



IMA News

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IMA Executive Committee:

Karl Kainer	ima.magnesium@hzg.de	Nic Andrews	nic.andrews@magontec.com
Ronald Chang	c.j.chang@foxconn.com	Jan Guy	JGuy@amacor.us
Tom Heider	tomh@tcdcinc.com	Anthony LoCoco	tlococo@cwmtl.com
Walter Treiber	wtreiber@cwmtl.com		
Ken White	ken.white@magnesium-elektron.com		

Below are articles and summaries of magnesium related stories. IMA Member companies are asked to distribute the update to their employees and if their employees wish to receive the monthly IMA News issues, please send their email addresses to the IMA World Headquarters. The IMA appreciates all member company press releases and announcements for inclusion in the monthly IMA News issues.

INDUSTRY CALENDAR

IMA Events

December 5, 2013

[IMA European Health & Safety Seminar](#)

Leonardo Hotel Köln
Cologne, Germany

June 1 – 3, 2014

[IMA 71st Annual World Magnesium Conference](#)

Westin Grand München
Munich, Germany

Industry Events

February 6 – 10, 2014

[TMS 2014 143rd Annual Meeting & Exhibition](#)

San Diego Convention Center
San Diego, California, USA

September 22 – 24, 2014

[NADCA Die Casting Congress & Tabletop](#)

The Wisconsin Center
Milwaukee, Wisconsin, USA

Contact IMA

Mike Schultze, Executive Vice President

E-mail: mschultze@tso.net

Ann Scheible, Director Member Services

E-mail: ascheible@tso.net

IMA staff can also be reached at:

International Magnesium Association
1000 N. Rand Road, Suite 214
Wauconda, IL 60084 USA

Tel: ++1-847-526-2010

Fax: ++1-847-526-3993

E-mail: info@intlomag.org

Website: www.intlomag.org

European Director: Christian Payn

IMA European Representative

343 Chemin de Durban

84190 beaumes de Venise

France

Phone: +33 (0)6 79 91 44 37

Email: Christian.payn@gmail.com

ASSOCIATION NEWS

IMA European Environment Health & Safety Seminar – [Online Registration Open!](#)

Join U.S. for the 71st Annual World Magnesium Conference in Munich, Germany – [Call For Papers Deadline is December 31!](#)

IMA North America Magnesium Applications Seminar & Exhibits Recap

IMA Award Winners in Fall 2013 Mg Showcase Spotlight Magnesium Innovation

[Articles follow below](#)

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November Magnesium Review from Metal-Pages

JOM Publishes IMA-Sponsored Study, “Life Cycle Assessment of Magnesium Components in Vehicle Construction”

EU Legislation to Control F-gases

Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research Announces “Magnesium Research Award” Winner

“Structural Casting” - A New Opportunity for North American Die Casters

Latrobe Magnesium Granted Australian Patent for its Unique Hydromet Process

Morwell Magnesium Move

80 Years of the Rolls-Royce Merlin

Valparaiso University Receives \$2.3 Million Funding from DOE for Solar Light-Metal Research

[Articles follows below](#)

EDITOR'S NOTE: IMA makes every possible effort to substantiate the articles which appear in the Update. However, as this is not always possible IMA does not warrant the details nor accuracy of any given article. Please keep in mind that materials are attained through press releases, outside articles from numerous sources and publications. Such materials often contain opinions which are not that of the association nor should they be construed as such. We realize that in the case of some materials, the translations might often lead to less than perfect grammar, etc. It is our position however to print as submitted rather than take upon ourselves the editing of such materials which would entail potential changes unwanted by any given author.

ASSOCIATION NEWS

IMA European Environment Health & Safety Seminar – *Online Registration Open!*

Online registration is now open for the IMA European Environment Health & Safety Seminar including an Environmental educational session. It will be held on December 5, 2013 in Cologne, Germany. Please visit the [newly redesigned IMA website](#) to register.

This Seminar is specially intended for:

- Foundry Managers
- Safety Staff
- Planning Engineers
- Steel & Chemical Industry Managers
- Consultants
- Production Managers
- Foundry Foremen
- Fire Fighters
- Magnesium Recycling Managers & Staff
- Automotive OEM Staff

It will offer an excellent opportunity to learn from recognized industry experts the safe handling of Magnesium and Magnesium Alloys, to exchange experiences in practical matters as well as discuss means and measures for the implantation of safety standards. It will, for the first time, have a presentation related to the environment, showing the benefit of using magnesium versus aluminum in the transportation industry in term of carbon footprint.

Please visit the European seminar website at http://intlomag.org/about/auto_eu.cfm for more information about the program, hotel and lodging, and travel information. You can also print the registration form to fax or mail it to IMA World Headquarters.

