



## HIGH MAGNESIUM A380 AND T5 HEAT TREATMENT IMPROVES PERFORMANCE

As part of the American Metalcasting Consortium (AMC), the North American Die Casting Association (NADCA) has identified chemistry variants of the standard aluminum die casting alloys that provide performance improvements over the standard alloys. In addition, through studies at NADCA, it had been determined that heat treatment of standard high pressure die castings is viable and can provide further improved performance. One such alloy variant is high magnesium containing A380 (up to 0.5% as opposed to 0.1% maximum). Under the AMC Castings Solutions for Readiness (CSR) Program's project on Manufacturing and Design Resources, other alloy variants in the as cast and heat treated condition have shown strength and ductility improvements. The benefits are significant and are enumerated below.

## SUCCESS STORY

**Problem:** Fiat Chrysler Automobiles (FCA) Product Engineering was requiring higher performance of engine blocks. In order to meet the requirements with the alloy that was currently being cast, the wall thickness of the new block would have to be increased.

**Solution:** The engineering team at the FCA Kokomo Casting Plant suggested the application of the T5 heat treatment to the high magnesium variant of A380 and in an attempt to increase the strength level of the casting and meet the minimum requirements without increasing wall thickness.

**Benefits:** After implementation of the high magnesium variant and T5 heat treatment, FCA noted improvements similar to those revealed in the NADCA study. The level of improvement exceeded the strength requirements for the new engine block. Having to resort to a thicker wall design to meet the performance requirements would have increased the weight of the block by approximately 8%. With current volumes, this represents a cost avoidance of over \$3.6M (about \$1/lb X 0.08 X annual pour weight for this block) per year. A precedent has now been set to utilize high magnesium A380 in the T5 heat treatment condition for future engine block designs.



*"Not only were we able to meet the requirements of the new engine block with the high magnesium variant of A380 coupled with the T5 heat treatment, the T5 heat treatment provides an additional benefit of dimensional stability. The dimensional stability has assisted in maintaining tight machining tolerances in the cylinder bores."* Corey Vian, Tool Engineer