Published on *CD-adapco* (http://www.cd-adapco.com)

Simulation of centrifugal casting via STAR-Cast

Download PDF Version of This Document [1]

Presented at the STAR Global Conference 2012

Centrifugal casting processes are widely employed to manufacture stainless steel components, steel rollers or high precision components involving very thin geometrical dimensions. Due to high centrifugal forces very dense and pure material structures can be obtained.

STAR-Cast?s multiphase approach along with the advanced meshing technology is necessary to predict casting defects like misruns. The first necessary step is to obtain a sharp metal-air front during filling. This is ensured by the state-of-the-art High-Resolution Interface-Capturing (HRIC) scheme. This continuum mechanics based approach is fully coupled to solve simultaneous occurrence of mold filling and solidification. The governing equations are solved in a rotating coordinate system to incorporate rotation rate, Coriolis and centrifugal forces. The resistance the metal experiences is modelled based on Kozeney Carman equation and takes into account the Secondary Dendrite Arm Spacing (SDAS) of the material microstructure.

Input parameters like rotation rate, SDAS or reduced pressure are defined using the STAR-Cast graphical user interface. This presentation shows a simulation methodology to cast Low Pressure Turbine (LPT) blades for aircraft engines using the centrifugal casting process. The LPT blades have less than 1 mm thickness at the trailing edges, the effect of surface tension and wetting angle is dominant during the filling stage.

High quality automatically generated body-fitted polyhedral meshes with thin prism layers are generated using STAR-Cast. Finally the simulations are compared with the casting trials and shows, an excellent agreement in prediction of misruns.

Author Company:
Access e.V
Author Name:
Santhanu Jan
Industries:
Electric Machines[2]
Manufacturing[3]
Products:
STAR-Cast[4]
Conference:
STAR Global Conference 2012[5]

CD-adapco is the world's largest independent CFD focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.

Source URL: http://www.cd-adapco.com/presentation/simulation-centrifugal-casting-star-cast

Links:
[1] http://www.cd-adapco.com/sites/default/files/Presentation/Casting1_Access_SJ.pdf
[2] http://www.cd-adapco.com/industries/electric-machines
[3] http://www.cd-adapco.com/industries/manufacturing-0
[4] http://www.cd-adapco.com/products/star-cast
[5] http://www.cd-adapco.com/conference/star-global-conference-2012