IT Services

# Case Study

**BlueBEAR** provides a substantial computing resource that properly supports the research work of research staff and students at Birmingham. It provides a cost effective facility that optimises the effectiveness of research and ensures the University continues to be a world-class academic learning and research environment.

## Optimizing the Centrifugal Casting of Gamma Titanium Aluminides

### Challenges

To produce sound and reliable engineering components for the aerospace industry using centrifugal casting process.

### Background

There are increasing demands for the development of energy conversion systems such as engines and turbines with improved efficiency and ecological compatibility. Improving the machines efficiency has the effect of reducing fuel consumption which also reduces the pollutant emissions. The use of light weight gamma titanium aluminides contribute to this goal.

Gamma titanium aluminides are widely recognized as having excellent mechanical properties such as tensile, fatigue and creep strengths at high temperature. The intention of using these alloys is to substitute the heavier Ni or Fe-based superalloys in certain ranges of stress and temperature.

Centrifugal casting is used to fill thin section castings in a variety of conventional alloys, but little research has been carried out to establish a scientific understanding which would allow the process to be applied to more difficult alloys such as TiAl. The high g-force assists in mould filling and may also help to feed the shrinkage during solidification, but these benefits may be partly offset by the surface turbulence during mould filling which may entrain various defects such as bubbles.

### Results

Using ANSYS CFX to model centrifugal casting helped to understand the filling stage for two gating systems: direct and indirect. The results obtained so far for aluminium alloy castings showed relevant differences for both gating systems. However, it is necessary to improve the fluid flow simulations to predict defects founded in real experimental castings.


**Client Profile**
Eduardo Trejo
The University of Birmingham
School of Engineering
Department of Metallurgy and Materials
Birmingham
B15 2TT

Email : EXT716@bham.ac.uk


**Product Used**
Ansys CFX


**Funding**
School of Engineering,
Department of Metallurgy and Materials


UNIVERSITY OF BIRMINGHAM


**For more information:**
BEAR, IT Services
Elms Road Computer Centre (G5)
Edgbaston
Birmingham B15 2TT
Tel: 0121 414 5877
Email: bearinfo@contacts.bham.ac.uk
Website: www.bear.bham.ac.uk