IMA North America Magnesium Applications Seminar & Exhibits Recap



The IMA North America Magnesium Applications Seminar & Exhibits took place on Tuesday, October 29, 2013 at IMA member BuhlerPrince, Inc. in Holland, Michigan, USA. Attendees were welcomed by Professor Karl, Kainer of the Helmholtz-Zentrum Geesthacht, Centre for Materials and Coastal Research Institute of Materials Research and President of the IMA. IMA North American Committee Chairman, Tom Heider of Twin City Die Casting set the stage for the seminar and chaired the sessions with Jeff Rivers of Pace Industries – Product Technology Division.

We have received permission to publish some of the presentations in future issues of the IMA News, so please watch for the following outstanding presentations:

- **The State of Die Casting and What Customers Want**, *Dan Twarog, North American Die Casting Association*
- **Magnesium 101 – Fundamentals of Using Magnesium Alloy as a Material of Construction**, *Steve Erickson, MAGONTEC GmbH*
- **Die Cast Application: “Light Engine” – Frame and Housing for a Digital Cinema Projector**, *Jon Miller, Chicago White Metal Casting Inc.*
- **Development and Applications of Ultrafine Grain Magnesium**, *Terry Lowe, The Colorado School of Mines*
- **How to Utilize the Investment and Sand Casting Process to Generate the Parts Needed to Validate the Performance of Magnesium**, *Jack Ziemba, Aristo Cast, Inc.*
- **Creep-Resistant Magnesium Alloys for Automotive Drivetrain Applications**, *Steve Erickson, MAGONTEC Limited*

- **Manufacturing Technologies for more Magnesium Applications – Why and How?**, Kurt Brissing, RAUCH, North America and Christian Domanyi, Ing. Rauch-Fertigungstechnik Ges.m.b.H., Austria
- **High-Strength Wrought Magnesium Alloys: The Future is NOW!**, Rick Delorme, Magnesium Elektron North America
- **Magnesium Die Cast Applications: Examples and Case Studies**, Doug Rourke, MAGONTEC GmbH
- **Magnesium Application Success Story: X-Porte: The World’s First Ultrasound Kiosk**, Andrea Mudrey, Twin City Die Casting
- **Research on High Performance Magnesium Components at Purdue University**, Qingyou Han, Purdue University
- **Case Study: High Pressure Die Cast Magnesium Which Serves as a Cast Frame in a Medical Communications Device**, Jeff Rivers, Pace Industries – Product Technology Division
- **North American Manufacturing and Global Die Casting Footprint**, Mark Los, President and CEO, BuhlerPrince, Inc.

Also in attendance were industry luminaries such as IMA President Elect, Jan Guy of AMACOR, Jerry Cole of Light Weight Strategies, Inc. and Peter Ried of Ried and Associates, LLC.

The seminar would not have been possible without the support of event sponsor BuhlerPrince, Inc. and lunch sponsor MAGONTEC GmbH and the eight exhibitors who were arrayed around the room.

The IMA Thanks our 2013 Magnesium Applications Seminar Sponsors!



Attendees were able to meet with and see sample products of the following exhibiting companies: opportunity to attend the seminar sessions with the convenience of sitting right at their booth!

The IMA Thanks our 2013 Magnesium Applications Seminar Exhibitors!



Chicago
White Metal
Casting, Inc.



FRECH[®]
U. S. A.
Ahead in Diecasting Technology



 Magnesium Elektron
SERVICE & INNOVATION IN MAGNESIUM



TWIN CITY
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Since 1919

Join us for the 71st Annual World Magnesium Conference in Munich, Germany – [Call For Papers Deadline is December 31!](#)

The [2014 Call For Papers](#) was released to the IMA worldwide distribution list the week of October 14. Please share the announcement invite your colleagues to submit abstracts.

Also, please be sure to save the dates for the 71st Annual World Magnesium Conference which will be held from June 1 – 3, 2014 at the Westin Grand München, Munich, Germany. This event is the premier international magnesium industry conference that highlights the latest technological advances, innovative applications, and emerging developments in the global marketplace. The conference combines informative technical sessions, exhibits, networking and social opportunities for a well-rounded industry experience.

- Industry Updates
- Technical Program, provides a wealth of information for magnesium industry professionals and addresses topics ranging from an overview of the current state of the magnesium industry to magnesium process breakthroughs, applications, and business management issues.
- Social Program and Spouse Program
- Exhibit Showcase and Sponsorship Opportunities
- Awards of Excellence, IMA's competition recognizing outstanding magnesium products and innovative manufacturing technologies
- International Environmental Responsibility Awards
- IMA Annual Membership Meeting

Munich is, "a city of contradictions that somehow create an intriguing blend of old and new; Lederhosen and the latest designer outfits, traditional beer gardens and stylish clubs, historical buildings and the most modern architecture - all stand proudly side by side."

