Mg Showcase

The Pros Know:

Magnesium Creates a Competitive Edge

Lightweight, strong and durable, magnesium alloy parts are expanding their sphere of influence into professional grade high-end appliance and electronics products. Manufacturers who are looking for ways to improve quality and reliability are fine tuning product capabilities by adding the precision and versatility of magnesium components. Original Equipment Manufacturers, working together with metal forming experts, strategically integrate key magnesium parts into product designs to maximize performance. Magnesium is chosen for top-of-the-line products that offer superior staying power, and rugged structural and mechanical properties that are unmatched by other materials. Magnesium's inherent ability to shield internal technology from Electromagnetic Interference and Radio Frequency Interference (EMI/RFI) make it the ideal light metal for housing electronics.

Magnesium is the Recipe for a Great Appliance

The powerful KitchenAid® Professional 600™ stand mixer has long been considered the industry standard in countertop kitchen appliances that chefs, cooks and bakers everywhere count on to mix and blend their favorite recipes. The mixer's direct drive transmission with all-metal construction is housed in magnesium. Every part of the stand mixer, from its magnesium-housed transmission, to its professional-level 575-watt motor, to its Powerknead™ spiral dough hook is equipped for high performance.

KitchenAid, Greenville, Ohio, product engineers selected magnesium for the stand mixer's transmission housing because the magnesium housing withstands higher temperatures and may be molded without any secondary operations, without machining for the bearing pockets and locator pins. The mixer's designers also cite magnesium as a very stable material that offers excellent part-to-part repeatability. A major benefit for the heavy-duty stand mixer is that the magnesium transmission housing may be subjected to higher loads and temperatures than the previously used thermostat plastic.

KitchenAid engineers explain that in a high-load, high-temperature application, magnesium was chosen over cast aluminum because of its ability to be molded, since cast aluminum or cast zinc would require secondary machining. Product engineers co-developed the magnesium part design with magnesium molders, to allow for a very accurate part with precision, molded-in features. "It is very important to look at the total cost, instead of just the cost per pound of the material. By eliminating all of the machining operations, we were able to develop a significantly stronger part, without a significant increase in price. The part is used as-molded, with no special finishing operations," notes KitchenAid.

The magnesium transmission housing has proven to be a cost-efficient and key part that keeps this powerful mixer dishing out great food. KitchenAid states: "To our customers, a magnesium metal housing offers peace of mind, in contrast to what they perceive a plastic part to be."

A magnesium transmission housing helps the KitchenAid® Professional 600™ 6-quart stand mixer achieves commercial-grade high performance. © Photo courtesy of KitchenAid. Used with permission.

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Magnesium on a Mission

The Maintenance Support Device, MSD-V3 rugged convertible militarized laptop, made by VT Miltope, Hope Hull, Alabama, is the ultimate in high-performance computing. Magnesium alloy AZ91D is used by Phillips Magnesium Injection Molding, Eau Claire, Wisconsin, to form 15 different parts used in the MSD-V3. Phillips engineering manager Eric Semingson says, "This device is a true showcase of our magnesium capabilities. It really shows the wide range of advantages that Magnesium Injection Molding technology can provide."

Magnesium meets and exceeds the most challenging conditions to form one of the most powerful, portable and configurable computing systems available for tactical operations. © Photo courtesy of VT Miltope and Phillips. Used with permission.

Magnesium's advantages include high strength, stiffness, durability, and superior impact resistance, making the laptop parts 20 times stronger than typical thermoplastics. The rugged core computer and dock benefit from lightweight magnesium alloy, which may be molded into ultra thin-walled parts, down to 0.020 inches. The precision laptop design weighs just 7.9 pounds and measures 11inches wide by 8.5 inches deep by 2.4 inches high. The 15 magnesium injection molded parts in the MSD-V3 include: power input mount housing; manifold cover; docking station battery door; RAM access, CMOS, PCMCIA, DVD, computer battery and hard drive doors; bezel for display screen frame and cover for back of display screen; the computer chassis and cover; and the docking station chassis and cover.

Fifteen magnesium injection molded parts comprise one of the toughest, most compact laptops available that meet strict military specifications in the field of operations. © Photos courtesy of VT Miltope and Phillips. Used with permission.

The magnesium alloy housings and enclosures provide effective EMI shielding without using fillers, with an applied conversion coating. Magnesium's EMI shielding ability is critical during military field operations, since the magnesium parts protect the laptop from radiated and conducted emissions, electromagnetic pulses and radiation hazards. In addition, magnesium used in the MSD-V3 meets military specifications for withstanding extreme temperatures, solar radiation, shock, transportation vibration, altitude, rain, humidity, sand, dust, and salt fog.

