INTRODUCTION

Dip brazing (DP) is one of the oldest brazing processes. The process is comprised of two basic variations: (1) dipping or immersing the assemblies to be brazed in a molten brazing filler metal, termed molten-metal dip brazing, and (2) dipping the assembly to be brazed into a molten salt, termed chemical-bath dip brazing. In both cases, the temperature of the bath is below the solidus of the base metal but above the liquidus of the brazing filler metal. Whereas dip brazing in molten metal is limited in application, chemical-bath dip brazing in molten salt is widely used for the brazing of aluminum, copper, and ferrous alloys.

MOLTEN-METAL DIP BRAZING

Molten-metal dip brazing is used primarily in the electronics industry to braze wire and small components. One way to apply molten brazing filler metal from a molten bath is to coat the assembly with flux by either dipping or spraying and then thoroughly drying prior to placing the assembly into the molten brazing filler metal.

A second method of molten-metal dip brazing involves first immersing the assembly into a molten flux bath and then into the molten brazing filler metal. Molten flux may also be used to cover the molten metal. In both of these techniques, the molten brazing filler metal flows into the assembled joints by capillary action to produce the brazed joint, simultaneously coating all surfaces of the assembly that are submerged in the molten metal.

CHEMICAL-BATH DIP BRAZING

A large bath or tank of molten flux is constantly kept at brazing temperature for dip brazing. This compares to the minute amounts of flux applied per joint in other brazing processes. When the assembly is dipped into the bath, the molten flux, usually a salt mixture, not only heats the components and brazing filler metal to brazing temperature but also fluxes the surfaces of the base metals and brazing filler metal for wetting and flow. Complex assemblies can be brazed; however, all surfaces are coated with flux, which must be removed before finishing and service.

The predominant dip brazing process is aluminum dip brazing in which molten salt serves as the flux. In ferrous and copper-alloy dip brazing, the molten salt generally does not have fluxing properties.

ADVANTAGES AND LIMITATIONS

The advantages of chemical-bath dip brazing include the following:

1. Strong, smooth, continuous joints are formed quickly;
2. Selective brazing is practical;
3. A large number of joints in a unit may be brazed simultaneously;
4. Extremely thin gauge aluminum can be brazed;
5. Section sizes from less than 0.002 inches (in.) to over 2.5 in. (0.05 millimeters [mm] to 63.5 mm) thick can be brazed;
6. Rapid and uniform heating rates are possible;
7. Metal surfaces are protected from oxidation during the brazing operation by a film of salt;
8. The rate of heating in a salt bath furnace is four to five times faster than that in an atmosphere furnace. Shorter time cycles and faster heating reduce the risk of degradation; and
9. The buoyancy provided by the molten flux minimizes the distortion or collapse of fragile assemblies.