

Research Topic for the Arts et Métiers ParisTech - CSC PhD Program

Subfield: Mechanical Engineering, Materials

ParisTech School: ENSAM (Ecole Nationale Supérieure des Arts et Métiers) in Metz

Title: Modeling and simulation of the behavior of metal forming machines and processes

Advisor(s): Prof. Régis BIGOT, regis.bigot@ensam.eu
Camille DURAND, camille.durand@ensam.eu

Short description of possible research topics for a PhD: (10-15 lines in English)

Process control in forging operations is essential to ensure the good quality of resulting products. But the problem in forging processes is the difficulty to access directly to product parameter during manufacturing. Thus the understanding of physical phenomena in forging is mandatory. A number of key parameters such as material, temperature and technology of the process should be analyzed in order to find a relation between production equipment, process parameter to control and product specifications. Due to the complexity of the interactions between the different components of the system, the complete process should be modeled. Simulation results would then be compared to representative experimental results. The objective of the thesis could be to develop consistent models of the process, to set up an experimental program to identify process parameters and to validate models with Finite Element simulations. Depending on the skills of the candidate, more or less weight could be given to one or another of these topics.

Required background of the student:

The candidate should have a good background in mechanical engineering and in mathematics, especially in solid mechanics and in materials. Experimental skills and/or experience of Finite Element Method in mechanics or material science would be appreciated. Knowledge of metal forming processes would be very useful.

A list of 5 (max.) representative publications of the group: (Related to the research topic):

C GIRAUD-AUDINE, T.H. NGUYEN, B LEMAIRE-SEMAIL, G ABBA, R BIGOT, Modelling of forging processes assisted by piezoelectric actuators : principles and experimental validation, *IEEE Transactions on Industry Applications*, Vol. 50, n°1, p.244-252, (2014)

Z ALLAM, E BECKER, C BAUDOUIN, R BIGOT, P KRUMPIPE, A generic methodology to improve the control of forging process parameters, *Key Engineering Materials*, Vol. 554-557, p.2138-2144, (2013)

R BIGOT, E BECKER, L LANGLOIS, Some approaches on industrialization of steel thixoforging processes, *Solid State Phenomena*, Vol. 192-193, Chapter 5, p.521-526, (2012)

R Ly, C GIRAUD-AUDINE, G ABBA, R BIGOT, Experimentally validated approach for the simulation of the forging process using mechanical vibration, *International Journal of Material Forming*, p.133-136, (2009)

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:
ali.siadat@ensam.eu AND yvon.velot@ensam.eu