

Special Process: Heat Treat System Assessment

Facility Name: Bodycote Thermal Processing Canada Inc.
Address: 9- Shirley Avenue Kitchener, Ontario N2B 2E6

Phone Number:	519 744-6301	Type(s) of Thermal Processing at this Facility:	
Fax Number:	519 744-6347	Process Table A - Ferrous	
		Carburizing	x
Number of Heat Treat Employees at this Facility:	22	Carbonitriding	x
		Carbon Correction	X
Captive Heat Treater (Y/N):	No	Neutral Hardening	x
		Quench & Temper	x
Commercial Heat Treater (Y/N):	Yes	Austempering / Martempering	N/A
		Tempering	x
Date of Assessment:	13-Jan-2010	Precipitation Hardening / Aging	x

Date of Previous Assessment:	31-Mar-2009	Process Table B - Ferrous	
		Nitriding (Gas)	N/A
		Ferritic-Nitrocarburizing (Gas or Salt)	x
		Process Table C - Aluminum	
		Aluminum Heat Treatment	x
		Process Table D - Ferrous	
		Induction Heat Treating	N/A
		Process Table E	
		Annealing	x
		Normalizing	x
		Stress-Relieving	x

Current Quality Certification(s): ISO/TS-16949:2002 , ISO-14001:2004, AS-9100B

Date of Re-assessment (if necessary):

Personnel Contacted:

Name:	Title:	Phone:	Email:
Gary Prattis	General Manager	519 744 6031 x223	gary.prattis@bodycote.com
Louise Lalonde	Quality Manager	519 744 6031 x229	louise.lalonde@bodycote.com

Auditors/Assessors:

Name:	Company:	Phone:	Email:
Madhu S Chatterjee	General Motors		madju.chatterjee@gm.com
Louise Lalonde	Quality Manager	519 744 6031 X229	louise.lalonde@bodycote.com
Tariq Mahmood	Quality Metallurgist	519 744 6301 X224	tariq.mahmood@bodycote.com
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Ron Prattis	Production/Maintenance Mgr	519 744 6301 X227	ron.prattis@bodycote.com

Number of "Not Satisfactory" Findings:
0

Number of "Needs Immediate Action" Findings:
0

Number of "Fail" Findings in the Job Audit(s):
1

Finding was from Job Audit completed on March 25, 2010
This finding was corrected on March 26, 2010

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Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
Section 1 - Management Responsibility & Quality Planning							
1.1	Is there a dedicated and qualified heat treat person on-site?	To ensure readily available expertise, there shall be a dedicated and qualified heat treat person on site. This individual shall be a full-time employee and the position shall be reflected in the organization chart. A job description shall exist identifying the qualifications for the position including metallurgical and heat treat knowledge. The qualifications shall include a minimum of 5 years experience in heat treat operations or a combination of a minimum of 5 years of formal metallurgical education and heat treat experience.	Ron Prattis - Production & Maintenance Manager has over 35 years Heat Treating experience in this facility. See Production - Maintenance manager job description.		X		
1.2	Does the heat treater perform advanced quality planning?	The organization shall incorporate a documented advance quality planning procedure. A feasibility study shall be performed and internally approved for each part. Similar parts can be grouped into part families for this effort as defined by the organization. After the part approval process is approved by the customer, no process changes are allowed unless approved by the customer. The heat treater shall contact the customer when clarification of process changes is required. This clarification of process changes shall be documented.	APQP form is used and monitored by BMS (Bodycote Management System) APQP meetings are held as required for new work. Ie: M.M.M. Magna, ComDev, Acroturn, Transgear, Ready Rivet to name a few. All documentation is on file.		X		
1.3	Are heat treat FMEA's up to date and reflecting current processing?	The organization shall incorporate the use of a documented Failure Mode and Effects Analysis (FMEA) procedure and ensure the FMEA's are updated to reflect current part quality status. The FMEA shall be written for each part or part family or they may be process-specific and written for each process. In any case, they shall address all process steps from part receipt to part shipment and all key heat treat process parameters as defined by the organization. A cross-functional team shall be used in the development of the FMEA. All special characteristics, as defined by the organization and its customers, shall be identified, defined, and addressed in the FMEA.	PFMEA for parts have been submitted per customer requests		X		

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1.4	Are heat treat process control plans up to date and reflecting current processing?	<p>The organization shall incorporate the use of a documented Control Plan procedure and ensure the Control Plans are updated to reflect current controls.</p> <p>The Control Plans shall be written for each part or part family or they may be process-specific and written for each process. In any case, they 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.</p> <p>A cross-functional team, including a production operator, shall be used in the development of Control Plans, which shall be consistent with all associated documentation such as work instructions, shop travelers, and FMEA's. All special characteristics, as defined by the organization and its customers, shall be identified, defined, and addressed in the Control Plans. Sample sizes and frequencies for evaluation of process and product characteristics shall also be addressed consistent with the minimum requirements listed in the Process Tables, Sections 3.0 and 4.0.</p>	<p>Review of Control Plans is in progress for 2010. See KIT 180</p>		X		

