MECHANICAL DESIGN OF A CYLINDER BLOCK BY CONTINUOUS MODELING FROM PROCESS TO LIFETIME

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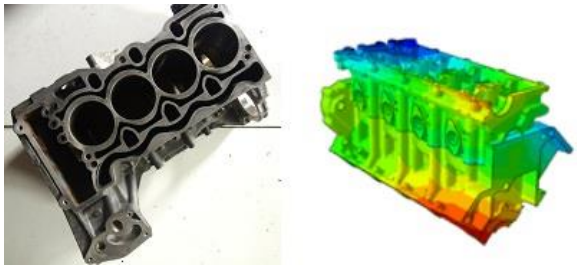

Figure : Cylinder block and its numerical counterpart

- Mechanical characterization of aluminum alloy at high temperature
- Sensitivity study of parameters that may affect the geometric drifts and development of a new constitutive model
- Numerical implementation and comparison with experimental data

Abstract :

The cylinder block has many functions that result in a geometric complexity requiring a die casting process with prior insertion of cast iron sleeves in the mold. Most of the time, cylinder block's failure means the ruin of the powertrain and thus, a special attention is paid to the control of the manufacturing process and the mechanical design protocol. The project aims to provide a robust and continuous modeling of the aluminum alloy behavior during the die casting process and later, under conditions of use.

The first step will be to analyze loadings applied to the structure as well as to characterize the metallurgical state of the material. The second phase of the work will then focus on the development of a mechanical characterization strategy to characterize the behavior during and after quenching. These "extreme" test conditions with respect to the melting temperature of aluminum will require the development of original experimental protocols.

Furthermore, a constitutive model allowing to predict the mechanical response of the structure will be developed on the basis of collected experimental data. The required model must take into account the stress relaxation phenomena over a very wide range of temperature and strain rate. A predictive representation of the deformed shape resulting of manufacturing and evolution during service life must indeed be obtained. Finally, the model will be integrated into the PSA company calculation tools and will be validated by comparison with the measurements made on a real instrumented component.