

# Heat Treat Checklist

Following is a list of questions that should be asked to determine if your heat treater has his process under control and his equipment properly maintained.

## *Control of operation*

- Is the overall operation in control?
- Are written instructions, operating procedures, and all rules and regulations being used on a daily basis, or do they exist only for show?
- Are all procedures understood by the workforce, or only by management?
- Are the heat treat practices being used effective?
- Is maintenance planned (predictive maintenance), or does it occur only when machinery breaks?
- What types of quality control checks being made on the furnace (daily, weekly, monthly, semi-annually, annually)?

## *Parts preparation*

- How effective is the precleaning of parts?
- Are the incoming parts clean?
- How are they being cleaned?
- How effective is the cleaning method?
- How well is it controlled?
- How often is it monitored?
- Is a bath chemistry check performed?
- How often are the washers monitored for proper concentration and pH?
- How are the washers being cleaned?
- Are oil skimmers in use and are they properly maintained?

## *Furnace inspection*

- How often is the furnace inspected?
- What method(s) is used?
- What are the criteria for acceptance?
- How effective are the inspections?
- Are they frequent enough?
- Does the atmosphere flow fluctuate or remain steady?
- What method is being used to check the furnaces for leaks?
- What type of thermocouple is being used?
- Are they adequate for the temperature range being run?

- When maintenance is performed on thermocouples, are their insertion depths per equipment manufacturer's recommendations?
- Has the insertion depth of the thermocouples changed since the temperature uniformity survey (of the workload area) was performed?
- Are the protection tubes alloy or ceramic (high-nickel alloys act as catalysts and will cause errors in carbon potential, especially in computer controlled systems)?
- Are radiant tubes checked frequently for leaks (cracks), and are the seals checked to avoid making atmosphere control more difficult?
- Have the position of the pilot and flame curtains (flame screens) near exit doors been properly adjusted to ensure they are not under the part trays, where if a tray stopped in this location, the parts could be tempered back?

## *Quench system control*

- How is the quench oil being monitored?
- How is the quench oil being controlled?
- Is the degree of agitation sufficient for the quenching operation being performed?
- How often is the quench media analyzed (in-house or outside)?
- How is the quench media checked for particulates?
- Is the motion of the elevator (batch furnaces) smooth and quick (2-3 s being typical)?
- How often is the quench tank serviced?
- How much drag out (removal) of quench media occurs?
- What is the transfer time of the workload to the quench?
- What type of quench tank maintenance is performed and how often?
- Are trays, baskets, screens, and other fixtures/racks being inspected?
- Is proper inspection and maintenance of tray sensors and "flippers" (if trays are pushed) being performed (if they are cracked or sticking, trays will be pushed from only one side causing "pile ups" in the furnace)?