Automated Flame Brazing of Multi-Joint Assemblies

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Introduction

Historically, much of the brazing of multi-joint assemblies has taken place in the furnace. Lengthy slow-ramping heat cycles allow the parts to come up to temperature in a consistent, even manner. These same parts can be flame brazed in a fully automated system in a fraction of the time.

Discussion

There are several basic types of multi-joint assemblies. The first type has many joints of the same configuration. To the casual observer, the assembly with many joints of the same configuration should pose no challenge to the trained braze operator. This, however, is not the case. Although, the tubes and pierced holes may be of the exact same dimensions and the filler metal may be applied in precise increments, the various joints reside in distinctly different environments that influence the amount and nature of the heat they come into contact with. Marine oil coolers, heat exchangers and trumpet valve assemblies are examples of multi-joint assemblies that contain many joints with the same configuration.

The second type has several different joint configurations on one assembly. This type, is handled as individual joints that happen to be in close approximation to one another. Can assemblies, tub faucet assemblies and torch handles are examples of multi-joint assemblies with different joint configurations on one assembly.

Key Points

The key factors involved in the automated flame brazing of multi-joint assemblies are the application of the paste, the fixturing of the parts, and the application of the heat (including burner types). These same factors come into play in all types of brazing, but with multi-joint assemblies the processes are further complicated by the number and type of joints involved.

The application of the paste is generally more challenging due to the close proximity of the joints. The joints may also lie in different planes, so the positioning of the paste dot is very important. Paste applicating is done by hand syringe, a paste gun mounted on a slide, an xyz applicating system or by robot arm. Applicator performance isn't the only issue to be considered, cost is also an important factor.

The fixturing is also an important issue. As was mentioned, the joints are likely to lie in more than one plane. So, the fixture must not impinge on the flames and the flame wash unless that is the desired effect. The fixture must also heat sink the part where required and eliminate all heat sinking where it is not specifically needed.

The final issue is the application of the heat. Many different burner types are available which allow the heat to be of a pinpoint nature while others are more diffused. The distance the burners are away from the part is also important. Multi-joint assemblies often require either a rotation of the part or oscillation of the part or the heat source in order to bring the part up to temperature evenly and rapidly.

Conclusion

By considering each of these important factors and setting up the process parameters based on all applicable considerations, a very consistent process will result.