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1.5	Are all heat treat related and referenced specifications current and available? For example: SAE, AIAG, ASTM, General Motors, Ford, and DaimlerChrysler.	To ensure all customer requirements are both understood and satisfied, the organization shall have all related heat treat and customer referenced standards and specifications available for use and a method to ensure that they are current. Such standards and specifications include, but are not limited to, those relevant documents published by SAE, AIAG, ASTM, General Motors, Ford, and DaimlerChrysler. The organization shall have a process to ensure the timely review, distribution, and implementation of all customer and industry engineering standards / specifications and changes based on customer-required schedule. Timely review should be as soon as possible and shall not exceed two working weeks. The organization shall document this process of review and implementation, and it shall address how customer and industry documents are obtained, how they are maintained within the organization, how the current status is established, and how the relevant information is cascaded to the shop floor within the two-week period. The organization shall identify who is responsible for performing these tasks.	All specifications are reviewed annually or before use for revision date. Library of standards include SAE, ASTM, General Motors etc.... When a customer provides a RFQ or PO that references a standard. We immediately review / request the standard for our library. Standards are also listed in Contract Review. See KIT 135		X		
1.6	Is there a written process specification for all active processes?	The heat treater shall have written process specifications for all active processes and identify all steps of the process including relevant operating parameters. Examples of operating parameters include process temperatures, cycle times, load rates, atmosphere or gas flow settings, belt speeds, quench agitation speeds, etc. Such parameters shall not only be defined, they shall have operating tolerances as defined by the organization in order to maintain process control. All active processes should have a written process specification. These process specifications may take the form of work instructions, job card, computer-based recipes, or other similar documents.	Bodycote uses Navigator that enables individual / repeatable part profiles. Approved temperature ranges and processes are posted on each furnace. Form: KIT 122 Furnaces also have recipes that they follow		X		

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1.7	Has a valid product capability study been performed initially and after process equipment has been relocated, or had a major rebuild?	To demonstrate each process is capable of yielding acceptable product the organization shall perform product capability studies for the initial validation of each process, after relocation of any process equipment, & after a major rebuild of any equipment. The organization shall define what constitutes a major rebuild. Initial product capability studies shall be conducted for all heat treat processes per furnace line defined in scope of work & in accordance with customer requirements. A furnace line may include a combination of equipment that is integrated in the performance of a heat treatment process, e.g., hardening, quenching, and tempering. Capability study techniques shall be appropriate for the heat treat product characteristics, e.g., tensile strength, case depth, hardness. Any specific customer requirements shall be met, in the absence of customer requirements, the organization shall establish acceptable ranges for measures of capability. An action plan shall exist to address the steps to be followed in case capability indices fall outside customer requirements or established ranges.	Capability Studies are on file for each furnace.		X		
1.8	Does the heat treater collect and analyze data over time, and react to this data?	The analysis of products and processes over time can yield vital information for defect prevention efforts. The organization shall have a system to collect, analyze, and react to product or process data over time. Methods of analysis shall include ongoing trend or historical data analysis of product or process parameters. The organization shall determine which parameters to include in such analysis.	3 Gas analyzer (Data collected weekly). Oil checks, concentration checks. Also TUS's, SAT's, Calibrations checks and SPC's		X		

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1.9	Is management reviewing the heat treat monitoring system every 24 hours?	Management shall review the furnace monitoring systems at intervals not to exceed 24 hours. 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. The management review shall include efforts to detect out-of-control conditions or alarm conditions. The process of reviewing the furnace data shall be documented and this requirement also applies to computerized data.	Production manager reviews, signs off every 24 hours and operator performs checks every 2 hours. Form KIT 552		X		
1.10	Are internal assessments being completed on an annual basis, at a minimum, using AIAG HTSA?	The organization shall conduct internal assessments on an annual basis, at a minimum, using the AIAG HTSA.	Last CQI-9 Self Assessment: Mar 31, 2009 based on 2nd edition		X		
1.11	Is there a system in place to authorize reprocessing and is it documented?	The quality management system shall include a documented process for reprocessing that shall include authorization from a designated individual. The reprocessing procedure shall describe product characteristics for which reprocessing is allowed as well as those characteristics for which reprocessing is not permissible. Any reprocessing activity shall require a new processing control sheet issued by qualified technical personnel denoting the necessary heat treat modifications. Records shall clearly indicate when and how any material has been reprocessed. The Quality Manager or a designee shall authorize the release of reprocessed product.	NPDR (Non conforming disposition report) is raised, customer is notified and instructions are documented and followed. This procedure is derived from our BMS		X		
1.12	Does the Quality Department review, address, and document customer and internal concerns?	The quality management system shall include a process for documenting, reviewing, and addressing customer concerns and any other concerns internal to the organization. A disciplined problem-solving approach shall be used.	Yes Bodycote uses C/A, and 8D's all this is documented and logged: Form KIT 072 All C/A's & 8D's are reviewed during Management Review Meetings		X		

