reviewed quote# 24473, necessary area checked off. Work instruction 3QP130 being followed				
The frequency for checking the cleaning parameters shall conform to applicable Process Table, Section 5.0					
Comments:					

2.12	**Is the quenching system monitored, documented, and controlled?**

Refer to Process Tables, Sections 3.0 and 5.0, for details and frequency of checks.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The quenching system shall be monitored, documented, and controlled. (Computer-monitoring equipment, with alarms and alarm logs, satisfy the verification requirement.)	Continuous computer monitoring of temperature, time, and agitation is used with Alarms. Quench salt level checked daily - Preventative maintenance. Quench delay and temper delay not applicable to continuous mesh				
Quench delay time with alarm is required. Not applicable for belt, shaker, or pusher furnaces where parts free-fall into the quench.					

Temper delay time shall be specified by the heat treater for parts that are quenched and tempered (e.g. carburizing, carbonitriding, neutral hardening, induction hardening).	temper delay not applicable to continuous mesh belt austempering furnaces. Verified, Quench level alarms checked on Daily PM checklist. Temperature on job certifications and 24 hr. computer monitoring				
Comments:					

2.13	**Are soluble oil or other rust preventive solutions monitored and controlled if applicable?**				
Parts are often dipped in or sprayed with rust preventive solutions immediately after the heat treating process. Refer to Process Tables, Section 5.0, for frequency of checks.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Soluble oil solutions or other rust preventive solutions shall be monitored and controlled, if applicable.	Water-based rust inhibitor concentration monitored daily using control chart. Tolerance is 1.2%-1.7% - Preve				
The heat treater shall have and maintain documented tolerances for the solutions.					
Comments:					

2.14	**Are process control parameters monitored per frequencies specified in Process Tables?**				
Refer to Process Tables, Section 3.0.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Process control parameters shall be monitored per frequencies specified in Process Tables.	Computer Monitoring of all furnace parameters with Alarms. Operators verify every setting per job using process sheet. Microstructure / Lab Log. Surface Hardness/ Job Certification				
A designated floor person shall verify the process parameters, e.g. by initialing a strip chart or data log. (Computer monitoring equipment with alarms and alarm logs satisfy the verification requirement.)					
Comments:					

2.15	Are In-Process/Final Test Frequencies performed as specified in Process Tables?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
In-Process/Final Test Frequencies shall be performed as specified in Process Tables.	Quality checks 3 parts when the load first begins to come out of the wash tanks. Foreman/Quality Inspector continues to check samples at evenly spaced intervals of about 15-20 minutes throughout the load. The goal is to make sure these parts represent the whole lot, parts must be checked at the beginning, middle				
Any exceptions to test frequencies specified in the process tables shall be approved by the Customer in writing.					
Comments:					

2.16	Is product test equipment calibrated and verified?

Refer to Process Tables, Section 1.0, for frequency of checks.

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Test equipment shall be calibrated and verified per applicable customer-specific standards or per an applicable consensus standard such as those published by ASTM, DIN, EN, ISO, JIS, NIST, SAE etc.	Hardness testers verified with test blocks at the start of each shift. Data entered into the HTAS. Testers are calibrated every 90 Days by an ouside source.				
Calibration and verification results shall be internally reviewed, approved, and documented.					
Comments:					

Section 3 - Equipment

Please describe Objective Evidence for each Requirement

3.1	Do furnaces, generators, and quench systems have proper process control equipment?

Examples include temperature, carbon potential, dew point, gas flows, quench monitoring system including agitation, temperature control, etc., as listed in the applicable Process Tables, Section 1.0

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**

The heat-treat equipment including furnaces, generators, and quench systems shall have proper process controls.	Process controls comply with Process Tables where applicable. Automatic continuous computer monitoring of all process parameters.				
Comments:					

3.2	**Are process equipment calibrations, verifications and certifications current?**				
Refer to the applicable Process Tables, Sections 1.0 and 2.0, for equipment calibration, verification and certification frequencies.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The calibrations, verifications and certifications of the process equipment shall be performed at regular intervals as specified in the applicable Process Table(s).	Calibrations comply with process Table A. Calibration verification stickers on furnace panel - all current. Certificate of verification - 10/08/25 Atmosphere 10/08/25 Model : Furnace panel #2 Calibration report number 100825				
Non-contact thermometry devices shall be calibrated as specified in the applicable Process Tables.					
A documented offset procedure as defined in Section P3.2.3 shall exist.					
The documented offset procedure shall indicate who has the authority to approve the use of offsets and how this approval is documented.					
Offset or bias applied for the instrumentation calibration adjustment shall comply with P3.2.3.					
Calibration labels shall meet the requirements established in Section P3.2.5.1.					
Calibration reports shall meet the requirements established in Section P3.2.5.2.					
Comments:					

