**Stress & Hydrogen Embrittlement Relief Oven Checklist (ref. AMS 2750D)**

*Note: Ovens must meet the temperature uniformity requirements of AMS 2750D for Furnace Class 5 (± 25⁰F), Instrumentation Type D, unless more stringent requirements are specified.*

1. Are temperature uniformity surveys (TUS) performed quarterly on processing ovens?

(Note: Frequency may be reduced to twice/year after 4 consecutive successful surveys.) Reference Table 8, page 37.

2. Are system accuracy tests (SAT) performed twice/month on temperature control and recording systems? (Note: Frequency may be reduced to monthly if a preventive maintenance program for ovens is in effect.) Reference Table 6, page 35, and para. 3.4.2.

3. Is the SAT performed using a test instrument meeting the requirements of Table 3, and a test sensor meeting the requirements of Table 1 (3.4.1.1)?

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| --- | --- | --- | --- | --- | --- |
| Instrument | Instrument Type | Maximum  Calibration  Period  (Months) | Standard | Calibration Accuracy | Use |
| Field Test  Instrument | SAT/TUS Portable potentiometer or digital instrument, electronic data recorder, or data  acquisition system | 3 | Primary or  secondary  standard | ±1 °F (±0.6 °C) or  ±0.1% of reading in °F, whichever is  greater | Limited to controlling,  monitoring, or recording  instrument calibration,  performance of system  accuracy tests, and  temperature uniformity  surveys |

Table 3 excerpt:

Table 1 excerpt:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sensor | Sensor Type | Use | Calibration | | Maximum Permitted  Error |
| Period | Against |
| System  Accuracy  Test | Base or  Types B, R,  and S noble  metal | System  accuracy tests | Before first use.  Recalibration:  6 months - Types B, R, & S  3 months - Types J & N  not permitted - other base metal | Primary or  secondary  standard | Base metal ±2 °F (±1.1 °C)  or ±0.4%  Noble metal ±1.0 °F (±0.6 °C)  or  ± 0.10%, Type R, S  ± 0.25%, Type B |

NOTE: Recalibration of any expendable base metal test thermocouples (SAT or TUS) is prohibited. **Reuse is permitted so long as "U" in the following formula does not exceed 30.** A “use” for test thermocouples is defined as one cycle of heating and cooling the thermocouple. U = Number of uses below 1200 °F + 2 times number of uses between 1200 °F and 1800 °F. Expendable base metal test thermocouples shall be limited to a single use above 1800 °F. (3.1.1.10)

1. Do SAT test sensors (thermocouples) have a certificate of compliance that identifies the source of the calibration data, nominal test temperature, actual test temperature readings, calibration technique, and correction factor for each calibration temperature traceable to NIST or other recognized National Standard; and does the calibration technique comply with ASTM E 220, ASTM E 207, or other national standard? (3.1.1.1)
2. Is there a written procedure for controlling the replacement of SAT test sensors, including limits on maximum life and/or number of uses? (3.1.1.4.1)

6. Do system accuracy test records contain the following information (3.4.6.1):

Identification of the sensor being tested

Identification of the test sensor

Identification of the test instrument

Date and time of day of the test

Observed control or recording instrument reading

Observed test instrument reading

Test sensor and test instrument correction factors

Corrected test instrument reading

Calculated system accuracy difference

Indication of test acceptance or failure

Identification of technician performing the test

SAT company (if not performed in-house)

Signature of the calibration company representative (if not performed in-house)

Quality Organization approval.

7. Does the oven chart recorder have a maximum resolution of 250F per inch of chart paper, and a maximum chart recording increment of 10F? (3.2.2.1)

8. Is the chart recorder (circular and strip) speed verified annually, and is it accurate within ± 3 minutes per hour (3.2.5.4)?

**Definitions**

**SYSTEM ACCURACY TEST (SAT).** An on-site comparison of the instrument/leadwire/sensor readings or values, with the readings or values of a calibrated test instrument/leadwire/sensor to determine if the measured temperature deviations are within applicable requirements. Performed to assure the accuracy of the furnace control and recorder system in each control zone.

**TEMPERATURE UNIFORMITY.** The temperature variation (usually expressed as ± degrees) within

the qualified furnace work zone with respect to set point temperature.

**THERMOCOUPLES, EXPENDABLE.** Those thermocouples made of fabric or plastic covered wire. The wire is provided in coils or on spools. Insulation usually consists of glass braid, asbestos, or ceramic fiber cloth on each conductor plus glass braid overall.

**THERMOCOUPLES, NON-EXPENDABLE.** Those thermocouples that are not covered with fabric or plastic insulation. One type consists of ceramic insulators over bare thermocouple wire, sometimes inserted in a tube for stability and protection. A second type consists of a combination of thermocouple wires, mineral insulation, and a protecting metal sheath compacted into a small diameter.