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1.13	Is there a continual improvement plan applicable to each process defined in the scope of the assessment?	The heat treater shall define a process for continual improvement for each heat treat process identified in the scope of the HTSA. The process shall be designed to bring about continual improvement in quality and productivity. Identified actions shall be prioritized and shall include timing (estimated completion dates). The organization shall show evidence of program effectiveness.	We have a continual improvement plan that is reviewed during management review meetings. Continual Improvement is achieved through the use of Quality Alerts, Non Conforming Product, 8D's, C/A's		X		
1.14	Does the Quality Manager or designee authorize the disposition of material from quarantine status?	The Quality Manager is responsible for authorizing and documenting appropriate personnel to disposition quarantine material.	The QM signs the quarantine log daily. Form: KIT 052 Only staff of the Quality department are authorized to release parts from the quarantine area.		X		
1.15	Are there procedures or work instructions available to the heat treat personnel that define the heat treating process?	There shall be procedures or work instructions available to heat treat personnel covering the heat treating process. 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. These procedures or work instructions shall be accessible to shop floor personnel.	Recipe and process instructions are included in the work order which is displayed on the furnace depending on the parts Start up and shut down has SSWI's (Site Specific Work Instructions), Level 3 WI's from BTP have an electronic version available.		X		
1.16	Is management providing employee training for heat treating?	The organization shall provide employee training for all heat treating operations. All employees, including backup and temporary employees, shall be trained. Documented evidence shall be maintained showing the employees trained and the evidence shall include an assessment of the effectiveness of the training. Management shall define the qualification requirements for each function, and ongoing or follow-up training shall also be addressed.	Training matrix for all employees is in employee training file. This is reviewed / revised annually or as required. 2008 training included: Contract Review, Hardness Testing, Microhardness Testing, Metallographic Sample Prep, C.A.M.S. Operation, Clark Operation, Process & Production Review, Racking, Certified Operator review, along with verification of heat treating operations.		X		

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1.17	Is there a responsibility matrix to ensure that all key management and supervisory functions are performed by qualified personnel?	The organization shall maintain a responsibility matrix identifying all key management and supervisory functions and the qualified personnel who may perform such functions. It shall identify both primary and secondary (backup) personnel for the key functions (as defined by the organization). This matrix shall be readily available to management at all times.	Responsibility matrix as per BMS WI 01.00.00 is reviewed, updated as needed and signed off by the QM and GM and was updated in October 2009.		X		
1.18	Is there a preventive maintenance program? Is maintenance data being utilized to form a predictive maintenance program?	The organization shall have a documented preventive maintenance program for key process equipment (as identified by the organization). 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 problems shall also be handled in a closed-loop manner. 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. Furnaces and generators shall be scheduled for burn-out at frequencies determined by the organization (see Section 1 of the Process Tables). Maintenance data shall be collected and analyzed as part of a predictive maintenance program.	BTP Kitchener uses a closed loop computer system to track, flag PM requirements, this is also used to track downtime. Quality rejects are tracked in Navigator and a PPM is monitored. Daily PM checks are done for Forklifts, Cranes, charge car, furnaces. TUS, SAT and Calibrations are also done as per AMS2750 and BMS requirements.		X		
1.19	Has the Heat Treater developed a critical spare part list and are the parts available to minimize production disruptions?	The heat treater shall develop and maintain a critical spare parts list and shall ensure the availability of such parts to minimize production disruptions.	There is a list for some designated parts and if needed spare parts can be brought from other Bodycote plants (using same furnace)		X		

Section 2 - Floor and Material Handling Responsibility

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Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
2.1	Does the facility ensure that the data entered in the receiving system matches the information on the customer's shipping documents?	It is critical that all customer requirements and lot identification be adequately transferred to internal heat treat documents. The facility shall ensure that the data entered in the receiving system match the information on the customer's shipping documents. Documented processes and evidence of compliance shall exist, e.g., shop travelers, work orders, etc. Sometimes the material received does not precisely correspond to customer shipping documents. The facility shall have a detailed process in place to resolve receiving discrepancies. The requirements stated above also apply to captive heat treat departments. This process refers to receiving and shipping the parts in and out of the heat treat department.	A unique Travel # is given to each job during incoming inspection / Contract Review Process that comes in. This is traceable and traced with a bar code system Form: Order entry deviation is prepared as necessary per BMS WI 03.00.00		X		
2.2	Is product clearly identified and staged throughout the heat treat process?	Procedures for part and container identification help to avoid incorrect processing or mixing of lots. Appropriate location and staging within the facility also help to ensure that orders are not shipped until all required operations are performed. Customer product shall be clearly identified and staged throughout the heat treat process. Non-heat treated, in-process, and finished product shall be properly segregated and identified. All material shall be staged in a dedicated and clearly defined area.	All product is tagged with a unique ID # and is traceable throughout the process. Product is returned to original bins / totes that is clearly identified and tagged "OK to Ship"		X		
2.3	Is lot traceability and integrity maintained throughout all processes?	Out-going lot(s) shall be traceable to the incoming lot(s). The discipline of precisely identifying lots and linking all pertinent information to them enhances the ability to do root cause analysis and continual improvement.	All product is taged with unique ID # along with appropriate tags, "OK to Ship", "Greenstock", "OK for Final Inspection", "Hold", "Reject". Work order follows product through process.		X		

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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. Procedures shall be adequate to prevent movement of non-conforming product into the production system. Procedures shall exist addressing proper disposition, product identification, and tracking of material flow in and out of the hold area. A non-conforming hold area shall be clearly designated to maintain segregation of such material.	Tagged and placed in locked quarantine area. Only authorized Quality personnel can release from the quarantine area. Per BMS QP 13.00		X		
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 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. A system shall exist 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). The heat treater shall have documented procedures to identify and monitor trap points for each process/equipment. Monitoring of potential trap points shall occur for every part changeover.	Yes See SSWI 101 Trapped and Mixed parts. Also every order has a sign off to state that they have checked for foreign material, trapped mixed parts.		X		
2.6	Are containers free of inappropriate material?	Containers handling customer product shall be free of inappropriate material. After emptying and before re-using containers, containers shall be inspected to ensure that all parts and inappropriate material have been removed. The source of inappropriate material shall be identified and addressed. This is to ensure that no nonconforming heat treated parts or inappropriate material contaminate the finished lot.	Yes See SSWI 101 Trapped and Mixed parts. Also every order has a sign off to state that they have checked for foreign material, trapped mixed parts.		X		

