Ford Specific CQI-9 requirements

Requirements and Guidance				Assessment			
W-HTX Element/Pg #	W-HTX Requirements and Guidance not included in CQI-9	CQI-9 section	Objective Evidenc	NA	Satisfactory	Not Satisfactory	Needs Immediate Action
Scope (pg 7)	CQI-9 assessment and Ford Specific CQI-9 assessment is also to be completed for brazing and sintering.	Scope 1.2		N/A			
Carburizing/ Carbonitriding/ Carbon Correction (pg 24)	- Alarms, if used for process monitoring, must be set at acceptable control limits. - Quench media Soluble oil: Concentration must be checked daily. - Quench media Soluble oil: Suspended solids must be checked semi-annually. - Microstructure for batch heat treat must be checked per batch and when any of the process parameters are out of spec.	Process Table A		N/A			
Neutral Hardening (pg 26)	- Alarms, if used for process monitoring, must be set at acceptable control limits. - Quench media Soluble oil: Concentration must be checked daily. - Quench media Soluble oil: Suspended solids must be checked semi-annually.	Process Table A	Alarms set to match process requirements. N/A N/A		YES		
Tempering/Stress Relieving/ Annealing/Normalizing/ Solution Heat Treat/Age Hardening (pg 27, 29, 30)	- Alarms, if used for process monitoring, must be set at acceptable control limits.	Process Table A and E		N/A			
Nitriding/ Nitrocarburizing (pg 28)	- Alarms, if used for process monitoring, must be set at acceptable control limits. - Dissociation of ammonia must be checked in gas nitriding twice a shift and after any change (or per batch). - Gas ratios for ferritic nitorocarburizing must be checked twice a shift and after any change (or per batch).	Process Table B		N/A			
Brazing/Sintering (pg 31)	Assess Brazing/Sintering heat treat processes per Attachment 1 for WHTX - Brazing & Sintering Process Table.	Scope 1.2		N/A			
Vacuum Carburizing (pg 25)	Assess Vacuum Carburizing heat treat processes per Attachment 2 for WHTX - Vacuum Carburizing Process Table.	Scope 1.2		N/A			
Salt Bath (pg 32)	- Alarms, if used for process monitoring, must be set at acceptable control limits. - Bath activity and exhaust smoke analysis must be done every batch and after any change. - Visual condition of quench media must be checked each shift. - Quench media Soluble oil: Concentration must be checked daily. - Quench media Soluble oil: Suspended solids must be checked semi-annually.	Process Table A and B		N/A			

Induction (pg 33)	- Cycle time must be visually checked and logged twice a shift and after any change. - In the absence of an alarm system for high and low control limits quench media temperature must be checked and logged each shift and after any change. Quench level must be checked each shift and after any change. - Quench media Soluble oil: Concentration must be checked daily. - Quench media Soluble oil: Suspended solids must be checked on semi-annual bases. - Quench media Oil: Water content, Suspended solids, Viscosity, Quenchability, Flash and fire point must be checked on semi-annual bases. - Flame processes: Oxygen to fuel ratio shall be monitored and recorded.	Process Table D		N/A			
Loading rate and cycle parameters (pg 15)	Control plan must have maximum delay between quench and temper and it must be monitored and logged.	2.7; A3.8; B3.9; C3.4; E3.7		N/A			
Processing temperature (pg 11)	Overtemp/Undertemp (when applicable) must be set at 50 deg F over the process set temperature to protect material and furnace from overheating.	N/A	Overtemp set at 1675.		YES		
Monitor of carbon atmosphere (pg 11)	Dew point test is not acceptable for inverted delta parts.	3.7; 3.8; A3.3; A3.4; B3.2; B3.3; E3.3; E3.4	Dewpoint / Carbon Analyzer		YES		
Furnace atmosphere (pg 12, 13)	2-Oct-09	3.7	Furnace checked for leaks each startup.		YES		
Condition of quench (pg 15)	Additions to quench systems must be recorded in logging record.	3.14	Recorded salt additions.		YES		
Rules for checking service T/C (SAT test) and temperature instrumentation (pg 34)	The calibrated test thermocouple must be placed adjacent to the service thermocouple with the two junctions within 2 inches of each other. The test results of the instrument, thermocouple, and protection tube checks must be appropriately logged. The date that a given thermocouple or protection tube is replaced must be recorded. Service Thermocouples should be checked in place at their normal operating temperatures (not by removing the thermocouples from the normal operating temperature and checking them at a lower temperature).	Item # 2.0 of the applicable Process Table	Test TC placed in same protection tube. Certifications provided. TC replacement dates recorded. TC checked in furnace at operating temperature.		YES		
Microstructure (pg 17, 22)	At the minimum, microstructure must be checked @ 100X and 500X. Visual standards are required. Results must be recorded.	Item # 4.0 of the applicable Process Table	Microstructure checked up to 1000X. Examples Microstructure Ref. Microstructure log.		YES		

Hardness (pg 18, 23)	- When tempering is done immediately after the quenching, the testing may be done after tempering rather than after both quenching and tempering. The heat treater shall maintain average and range or other statistical charts as appropriate for hardness to detect trends in the process and to serve as a quality record. File, Rockwell, or Brinell scale shall be used as indicated on the Engineering Drawing unless the affected Product Engineering Office permits the use of an alternative hardness scale and the change is noted in the control plan. Surface hardness testing with files (refer to SAE J864), where an indentation hardness test is not specified and/or for purposes of correlation, shall only be used if authorized by the affected Ford Supplier Technical Assistance (STA) engineer. When checking the hardness tester with certified blocks the distance between the centers of two adjacent indentations shall be at least three times the diameter of the indentation and the distance to the edge of the test piece shall be at least two and a half times the diameter of the indentation.	Item # 4 of the applicable Process Table	Hardness data stored electronically. Rockwell hardness used, scale based on part requirement. Files are not used. Hardness test blocks are used in accordance with ASTM E-18.		YES		
Case Depth (pg18, 23)	Case depth checks may be made on production parts or test bars provided correlation to production parts has been established. However, case depth for induction and flame processes must be checked on production parts. Case depth records shall be maintained on average-range or other statistical charts as appropriate to detect trends in the process and to serve as a quality record.	Item # 4 of the applicable Process Table		N/A			
Induction/Flame Pattern (pg 23)	The surface and cross-sectional pattern shall be checked as required by the Engineering Drawing or in-process specification.	Item # 4 of the Process Table D		N/A			

The objective of CQI-9 and WHTX is to define the requirements and to encourage Best Practices which will assure a quality part as well as promoting continuous improvement relative to quality and productivity. Exceptions to the CQI-9 and WHTX requirements or reductions of sampling strategies for control of heat treating processes may be used, provided they afford adequate protection of a process currently proven to be stable and capable, and have the concurrence of the affected Ford Supplier Technical Assistant (STA) engineer and/or Quality Planning Team and are documented in a control plan.