3.3	**Are thermocouples and protection tubes checked or replaced per Process Tables?**				
The accuracy of thermocouples is essential for good temperature control, the collection of accurate process data and the protection of furnace equipment.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Thermocouples shall be calibrated before first use, within the temperature range in which they will be used and meet the accuracy requirements of the Section P3.1 Tables.	Thermocouples and instrument controls are checked monthly by Temperature Certification & Uniformity (TCU) in Oakland, MI. A review of the data indicates compliance to CQI-9 requirements. This frequency exceeds the CQI-9 requirements (quarterly). Question				
Control, monitoring and recording thermocouples shall be SAT checked as per the applicable Process Table(s) and Section P3.3.					
The insertion depth of Type K and Type E test thermocouples shall be documented when the thermocouple is reused as per Section P3.1.3.3.					

System Accuracy Test records shall meet the requirements established in Section P3.3.5.	10/08/25 Report #100825 all Atmosphere furnaces.				
Protection tubes shall be checked or replaced in compliance to a documented preventive maintenance schedule.					
Comments:					

3.4	**Are temperature uniformity surveys performed per requirements in Process Tables?**				
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Temperature uniformity surveys shall be conducted per the requirements in the applicable Process Tables, Section 2.0.	TUS is performed annually by Heat Treating Services Unlimited in Eastpointe, MI. A review of the TUS performed on 10/08/25 on the 3 furnaces indicate compliance to CQI-9 requirements. 10/08/25 Furnace 3 verified. A review of the TUS reports performed on 10/08/25 - Furnace #1, #2, #3, indicates compliance to CQI-9 requirements. Next due date: 11/08/25				
Actions that alter the temperature uniformity characteristics of a furnace shall be documented per section P3.4.1.2.					
If used, alternate temperature uniformity test methods shall meet the requirements of Section P3.4.8.					
The upper temperature tolerance shall not be exceeded at any time. Exceptions may exist in systems where multiple process temperatures exist in a single process cycle per section P 3.4.5.1.					
The organization's internal process specification shall define suitable soak time at temperature requirements for pass/fail determination as per Section P3.4.5.1.					
Temperature uniformity survey reporting shall meet the requirements established in Section P3.4.7.					
Comments:					

3.5	**Is the variation of the furnace control thermocouple from set point within the requirements in the Process Table?**				
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The variation between the furnace control thermocouple value and the set point temperature shall be within the limits defined in the applicable Process Tables, Section 2.0.	Variation Complies with process table A. Variation +/- 15 F - work zones.				
Comments:					

3.6	**Are the process and equipment alarm checks being tested quarterly or after any repair or rebuild?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall have a list of alarms that, if not properly working, may have a high probability of producing non-conforming product.	Tested each startup. Alarm horn checked daily. Belt load height alarm verified daily Verified daily checklist. Verified -Oct/25 furnace 1,2,&3 AHT				
The listed alarms shall be checked quarterly at a minimum or after any repair or rebuild.					
Other alarms, including but not limited to safety-related, shall be checked per the heat treater's requirement.					
These alarm checks shall be documented.					
Comments:					

3.7	**Are generators and furnace atmospheres continuously monitored, automatically controlled, and documented?**
For furnaces that preclude in-situ control and monitoring, use the method described in Section 3.4.5 "Property Surveys".	

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Generator and furnace atmosphere carbon potential/dew point shall be continuously monitored, automatically controlled, and documented.	Carbon potential and dew point are continuously monitored and automatically controlled at furnace and generator. Back up method is dew point test performed daily. Computer data system. 11/06/25 Reviewed all carbon control charts, no concerns AHT for the year of 2025				
The recorded furnace carbon potential shall be controlled within ±0.05 of the set point.					
The recorded dew point shall be controlled within acceptable limits as specified in the control plan or internal procedures.					
If generators are not used, the flow rates of the supplied atmosphere gases shall be monitored and controlled.					
The automatic and continuous atmosphere control system shall consist of sensors such as oxygen probes or on-line infrared (IR) gas analysis.					
The heat treater shall also have a back-up method of checking carbon potential/dew point.					
Back up method verification frequencies shall be conducted according to the applicable process tables.					
Comments:					