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2.7	Is furnace loading specified, documented and controlled?	Furnace loading parameters shall be specified, documented, and controlled. Examples include feed rate, belt speed, number of parts per fixture, and load weight. Refer to Process Tables, Section 3.0, for frequency of checks.	Yes - as applicable work order describes loading instructions and photos are attached when applicable.		X		
2.8	Are operators trained in material handling, containment action and product segregation in the event of an equipment emergency including power failure?	Unplanned or emergency downtime greatly raises the risk of improper processing. Operators shall be trained in material handling, containment action, and product segregation in the event of an equipment emergency including power failure. Training shall be documented. Work instructions specifically addressing potential types of equipment emergencies and failures shall be accessible to and understood by equipment operators. These instructions shall address containment actions related to all elements of the heat-treating process, e.g., loading, austenizing, quenching, tempering.	All operators are cross trained by team leaders to handle material and provide containment when required. Batch furnaces are set to automatic nitrogen purge, 2 hr checks, alarm checks. Operators have been trained to place product on "hold" and communicate in log book. per BMS QP 13.00		X		
2.9	Is the handling, storage and packaging adequate to preserve product quality?	Handling, storage, and packaging shall be adequate to preserve product quality. 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. 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.	Product is stored inside and not exposed to exterior elements. Baskets, screens are monitored daily and straightened before use. As applicable gloves are used to handle parts. All instructions are on work order and is followed by employees. Product is packaged to return in same or better condition. Pictures are taken to ensure proper packaging is followed.		X		
2.10	Are plant cleanliness, housekeeping, environmental and working conditions conducive to control and improved quality?	Plant cleanliness, housekeeping, environmental, and working conditions shall be conducive to controlling and improving quality. The heat treater should evaluate such conditions and their effect on quality. 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.	Bodycote Kitchener maintains a 5S program and housekeeping is of vital importance to this facility.		X		

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2.11	Are parts free from contaminants that would be detrimental to the heat treatment of the product?	<p>Many heat-treated parts are subjected to surface finish or appearance operations such as plating or coating after heat treatment. Parts shall be free from contaminants that are detrimental to subsequent processes or the product. Pre-wash (if applicable) and post-wash parameters shall be monitored and documented. Oils and other contaminants or residues can be difficult to remove once subjected to the heat treatment process. Review the chemical supplier's recommendation for cleaning the system. Parts shall be free of rust, burrs, chips, detrimental amounts of drawing compound, cutting fluids, rust preventing oils, lubricants, etc., prior to heat treat.</p> <p>Note: Refer to the appropriate heat treater's requirements and specifications to determine acceptability. Refer to Process Table, Section 5.0, for frequency of checking washer solutions.</p>	<p>Parts are washed when required to remove any cutting oil that may still be on parts. Rust Preventive is checked 2 x's or more per week and washer concentration. Temperature is a continuous check by controller. SAT is performed monthly on controller</p> <p>PH is checked daily.</p> <p>Temperature is verified daily - KIT 706</p>		X		
2.12	Is the quenching system monitored, documented, and controlled?	<p>The quenching system shall be monitored, documented, and controlled. The temperature, agitation, level, concentration (if applicable), time in the quenchant, and additions shall be controlled to the heat treater's specifications. Refer to Process Tables, Sections 3.0 and 5.0, for frequency of checks. Computer-monitoring equipment, with alarms and alarm logs, satisfy the verification requirement. Quench delay tolerance and alarm is required for furnaces with integral quench tanks. Temper delay time shall be specified by the heat treater for parts that are quenched and tempered, e.g., carburizing, carbonitriding, neutral hardening, solution treating and aging.</p>	<p>All requirements per tables Sections 3 & 5 are followed per CQI-9 2nd edition. Temperature control is monitored every 2 hours.</p> <p>Quench level is checked daily.</p> <p>Agitation is checked daily.</p> <p>Alarms are checked with each load. Quench delay time is verified by alarm. SAT's are done monthly</p> <p>Temperature controllers are calibrated quarterly.</p> <p>Quenching oil is sent out quarterly for moisture, viscosity and cooling curve.</p>		X		

