Highly accurate manufacturing of complex aluminium parts employing vacuum brazing: role of surface preparation

What is vacuum brazing?

Vacuum brazing is a joining technology where two or more solid parts are connected through an intermediate layer of a filler material with a slightly lower melting point in a vacuum environment. The materials are placed in contact with each other after proper surface preparation and brought to a temperature just above the melting point of the filler material, where it spreads over the joint area through capillary action. After cooling down a well-joined product is realized. Vacuum brazing is an interesting approach for the manufacturing of complex parts where dimensional tolerances are important or where many parts should be connected (for example: aluminium heat exchanger).

What is the problem?

Vacuum brazing takes place at high temperatures requiring good surface preparation and excellent process control. Brazing surfaces need to be smooth and clean. In case of aluminium parts, the part surfaces often undergo chemical treatments to remove the tenacious aluminium oxide layer. However, reoxidation of the surface cannot be avoided and can hamper the formation of a reliable joint. It is not yet clear what degree of surface oxidation is allowed (oxide layer thickness). Furthermore, there is a need to use more environmentally friendly cleaning methods, but their ability to safeguard a sufficiently clean surface has not been established.

MSc assignment

In this MSc assignment you will study the vacuum brazing process and develop a deeper understanding of the main phenomena that determine the joining process. You will concentrate on the cleaning and joining process. The research is done in close cooperation with NTS Norma in Hengelo who has state-of-art vacuum brazing facilities.

More information

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