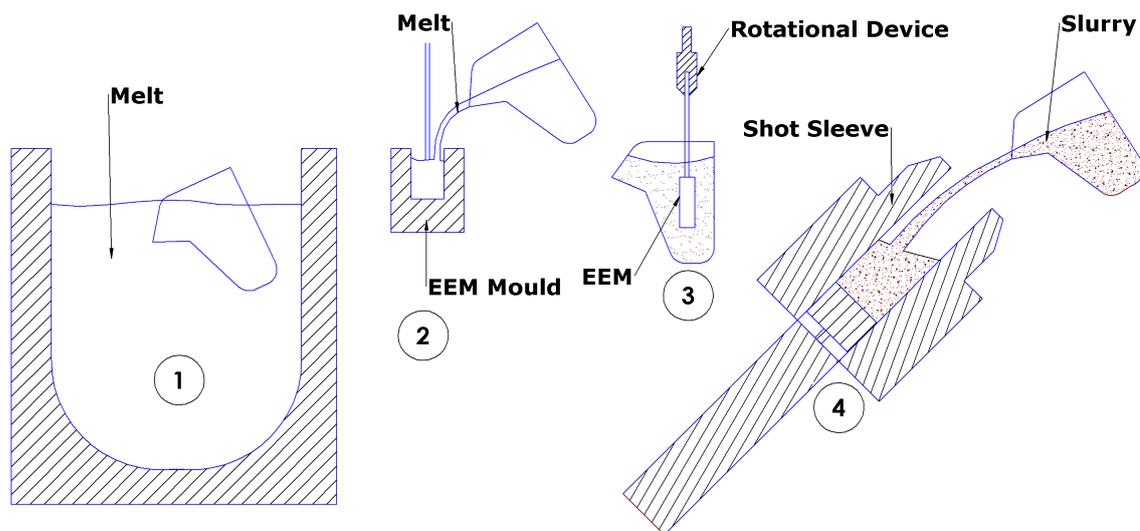


Rheocasting using the RheoMetal™ process

Rheocasting as such has been known since the ground-breaking experiments at MIT in 1972, when it was found that metals in the semi-solid state, with globular grains, have very special rheological properties and which make them suitable for casting of high quality parts.

Over the years, many processes have been developed for producing such semi-solid slurries. When cooling a liquid into the semi-solid state to produce slurries suitable for rheocasting it is vital to have a good control of the heat extraction, combined with a strong stirring or likewise to avoid formation of dendritic grains. The outcome should be a slurry with small, round grains and a well-controlled solid fraction. Further, the process should be able to produce sufficiently large amounts of slurry in a short time combined with a low cost. Most processes have failed on at least one of these requirements, which explains why rheocasting still has a rather limited industrial use.

The RheoMetal™ process came out as a spin-off from experiments done at Jönköping University in 2004 by the researchers Prof. Magnus Wessén and Dr. Haiping Cao. The beauty of this process, as schematically shown in the figure below, lies in its simplicity.



Melt (1) is poured into a mould (2) to produce a so-called EEM (Entalphy Exchange Material). The EEM, which is rotating, is thereafter immersed into liquid aluminium (3). The melting of the EEM causes very efficient cooling of the liquid, thereby producing a slurry suitable for rheocasting in short time; typically, within ~15 sec's. The solid fraction of the slurry can easily be determined by the size of the EEM as well as the initial temperature of the melt, which both are easily controllable. The slurry is then poured into the shot sleeve of the die casting machine (4). For most components produced by the RheoMetal process, it is suitable to trim the solid fraction in the slurry to be in the range 30-40 %.

The process is globally patented by RheoMetal AB (www.rheometal.com).