3.8	**When the back-up verification check of the atmosphere does not correlate within pre-established limits with the primary control method (carbon potential/dew point reading), is correlation of the carbon-bearing atmosphere to the primary control method re-established?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**

The back-up atmosphere monitoring system reading and the primary control method atmosphere dew point/carbon potential reading shall be maintained within the correlation limits specified in the control plan or internal procedures.	The quality technician tests the furnace atmosphere carbon potential of each furnace once per day using the dew point analyzer. The results are recorded on the Furnace Atmosphere Control Chart (Form QA 110) carbon potential is maintained within +/- 0.05. If the carbon potential is out of tolerance, maintenance will be contacted immediately to start the process of isolating the specific cause or causes of the malfunction.				
The back-up carbon potential/dew point reading shall be established using one or more of the following methods: • Direct measurement of surface carbon of sample • Shim Stock • Gas Analyzer • Dew Point • Wire Resistance • Redundant Oxygen Probe					
When a discrepancy has been detected, the correlation shall be re-established between the back-up and primary method and documented.					
The range tolerances for correlation between the two readings shall be in the control plan or internal procedures.					
Comments:					

3.9	**Are all ammonia lines equipped with a fail-safe method to prevent the inadvertent introduction of ammonia into the furnace?**				
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
One of the following fail-safe methods shall be used to prevent inadvertent introduction of ammonia into the furnace. • A quick disconnect or physical separation of the lines • Three-valve ammonia "fail-safe" vent system is permitted. See the definition “Three Valve Fail-Safe Vent” and diagram in the glossary. • 1 manual and 2 electrical magnetic valves in series		N/A			
The disconnecting of ammonia atmosphere from non-ammonia bearing atmosphere shall be documented.		N/A			
Comments:					

3.10	**Is there a minimum of 3 hour purge of the furnace atmosphere when switching from an ammonia bearing atmosphere to a non-ammonia bearing?**				
Ammonia pick-up can be undesirable in parts and heat treat processes not specifying/requiring ammonia as an addition.					
		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall perform a minimum 3 hours purge prior to processing product not requiring ammonia as an addition.		N/A			
Any reduction of the 3 hour purge shall require conclusive test data of the atmosphere to show no significant amount of residual ammonia is present in the furnace atmosphere.		N/A			
Log book, data logger, or other records shall document the actual purge time and that sufficient time has been allocated to remove ammonia from the furnace prior to processing parts in heat treat processes not specifying ammonia.		N/A			

Comments:

3.11	**Do all atmosphere furnaces and generators have flow scopes or flow meters for all gases?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
All atmosphere furnaces and generators (output trim/adjustment gas) shall have flow scopes or flow meters for all gases.	Electronic flow meters installed on all furnaces and generators, trim gas is controlled by carbon or dew point probe. Flowscopes are inspected and cleaned every 500 hours per PM form QA 380C				
Flow scopes and meters shall be periodically serviced per the heat treater's preventive maintenance program.					
Cleaning and proper re-assembly procedures shall be documented.					
Comments:					

3.12	**Is there a fail-safe system at the front of continuous belt furnaces for austenitizing to prevent non-uniform loading of parts?**

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Sight glass inspection ports shall exist for the visual evaluation of load distribution.	Electronic load height curtains are installed at the front of all furnaces to prevent overloading of parts. Process indicates what load setting to use. Load height verification performed daily. All furnaces have sight glass inspection ports. Glass cleaned by furnace operators as necessary. Glass inspected during daily preventative maintenance. Verification of load height curtains documented on AHT Furnace daily PM Checklist Form QA 040				
Sight glass inspection ports shall be cleaned per the preventive maintenance schedule.					
There shall be a fail-safe system implemented on continuous belt furnaces to prevent non uniform loading of the parts.					
In the absence of a fail-safe system, a non-contact thermometry device shall be employed with the following requirements met: • A non-contact thermometry device shall be aimed at the center of product mass from the discharge end of the furnace (i.e. bulk head portal) in order to acquire part temperature immediately prior to quenching. • A non-contact thermometry device temperature alarm shall be -28°C (-50°F) maximum of the final zone set point temperature. • Non-contact thermometry device temperature data shall be continuously recorded.					
Comments:					

3.13	**Is salt chemistry in the austenitizing salt bath monitored?**
This is applicable to salt bath heat treating processes listed in Process Tables A and B.	

