PRESS RELEASE

DELTA PT Safety Application Success Story--Metal replacement

IMPROVING SAFETY: BMCI, Takata Work Together in Pioneering Advances for Airbags

This story may sound a bit unusual, and that's only because it is. Who ever heard of pioneering safety developments coming out of China? Aren't they supposed to come out of Germany or the U.S.? Who ever heard of injection molding a bulk molding compound, much less to replace a metallic component? This is a remarkable story of what involved a global effort between a Japanese auto safety equipment manufacturer, an innovative thermoset resin manufacturer and a few Chinese auto companies all committed to finding a better way to build a safer vehicle.

“We began working with Takata in 2004, developing the optimal compound and part design to meet the performance criteria,” notes Craig Carder, manager of Technical Services at BMCI. The project began as paper sketches, gained momentum and then progressed through test plaque evaluations, FEA and finally, prototype tooling/injection molding. Fred Oswald, integration engineer with Takata, worked with the technical team at BMCI to create several design iterations that were molded at BMCI’s West Chicago applications development laboratory. Mr. Oswald commented, “This is the best supplier that I have worked with in 25 years in automotive engineering. Prototyping at BMCI allowed five iterations of tooling in less than two months, with parts being assembled and tested in between."

The project Craig Carder is talking about involved the design and development of a Takata Airbag Control Unit (ACU) that used a new and innovative injection molding grade of BMC (bulk molding compound) to replace an aluminum housing. Takata, with engineering based out of Farmington Hills, Mich., is manufacturing the ACU in China for vehicles built by SAIC, Chery, First Auto Works and London Taxi. The ACU is the central control unit for all of the airbag sensors throughout the vehicle and it is the first ever to use a BMC compound for the all-important housing material.

Because it was the first time BMC was used in this type of application, testing was critical and intensive. Yet, the injection molded housings made from a proprietary BMCI compound passed all of the same performance tests required of the aluminum die cast alternative. In fact, the BMC component was stiffer than the aluminum part, something that threw the functional advantage to BMC. Stiffness is critical to the performance of an ACU as its technology is dependent upon the accurate conveyance of forces acting upon a vehicle during a crash. In this case, the resonant frequency of accelerometer assemblies approached 1000 Hz with BMC 605.

There were also demonstrated advantages for using BMW in assembly and attachment of the ACU. Fred Oswald continues, "Self threading fasteners used in aluminum ACU housings result in scrapped housings if, for any reason, disassembly is required. BMC 605 self tapping bosses held fast through 30+ cycles, allowing for potential for rework versus the sure expense of scrap.”

Additionally, Takata was able to directly attach BMC covers without the cost of torque limiters or inserts, still another benefit provided by the rigid BMC 605 molding compound. Oswald adds, “When a screw is fastened, it creates a clamp load. Specifically our M3 screws (we are using Delta PT 30 M3 x 9.5mm long screws produced by ATF, Inc.) will provide almost 200 lbs of clamp load when 0.4 Nm of torque is applied. After thermo-cycling a fastening system will lose some clamp load. Our system would drop to 80% with an M3 screw tapped into BMC 605 (this would mean clamp load reduces to 160 lbs). Our system would drop to 70% with an M3 screw tapped into aluminum (reducing final clamp load to140 lbs).”

"(The) 80% clamp load retention after thermo-cycling is a big deal. I've worked on some aluminum with steel screws that would drop to 50% in automotive designs. If you can retain clamp load you can use smaller fasteners for weight savings, but more importantly, in automotive electronics modules you waste less space on expensive PC boards. Also, clamp load retention gives you better margins for 'torque and torque to strip' ratios as compared to 'torque and torque to loosen'."

Through the elimination of secondary operations, Takata calculates it has saved more than 60% in part cost by replacing aluminum with BMC 605. This calculation overlooks the amotized savings involved with extended tool life, as well maintained molds will last for millions of shots when processing BMC. With die-cast aluminum on the other hand, most manufacturers will realize about one-half million cycles per tool.

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