But Munich is not only the capital of Bavaria, it is home to the world's largest festival "Oktoberfest," Bayern Munich and BMW. Discover this pulsing city, and beyond, offering treats such as:

- A city of culture, Munich offers about 40 theatres or smaller stages, 50 museums and collections, different opera houses, old buildings like the 500-year old church "Frauenkirche", the Marienplace with the new Neo-Gothic Town Hall and famous parks like the English Garden and the Olympic Park.
- Outside Munich, on the way to the Alps, there are plenty of beautiful lakes and castles just waiting to be discovered, among them the fairytale castle "Neuschwanstein."
- Find out more about the medieval cities of Nuremberg and Augsburg, Roman architectural ruins in Regensburg and Passau, the salt mines in Berchtesgaden and the majesty of the Zugspitze, Germany's highest peak near Garmisch-Partenkirchen.

Munich is unique in combining modernity with tradition. Please mark your calendar and watch for upcoming details at www.ima-worldconference.org!

IMA Award Winners in Fall 2013 Mg Showcase Spotlight Magnesium Innovation

Wauconda, Illinois – Winning entries from the International Magnesium Association's (IMA) 2013 Awards of Excellence are highlighted in the latest issue of Mg Showcase, the online publication that recognize exceptional achievement in the global advancement of magnesium products and processes. From transportation to industrial applications, the Fall 2013 issue, IMA Award Winners Spotlight Magnesium Innovation, demonstrate how strategic innovations and great teamwork have a true impact in markets where magnesium alloys' lighter weight and superior strength create a competitive edge.

- The X-Porte Ultrasound System by FUJIFILM SonoSite was the winning design in the IMA Awards of Excellence Cast Product (commercial) category.
- A magnesium convertible roof top casting from GF Automotive, Schaffhausen, Switzerland, was the winner of the Cast Product – Automotive category.

- Nippon Kinzoku Company, Ltd., Tokyo, Japan, and partners were the winners in the Wrought Product Design category for a unique collaboration that created and implemented the world's first practical application and mass production technology using magnesium alloy LZ91 thin sheet.
- The automotive industry-first structural and functional application of AZ31B magnesium sheet in a magnesium-intensive decklid inner panel was the winner in the Awards of Excellence Application Category. Awarded to General Motors (GM) LLC, Warren, Michigan, USA, and its joint venture partner Pan Asia Technical Automotive Center Co., Ltd., (PATAAC), Shanghai, China.
- Jiangsu RM Wheel Company, Ltd. (RM) was the winner in the Process category for their superplastic monoblock forged molding magnesium wheel technology.

Source: www.intlmaq.org (04-Nov-2013)

INDUSTRY NEWS

IMA Members Only: November Magnesium Review from Metal-Pages

Prices for 2014 magnesium contracts in the US are being settled around 2.5% higher than this year as volumes are up slightly and the supply pipeline is widely expected to be tighter, according to trade sources.

Contract negotiations are running ahead of schedule this year amid a belief of tighter market conditions and trade sources report that a large proportion of deals are now settled. Deals for pure min 99.9% magnesium are being fixed around a nickel higher than this year, which puts settlements in a range of about \$2.05-2.25/lb. Fixed-priced contracts were settled in a range of \$2.00-2.20/lb for 2013. Contract deals for secondary 90/10 magnesium are also generally up in a range of \$1.75-1.85/lb from \$1.70-1.80/lb this year.

Part of the expected supply crimp is set to come as imports from overseas producers in countries like Russia, Kazakhstan and Ukraine are set to be down again next year due to solid domestic demand.

"The little bit of material coming in from Russia is going to be offered at a much higher price. Maybe the material from Eastern European is also going to be a bit higher," said one trade source. "The tightness in scrap has been going on for some time. Margins are being really squeezed by those customers that need scrap, especially those supplying into automotive as the automakers squeeze those guys to death."

The aluminium scrap market has tightened up this year and forced some consumers to switch into primary metal that requires more alloying ingredients like magnesium, traders note. Another trade source noted that a larger proportion of consumers are booking on a fixed-price basis rather than on a formula due to expectations of prices trending higher on the supply crimp and robust volumes.

The European magnesium market has strengthened slightly in the past couple of weeks in line with moves in the market in China, the key supplier to Europe, although Chinese production will be watched for a any substantial increase that may cap the rally, industry sources told Metal-Pages on Tuesday. The European spot market is some \$2,725-2,775 a tonne delivered.