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2.13	Is soluble oil or other rust preventive monitored and controlled if applicable?	Parts are often dipped in or sprayed with rust preventive solutions immediately after the heat treating process. Soluble oil solutions or other rust preventive solutions shall be monitored and controlled, if applicable. The heat treater shall have and maintain documented tolerances for the solutions. Refer to Process Tables, Section 5.0, for frequency of checks.	Quality department does concentration check 2 x's per week.		X		
2.14	Are process control parameters monitored per frequencies specified in Process Tables?	Process control parameters shall be monitored per frequencies specified in Process Tables. Refer to Process Tables, Section 3.0. Computer monitoring equipment with alarms and alarm logs satisfy the verification requirement. A designated floor person shall verify the process parameters, e.g., by initialing a strip chart or data log. Management review is required per Question 1.9.	Temperature: Monitored each batch by signing off the process step Atmosphere Controls: Each batch signed off on work order Atmosphere is verified daily on KIT 552 Time in Furnace: monitored by recipe for batch and vacuum and by a timer for temper furnaces. Load Size: each batch per work order instructions. Furnace Server Pro monitors process controls and is backed up nightly on our server.		X		
2.15	Are In-Process / Final Test Frequencies performed as specified in Process Tables?	In-Process / Final Test Frequencies shall be performed as specified in Process Tables. Refer to Process Tables, Section 4.0.	Microstructure: is performed according to the control plan and customer requirement. Surface Hardness: each batch Core hardness: Each batch when specified by work order Case Depth: Each batch when specified by work order Aluminum Tensile testing is not done in house. This is arranged by our customer.		X		
2.16	Is product test equipment verified?	Product test equipment shall be verified. Test equipment shall be verified/calibrated per applicable customer-specific standard or per an applicable consensus standard such as those published by ASTM, DIN, EN, ISO, JIS, NIST, SAE etc. Verification/calibration results shall be internally reviewed, approved, and documented. Refer to Process Tables, Section 1.0, for frequency of checks.	All Testing equipment is calibrated quarterly and verified daily or before use as is applicable.		X		

Section 3 - Equipment

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3.1	Do furnaces, generators, and quench systems have proper process control equipment?	The heat-treat furnaces, generators, and quench systems shall have proper process controls and related equipment. Examples include temperature, carbon potential/dew point, gas flows, quench monitoring system including agitation, temperature control and quenching oil analysis, etc. as listed in the applicable Process Tables, Section 1.0.	All processing equipment is equipped with temperature controllers and chart recorders		X		
3.2	Are process equipment calibrations and/or verification certified, posted, and current?	The calibration and certification of the process equipment shall be checked at regular specified intervals. Refer to the applicable Process Tables, Sections 1.0 and 2.0, for equipment calibration or certification time tables.	Carbon potential is recorded for each batch furnace with continuous data logging Probes are burned off after each batch 3 Gas Analyzer is calibrated annually Verification of 3 Gas Analyzer is done weekly. Form: KIT 656 Verification of Oxygen Probe is daily: Form: KIT 552 Refractometers are calibrated quarterly (KIT 654) and verified prior to use KIT 653.		X		
3.3	Are thermocouples & protection tubes checked or replaced per Process Tables?	The thermocouples and protection tubes shall be checked or replaced in compliance to a preventive maintenance schedule. Refer to the applicable Process Tables, Section 2.0.	Thermocouples are procured per AMS2750 Instrument Calibration is Quarterly. Form: KIT 120 SAT's are performed monthly within +/- 10 deg F KIT 119		X		
3.4	Are temperature uniformity surveys performed per requirements in Process Tables?	Temperature uniformity surveys shall be conducted per the requirements in the applicable Process Tables, Section 2.0. The frequency reductions allowed in AMS 2750D are not allowed under this document. Certain furnace designs, e.g., rotary retorts preclude direct temperature profiles. Alternate test methods per AMS 2750D 3.5.15 are acceptable for furnaces where temperature uniformity studies are not possible.	TUS are performed per AMS 2750 annually at a minimum and more frequently as required. Form: DataPaq report / application Tolerances are when required per Form: KIT 122		X		
3.5	Is the variation of the furnace controlled thermocouple from set point within the requirements in the Process Table?	The variation between the furnace-control thermocouple and the set point temperature shall be within the limits defined in the applicable Process Tables, Section 2.0. This does not apply to the first zone of a multi-zone continuous furnace.	Set point / actual is verified every 2 hours. Form: KIT 552 This is also data logged on Trend Server Pro for batch and Wonderware for GM Chart recorders for all other equipment		X		

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				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
3.6	Are the process & equipment alarm checks being tested quarterly or after any repair or rebuild?	The heat treater shall have a list of heat treat process and equipment alarms. These alarms shall be independently tested quarterly at a minimum, and after any repair or rebuild. These checks shall be documented.	Alarms are verified quarterly. This is flagged through express maintenance and documented on alarm check sheet KIT 717		X		
3.7	Are generators and furnace atmospheres continuously monitored, automatically controlled, and documented?	<p>Generator and furnace atmosphere carbon potential/dew point shall be continuously monitored, automatically controlled, and documented. This requirement is specific to Process Table 1, Sections 1.0 and 3.0, for carburizing, carbonitriding, and neutral hardening. Continuous monitoring and automatic control of the carbon potential/dew point is required for all generators and atmosphere furnaces except rotary retort and shaker furnaces that preclude in situ control and monitoring. For rotary retort and shaker furnaces, the method described in AMS 2750D 3.5.15..2 "Property Surveys" shall be used to ensure adequate control of the furnace atmosphere. If generators are not used, the flow rates of the supplied atmosphere gases shall be monitored and controlled. The assessor shall verify the effectiveness of the atmosphere control system per customer requirements, the heat treater's control plan, and internal procedures.</p> <p>The atmosphere control system shall maintain the atmosphere dew point/carbon potential set point within the parameters specified in the control plan or internal procedures. The heat treater shall have a back-up method of checking the carbon potential/dew point. Examples are dew point, electrical wire resistance, gas analysis, shim stock, carbon bar, etc. The automatic and continuous atmosphere control system shall consist of sensors such as oxygen probes or on-line Infrared (IR) gas analysis. See Process Table A, Sect. 3.0 for verification frequencies.</p>	<p>The following forms are used to monitor all the various CQI-9 2nd edition requirements. Monitor primary atmosphere controls every 2 hours. Verify primary atmosphere control daily. See KIT 552 2 Hour furnace Check Sheets, KIT 656 3 Gas analyzer / Generator checksheet, KIT 704 PM Inspectin Log, KIT 706 Facility Check sheet, KIT 707 Vacuum Inspection sheet, KIT 709 Vacuum checksheet, KIT 711 Maintenance Casemaster check, Carbon potential is data logged for all batch furnaces.</p> <p>per KIT 656 3 Gas Analyzer / Generator is checked daily and signed off. KIT 552 Furnace 2 hour check sheet. Back up method: Alarm goes off if it goes in excess of + / - .1.</p>		X		