	Assessment

Requirements	Objective Evidence	N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
The heat treater shall check the salt chemistry in the austenitizing salt bath, or part decarburization.		N/A			
The heat treater shall conform to the frequency of checks defined in the applicable Process Table Sections 3.		N/A			
Comments:					

3.14	Is the quenching medium analyzed?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall periodically have the quenching medium analyzed for specific quenching characteristics, e.g. cooling curve, water content, salt concentration, as specified in the applicable Process Tables, Section 5.0.	Quench Salt analyzed every 6 months by outside lab. EDS test used to look for contaminates. Melting point checked. 07/15/25 Reviewed analytical report Carbonate report content below specification of 1.5%. Salt analysis due. Sent out samples 11/14/25 waiting for reports				
The quench medium characteristic tolerances shall be specified by the quench medium supplier or the heat treater.					
Test results shall be reviewed for conformance and documented by the heat treater.					
Comments:					

FOR INDUCTION HEAT TREATING

3.15	Is the positioning of each part being controlled?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
There shall be a method to ensure proper part position such as the use of proximity switches, optical sensors or mechanical Poka-Yoke system.		N/A			
Comments:					

3.16	Does the heat treater control the energy or power for each part?

		Assessment			
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
The heat treater shall control the energy or power for each part.		N/A			

Signature monitor or energy monitor shall be used to monitor energy or power to the part and record all out of control events.		N/A			
Any alternative method shall be approved by the Customer.		N/A			
Comments:					

3.17	**Does the supplier have a coil management system?**					
Coil refers to the heating coil and the quench plenum.						
		Assessment				
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**	
The heat treater shall have a coil management system.		N/A				
Spare coils for each part shall be available on-site.		N/A				
Coils shall conform to the customer approved design.		N/A				
Comments:						

3.18	**Is quench system automatic?**					
		Assessment				
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**	
The quench system shall be automatically initiated and controlled.		N/A				
Comments:						

3.19	**Is there a procedure that addresses maintenance of the inductor and quench spray nozzle(s) (e.g. quench ring, quench shower)?**					
		Assessment				
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**	
There shall be a procedure that includes regular inspection and cleaning of the inductor and quench spray nozzle(s).		N/A				
Comments:						

3.20	**Is there a procedure to purge the air pockets from the quench lines?**					
After downtime of the induction heating system, air pockets may form in the quench lines. These air pockets will cause interrupted quenching at start-up. Factors such as quench line diameter, length, geometry, etc., should be considered when establishing the time limit of the downtime.						
		Assessment				
Requirements	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**	
There shall be a procedure to purge the quench lines after downtime.		N/A				

The Heat treater shall establish the time limit (of the downtime) when this procedure is to be followed.		N/A			
Comments:					

Section 4 - Job Audit

Job Identity: 11/7/2025
Customer: NON-DISCLOSER
Shop Order Number: 419041
Part Number: P100514
Part Description: BOLT
Material: SAE 4140
Heat Treat Requirements: 42.0 / 48.0 HRC

