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Understanding and Conquering CQI-9 3rd Edition: Thermocouples (Part One)

New Requirements and Changes identified and explained

by: Darrell A. Rydzewski

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CQI-9 3rd Edition is improved. The most standout change is the removal of AMS2750 references.

On December 08, 2011 at the AIAG Headquarters in Southfield, Michigan, the third edition of CQI-9 was formally released to an audience of anxious automotive heat treaters.

Generally speaking, and understandably so, the concerns were about the impact this new revision of CQI-9 would have upon their heat treat operations and what, if any, costs would be associated with these changes.

In this series of articles I would like to discuss those changes made in the third edition of CQI-9 specifically relating to Pyrometry requirements and what impact these changes will have on the automotive heat treater.

Introduction to Thermocouples

To begin, let's explain where one will find the Pyrometry requirements of CQI-9 3rd Edition. They are referenced in three areas; the Heat Treat Assessment Questions, Section 3 Equipment; the Process Tables A through H, Item 2.0 Pyrometry; and in Sections 3.1 through 3.4, Thermocouples, Instrumentation, System Accuracy Tests and Temperature Uniformity Surveys.

This initial article will focus on the requirements established for Thermocouples as detailed in Section 3.1.

What's Changed?

Perhaps the most obvious change to the Pyrometry requirements of CQI-9 3rd Edition is the elimination of any reference to AMS2750D.

In previous editions of CQI-9 it was the intent to reference specific sections of AMS2750D that not only represented a best practices approach to Pyrometry, but were also well suited to the automotive heat treat market segment.

Unfortunately, this abbreviated reference to the AMS2750D Pyrometry specification was not always easy to follow and at times did not provide adequate direction or worse, resulted in conflicting requirements.

With CQI-9 3rd Edition this has changed. Through the use of Tables, Illustrations, concise text and an expanded Glossary of terms the automotive heat treater will find the Pyrometry requirements far easier to understand than previous editions.

New to this edition of CQI-9 is the requirement that external sources providing calibrations shall be accredited to ISO/IEC17025 or other national equivalent. Internal sources providing calibrations needn't be accredited to ISO/IEC17025 however the calibrations they provide must be done so in accordance with the intent of ISO/IEC17025 or other national equivalent.

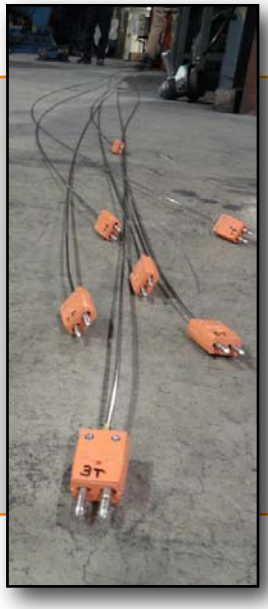

Table 3.1.1 to Table 3.1.5 is where you will find all requirements for your sensors in CQI-9 3rd Edition

While this may be new to CQI-9, this has been a requirement of TS16949 (and QS9000 before that) since its inception and therefore doesn't really represent a "new" requirement for the automotive heat treater.

Other modifications to Section 3.1 do not reflect any drastic changes rather they reflect attempts to clarify and simplify the requirements of thermocouples and their usage.

For example, in CQI-9 3rd Edition base metal thermocouples (e.g. Types J, K, N and T) shall not be recalibrated. In prior editions of CQI-9 under certain circumstances Type N and Type J base metal thermocouples could be recalibrated.

This modification simplifies the rules for recalibration of base metal thermocouples and, since most heat treat operations that utilize base metal thermocouples use Type K, the change is fairly inconsequential and essentially has no cost impact.

Another modification helping to simplify things is the elimination of spool length requirements for calibrated thermocouple wire. In previous editions of CQI-9 one first had to consider the intended use for the thermocouple wire and then abide by spool length restrictions appropriate for that intended use and then determine whether the spool needed to be calibrated at one end or both ends.

In CQI-9 3rd Edition we only need to satisfy the thermocouple accuracy requirements as specified in the Section 3.1 tables, however, new to this latest edition of CQI-9, both ends of the spool shall be calibrated.

Another clarification point in CQI-9 3rd Edition is that the date any thermocouple is placed in service shall be documented. However, prior editions of CQI-9 required a time based replacement of control, monitoring, recording and some test thermocouples and, although not specifically stated in prior editions of CQI-9, this requirement essentially did make it necessary to document the "placed-in-service" date. Subsequently, there really isn't any change here.

A welcome change made to this latest edition of CQI-9 is the establishing of an easy to understand "grace period" for all calibrations. In previous editions of CQI-9, because of the reference to AMS2750D, this requirement was not particularly clear. Now that "grace period" has been established as two weeks, end of story.

The remaining changes in CQI-9 3rd Edition regarding thermocouples can

In the NEW CQI-9: Thermocouples

- **NO reference to AMS2750**
- **Base metal thermocouples shall not be recalibrated**
- **Spool length restrictions have been removed**
- **Easy to Understand Calibration "Grace Period" established**
- **For complete list See Table 3.1.1 through 3.1.5**

Quarterly Industry Newsletter
CSINQUIRER

CSinquirer
Quarterly Industry Newsletter
Vol. 1, No. 3 April 2012

be found in Tables 3.1.1 through 3.1.5. Heat treaters should find this table format very practical and helpful for easily determining the requirements for calibration, accuracy, usage and replacement requirements for all thermocouples.

No longer are there multiple accuracy requirements for thermocouples to be used in the field. Regardless of their type, whether base or noble, their intended use, whether for system accuracy tests, temperature uniformity surveys, control, monitoring, recording or load thermocouples, the accuracy requirement is ±2ºF (1.1ºC).

Limitations on thermocouple re-use are now clearly stated. No "U" formulas to consider, no calculations to perform, just a quick look-up in Table 3.1.5. Replacement frequencies for our control, monitoring and recording thermocouples have remained pretty much the same, except now CQI-9 3rd Edition clearly states that the heat treater may recalibrate his noble metal sensors each two year period in lieu of replacement.

Naturally the heat treater will need to refer to these tables often to determine the requirements for their specific situation but the answers to their questions will be surprisingly easy to find. Another welcome change.

Conclusion

In conclusion, through the use of concise wording, coupled with the use of multiple tables, CQI-9 3rd Edition has made the requirements for thermocouples much easier for the heat treater to understand. Further, the changes made to these requirements allow the heat treater to reduce the costs associated with their usage.

In the next issue of the CSinquirer we will discuss those changes concerning Instrumentation in Section 3.2 of CQI-9 3rd Edition.

In the meantime, if you should have any questions concerning the requirements of this latest edition of CQI-9 don't hesitate to e-mail me.

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About the Author

Darrell A. Rydzewski
President
Controls Service, Inc.

Darrell Rydzewski has over 40 years experience working with process controls, heat treat and quality standards within the automotive and aerospace industries. He got his start at the Industrial Process Controls Group of Honeywell in 1972. Mr. Rydzewski joined Controls Service, Inc. in 1984 and was made President in 1992. Mr. Rydzewski was also a presenter at the roll-out of CQI-9 3rd Edition at AIAG Headquarters in Southfield, MI.

Email questions to:
CSi@ControlsService.com