The European market has been moving around a four-year low for most of this year and well off a peak average of some \$3,325/tonne in early January when Beijing abolished export duties on magnesium metal.

"The Chinese prices have been going up and you're starting to see that filtering into Europe," one dealer told Metal-Pages, adding that they have an offer at \$2,720/tonne basis ex-works in the spot market. Dealers said Chinese stock levels appear to be fairly low, hence the latest market moves up, while production levels there will be watched in the coming weeks as they typically increase in line with prices.

In Europe, however, there has been some consumer interest for first quarter delivery next year around present spot price levels, sources said.

The Chinese magnesium metal market has been picking up since last week on reduced stocks, industry sources told Metal-Pages on Monday. Prices of magnesium metal 99.9% grade have picked up from RMB15,000-15,500/tonne to RMB15,300-15,800/tonne in the past two weeks.

"We are quoting RMB15,300/tonne for the metal," a producer source from Shaanxi said, adding that some business has taken place at this level. The source reported that there are only a couple hundred tonnes of magnesium stocks in warehouse, and there is little inventory pressure now.

Export prices have been pushed up to \$2,620-2,680/tonne FOB, up by \$40/tonne compared with two weeks ago.

A trader from Shanxi reported that demand from downstream consumers remains quiet although a little business has been done recently despite rising offer prices. "The price increase has slowed down, and the magnesium market is expected to stabilise soon."

As the biggest consumption field, the aluminium industry in China has weakened with more than ten smelters cutting production. According to industry data, six key aluminium producers, including Aluminium Corporation of China, are expected to cut output by 850,000 tonnes in 2013.

China's exports of unwrought magnesium metal (Mg 99.8% min) have decreased 4.8% year on year to 11,257 tonnes in September, according to official Customs data. Shipments in September marked the lowest in recent months ending three months of growth. Major destinations, including the Netherlands, Japan and Canada, cut imports after a busy July and August, normally a slow period.

For the latest magnesium news and prices visit www.metal-pages.com. To subscribe at the special IMA membership rate, email Metal-Pages at info@metal-pages.com.

JOM Publishes IMA-Sponsored Study, "Life Cycle Assessment of Magnesium Components in Vehicle Construction"

JOM's October 2013 issue published the "Life Cycle Assessment of Recycling of Magnesium Vehicle Components," by Simone Ehrenberger and Horst E. Friedrich. This article presents the results from a study on the LCA of magnesium. The work on this study was financially supported by the International Magnesium Association. (Link to JOM article)

JOM is a technical trade magazine devoted to exploring the many aspects of materials, science and engineering published monthly by The Minerals, Metals & Materials Society (TMS) (a member-based professional society).

If you do not subscribe to JOM, the complete study is available to IMA Members in the [Members Only](#) section of the new IMA website.

If you need the new Members Only user name and/or password, please email Ann Scheible at info@intlomag.org or call ++1-847-526-2010.

Source: www.jomgateway.net (Oct-2013)

EU Legislation to Control F-gases

To control emissions from fluorinated greenhouse gases (F-gases) the European Union has adopted two legislative acts: the "MAC Directive" on mobile air conditioning systems used in motor vehicles, and the "F-gas Regulation" which covers all other key applications in which F-gases are used.

The [MAC Directive](#) prohibits the use of F-gases with a global warming potential more than 150 times greater than carbon dioxide (CO₂) in new types of cars and vans introduced from 2011 and in all new cars and vans produced from 2017.

Click [here](#) to read the full article and access the original and current proposals.

Source: ec.europa.eu (31-Oct-2013)

Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research Announces “Magnesium Research Award” Winner

The “Magnesium Research Award,” endowed with 5,000 Euro, has been conferred by the Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research with support of Gesellschaft zur Förderung des Helmholtz-Zentrums Geesthacht e.V. since 2007. This prize offers recognition to young researchers for their innovative research in the field of magnesium. The main focus of the award is on alloy development and the characterisation of microstructure-property relationships with regard to the chosen processing technology. The winner of the HZG-Magnesium Research Award 2013 is the Korean Scientist In-Ho Jung, Ph.D. Assistant Professor in the Department of Mining and Materials Engineering, McGill University, Montreal, Canada. The Award presented at the banquet on the "6th International Light Metals Technology Conference 2013 (LMT2013)" in Old Windsor/UK.



Dr. Jung graduated from Pohang University Sci. Tech. (POSTECH) in Materials Science and Engineering (MSc). In 2003, he received his Ph.D. in Génie Métallurgique at the École Polytechnique, Montreal, Canada. Then he became a Post-Doctoral Fellow at the Department of Materials Science and Engineering at Pohang University Sci. Tech. From 2003 to 2007, he was Senior Researcher at Research Institute of Industrial Science and Technology (RIST). Since 2007 he is an Assistant Professor at the Department of Mining and Materials Engineering, McGill University, Montreal.