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / NA
4.1	Does the heat treat facility have the customer specifications for the part?	1.5	AHT admin system has the same hardness spec as the print and customer PO		Customer PO P951605 call-out matches the print and AHT admin system	Pass
4.2	Is material identification (part numbers, lot numbers, heat numbers, contract numbers, etc.) maintained throughout the heat treat process?	2.2 2.3 2.4			Process sheet wo# 419041 has ther material, lot number & shipper number	Pass
4.3	Are the Loading/Racking requirements identified?	1.6 2.7 2.9	Process sheet with wo# 419041 has loading instructions.1200(LB/HR)	Process sheet does have loading and inspection instructions	Furnace #2.5 laod rate 1078 LP/HR - PER CUSTOME, SAME AMOUNT OF PARTS IN CONTAINER, LEFT GAPS BETWEEN EACH TUNB	Pass
4.4	Is the proper recipe or process specification (cycle times, temperature, atmosphere, etc.) used? Refer to Process Tables, Section 3.0, for specific parameters.	1.5 1.6 2.1 2.14 2.15	*Per customer - Process to a hardness of 42/48 HRC 42/48 *Hardness inspection - check at 1/2 RADIOUS * test minimum of 5 parts PER TUB **QC needs to test on part per container - MICROS	On Part Master and on Process Sheet	Work instructions	Pass
4.5	What are the product inspection requirements per the Control Plan?	2.15	ASTM / E - 18			Pass
4.5.1	Requirement: (1)					
	Test Method:		ASTM / E - 18	ASTM / E - 18	ASTM / E - 18	Pass
	Test frequency or quantity:		20 PCS. Per Hr.	20 PCS. Per Hr.	20 PCS. Per Hr.	Pass
	Selection of samples:		Beginning/Middle/End	Beginning/Middle/End	Beginning/Middle/End	Pass
	Specification:		42.0-48.0 HRC	42.0-48.0 HRC	42.0-48.0 HRC	Pass
4.5.2	Requirement: (2)					
	Test Method:					
	Test frequency or quantity:					
	Selection of samples:					
	Specification:					
4.5.3	Requirement: (3)					
	Test Method:					
	Test frequency or quantity:					
	Selection of samples:					
	Specification:					
4.5.4	Requirement: (4)					
	Test Method:					
	Test frequency or quantity:					
	Selection of samples:					
	Specification:					
	Operator or Inspector Responsibilities					
4.6	Were appropriate process steps signed off?	1.4 2.2 2.3 2.14			Sign-off on Process Sheet &Two sign-off on Container Tag	Pass
4.7	Were all inspection steps, as documented in the control plan performed?	1.2 1.4			Hardness Testing per the Control Plan & Master	Pass
4.8	Were steps/operations performed that were not documented in the control plan?	1.2 1.4 1.6			No	Pass
4.9	If additional steps were performed, were they authorized?	1.2 1.4 1.6 1.11 1.17			N/A	Pass

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / NA
4.10	Does the governing specification allow reprocessing or rework?	1.11	Customer Approval required for reprocessing	Customer Approval required for reprocessing	No - Customer Approval required for reprocessing	Pass
4.11	If the order was certified, did the certification accurately reflect the process performed?	2.14 2.15			Job Certification sent to customer reflected the correct process	Pass
4.12	Was the certification signed by an authorized individual?	1.17			Operator and quality auditor names on cert	Pass
4.13	Are the parts and containers free of inappropriate objects or contamination?	2.6 2.11			Two sign-offs on container tag	Pass
	Packaging Requirements					
4.14	Are packaging requirements identified?	2.9	Customer provided containers	Customer provided containers	Customer provided containers - 31 containers	Pass
4.15	Are parts packaged to minimize mixed parts (for example, parts packed over height of container)?	2.9	Customer provided containers - Dock Audit	Customer provided containers - Dock Audit	Dock Form QA330 dated 11/07/25	Pass
	Shipping Requirements					
4.16	Were the parts properly identified?	2.3 2.9			Process Sheet, Job Cert, and Container Tag - OK	Pass
4.17	Were the containers properly labeled?	2.3 2.9			Process Sheet, Job Cert, and Container Tag - OK	Pass

PROCESS TABLE A – Carburizing / Carbonitriding / Carbon Restoration / Hardening / Austempering / Martempering / Tempering / Precipitation Hardening - Aging

All requirements given below are subordinate to customer specific requirements.

The Customer may have additional requirements, e.g. inspection testing, greater frequencies. When performing the job audit, the auditor shall verify heat treater is conforming to the Customer's requirements.

Continuous furnace frequencies for item numbers A4.2, A4.3, and A4.4 are per lot (work order) or as specified, whichever is more frequent.

OK - Complies to requirement
NOK - Does not comply to requirement (Explain noncompliance in 'Related HTSA Question #')
NA - Requirement not applicable