Special Process: Heat Treat System Assessment							
Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
3.8	When the back-up verification check of the atmosphere does not agree or 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?	<p>This issue is specific to Process Table 1, carburizing, carbonitriding, and neutral hardening. When the back-up verification check of the atmosphere does not agree or correlate within pre-established limits with the primary control method (carbon potential/dew point reading), the heat treater shall resolve the out-of-limit discrepancy. The back-up atmosphere monitoring system reading and the automatically controlled atmosphere dew point/carbon potential reading shall be maintained within the correlation limits specified in the control plan or internal procedures. These range tolerances vary with the specific heat treat process and the equipment used. The heat treater shall make appropriate technical adjustments and corrections and then re-establish/demonstrate the correlation of the actual atmosphere carbon potential/dew point reading to the primary control and back-up atmosphere reading. The range tolerances for correlation between the two readings shall be in the control plan or internal procedures. The back-up carbon potential/dew point reading shall be established using:</p> <ul style="list-style-type: none"> • Carbon bar or slug • Shim stock • 3-gas analyzer • Dew point • Hot wire resistance 	<p>We have Nitrogen / Span gas that are calibrated. If the furnace atmosphere the 3 gas analyzer can be verified. Dew point tester is also used as a secondary method.</p>		X		

Special Process: Heat Treat System Assessment							
Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
3.9	Are all ammonia lines equipped with quick disconnects or a three valve fail safe vent system?	<p>All ammonia lines to furnaces shall be equipped with quick disconnects or a three-valve fail-safe vent system. Normal valves may allow ammonia to leak through even when they are closed. This can be undesirable and detrimental in heat treat processes not specifying/requiring ammonia.</p> <ul style="list-style-type: none"> • A quick disconnect shall be present in any ammonia line going to a furnace. This line shall be disconnected after carbonitriding (or any other process using ammonia) before another heat treating operation not specifying/using ammonia begins. • An alternative three-valve ammonia "fail-safe" vent system is permitted. See the definition "Three Valve Fail-Safe Vent" and diagram in the glossary. • Documentation shall show when ammonia lines are disconnected for non-ammonia bearing atmosphere processes. 	<p>Quick disconnect and alarm (after disconnection attached to a capped tube) We also are equipped with alarms. Trend Server Pro logs when Ammonia is not in use and when it is in use. Ammonia off is also documented on work orders as applicable.</p>		X		
3.10	For fasteners and small metal parts, is a minimum of 3 hours allocated for an oxidizing burn-out prior to processing product not requiring ammonia?	<p>This is applicable to fasteners and small metal parts. The heat treater shall perform a minimum 3 hours oxidizing burn-out prior to processing product not requiring ammonia as an addition. Ammonia pick-up can be undesirable in parts and heat treat processes not specifying/requiring ammonia as an addition. Log book, data logger, or other records shall document the actual oxidizing burn-out 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.</p>	<p>Per BMS WI 09.09.03 BTP performs 2 hour burn off. This is evident on the Trend Server Pro and is also recorded on form KIT 555 - Atmosphere Change Log</p>		X		
3.11	Do all atmosphere furnaces and generators have flow scopes or flow meters for all gases?	<p>All atmosphere furnaces and generators (output trim/adjustment gas) shall have flow scopes or flow meters for all gases. 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.</p>	<p>Waukee Flow meter is used for all gases on each furnace. (endo gas, natural gas, nitrogen, air, ammonia) Clean and service all flow meters is documented on KIT 711.</p>		X		

Special Process: Heat Treat System Assessment							
Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
3.12	For threaded fasteners, are all continuous belt furnaces equipped with sight glass inspection ports and infrared pyrometers at discharge end of the hardening furnace?	Infrared temperature pyrometers are required at the exit end of continuous belt furnaces running threaded fasteners to monitor for under temperature parts. The temperature alarm shall be within 28C (50F) of the furnace set point temperature. Results shall be strip charted or continuously data logged. Infrared (IR) units shall be calibrated annually at a minimum and certified. All sight glasses shall be cleaned per the preventive maintenance schedule.		N/A			
3.13	Is salt chemistry in the austenitizing salt bath monitored?	Applicable to ferritic-nitrocarburizing, austempering, and neutral hardening in salt. The heat treater shall check the salt chemistry in the austenitizing salt bath, or part decarburization, daily. Refer to the applicable Process Tables, Section 3.0, for frequency of checks.		N/A			
3.14	Is the quenching medium analyzed?	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. <ul style="list-style-type: none"> The quench media characteristic tolerances shall be specified by the quench medium supplier or the heat treater. Analysis shall be reviewed for conformance by the heat treater. This review shall be documented. 	Quenching medium is sent out for analysis quarterly. Results are documented and monitored on KIT 553 and in a report provided by outside source. Quenching oil is tested for Viscosity, Water content and Cooling content.		X		
3.15	Is the positioning of each part being controlled?	A method to detect proper part position, such as the use of proximity switches, optical sensors, mechanical probes, etc., is required for each part.		N/A			

