

Electrically Assisted Forming Simulation Solutions with FORGE®

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Abstract. Electrically coupled processes have proven very effective in the search for optimizing manufacturing processes of metallic components in various industries ranging from automotive or aerospace down to medical applications. The present work reviews the fundamental blocks introduced into the finite elements simulation software FORGE® to deal with electrically assisted forming processes such as electric upsetting and joining, spot welding and capacitor discharge welding. This work has been carried out using intrinsic coupling between the physical blocks defining the charge conservation equation, the energy conservation, the linear momentum equilibrium as well as sophisticated metallurgical databases, High-performance parallel computing and advanced remeshing algorithms to cover large deformations. We also present experimental and numerical studies that have been carried to validate the present model for its two main applications in electric upsetting and resistance welding [1], [2].

- [1] J. Alves, S. Acevedo, S. Marie, B. Adams, K. Mocellin, and F. Bay, “Numerical modeling of electrical upsetting manufacturing processes based on Forge® environment,” *AIP Conf. Proc.*, vol. 1896, no. October, 2017.
- [2] J. Queval, E. Geslain, P. Rogeon, T. Pierre, C. Pouvreau, L. Cretteur, and S. Marie, “Improvement of Weldability of Dissymmetric Assembly With Very Thin Sheet During Resistance Spot Welding,” in *12th International Seminar on Numerical Analysis of Weldability*, 2018.