Postdoctoral fellowship (within European project **JOIN'EM**)

Life prediction and fatigue design of tools for joining by electromagnetic forming

Keywords: Fatigue design, Lifetime prediction, Multi-material systems (metal/composites).

Context

Within European project JOIN'EM, structural components in cooling equipment or electrical devices, currently made completely out of copper, shall be substituted by copper-aluminium hybrid parts. This approach helps to significantly decrease the consumption of copper as a high-cost material, but it necessitates high quality connections of copper aluminium parts. Joining by electromagnetic forming (EMF), also called electromagnetic pulse joining or welding, is a promising innovative technology which is suitable to provide the solution. EMF is a high-speed forming technology using pulsed magnetic fields for forming electrically-conductive tube or sheet metal workpieces.

The tools for EMF joining are made of different materials: conductive parts are metals (Cu, Al) and structural parts are composites (currently glass-fiber). The lack of validated methods for designing robust, durable and efficient tools is limiting the industrial implementation of the technology and accordingly will be main objective of this postdoctoral fellowship. The main task is dedicated to development of an efficient design methodology of EMF tools. The project includes investigation of the tool's materials (mechanical properties and failures), analysis of the existed EMF systems and their manufacturing. Based on the analyzed data the new design solutions which improve the mechanical properties (lifetime) will be proposed. The new design solutions must be validated by numerical simulation and confirmed by testing of prototypes.

Mission of the postdoc

- Computational simulation of the inductor system during joining process (estimation of the mechanical loads acting on inductor).
- Application and implementation of life prediction models for multi-material system (metal-composite) under multi-physics loading conditions (cyclic mechanical loading with temperature effects).
- Analysis of the fatigue experiments for the materials used in the tools.

The candidate

The candidate should have obtained a PhD in solid mechanics, materials science, or any related field. He/she is expected to conduct enriched simulation and modelling. Experience in main aspects of the project is expected from the candidate, i.e. coding and/or scripting, fatigue damage simulation, finite element modeling and material model development (ABAQUS/UMAT).

Laboratory: TPCIM department (Mines Douai, France)(http://tpcim.mines-douai.fr/).
Duration: 12 months.
Beginning: not fixed, no later than November 2015.
Salary: 2665 € gross salary/month, equivalent to 2010 € net salary/month.

To apply, please send a single pdf file including a detailed CV, a full list of publications and a cover letter, to:

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