Special Process: Heat Treat System Assessment							
Question Number	Question	Requirements and Guidance	Objective Evidence	Assessment			
				N/A	Satisfactory	Not Satisfactory	Needs Immediate Action
3.16	Does the heat treater control the energy or power for each part?	The heat treater shall control the energy or power for each part. <ul style="list-style-type: none"> • A signature monitor for each machine is preferred. A signature monitor gives the energy unit (voltage, kilowatt, etc.) vs. time or distance (for scanning systems). • An energy monitor or equivalent is acceptable if approved by the authorized customer representative. 		N/A			
3.17	Does the supplier have a coil management system? Coil refers to the heating coil and the quench plenum.	The heat treater shall have a coil management system. Coil refers to the heating coil and the quench plenum. <ul style="list-style-type: none"> • Spare coils for each part shall be available on-site. • Coils shall conform to the approved original design. • Engineering change approval from the customer is required whenever the coil design is changed. 		N/A			
3.18	Is quench system automatic?	The quench system shall be an automatic operation. No manual quenching is allowed unless specifically approved by the authorized customer representative. Quenching shall be automatically initiated and controlled.		N/A			
3.19	Does each lot of parts have first piece set-up?	The heat treater shall perform first piece set-up for each lot of parts		N/A			

Section 4 - Job Audit

Job Identity:

Customer: Sinteris
 Shop Order Number: 391132 / Order # 68219
 Part Number: 7T4P-7G101-AA - Dwg 24225199 Sub-P0904 Rev 7
 Part Description: Guide Park Pawl, Actr
 Material: Powdered Metal
 Heat Treat Requirements: Neutral Harden to Surface Hardness Min. 37.0 HRC and Hardness at depth (Particle Hardness) Min. 53.0 HRC

Job Audit Completed
25-Mar-10

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
4.1	Are contract review, advance quality planning, FMEA, control plans, etc., performed by qualified individuals?	1.2 1.3 1.4 1.17	Process Flow Diagram, FMEA & Control Plan, PSW submission etc. are to be performed by qualified individuals.	Job Order as per P.O. and customer requirement.	Process Flow Diagram, FMEA # 26 & Control Plan-Sep 16, 2009, All performed by qualified individuals.	P
4.2	Does the heat treat facility have the customer specifications for the part?	1.5	Specifications are well detailed on customer purchase order & Control Plan	Specifications are transferred to w/o and repeatable thereafter	Specifications are transferred to w/o and repeatable thereafter.	P
4.3	Is a shop traveler created to meet customer requirements?	1.6 2.1	All orders are given a unique # upon receipt for traceability	Unique # allocated	Unique # i.e. PL # 391132	P
4.4	Is material identification (part numbers, lot numbers, heat numbers, contract numbers, etc.) maintained throughout the heat treat process?	2.2 2.3 2.4	Work Order must have unique PL # to locate product. Work Order contains all necessary information from Customer paperwork to ensure proper processing.	Work order is consistent and follows customer requirements as indicated on purchase order	Work order follows customer requirements as indicated on purchase order and customer dwg # 24225199	P
4.5	Is there documented evidence of Receiving Inspection?	2.1	All orders receive Contract Review and are to be stamped and initialled	Contract Review Stamp / Date and Initial	Customer PO is stamped / dated and initialled on Jan 06, 2010	P
4.6	Are the Loading / Racking requirements identified?	1.6 2.7 2.9	Every work order to indicate specific loading instructions	Lay flat as per photo attached. Conform Baskets are free of foreign material, customer containers have been completely unloaded.	Operator has signed off Step # 1 as an evidence	P
4.7	Is the proper recipe or process specification (cycle times, temperature, atmosphere, etc.) used? Refer to Process Tables, Section 3.0, for specific parameters. List parameters that were verified in this audit in the spaces provided below.	1.5 1.6 2.1 2.14 2.15	Neutral harden to surface hardness Min 37.0 HRC, and particle hardness Min 53.0 HRC	Neutral harden to surface hardness Min 37.0 HRC, and particle hardness Min 53.0 HRC	Surface Hardness and particle Hardness checked.	P

Section 4 - Job Audit

Job Identity:

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 Part Number: 7T4P-7G101-AA - Dwg 24225199 Sub-P0904 Rev 7
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Job Audit Completed
25-Mar-10