Item #	Related HTSA Question #	Category/Process Steps	
1.0		**PROCESS AND TEST EQUIPMENT REQUIREMENTS**	**OK / NOK / NA**
A1.1	3.1 3.7	Recording instruments are required for temperature controlling devices and protective atmosphere monitoring unit, e.g. dew point, oxygen probe, or other atmosphere controlling devices.	OK
A1.2	1.18	A program for furnace, generator, and oxygen probe burnout is required (applies to carbon bearing atmospheres).	OK
A1.3	3.2	Furnace loading weigh scales shall be verified quarterly and calibrated annually at a minimum.	OK
A1.4	3.2	Dew pointers, gas analyzers, spectrometers, and carbon IR combustion analyzers (shim stock/foil analysis), used to verify carbon potential in furnaces, shall be calibrated annually at a minimum.	OK
A1.5	3.2	Verification of spectrometers and carbon IR combustion analyzers (shim stock/foil analysis) shall be performed daily or prior to use.	NA
A1.6	3.2	Verification of gas analyzers with zero gas and span gas when used as the back-up verification shall be performed weekly at a minimum. When used for primary control of the carbon-bearing atmospheres, verification shall be daily.	OK
A1.7	3.2	Atmosphere controllers shall be calibrated quarterly (single-point or multi-point calibration). A six month calibration interval is allowed if multi-point calibration is utilized.	OK
A1.8	2.16 3.2	Laboratory and Test equipment used for product and process testing shall be calibrated annually at a minimum, per the applicable national standard (e.g. ASTM, EN, JIS) or approved equivalent standard, and verified per internal procedure if not specified in the applicable standard.	OK
A1.9	2.16	Files for testing hardness shall be verified per the Customer requirement.	OK
A1.10	3.2	Refractometers typically used to check polymer quenchants and washer solutions shall be verified prior to use with distilled water.	OK
2.0		**PYROMETRY**	**OK / NOK / NA**
A2.1	3.2 3.3	Thermocouples and calibration of thermocouples shall conform to Section P3.1.	OK
A2.2	3.2 3.3	Calibration of instrumentation shall conform to Section P3.2.	OK
A2.3	3.2 3.3	System Accuracy Test (SAT) for all control, monitoring, and recording thermocouples shall conform to Section P3.3.	OK
A2.4	3.4	Temperature Uniformity Survey (TUS) shall be performed annually and after major rebuild per Section P3.4. Temperature uniformity tolerance for austentizing furnaces shall be +/- 15°C (or +/- 25°F). Temperature uniformity tolerance for tempering and precipitation hardening furnaces shall be +/- 10°C (or +/- 20°F).	OK

Item #	Related HTSA Question #	Category/Process Steps				
A2.5	3.5	Temperature(s) for austentizing processes shall be controlled within +/- 10°C (or +/- 15°F) of the set point as evidenced by recording instruments. Furnace temperature shall be controlled with soak times starting at the lower tolerance limit (as defined above). **For Continuous Furnaces, this requirement applies to the Qualified Work Zone.**				OK
A2.6	3.5	Temperature(s) for tempering and precipitation hardening processes shall be controlled within +/- 5°C (or +/- 10°F) of the set point as evidenced by recording instruments. Furnace temperature shall be controlled with soak times starting at the lower tolerance limit (as defined above). **For Continuous Furnaces, this requirement applies to the Qualified Work Zone.**				OK
A2.7	3.2	Non-contact thermometry devices used for temperature monitoring (e.g. infrared pyrometer, thermal imaging camera) shall be calibrated annually at a minimum in the temperature range to be used utilizing a blackbody device or per the manufacturer's recommended procedure.				OK
3.0		**PROCESS MONITORING PARAMETERS**	**REQUIREMENTS / FREQUENCY**			**OK / NOK / NA**
			Batch (Chamber) Furnace	**Continuous Furnace**	**Atmosphere Generation**	
A3.1	1.4 1.6 2.14	Monitor primary temperature control instrument(s).	Continuous recording with alarm system set per limits in A2.5 and A2.6. In absence of alarm system, sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours satisfies this requirement.	Continuous recording with alarm system set per limits in A2.5 and A2.6. In absence of alarm system, sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours satisfies this requirement.	Generators shall be continuously monitored and recorded. Sign-off required for each shift for generators. An alarm system will satisfy the sign-off requirement.	OK
A3.2	1.4 2.14 3.7 3.11	Monitor atmosphere generation as applicable.			Generators shall be continuously monitored and recorded. Other systems, such as nitrogen-methanol systems, may either be continuously monitored and alarmed, or sign-off every 2 hours.	OK
A3.3	1.4 1.6 2.14 3.7	Monitor primary furnace atmosphere control(s).	Continuous recording with alarm system. In absence of alarm system, sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours satisfies this requirement.	Continuous recording with alarm system. In absence of alarm system, sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours satisfies this requirement.		OK
A3.4	1.4 2.14 3.7 3.8	Verify primary atmosphere control method by back-up method.	Daily	Daily	Daily	OK
A3.5	1.4 2.14 3.13	For austenitizing salt baths: Salt chemistry (soluble oxides) or decarburization on the parts shall be checked.	Daily	Daily		OK

