

## RESEARCH PROJECT:

The aluminum castings are good candidates for many structural components for automotive and aeronautical industries. For these applications are requested high mechanical properties (in particular fatigue resistance) and, at the same time, weight saving. The wheel is one of the most critical component for the automotive engineering due to its function of reliability and safety. As far as the mechanical properties of casting wheels these are influenced by the microstructure (SDAS and casting defects) and the heat treatment. The fatigue properties of castings are largely influenced by the sizes of microstructural defects in particular porosity and oxide films.

The cavity filling and the solidification process are the two most critical aspects to produce high quality casting components. The entrapment of oxide films is influenced by the mold filling, in particular the fluid velocity, the instauration of turbulent flow and the presence of different thickness. The SDAS, the grain size and the size and position of shrinkage porosity are related to the cooling rate and the achieve of directional solidification.

The targets of the research are:

- Investigate the influence of solidification parameters on the microstructure and casting defects by DOE method. Identify which parameters are most decisive and manage the process with the aim to achieve an optimization of the microstructure.
- Research an analytical correlation between tensile elongation and fatigue performance.
- Perform a model to achieve a fatigue life prediction using an artificial neural network.