Dr. In-Ho Jung was nominated for the HZG Award for his achievements in the development of FactSage thermodynamic database and kinetic model (solidification and diffusion) for Magnesium alloys. Dr. In-Ho Jung is one of the most outstanding young to medium aged researchers working in the field of magnesium research in the world. He excels in a broad range of research on Mg alloys. His leading achievements in the development of FactSage FTlite thermodynamic database and the kinetic models (solidification and diffusion) for Mg alloys are highly praised in the community and are very important to alloy design and development. As one of the theme leaders in the Canadian MagNET project his research is linked with industrial and international partners. Moreover, he is active in the development of the process technology and melts quality control of Mg twin roll casting at Posco/RIST. Dr. Jung's experience in both applied and fundamental science has made a very large impact on the magnesium industry. His contributions toward twin-roll casting have led to Posco being one of the world leaders in full-scale TRC sheet production. It will continue to be a large impact for the magnesium industry.

Source: Prof. Dr. Karl U. Kainer, Helmholtz-Zentrum Geesthacht, Centre for Materials and Coastal Research Institute of Materials Research (Sept-2013)

“Structural Casting” - A New Opportunity for North American Die Casters

Hamilton Ontario Canada, September 30 – “Structural” is Bühler’s comprehensive approach to cost-effective production of thin walled aluminum die castings that require heat treatment or welding. On September 30, more than 50 participants from all over North America attended BuhlerPrince’s ‘Structural’ symposium in Hamilton, Ontario to participate in discussions highlighting the requirements, challenges and opportunities related to the production of structural components.

Mark Los, President and CEO of BuhlerPrince, Inc., opened the event with a warm welcome and a special thank you to Natural Resources Canada’s CanmetMATERIALS laboratory for hosting this event. He discussed the importance of industry cooperation in supporting the diverse technical challenges presented by Structural castings.

Requirements from the OEMs Dr. Lutz Storsberg, Leader of Casting Development, Mercedes-Benz Cars Research and Development at Daimler AG, provided an impressive description of Daimler’s requirements for structural components. The attendees were also given an interesting look at future applications for these highly-developed elements in vehicle construction. With this insight, the subjects of sustainability and energy efficiency became more relevant to the participants.

“Structural” Process Bühler experts, Ueli Jordi and Martin Lagler emphasized the challenges that have to be met for the individual process steps and the measures that are needed to attain a stable process. Structural has been studied and researched at Bühler for several years. During this time, the technology

has undergone continuous development and improvement. In addition to the die casting machines that are particularly well-suited to the production of complex components, Bühler also provides customers with the required accessories and know-how to produce structural components. Bühler supports the worldwide die casting industry by implementing and executing a particularly cost-effective process solution.

Canmet

Mr. Gabriel Birsan of CanmetMATERIALS discussed the strong capabilities of their laboratory, specifically for die casting process development. At the heart of their die casting lab is the Bühler Carat 105L Compact die casting machine. This machine is the ideal choice for process development. The flexibility of the Dat@net controller provides a streamlined interface to automation equipment and process tools.

Metallurgy of the Structural Aluminum Die Casting Alloys

A lively presentation by Dr. Raymond Donahue, Mercury Marine, described the importance of proper alloy composition. The genesis of any die casting application for structural components must first consider the alloy that best satisfies the mechanical requirements of the customer. Careful control of the alloy elements will increase mechanical properties and ultimately the performance of your structural member.

The Development of Structural Die Casting in North America

Shiloh Industries is the first North American company to support the automotive industry with a structural die casting part. Don Carter, Director of Engineering, reviewed the history of Shiloh starting with the first part, BMW's X5 shock tower produced in 2006. Now, Shiloh continues to develop new applications with OEMs across North America. Mr. Carter's presentation detailed the growth of this young market and pointed to the future potential in automotive and heavy truck applications.

Source: BuhlerPrince, Inc. (30-Sep-2013)

Latrobe Magnesium Granted Australian Patent for its Unique Hydromet Process

Latrobe Magnesium Limited (ASX:LMG) has been granted an Australian patent for its unique hydromet process. The patent has been granted for 20 years starting from 27 August 2010. The process involves the treatment of the spent fly ash from brown coal-powered electricity generation using chemicals to reduce sulphur, iron and silicon to acceptable levels so that the beneficiated material can be used as a feedstock in the thermal reduction process.

The result is an efficient and novel means of magnesium production extracted from voluminous tailings of industrial fly ash from some of the world's brown coal electricity generators.

