

Abstract

„Resistance implant welding of thermoplastic carbon fibre reinforced structures“

Freist, C. Dipl.-Ing.

Keck, R. Dipl.-Ing.

Voggenreiter, H. Prof. Dr.-Ing.

DLR Stuttgart

Pfaffenwaldring 38-40

0711-6862 8002

Carsten.Freist@dlr.de

The integration of fibre reinforced composites in primary structures is incessantly important for Aircrafts to stay competitive – economically and technically. Carbon fibre reinforced high-performance thermoplastic matrix systems, such as PEEK (Polyetheretherketone), have a high potential not only for impact, strength or stiffness but also enable thermal joining. Joining is an issue, as traditional joining technologies are not suitable for composite structures. Fusion bonding or welding offer fibre equitable alternatives compared to traditional joining technologies.

This paper focuses on the resistance implant welding technology. Resistance implant welding is a fast, flexible and reliable process, which has a high economical potential. For the process a conductive insert is trapped between the two parts to be joined. An electrical current is then circulated in the insert and its temperature rises by resistance heating.

One main aspect of this paper is the use of different types of metal-based heating elements. Metal-based heating elements enable amongst others higher process quality and repeatability compared to carbon fibre based heating elements. The examinations include a study of the properties of the heating element, which have a direct influence on the process parameters as well as on the mechanical properties. Carbon fibre reinforced structures cause further problems, resulting in critical process steps, like the heating up or in physical effects like the electro-chemical isolation between the heating element and the bulk material, which are also addressed in this paper.