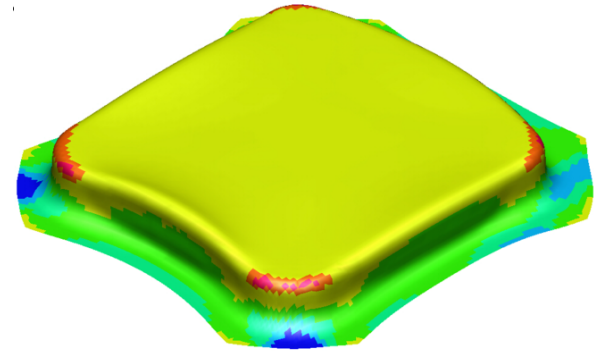


Forming and Casting of Lightweight Materials

Research in metal forming and casting was firmly established at OSU in 1986 with the creation of the National Science Foundation funded Engineering Research Center for Net Shape Manufacturing (ERC/NSM). Sheet metal forming, high pressure die casting, bulk forming of lightweight materials, and the design and manufacture of tooling in support of these processes were primary focus areas of the ERC/NSM, which was funded through 1997. One direct offspring of the ERC/NSM is the Center for Precision Forming (CPF), led by Professor Taylan Altan. The CPF is focused on Manufacturing Process Engineering for sheet forming of high strength steels, aluminum, titanium, and magnesium alloys. One example of the type of research addressed by the CPF is shown in the image to the right. The areas of maximum thinning (red) during servo-press forming of an advanced high strength steel were predicted via computer simulation.



The high pressure die casting process is particularly suited to the forming of complex geometric shapes having thin walls, at high production rates, in both aluminum and magnesium alloys. Research in light metal die casting is led by Professors Alan Luo and Jerald Brevick. One area of research interest is new alloy development of light metals for high pressure die casting having improved mechanical properties (strength and ductility), heat-treatability, and enhanced corrosion resistance. Other topics of research include new process technologies to enable castings to be produced with better dimensional control, lower contained gas contents, and the production of castings having inserts of other materials. Shown to the right is the Buhler 250 metric ton horizontal high pressure die casting machine utilized in many of the funded die casting research project activities in ISE.



In bulk forming of lightweight materials, research is led by Professor Rajiv Shivpuri. Bulk forming processes for lightweight metals include forging, rolling, extrusion, and wire drawing of aluminum, magnesium, and titanium alloys. Areas of research for these processes and materials include computer-aided process modeling (finite element simulation), prediction of fracture and fatigue, and the design and analysis of machines and tooling.

Areas where forming and casting of lightweight materials has a significant role in society include national security, aerospace, automotive, and the consumer electronics industries.