The process is owned 50% each by Ecoengineers Pty Ltd and Magnesium Investments Pty Ltd, a 100% owned subsidiary of LMG. LMG has the exclusive worldwide marketing rights for the commercialisation of this technology.

Patent applications were lodged in March 2013 for additional international territories being all countries within the European Union, United States of America, China, India and Indonesia. All these countries are known to have large lignite/brown coal deposits. To date LMG has concentrated its activities on the Latrobe Valley and Germany.

LMG has been approached by an India-based company to form a joint venture and potentially establish a magnesium plant. LMG has executed a confidentiality agreement in relation to this proposal. India currently imports 14,000 tonnes of magnesium per annum from China.

RWE Power AG and LMG have identified the brown coal fly ash from RWE's Hambach mine near Cologne as being suitable to commercially extract magnesium. Initial estimates indicate that some 80,000 tonnes of magnesium and 600,000 tonnes of cementitious material could be produced annually from this mine. Last year, Europe imported over 150,000 tonnes of magnesium from China.

Based on its Australian adjustment study results, LMG's process is cost competitive with Chinese producers. LMG is currently completing a concept study to determine whether it appears commercially feasible to establish a magnesium plant in Germany.

RWE Power AG is part of the RWE Group in Germany, a top 30 company listed on the German Stock Exchange (DAX). RWE Power employs over 13,500 people and provides an energy mix of brown coal, hydro and nuclear power stations. RWE Power is also a driver of innovation for coal fired power stations and CO2-avoidance.

Source: www.latrobemagnesium.com (11-Oct-2013)

Lower Cost Key to Magnesium's Lightweighting Uses

The industry target is to use an average of 350 lbs. of magnesium components in vehicles by 2020. This would significantly lower the weight of the average car from the current 3,360 lbs.

For automakers, "lighten up" is not mood-altering advice but an imperative to shave hundreds of pounds of mass from cars and trucks to meet rising fuel-economy standards that kick in during the next decade.

One of the most promising materials for achieving weight reduction is magnesium. But because of its high cost and energy consumption in the manufacturing process, the metal is uncompetitive for most applications.



Government and industry now are partnering to boost magnesium use in lowering vehicle weight in coming years. The Advance Research Products Agency-Energy recently awarded \$32 million in grants to develop processes for cost-effective and energy-efficient manufacturing of lightweight metals for vehicles.

Research will focus on less-expensive and more energy-efficient ways of producing magnesium for vehicles designed to meet increasingly stringent emissions and fuel-economy regulations. ARPA-E, part of the U.S. Department of Energy, also is funding better ways to make aluminum and titanium for vehicles.

Magnesium currently is sparingly used in vehicles because it is about seven times more expensive to make than steel. Its price ranges from about \$2.90 to \$3.50 per pound – about 75% more than steel and 33% more than aluminum.

Part of that is due to stiff tariffs levied on imported magnesium. One-third of the metal is imported from China, which has the world's largest reserves and is the biggest global producer of magnesium. Chinese producers use the Pidgeon process that depends on a lot of inefficient coal-fired energy – creating massive amounts of carbon-dioxide emissions.

The U.S. has only one bulk magnesium plant in Utah that uses electrolysis to extract magnesium from molten salt brine in the Great Salt Lake.

Three of the ARPA-E grants encourage cleaner and cheaper magnesium production. A \$2.43 million grant to the Pacific Northwest National Laboratory funds research into an organic process of extracting magnesium salt from seawater, which normally has low concentrations of the metal, making extraction difficult, energy-intensive and expensive.

"Reinventing the magnesium production process so it's more affordable can help grow the magnesium market and decrease U.S. reliance on foreign-made materials," says Pete McGrail, a PNNL laboratory fellow. "We expect our method will be 50% more energy-efficient than the U.S. current magnesium production process."

McGrail tells *WardsAuto* in an email that PNNL's process breaks magnesium down to an "organo-magnesium compound." He says this produces magnesium flakes that are hot-pressed into ingots. "So, we actually take maximum advantage of magnesium's ductility in the process," he says.

The PNNL process requires temperatures no greater than 572° F (300° C), one-third the level required by the conventional U.S. process.

Global Seawater Extraction Technologies and the owner of the Utah plant are partnering with PNNL in the research.

Another approach funded by ARPA-E employs solar power to produce magnesium and synthesis gas, or syngas. The 3-year, \$3.6 million grant to University of Colorado-Boulder professor Alan Weimer seeks to create magnesium with a cooling process that produces a gas-to-solid metal phase change inside a reactor.

Magnesium production today uses electricity 24 hours a day, a method whose high energy consumption during daylight hours makes it particularly expensive. "Our plan is to use solar energy to power our reactor in the daytime and use electricity (from the grid) only at night during off-peak hours," Weimer says.

