

Scope of Work

Hybrid friction diffusion bonding (HFDB), originally developed at HZG for joining of thin layers can be successfully applied on other joining geometries by slight modification of the process management. During HFDB, plastic deformation, process temperature and process forces are used to produce a combined friction and diffusion welded joint. Within the scope of our basic research, the suitability of HFDB as a future joining process in heat exchangers for high temperature applications will be investigated.

Your work comprises of creating single hole geometry tube to tube sheet joints by HFDB and investigating the influence of different tool materials as well as process control strategies on tool life. This includes the preparation of the materials and tools, the set-up of the welding machine as well as the subsequent evaluation of the recorded data (e.g. process forces, process temperatures, etc.).

You will carry out analyses of the tool geometries before and after welding as well as characterisation of the modified material areas by means of metallographic characterisation. Selected welds will be further characterised by e.g. micro hardness tests, tube pull-out tensile tests, as well as leak tightness tests, to determine their mechanical and technological properties.

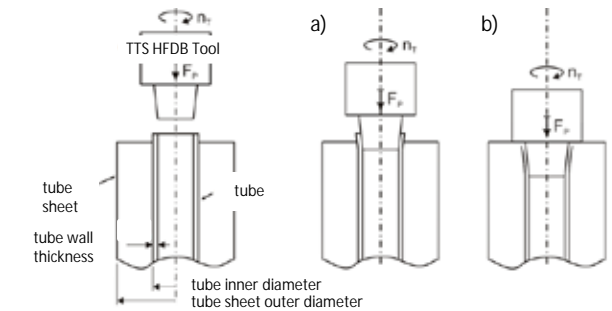
The place of employment would be the Helmholtz-Zentrum Geesthacht.

Tasks

- Literature research (e.g. materials, joining processes, surface activation, diffusion, chemical as well as mechanical wear).
- Development of the experimental design and execution of the desired experiments including data acquisition as well as mechanical and metallographic characterisation.
- Evaluation and presentation of the results as well as documentation of the experimental work (in English or in German).

Contact

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Schematic of the tube to tube sheet (TTS) hybrid friction diffusion bonding (HFDB) process. Two phases characterise the process: a) insertion phase and b) welding phase. Axial force (F_p) and rotational speed (n_r) partially plasticise tube and subsequently tube sheet material, creating a metallic, leak tight joint.



Single hole geometry steel demonstrator for the tube to tube sheet (TTS) hybrid friction diffusion bonding (HFDB) process.

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