

Process Table I – Dry Contact Press Hardening

Requirement to Comply:

This Process Table is made available as of May, 2014. Users of these parts may request suppliers be compliant to these requirements 90 days after notifying supplier.

Introduction:

Process Table I is being added to incorporate the growth of die quenching in the industry. The most common type of die quenching is known as hot stamping, which is a process that first austenitizes and then simultaneously quenches and forms the part. **Quenching is achieved by direct contact with a die that is water cooled.** Hot stamping is sometimes referred to as press hardening or hot forming.

The addition of a new table was warranted due to the unique nature of the process which includes furnace design, relatively short cycle times, materials, and quench method.

The most common furnace design is a continuous furnace, but other designs include single chamber and multi-chamber box type furnaces. Regardless of the furnace design, there is frequent part loading and unloading typically performed by robots with cycle times on the order of minutes. The material is typically an ultra-high strength steel sheet contain boron to improve hardenability. The quench rate (mechanical properties) is determined by die design and subsequent maintenance. The use of thermal imaging cameras during die development and the preventative maintenance program are also critical.

Another unique feature with this process is the use of coatings and their development during heat treatment. Some post treatments include sand blasting or similar cleaning process, trim operations including laser trimming, welding, and painting.

CQI-9, Process Table I

Special Process: Heat Treat System Assessment

Version 3 - Errata, Process Table I, Issued May 2014



Process Table I – Dry Contact Press Hardening

PROCESS TABLE I - Dry Contact Press Hardening

All requirements given below are subordinate to customer specific requirements.			
The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify heat treater is conforming to the customer's requirements.			
Continuous furnace frequencies 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
I1.1	3.1 3.7	All furnaces and quench (tool cooling) systems shall have temperature indicating instruments.	
I1.2	3.1 3.7	Continuous strip charts and/or data loggers are required for temperature controlling devices.	
I1.3	3.1 3.7	Continuous strip charts and/or data loggers are required for protective atmosphere monitoring unit, e.g., dew point, oxygen probe or other atmosphere controlling devices.	
I1.4	3.2	Furnace loading device and control elements used to avoid double layer loading shall be verified and maintained per maintenance plan.	
I1.5	3.2	Dew pointers, 3-gas analyzers, spectrometers, and carbon IR combustion analyzers (shim stock analysis) used to verify protective atmosphere in furnaces shall be calibrated annually at a minimum.	
I1.6	3.2	Oxygen probe controllers shall be calibrated quarterly (single-point or multi-point calibration) or semi-annual (multi-point calibration only, single-point calibration not allowed).	
I1.7	3.2	Verification of calibration of spectrometers and carbon combustion analyzers shall be checked daily or prior to use.	
I1.8	3.2	Verification of calibration of 3-gas analyzers with zero gas and span gas shall be performed weekly at a minimum.	
I1.9	2.16	All hardness test equipment (for each scale used) shall be calibrated annually minimum and verified daily or prior to use per the applicable ASTM standard, ISO standard, JIS standard, or approved standard.	
I1.10	2.16	Tensile Test Equipment shall be calibrated annually.	

PROCESS TABLE I - Dry Contact Press Hardening

"Dry Contact Press Hardening" is also known as hot stamping, press hardening, or fixture quenching. This process first austenitizes and then simultaneously quenches and forms a part. Quenching is achieved by direct contact with a die that is internally cooled with a suitable medium. The die is used in conjunction with a high tonnage press and relatively short heat treat cycles are used. All requirements given below are subordinate to customer specific requirements. The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify heat treat is conforming to the customer's requirements. Continuous furnace frequencies 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		
2.0		PYROMETRY		
12.1	3.2	Thermocouples and calibration of thermocouples shall conform to Section 3.1		
12.2	3.3	Pyrometry instrumentation and Calibration of instrumentation shall conform to Section 3.2		
12.3	3.3	CQI-9 requires a System Accuracy Test (SAT) check of the control thermocouple in each Zone per Section 3.3		
12.4	3.4	TUS shall be performed annually and after major rebuild per Section 3.4		
12.5	3.5	Temperature uniformity tolerance for hardening furnaces shall be +/- 15°C (or +/- 25°F) in the Qualified Work Zone.		
		Recorded temperature(s) for austenizing processes shall be controlled within +/- 10 C (or +/- 15F) of the set point as evidenced by continuous recording pyrometers. Furnace temperature shall be controlled with soak times starting at the lower tolerance limit (as defined above).		
12.6	3.2	For Continuous Furnaces, this requirement applies to the Qualified Work Zone.		
		Infrared pyrometers or thermo cameras shall be calibrated annually using proper calibration methods or an approved manufacturer's procedure.		
3.0		PROCESS MONITOR FREQUENCIES	Multi Chamber BOX Type Furnace	Continuous Furnace
13.1	1.4 2.14	Monitor primary temperature control instrument(s).	Continuous recording with sign-off every 2 hours for each chamber. Alarm systems (if set per limits in 12.5) satisfy the sign-off requirement	Continuous recording with sign-off every 2 hours. Alarm systems satisfy the sign-off requirement
13.2	1.4 2.14 3.7	Monitor atmosphere generation as applicable.		Dried air or nitrogen systems, may either be continuously monitored and alarmed, or sign-off every 2 hours.