KEITH
High Temperature Thermal Processing Systems
ISO 9001:2008 Certified

Minimizing Liability in Heat Treat Processes

Ask any top tool shop owner and they will tell you that heat-treatment of semi-finished tool steel parts is an operational risk. They will also tell you that the best way to mitigate the risk is by employing technology that ensures confidence in the process. Process confidence begins by utilizing quality furnaces built to an AMS2750E standard in combination with a process recorder.

The AMS2750E standard ensures that the furnace being used meets the pyrometric requirements as stipulated by aerospace material process specifications. This means that all components in the furnace related to pyrometry have been qualified, and the furnace is operating within a known temperature uniformity range. As an example, an AMS 2750E Class 1 furnace has a temperature uniformity of ± 5 °F. This value is confirmed, documented, and traceable to the last temperature uniformity survey performed on the furnace. An AMS2750E qualified furnace removes any doubt that the furnace is operating at the programmed temperatures and within the specified temperature uniformity.

The process recorder provides concrete data (evidence which can also serve as a process conformity certificate) that the furnace has properly executed the programmed time and temperature curves for the material being heat-treated. If an error does occur for example, in the form of diminished soaking time, it can be immediately identified based on the recorded process data. Alternatively, the same error would be nearly impossible to detect in a finished part since the surface would most likely be to the desired hardness; however, the core would remain soft.

It is not uncommon that a tool shop hardening furnace is charged with several thousand or even tens of thousands of dollars in semi-finished parts. Improper heat treatment can turn a profitable project into a negative-sum fiasco at the push of a button. Unlike a machining operation the heat-treating processes allows the tool maker little control beyond programming the ramp soak parameters. What happens after that is dependent on the furnace quality.

The consequences of an improper heat treatment can reach far beyond a furnace full of scrap parts. Improperly heat-treated parts are difficult to detect because parts are subjected to a Rockwell hardness test and visual inspection. The hardness test and visual inspections can detect surface hardness and superficial flaws, but are ineffective at detecting a myriad of other problems resulting from heat-treat errors that occur within the part's material. This makes it easy for flawed parts to find their way out of the shop and into very expensive tooling assemblies. Once installed the flawed parts can fail catastrophically resulting in significant cost and liability issues, not to mention loss of trust and credibility for the supplier.

It is important to employ equipment that can precisely implement, monitor and record process values throughout the heating cycle. Based on the recorded data and qualified furnace pyrometry the tool maker can be confident that the process was carried out correctly.

When selecting your next tool shop furnace please give us a call. We welcome the opportunity to allow our experience to work you.