Item #	Related HTSA Question #	Category/Process Steps				
A3.6	1.4 2.14	Monitor time in furnace, cycle time, or belt speed.	Each batch or furnace load.	Sign-off twice/shift and after any change in the belt speed. Alarm systems (if set per acceptable limits) or continuous recording satisfy this requirement.		OK
A3.7	1.4 2.7	Monitor load size, fixturing, or loading rate as applicable.	Each batch or furnace load.	Sign-off twice/shift and after any change in loading rate. Alarm systems (if set per acceptable limits) or continuous recording satisfy this requirement.		OK
A3.8	1.4 2.12	**Quench Media Process Parameters - Liquid**				
		Temperature	Continuous recording with sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours. Alarm systems (if set per acceptable limits) satisfy the sign-off requirement.	Continuous recording with sign-off every 2 hours and at the end of the cycle, or each cycle for processes under 2 hours. Alarm systems (if set per acceptable limits) satisfy the sign-off requirement.		OK
		Quench Level	Continuous monitor with alarm or daily verification.			OK
		Agitation	Daily visual check, or monitor the agitation during the quenching operation with alarm systems set at acceptable limits.			OK
A3.9	1.4 2.12	**Quench Media Process Parameters - Gas**				
		Pressure in the quench cell.	Monitor each load. Alarm system is required.			OK
		Fan speed or power.	Monitor each load. Alarm system is required.			OK
		Cooling water temperature and flow rate.	Monitor each load. Alarm system is required.			NA
A3.10	1.4 2.12	Quench Delay Time	Each batch or furnace load.	Each basket for pusher-type continuous furnaces where the loaded basket is quenched. Not applicable for belt, shaker, or pusher furnaces where parts free-fall into the quench.		NA
A3.11	1.4 2.12	Temper Delay Time - The maximum delay time between quenching and tempering shall be specified on the control plan and monitored.	Each batch or furnace load.	Each load.		OK
		IN-PROCESS/FINAL TEST	**REQUIREMENTS / FREQUENCY**			

Item #	Related HTSA Question #	Category/Process Steps				
4.0		**IN PROCESS/FINAL TEST PARAMETERS**	**Batch (Chamber) Furnace**	**Continuous Furnace**	**Atmosphere Generation**	**OK / NOK / NA**
A4.1	1.4 2.15	Microstructure shall be checked at a low magnification of 100X and a high magnification of 400X or above. Microstructure visual references shall be available.	Daily per furnace unless specified by Customer to be checked with greater frequency, e.g. each batch.	Daily per furnace unless specified by Customer to be checked with greater frequency, e.g. each load.		OK
A4.2	1.4 2.15	Surface hardness (when specified).	Each batch or furnace load.	Each lot or every 2 hours.		OK
A4.3	1.4 2.15	Core hardness (when specified).	Each batch or furnace load.	Each lot or every 4 hours.		OK
A4.4	1.4 2.15	Case Depth (when specified).	Each batch or furnace load.	Each lot or every 4 hours.		NA
5.0		**QUENCHANT AND SOLUTION TEST PARAMETERS**	**REQUIREMENTS / FREQUENCY**			**OK / NOK / NA**
			Batch (Chamber) Furnace	**Continuous Furnace**	**Atmosphere Generation**	
A5.1	2.12 3.14	**Polymer Quench Media**				
		Concentration	Daily	Daily		NA
		Cooling Curve Analysis	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).		NA
A5.2	2.12 3.14	**Water Quench Media**				
		Suspended solids	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).		NA
A5.3	2.12 3.14	**Salt Quench Media**				
		Analysis and Contaminants	Every six months.	Every six months.		OK
A5.4	2.12 3.14	**Brine or Caustic Quench Media**				
		Concentration and/or Specific Gravity	Daily	Daily		NA
		Suspended solids	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).	Every six months (complete replacement of the quench media and cleaning of the quench tank within six months satisfies this requirement).		NA
		Oil Quench Media				

Item #	Related HTSA Question #	Category/Process Steps				
A5.5	2.12 3.14	Water content, suspended solids, viscosity, cooling curve, maximum cooling rate, total acid, and flash point.	Every six months.	Every six months.		NA
A5.6	2.13	**Rust Preventive - Soluble Oil**				
		Concentration	2x/week	2x/week		NA
A5.7	2.11	**Cleaning Solution**				
		Concentration of cleaner	Daily	Daily		NA
		Temperature of solution (required if temperature is specified to be above ambient temperature).	Each shift.	Each shift.		NA