The Colorado process involves the reaction of carbon and magnesium oxide, which are heated to high temperatures in a hybrid solar-electrical reactor to produce magnesium vapor and carbon-monoxide gas. The magnesium vapor is converted into a solid metal. The carbon monoxide is combined with hydrogen produced by using excess heat recovered from the reactor to split water into its component parts of hydrogen and oxygen, resulting in the production of syngas that can be made into diesel fuel or gasoline.

"We anticipate that the demand for magnesium will increase as industry looks to produce lower-weight, higher-mileage vehicles," Weimer says.

Another ARPA-E grant to Valparaiso University in Indiana also seeks to produce magnesium with solar-thermal energy. The 3-year, \$2.3 million project could result in lower carbon emissions and less electricity use.

Magnesium is 75% lighter than steel and 33% lighter than aluminum. By 2020, magnesium parts will contribute to a 15% weight reduction in cars and trucks, leading to fuel savings of 9% to 12%, according to the U.S. Automotive Materials Partnership comprising Chrysler, Ford and General Motors.

The partnership says automakers used only 10 lbs. (4.5 kg) of magnesium per vehicle in 2005. That has grown slightly since then, but is still severely limited because of cost.

The industry target is to use an average of 350 lbs. (159 kg) of magnesium components in vehicles by 2020. This would significantly lower the weight of the average car from the current 3,360 lbs. (1,524 kg).

Such weight reduction would result in better performance and less noise, vibration and harshness, mainly by replacing multipart components with large castings. A magnesium third-row seat frame, for instance, could weigh 40 lbs. (18 kg) less than steel.

Ford uses one of the industry's largest die-cast magnesium structures in the liftgate of the Lincoln MKT. The metal also is used in Ford Explorer seats.

Matthew Zaluzec, global materials and manufacturing manager for Ford, predicts that beyond 2020, magnesium holds the potential for reducing vehicle weight 20%. But he says one of the big concerns about the metal is that it lacks ductility for energy absorption and shears easily.

Ford has done some developmental work on magnesium sheet meant to overcome this characteristic. "If I could get (magnesium sheet) wide enough, I would use it for fenders and roofs," Zaluzec says. "But I wouldn't use it for a crash rail or a bumper beam." His goal is to modify magnesium's chemistry to improve its ductility.

Zaluzec says magnesium could compete with aluminum in non-crash critical applications. "If we can crack the chemistry to make magnesium more ductile, it could be used in front and rear shock towers, some suspension components and in lower pillars," he says, noting the metal could be used in instrument panels in the near term if its price came down.

"We can push the envelope and make experimental door inner panels, but magnesium will never be cost-competitive with steel," Zaluzec adds.

General Motors recently ended production in China of the Cadillac SLS, which had a decklid with a magnesium inner panel made in a GM facility using 50% less heat than is conventionally used in forming high-strength steel stampings.

GM researcher Jon Carter says the use of magnesium for that application stopped when the SLS went off sale in late 2012. But he says the automaker is using the metal in steering wheels, instrument panels and roof-panel frames.

"Probably every car in the GM portfolio has some die-cast magnesium (content)," he says, adding. "Magnesium is just one of many candidates for lightweighting."

Source: www.m.wardsauto.com (04-Nov-2013)

Morwell Magnesium Move

Long held plans for a magnesium plant in the Latrobe Valley have progressed with an announcement yesterday the project's proponents have secured a brownfield site in Morwell for a proposed start-up.

Latrobe Magnesium Limited chairman David Paterson told The Express the company had finalised documentation to locate its magnesium plant, which it hoped would eventually produce 40,000 tonne of magnesium per annum, on land owned by the Di Fabrizio family on Tramway Road.

He said LMG expected to be in production in the third quarter of the 2015 calendar year. The proposal entails converting brown coal fly ash to magnesium, cement material and char.

Mr. Paterson said the site secured was almost 11 hectares and included some office and factory buildings.

The land had "historically been used for major infrastructure projects being the Loy Yang Power Station, Eastern Stand of the MCG and the Eastlink bridge beams," he said.

Mr. Paterson said the existing buildings would sufficiently accommodate LMG's initial 5000 tonne per annum magnesium plant and allowed for expansion.

It was also "ideally situated close to existing gas and water pipelines and local infrastructure".

LMG, a Sydney-based company, has secured an option for 12 months to enter into a three-year lease over the site and a right to buy the property during this period, Mr Paterson said, adding the 12-month option period "should be sufficient" for LMG to complete a bankable feasibility study of its proposal.

He said the company was currently negotiating fly ash agreements with local suppliers and was also negotiating with "potential key suppliers and customers".

