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Tue-Af-Po2.23-06 [93]: Experimental Analysis of the Interference-Fit Joining of Aluminium Tubes by Electromagnetic Forming

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This article investigates the main parameters influencing the joint strength of tubular components by electromagnetic compression, more specifically interference-fit (force-fit) by crimping tubes into mandrels. The mechanical parameters considered in this analysis are the remaining residual stress on the mandrel, the joining area and its shape, and the interfacial friction coefficient between tube and mandrel. These parameters are related in a very complex way with electromagnetic compression process parameters, starting with the charging energy and the distribution of the magnetic pressure pulse that triggers the forming process, the initial gap between the joining parts, the material components and geometry, the shape and surface roughness of the mandrel. This work investigates the Interference-fit joining of aluminum alloy tubes AA6082-O with mandrels of different materials and metallurgical conditions (AISI 1045, AA6082-O and AA6082-T6) and, therefore, the process is analyzed by the gradual influence of other process parameters such as the initial gap between joining partners, the energy pulse, the field shaper geometry, the mandrel material and surface roughness in order to manufacture joints of maximum strength. The achieved results indicate that the joint strength and its associated failure mechanism are directly related to process parameters and are an important contribution to the development and industrial implementation of this technology.

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