

Metalworking Machines

Metalworking Machines - Heat-treating

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What should you know before participating in heat-treating operations?

During heat-treating operations, the metal is subjected to heating or cooling to acquire specific properties from that metal.

Heat-treating operations require a quench as an integral part of this process. Quenching is a process that quickly cools the metal. Liquid quenches normally involve the use of mineral oils, water-based solutions or molten salt. Less severe quenches use circulated gases or forced air, or involve cooling in still air.

Quenching operations pose various health and safety hazards to workers. These hazards include exposure to chemicals, working in high temperatures, and the risk of fire or explosion.

Consider the properties of the quenchants plus the design, construction, location, control, monitoring and maintenance of the furnace itself to minimize these risks.

Quenching operations are often followed by degreasing with chlorinated solvents or water-soluble compounds.

Only operate heat-treating equipment when properly trained.

Please refer to the OSH Answers [Metalworking Machines - General](#) for safety tips and [Metalworking Fluids](#) for more information.

What are some safety precautions to follow during a heat-treating operation?

- Wear a CSA-certified face shield, CSA-certified safety glasses, appropriate gloves, and heat-resistant protective clothing when working with hot metal. Quench oils may be very hot (above 100°C), and the oil temperature increases during the quenching process. Splashes or skin contact cause burns. Avoid skin contact with oils by using gloves and protective clothing.
- Check that all safety devices, such as automatic shut-off valves, air switches, and exhaust fans are working properly before lighting the furnace.
- Make sure the volume of the cooling medium is sufficient for the job. As the metal cools, the medium absorbs the heat. If there is not enough medium, it will become too hot to cool the metal at the desired rate.
- Make sure that quenching areas have enough ventilation to keep oil mists at recommended levels.
- Follow the manufacturer's instructions when lighting the furnace.
- Stand to one side when lighting a gas or oil-fired furnace.
- Make sure that water does not contaminate the quenching oil. Any moisture which comes in contact with the oil can cause an explosion.
- Use the proper tongs for the job and make sure the tongs are dry before removing any work from a liquid carburizing pot.
- Ensure that a suitable bacterial inhibitor or fungicide has been added to the quenching liquid.
- Cover quench tanks when not in use.
- Clean up oil spills and leaks immediately using a nonflammable absorbant.
- Keep work areas, jigs, baskets, and tools free from oil contamination where possible.
- Wash hands thoroughly after work, at breaks (particularly meal times), before starting other tasks, or before using the toilet.
- Get first aid for all injuries, including cuts and abrasions.
- Report to your supervisor and get medical attention when suffering from, or if you suspect, skin trouble.

What are some things you should avoid doing?

- Do not inhale the fumes from a molten carburizing salt bath. During the carburizing process, carbon monoxide is generated. Ensure that this area is well-ventilated. These molten salt baths may contain potassium or sodium cyanide, a deadly poison. Handle the salt mixture with caution and watch for contamination from carburized metal pieces.

- Do not wear oil-soaked clothing or put oily rags in your pockets.
 - Do not bring food or drink into areas where quench oils are stored or used.
 - Do not wear or take oil-contaminated clothing or equipment into areas where food or drink are consumed.
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