What You Need to Know about Pyrometry Essentials

Problems around the control of furnaces, ovens and thermal equipment are probably the single most common strand of Non-Conformance Reports in Nadcap audits.

This means that people either do not understand or they ignore the Pyrometry rules which apply to the process.

In Aerospace, the rules for the management and control of thermal equipment are provided in AMS2750. Originally written for Heat Treatment, this document is now widely referenced as it gives the common requirements for Pyrometry – the control and management of thermal processes. The document is still written around the control of Heat Treatment of Metals for Aerospace, but it is used for thermal processes in fields as diverse as NDT, paint drying and composite curing in industries ranging from automotive to medical.

AMS2750 is both very simple and quite complex at the same time. Pyrometry covers the use of sensors and instruments that measure, control and record temperature. It covers the required accuracy of the sensors and instruments individually and also when combined into a system. Finally it includes assessing and managing the uniformity of the work zone within the equipment.

That is all relatively simple. However, it is the breadth of heat treatment processes that cause the complexity. Thermal processes cover temperatures from under -100F/-80C to over 2400F/1300C with process times ranging from less than 1 minute to over 120 hours. When we add in the variety of furnace constructions, heating systems and work-zone geometries it is easy to see that the rules can get very complex and become difficult to interpret.

To address this, eQuaLearn has long offered a two-day course called Introduction to Pyrometry. This course aims to lead attendees through the standard, explaining all the rules and clarifying known issues and problems. It is aimed at those who need a full understanding of the rules in order to manage Pyrometry and perform all the required testing.

In over ten years of presenting Introduction to Pyrometry, we have often found that some people do not need all the details. Some are reluctant to spend two days in a class when they feel they only need an ‘overview’. These are the people who have some responsibility for Pyrometry, but only need to know the basics, plus where and when special rules apply. They need to know the questions to ask, and what ‘right’ should look like, but do not need to be doing the work themselves. Typically this would include those who use sub-contractor service companies to carry out all the work.

That is the aim of eQuaLearn’s Pyrometry Essentials course. It is a one day course aimed at people who do not have day-to-day roles in managing the process, but need to understand enough to recognise when questions and problems exist. That would include managers, supervisors and technical people on the periphery of the process. Typically it also includes those who use sub-contractor service companies to carry out all their Pyrometry work. These heat treating companies are still responsible and need to know enough in order to talk to and supervise the sub-contractor.

The course also serves as an introduction for those who may be starting to work in Pyrometry but are not yet taking responsibility for anything.
So, which course to choose? Differentiating the two courses is difficult since the list of materials covered looks, and is, identical. However they are covered at different levels. In *Pyrometry Essentials*, the material under each heading explains what is needed generally and identifies where additional rules or actions may be relevant. Those additional aspects are not covered and are left to the full two day course.

As an example, under Temperature Uniformity Surveys, there are a number of variations of the method that can be applied to different furnaces – especially to salt baths and continuous furnaces. The full two day course explains the rules in detail with examples. The *Pyrometry Essentials* course indicates that rules exist and what they cover, but without going in to detail as to how they must be applied and the records needed to demonstrate compliance.

*Pyrometry Essentials* introduces the essential requirements of AMS2750 for aerospace thermal processes. It describes how to classify equipment so that the correct rules can be applied. It then explains what is critical in managing sensors and instruments. The importance of, and essential methods for, System Accuracy Testing are explained. Under Temperature Uniformity, the basic rules for performing a survey are presented along with some of the typical errors and misunderstandings. Where additional rules or requirements exist, these are indicated and highlighted.

After taking the course, attendees should be capable of discussing and reviewing overall Pyrometry requirements with practitioners and sub-contractors as well as monitoring the existing Pyrometry systems and results.