The MSD-V3 militarized laptop computer is designed and qualified to withstand the harshest tactical situations. The U.S. Army uses the rugged laptop under extreme weather and handling conditions. This portable unit is the tough framework that provides operations for diagnostics and maintenance on weapons and vehicles to verify systems status, assist in repairs, and to facilitate uploading, verification and the restoring and providing of software to weapons. Magnesium is VT Miltope's material of choice for hardware that troops rely on in the field for mission-critical support.

Magnesium Viewed in 3D

The Victor Company of Japan, Limited (JVC), Yokohama, Japan, and JVC USA, Wayne, New Jersey, have launched the world's first HD 3D consumer camcorder at this year's Consumer Electronics Show. The JVC Everio GS-TD1 camcorder is housed in a magnesium alloy frame, making the hand-held unit much lighter and easier to hold. According to JVC, the groundbreaking 3D camcorder has its weight well-balanced along its length, without being front-heavy.

Weighing just 1.4 pounds (590 grams) with the battery, this JVC magnesium frame video camera uses two lenses and two 3.32 mega pixel CMOS sensors to capture full HD 3D video by processing left and right images simultaneously using a high-speed imaging engine. © Photos courtesy of JVC USA. Used with permission.

The JVC camcorder with twin HD lenses allows glasses-free 3D video that lets the user preview in 3D as recording takes place. The magnesium frame enclosure houses a host of high-tech electronics, and includes features such as a backlit 3D button enabling easy switching from 2D to 3D mode, 5 times optical zoom, the ability to access the battery port and SD card slot while mounted on a tripod, and sports a mottled finish for an easier grip and high-end look.

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Casting Magnesium in a Starring Role

Sony Corporation, Tokyo, Japan, made the casting call for the perfect parts in their Sony® BVP-series professional video camera – magnesium and aluminum co-star as die-cast precision components for the out-of-studio camera's base, chassis, outer panels and internal sub-assemblies. Sony engineers required lightweight, high-strength components to protect the advanced CCD image sensors, digital video processing and digital control systems inside.

Sony® Professional BVP-550 portable video imaging system uses magnesium die castings to achieve high-strength, low weight, EMI/RFI shielding in its exterior enclosure. © Photo courtesy of Chicago White Metal Casting, Inc. Used with permission.

Chicago White Metal Casting, Inc., Bensenville, Illinois, was chosen by Sony to meet these demands by die casting the portable video camera's housing components using magnesium AZ91D and aluminum 380 alloys for the camera's chassis, base, case panels and related parts. Magnesium castings form the front-end chassis, frame, handle, and right and left cover panels and base, while aluminum takes the back-end role of left, right and top cover panels and back frame.

An ingenious internal magnesium/front and aluminum/rear stop block system enables a miniature camera to slide into and out of the main video camera's shell, allowing versatile options for televising in-studio or remotely. This breakthrough design, known as the Integrated Imaging Capsule, allows the virtual plug-in mini-camera to nest inside the studio camera head or the portable camera head, delivering equally precise advanced imaging from each camera version. The compact and lightweight Sony BVP-550 and its next-generation versions keep the telecaster mobile in the field as well as in the studio for multi-camera and blue screen work because of this ability to switch configurations.

The die-cast rigid magnesium chassis and case panels provide the internal electronics with built-in EMI/RFI shielding. Inside, the chassis is center-gated, with walls cast to 0.040 inches (1.016 millimeters). Outside panels are cast to net shape and some parts receive secondary machining, including: CNC hole drilling and tapping; vibratory deburring; hand cleaning; coating, and final powder coat or wet paint.

Professional Imaging Housed in Magnesium

When photography icon Eastman Kodak, Rochester, New York, designed its line of professional digital cameras, their engineers sought out the best in high-end components. Kodak teamed up with Nikon to develop the Kodak® Professional DCS-series digital cameras, built around Nikon's F-5 family of optics and accessories. For this groundbreaking product, Kodak engineers needed an enclosure design that would meet strict weight, shielding, precision and cost goals to house advanced digital imaging technology used by professional and high-end photographers.

A complex magnesium die cast case houses Nikon F-5 optics in a tough, yet lightweight design in the Kodak® Professional DCS 620 digital camera. © Photo courtesy of Chicago White Metal Casting, Inc. Used with permission.

Although investment casting, plastic molding and aluminum die casting were investigated, engineers chose hot-chamber magnesium die casting from Chicago White Metal Casting for the camera enclosure. To upgrade digital imaging performance to meet professional demands, Kodak worked with CWM to design a complex, thin-walled case that would achieve excellent EMI shielding integrity, ruggedness, high-impact strength, and an as-cast surface finish.