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
			Endo Harden AFC	Endo Harden AFC	Endo Harden AFC 2	P
			Temperature 1600°F	Temperature 1600°F	Temperature 1600°F	P
			Time Soak SP 1.5-2.5 HRS	Time Soak SP 1.5 Hrs	1.7 Hrs	P
			0.6 % C	0.6 % C	0.6 % C	P
			Quench Oil Temperature 110 - 160 °F (Control Plan)	Not available on Job Order	141 °F as per trend pro server	P
			Post Wash at 140°F±10°F	Post Wash at 140°F±10°F	Post Washed at 140°F	P
			After Quench Surface Hardness	After Quench Surface Hardness	45-46 HRC	P
			Tempering temp. 300 °F, Time 2.0-2.5 Hrs	Tempering temp. 300 °F, Time 2 Hrs	300 °F 2.1 Hrs	P
			Surface Hardness (apparent) Min. 37.0 HRC	Surface Hardness Min. 37.0 HRC	Surface Hardness Min. 41.0 HRC	P
			Hardness at depth (particle hardness) Min. 53.0 HRC	Hardness at depth (particle hardness) Min. 53.0 HRC	Hardness at depth (particle hardness) Min. 59.0 HRC (from 708 HK 300gf)	P
4.8	What are the product inspection requirements?	2.15	Surface Hardness Min. 37.0 HRC and Hardness at depth (Particle Hardness) Min. 53.0 HRC			P
4.8.1	Requirement: (1)		In process Surface Hardness	Step 3 Insp. As Quench Hardness	Performed and signed off by operator	P
	Test Method:		ASTM E 18	ASTM E 18	ASTM E 18	P
	Test frequency or quantity:		2 per load (Control Plan)	1 per load C/A - Work Order has been changed to require 2 - Mar 26, 2010	1 per load	F
	Selection of samples:		per load	per load	per load	P
	Specification:		Min. 37.0 HRC	Min. 37.0 HRC	Surface Hardness Min. 45.0 HRC	P
4.8.2	Requirement: (2)		Final Inspection	Step 6 Final Inspection	Performed and signed of by operator	P
	Test Method:		ASTM E 18	ASTM E 18	ASTM E 18	P
	Test frequency or quantity:		5 per load (Control Plan)	Use sampling plan table as applicable	30 pieces checked for PPAP	P
	Selection of samples:		per load	per load	per load	P
	Specification:		Min. 37.0 HRC	Min. 37.0 HRC	Surface Hardness Min. 41.0 HRC	P

Section 4 - Job Audit

Job Identity:
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Part Number: 7T4P-7G101-AA - Dwg 24225199 Sub-P0904 Rev 7
Part Description: Guide Park Pawl, Actr
Material: Powdered Metal
Heat Treat Requirements: Neutral Harden to Surface Hardness Min. 37.0 HRC and Hardness at depth (Particle Hardness) Min. 53.0 HRC

Job Audit Completed
25-Mar-10

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
4.8.3	Requirement: (3)		Final Inspection	Step 7 Final Inspection	Performed and signed of by operator	P
	Test Method:		ASTM E 384	ASTM E 384	ASTM E 384	P
	Test frequency or quantity:		1 per load	1 per load	1 per load	P
	Selection of samples:		per load	per load	per load	P
	Specification:		Particle Hardness Min. 53.0 HRC	Particle Hardness Min. 53.0 HRC	Hardness at depth (particle hardness) Min. 59.0 HRC (from 708 HK 300gf)	P
4.8.4	Requirement: (4)					
	Test Method:					
	Test frequency or quantity:					
	Selection of samples:					
	Specification:					

Section 4 - Job Audit

Job Identity:

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Job Audit Completed
25-Mar-10

Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
Operator or Inspector Responsibilities						
4.9	Were appropriate process steps signed off?	1.4 2.2 2.3 2.14	Steps outlined in Control Plan	Work Order Steps match steps in Control Plan	All steps performed and signed off	P
4.10	Were all inspection steps, as documented in the control plan performed?	1.2 1.4	Inspection steps outlined in Control Plan	Work Order Inspection Steps match steps in Control Plan	All steps performed and signed off	P
4.11	Were steps/operations performed that were not documented in the control plan?	1.2 1.4 1.6	No	No	No	P
4.12	If additional steps were performed, were they authorized?	1.2 1.4 1.6 1.11 1.17	N/A	N/A	N/A	P
4.13	Does the governing specification allow reprocessing or rework?	1.11	No rework allowed, nonconforming product is controlled per QP BMS 13.00	No rework allowed, nonconforming product is controlled per QP BMS 13.00	Product acceptable to ship	P
4.14	If the order was certified, did the certification accurately reflect the process performed?	2.14 2.15	Surface Hardness Min 37.0 HRC, and particle hardness Min 53.0 HRC	Surface Hardness Min 37.0 HRC, and particle hardness Min 53.0 HRC	Surface Hardness Min 41.0 HRC, and particle hardness Min 59.0 HRC	P
4.15	Was the certification signed by an authorized individual?	1.17			Yes signed by authorized individual	P
4.16	Are the parts and containers free of inappropriate objects or contamination?	2.6 2.11	Visually Inspect for foreign Objects is a standard sign off internally req'd on all work orders.	Step 1 on Work Order - Visually Inspect for foreign material	Signed off by operator	P

Section 4 - Job Audit

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Question #	Job Audit Question	Related HTSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
Packaging Requirements						
4.17	Are packaging requirements identified?	2.9	Material to be returned in customer supplied bins	It is standard practice for parts to be returned in customer supplied bins / totes for all customers	Parts returned in customer bin with identification tag.	P
4.18	Are parts packaged to minimize mixed parts (for example, parts packed over height of container)?	2.9	Parts to be returned in customer supplied bins	Parts to be returned in customer supplied bins	Parts returned in customer supplied bins and are not overloaded / mixed	P
Shipping Requirements						
4.19	Were the parts properly identified?	2.3 2.9	Parts are to be tagged and identified	Parts are tagged and identified with a unique PL # that appears on all documents and bins	All bins identifiable	P
4.20	Were the containers properly labeled?	2.3 2.9	All containers are to be labelled and identifiable	All parts / bins are identifiable with a unique PL #	Bins were labelled with customer labels and Bodycote PL tag.	P