Phillips Plastics Corporation®

INTERFACE

Making Strides with Magnesium Injection Molding

Magnesium injection molding (MAG), once known as an arduous, sometimes unpredictable process, is now an established, proven technology. Ideal for companies looking to produce parts lighter and stronger than aluminum, magnesium can be finished with a variety of decorative methods. The metal is well suited for such markets as appliance, automotive, consumer, defense, lawn and garden, medical, recreational, and telecommunications. Magnesium injection molding is an option to be considered for the toughest, most technically challenging programs.

Toro

Toro, a leading supplier of lawn and garden equipment, first came to Phillips for help with a takeover single-cavity mold program for an impeller on their leaf vacuum/blower/mulcher. Phillips was able to provide a rapid volume ramp-up and eliminate the substantial order backlog in a short period of time. Looking to magnesium for its rigidity, lightweight, and toughness, Toro had Phillips also build a revised, two-cavity mold that was able to answer the call for higher volumes and produce a part that did its job as a tough, high performance, state-of-the-art product.

With an impressive history of success on hundreds of programs for many types of markets, Phillips Plastics Corporation's magnesium injection molding is now thriving and reliable. According to Phillips' Vice President of Engineering, Bill Welch, "Phillips will continue to improve its magnesium injection molding process and the quality of the production parts that come through the process. It is still a relatively new technology in the marketplace, but we are world-class providers and our capabilities really demonstrate Phillips' continued commitment to these types of leading-edge technologies."

Today, Phillips' magnesium injection molding is providing solutions that weren't an option in the recent past, such as overmolding soft materials to magnesium; specialized plating finishes; a clear-coat finish to provide a natural metal look and feel; and large parts, up to 200 square inches total projected area including gates, runners, and overflows. Phillips' Chief Executive Officer, Founder, and Chairman of the Board, Bob Cervenka explains, "Our magnesium capabilities help us solve some of our customers' challenges. It is essentially a lightweight option for people looking for better performance without sacrificing strength."

In addition, Phillips' capabilities have proven to be award winning. Since 2004, the North American Die Casting Association (NADCA) has presented four awards to Phillips for excellence in magnesium injection molding. For more information on these awards, visit www.diecasting.org.

VT Miltope

Showcasing yet another example of magnesium injection molding's wide range of capabilities, Phillips partnered with VT Miltope, a Vision Technology Systems company, to manufacture components for the VT Miltope MSD V2. As one of the most versatile and compact rugged-militarized laptop computers available today, the VT Miltope MSD V2 is reliable under environmental challenges due to its strong magnesium foundation. "The device is a true showcase of our magnesium capabilities – it really shows the wide range of advantages this technology can provide," says Doug Simpson, Phillips Engineering Manager.

Phillips' Magnesium Injection Molding At A Glance:

- Seven thixomolding machines ranging from 220 to 850 metric tons
  - Ideal for large electronic enclosures or automotive parts
  - Accommodate maximum economical-shot weight of 4 pounds (1816 g)
  - Based on the size and number of our thixomolding machines, and the sales they generate, Phillips is the nation's largest thixomolder
  - Smallest production shot size achieved 0.011 pounds (5 g) using AZ91D versus industry standard minimum shot size of 0.143 pounds (65 g)
- Six-axis servo robots for part extraction and application of die lubricant
- In-line die lube mixing system
- Vision systems
- Phillips-developed material heating system
  - 28% less energy usage than OEM system
  - Material temperature control ±3 degrees Fahrenheit
- Molds use vacuum to assist die fill and reduce trapped air in cavity
- Current alloy-model mix
  - 65% AZ91D alloy, 35% AM60B alloy – Phillips processes more high ductility AM60B than any other North American thixomolder
- In-house secondary machining
- NADCA Precision Tolerances by default

Dynavox

DynaVox Technologies is dedicated to helping individuals and families who need alternatives to gain, or regain, the power of speech. In partnership with DynaVox, Phillips had the opportunity to be a part of the new era of augmentative and alternative communication by producing the external housings for two state-of-the-art devices: DynaVox V and the larger Vmax. Both are full-featured, portable speech-generating devices designed to meet a broad range of individual needs based on age and ability. In addition, they provide incredible volume and clarity, with multiple voice selections. "DynaVox chose magnesium for its external housings because of the metal's durability, lightweight, and inherent shielding properties. In addition, they selected the thixomolding part manufacturing process for its benefits of high repeatability and dimensional precision," says Darla Hoch, Phillips Project Engineer.

The Process

Magnesium injection molding is a single-step, semi-solid molding process that combines the best of plastic injection molding and die-casting. Chips of magnesium alloy are fed into a heated screw and barrel where the alloy is thermally and mechanically processed into a semi-solid state and is injected directly into the mold cavity. In contrast to the higher temperatures necessary for die-casting, magnesium injection molded components are processed at temperatures 50-100 degrees Fahrenheit cooler. The resulting semi-solid properties allow the metal alloys to flow like a thermoplastic in a more controlled, laminar-like flow. The magnesium injection molding process delivers net shaped components with many inherent benefits, which include:

- Superior strength-to-weight ratios
- EMI/RFI shielding
- Better straightness and flatness
- Heat dissipation
- Low porosity
- Tighter tolerances, which may reduce or eliminate some secondary machining operations
- Longer mold life
- Thinner wall sections possible than die casting can provide

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