CWM engineers teamed with Kodak to create a sleek case design that attains complex geometries using a hot-chamber magnesium die casting that weighs a quarter pound less than its plastic counterpart. Magnesium enables the camera case to attain built-in EMI/RFI shielding, using an innovative single-lap magnesium edge joint designed by Kodak engineers to eliminate the need for EMI seam gaskets in the metal joints. This integrated shielding design passed stringent EMI emissions tests. Castability and functionality are accomplished in one complex casting. CNC secondary machining for the housing includes 17 high-precision threads. The magnesium parts are painted and silk-screened with primer and three coats of black polyurethane paint.

Hot-chamber magnesium die-cast parts used in Kodak's DCS camera case feature built-in EMI shielding. © Photo courtesy of Chicago White Metal Casting, Inc. Used with permission.

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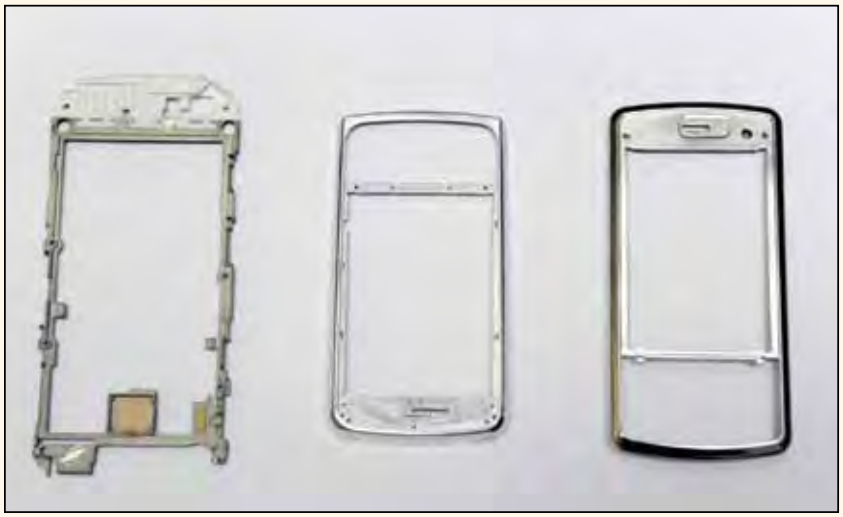
A Closer Look: Eco-Magnesium Process Adopted by LG Electronics

LG Electronics, Seoul, South Korea, is using a new type of clean magnesium alloy known as Environmentally Conscious (Eco-) Magnesium, for parts being produced for all of its mobile phones by 2012. LG relies on magnesium parts for its mobile phones due to its lightness and hardness, but sought out a way to mass-produce the magnesium parts using an environmentally responsible method. The die casting process used to produce Eco-Magnesium components virtually eliminates use of damaging sulfur-hexafluoride (SF_6) cover gases. As a result, LG projects a reduction in greenhouse gas emissions by a factor of approximately 24,000 during the die casting process without affecting product quality.

Eco-Magnesium was developed for LG by the Korea Institute of Industrial Technology (KITECH), funded by the Korean government, in order to substantially reduce carbon dioxide emissions by four kilograms for every handset that LG produces. LG has a memorandum of understanding with three companies to produce Eco-Magnesium, and LG provides technical support and training in carbon credit trading. KITECH's Shae K. Kim says that the Eco-Magnesium process adds calcium oxide to create magnesium alloys that achieve safety, health and environmental targets. Kim notes that Eco-Magnesium alloys may be formed without sacrificing process abilities, mechanical properties or cost considerations.



Eco-Magnesium components will be found in all LG mobile phones by 2012.
© Photo courtesy of LG Electronics. Used with permission.

Dr. Skott Ahn, LG Electronics President and Chief Technology Officer states, "This transition to Eco-Magnesium will allow LG and our customers to play a small but significant role in making the world cleaner for future generations." According to Dr. Ahn, Eco-Magnesium is one of LG's key strategies in their ongoing efforts to transform LG into a leader in environmentally responsible manufacturing.

LG spokesperson Nanako Kato says, "LG is now adopting Eco-Magnesium in its mobile phones because the new process does not use SF_6 and the magnesium material retains its same mechanical functionality. In addition to cell phone parts, LG is considering expanding the use of Eco-Magnesium in the future to other portable devices, such as laptops and tablets." If LG continues on this path, the potential environmental benefits for expanding Eco-Magnesium use to additional electronic devices are substantial, given the company's projections for massive reductions in greenhouse gas emissions from their mobile phone production alone.

Globally, manufacturers in key industries are seeking environmentally sound ways to produce and form magnesium alloys. Magnesium's spectrum of sustainable product possibilities is expected to broaden and grow, as new forming and processing technologies enable the use of magnesium parts in a host of new high-performance products.

To learn more about the benefits of designing products with magnesium, contact the
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