

High-strength alloy finds new automotive applications

ACuZinc™ is a new, patented family of zinc casting alloys offering superior strength, wear, hardness and creep properties. The alloys were developed at the General Motors Research and Development Center to support its drive to expand the Design for Manufacturability (DFM) concept, which includes assembly, disassembly and recycling.

ACuZinc is also an alloy family in search of applications. One of the alloys, ACuZinc 5, is a hot-chamber die-castable material offering higher strength, hardness and creep resistance than other zinc alloys. These enhanced properties further expand zinc die casting's ability to be used for structural applications. Because it was developed by GM, one of the first opportunities to test ACuZinc 5 was in *Delphi Interior and Lighting System's* newly-designed heliscrew horizontal actuator for power seats. The ACuZinc die castings replace a powder-metal gear rack and plastic gear housing design. Seat adjustment is comparable in smoothness to earlier pinion-gear actuators, but operates 30-percent faster. The rack is attached to a stationary

lower channel and the housing is secured to an upper sliding channel. The housing accommodates a worm-to-helix reduction gear. Although a steel gear is mated to the ACuZinc gear rack, the part exhibits greater wear resistance because of its lower coefficient of friction. For the same reason, a bearing insert was eliminated from the housing.

In this new seat design, the inboard seat belts are attached directly to the seat instead of the vehicle body. In a crash situation, seat belt loads are transferred through the seat adjusting mechanism to the lower channel, which is fastened to the vehicle floor. As a result, the rack and housing must withstand high loads at high strain rates.

Testing confirms the ACuZinc die castings meet all performance requirements. Load-to-fracture increased more than four-fold over the original design.

The components are die cast net shape. Other than removing the gating system, no secondary operations are performed. The gear racks have a flatness tolerance of 0.020 in. (0.5mm) along the entire length, a true position specification of 0.008 in. (0.2mm) on the mounting holes and a complex gear profile. Other benefits include excellent surface finish and high production rates with low scrap levels.

Both the gear rack and housing are hot-chamber die cast by Fishercast, Div. of Fisher Gauge Ltd., Peterborough, Ontario.



Die-cast ACuZinc replaced P/M for these gear racks and provides greater wear resistance and strength. The racks are produced in lengths of 255 mm, 300 mm and 340 mm.

Pictured is the newly-designed gear housing. Testing confirms the ACuZinc die castings meet all GM performance requirements. The housing measures 90 mm x 44 mm with a 30 mm x 13 mm dia. arm.