Brazing Troubleshooting

Introduction

Silver brazing allow is probably the most versatile of all the metal-joining processes available. An extensive range of similar and dissimilar parent metals can be joined permanently, provided the fundamental requirements of the processes are observed. However, even when engineers are convinced that they have followed the basic principles for successful silver brazing, there are still cases where they meet difficulty in the execution of the joint, or find that the joints do not, for some seemingly inexplicable reason, perform as they should.

The recommended action is to contact the technical team at Thessco Limited to see if we can offer assistance. The first questions we will ask are:

1. Are the parent metals clean (oxide and oil/grease free)?
2. Are you using the correct brazing alloy for the components being joined and their subsequent application?
3. Are the correct flux for the brazing alloy and brazing process being used?
4. Is the correct heat pattern on the parts to be joined being used?

Typical defects – causes and remedies

Defect	Possible cause	Remedy
Brazing alloy fails to wet either joint surface.	a) Gross surface contamination b) Ineffective fluxing action c) Refractory oxide formation	a) Examine cleaning procedures b) Check grade – increase amount used c) Seek expert advice

Brazing alloy fails to wet one joint surface	a) Gross surface contamination b) Refractory oxide formation c) Unsatisfactory heat pattern d) Badly fitting preform	a) Check cleaning procedure b) Seek expert advice c) Apply heat to heavier component. d) Use spring fit to bridge joint gap
Failure of brazing alloy to flow smoothly (joint is rough and fillet uneven)	a) Badly fitting components b) Uneven heating c) Poor joint ventilation d) Ineffective fluxing e) Overheating f) Liquidation (liquid/solid) separation	a) Check consistency of joint clearances. b) Raise whole joint to temperature simultaneously. c) Ensure gases have adequate escape route. d) Check grade – increase amount used. e) Adjust temperature close to liquidus. f) Increase heating rate or use narrow melting range alloy.
1. VOIDS Porosity in joints: (obvious gaps)		
	a) Excessive variable clearances. b) Insufficient or uneven heating c) Poor joint ventilation	a) Tighten or adjust tolerances b) Adjust heat pattern or time cycle c) Provide vents for escape of gas
2. BLOWHOLES (rounded shiny interiors)		
	a) Hydrogen pick-up molten alloy b) Flux entrapment	a) Adjust flame to neutral/slightly oxidising b) Check clearances and heat pattern
3. SHRINKAGE (usually in centre of fillet)		
	a) Excessive local tolerance b) Localised overheating c) General overheating d) Excessive freezing range alloy	a) Modify dimensions b) Balance up heat pattern c) Reduce time cycle d) Use short range grade.
Cracking in body of brazing alloy (usually near centre of fillet)		
	a) Thermal stresses on cooling b) Contamination of brazing alloy	a) Ensure that highest thermal expansion material is on outside of joint b) Seek expert advice
Failure at joint surface (usually close to one parent metal)		
	a) Contamination of surface concerned b) Formation of brittle layers c) Interfacial corrosion (stainless steel only)	a) Examine cleaning procedures b) Seek expert advice c) Seek expert advice