Test work was being undertaken before preparing a 500kg material sample to be sent to, and processed in, China in October, Mr Paterson said.

Final test work would then follow and LMG intended to tender the design and engineering for its plant in the last quarter of this financial year, he said.

Late last year The Express reported LMG had signed a 'follow-up' agreement with Beijing Tieforce Engineering to help progress plans for a Valley-based operation and BTE was understood to be the only company in the past 15 years to have built a magnesium smelter in the western world.

The potential for a local magnesium plant has been touted for many years and LMG first listed on the Australian Stock Exchange 10 years ago.

When asked why it had taken so long to progress the project, Mr Paterson said his company had "a breakthrough" with its technology several years ago, indicating it was now commercially realistic.

Source: www.latrobevalleyexpress.com (24-Oct-2013)

80 Years of the Rolls-Royce Merlin

October 2013 marks the 80th anniversary of the first run of the most produced Rolls-Royce engine type of all time; the Merlin. In 1932, Sir Henry Royce wished to develop an engine that had the reliability of his Kestrel design, combined with the power of the 1931 Schneider Trophy-winning "R" engine in the Supermarine S6B racing seaplanes. The result was called the P.V.12, a 27 litre, V-12, liquid cooled, single-stage supercharged engine (P.V. standing for Private Venture).

Royce died on 22nd April 1933 without ever seeing this engine run and without knowing it would eventually become his most produced design. Just six months after his death, the first P.V.12 engine run was conducted on 15th October 1933.

The prototypes of two other private ventures, the Hurricane and Spitfire fighter aircraft, were designed around the 890 hp (663 kW) Merlin 'C'. The early engine design's performance needed improvement but was sufficient to show off the potential of these new low-wing monoplane fighters. Rolls-Royce even contributed £7,500 towards the total cost of £15,000 (equivalent to about £850,000 today) of the Spitfire prototype, K5054, which first flew on 5th March 1936.

By 1937, after significant alterations to the cylinder head design, the Merlin II was capable of 1,030 hp (768 kW). All Spitfires and Hurricanes in RAF service at the outbreak of war in September 1939 were fitted with the Merlin II, with the Merlin III being fitted in ever larger numbers by the Battle of Britain in 1940.

Merlin development never ceased and more and more power was extracted from the engine using improved superchargers and fuels. In 1942 the Spitfire Mk IX was equipped with the two-speed, two-stage supercharger, 1, 280 hp (954 kW) Merlin 61. The Mk IX's performance was improved both in speed and ceiling and immediately outstripped the opposition to gain outright air superiority. This improved Merlin was also used in other aircraft, the most famous application being the North American P-51 Mustang which became one of the most successful fighter aircraft of WW2.

The Merlin was successfully fitted in many other aircraft types, not least the Lancaster and Mosquito. After the war the civil aviation industry restarted with Merlin-powered Lancastrian and York transports and the Canadian-built DC-4M Argonaut, many of which supported the Berlin Airlift in 1948. By the end of production in 1951, a total of 168,040 Merlin engines were produced including over 55,000 built under licence as the V-1650 by Packard in the USA.

Source: www.rolls-royce.com (Oct-2013)

Valparaiso University Receives \$2.3 Million Funding from DOE for Solar Light-Metal Research

The United States Department of Energy has awarded Valparaiso University a \$2.3 million cooperative agreement to fund solar research through a proposal from the College of Engineering. Part of the Modern Electro-Thermochemical Advancements for Light-metal Systems project, Valpo is the only organization in the state of Indiana to receive this funding.

The funding, which will be dispersed during the course of a three-year period, is a direct result of the James S. Markiewicz Solar Energy Research Facility housed in the College of Engineering. At the heart of the research facility is a solar furnace, the only one at an undergraduate institution in the United States and one of only four research facility solar furnaces in the nation.

Through the \$2.3 million cooperative agreement, Valpo's team of engineers and scientists will develop a novel electrochemical cell that produces magnesium using solar-thermal energy and electrochemical processes. The advanced hybrid cell uses concentrated solar power for heating, minimizing the electricity requirement for magnesium separation.

Valpo's system could reduce carbon emissions and electricity consumption compared to conventional production. During the three-year funding period, Valpo faculty and students will develop the technology needed to produce magnesium that will potentially reduce imports, emissions and costs of production.

The funding comes from the Advanced Research Projects Agency — Energy, an organization within the Department of Energy that supports the creation of transformational energy technologies and systems through funding and managing Research and Development efforts. Since its founding in 2007, the Agency has funded nearly 300 projects totaling approximately \$770 million across the entire technology landscape.

Source: www.green-energy-news.com (19-Sep-2013)