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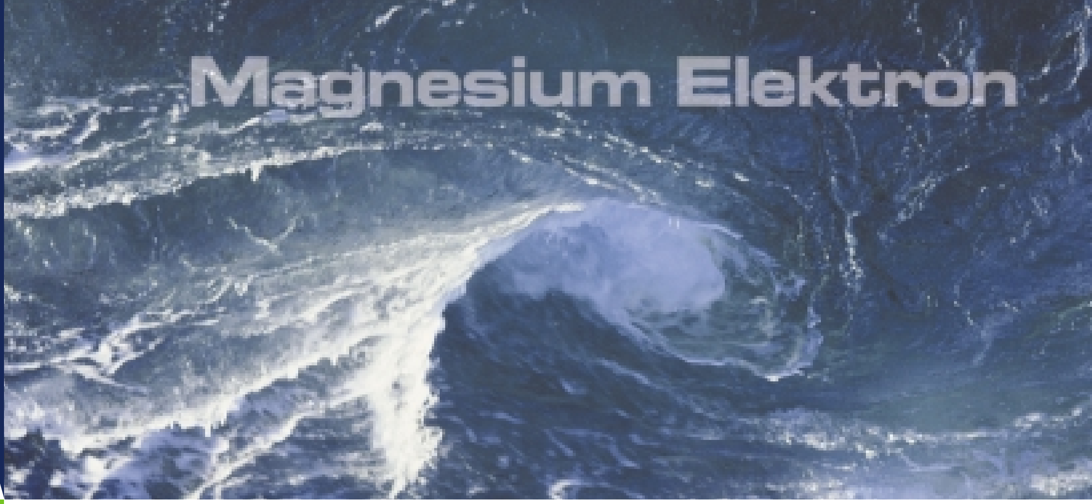

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Magnesium Recycling Brief

Moving Upstream to Internal Recycling?

At the Automotive Circle and EFM magnesium seminars in September 2001, Magnesium Elektron will present a financial appraisal of internal versus external magnesium recycling; highlighting the major cost drivers of each and illustrating the impact of six major variables on the decision making process.

The presentation will begin by defining what is meant by the term recycling and what quality standards the industry expects from recycled alloy ingot. The presentation will provide an overview of the capital costs of constructing an internal operation, highlighting the items required regardless of processing volume. The "soft costs" of permitting, training, commissioning and project management will be considered before reviewing the major variables that will have an impact on the project's internal rate of return (IRR). These include forecast volumes and demand profile; bulk density of scrap and distance to an external recycling centre; local labour rates and the availability of investment and training grants.

The presentation will show the impact of each of the major variables upon a project's IRR before considering some of the other factors which will have an impact upon the decision making process. These include the availability of land, the management of low grade arisings, the number of alloys to be recycled and the overall strategic fit of moving the die casting foundry upstream to manage this valuable raw material source.

Use of Chinese Alloy in European Marketplace Reaches 16%

The use of Chinese magnesium alloy in the European die casting market is forecast to reach 16% of the total primary magnesium supplied in 2001. This finding follows an analysis by Magnesium Elektron on the activities of the European die casting market.

In 2001, it is forecast that European die casting foundries will use 6,500 tonnes of alloy sourced from China out of a total requirement of 40,000 tonnes. This figure suggests that die casting foundries are increasing their use of this low cost feedstock material as a means of reducing total operating costs. Across the market, however, there are wide variations. While some foundries have pursued trials and experienced problems in material supply and metal quality, others have successfully identified suitable suppliers and now use Chinese alloy for a significant proportion of their primary alloy feedstock.

The figures from the ELEKTRON analysis suggest a higher use of Chinese alloy than the estimates presented on a quarterly basis by the International Magnesium Association.

Implications of the European End-of-Life Vehicle Directive

On the 27th April 2001, Materials Recycling Week presented a one day conference in London, UK, assessing the implications of the End-of-Life Vehicles (ELV) European Directive. The packed conference was attended by over 250 delegates with speakers from numerous organisations including BMW, Ford and the UK's Environmental Agency.

The Directive's broad objectives are firstly, to minimise the impact of ELVs on the environment, and secondly, to ensure smooth functioning of the internal market within the European community.

The Directive has set specific targets for European member states regarding the take back of ELVs and the reuse and recycling of the materials used in construction. In the case of material re-use and recycling, the Directive states that by 1st January 2006, there should be greater than 85% recovery from all ELVs (i.e. <15% to landfill) and by 2015 recovery should increase to 95%. The recovery figure does allow for a percentage of energy recovery but re-use and recycling of materials should be greater than 80% by 2006 and greater than 85% by 2015.

Marcus Essenpreis from the BMW Group highlighted that the Directive would have massive effects for the future of car development, obstructing the use of lightweight composites and renewable materials.

From a magnesium perspective, Magnesium Elektron has presented numerous papers to the automotive and magnesium industry on the recycling opportunities and issues of using this recyclable, lightweight material in automotive construction. In terms of material supply, it is forecast that significant volumes of magnesium will begin to appear in European recovery programmes from around 2008 when the first of the VW Passat vehicles containing magnesium transmissions become end of life.

To exploit the true recyclability of the magnesium recovered, it will be necessary for the industry to ensure that as much of the recovered magnesium as possible is recycled back into a high purity product displaying the same quality characteristics as primary metal. To meet this goal, the industry will need to liaise closely with the auto manufacturers and vehicle dismantlers.

Magnesium Elektron

Looking back...

With the construction of its primary magnesium operation commencing in March 1936 at a site at Clifton Junction, near Manchester, Magnesium Elektron produced its first magnesium metal in December 1936 using the I.G. electrolytic process. The original plant was designed to use natural magnesite and calcined natural magnesite as raw materials for the production of magnesium and ELEKTRON magnesium alloys.

By the end of the 1930's, there was a threat to the continued supply of these raw materials into the UK so other raw materials needed to be identified and incorporated into the production process. In February 1939, following a development in co-operation with the British Periclaese Company, Magnesium Elektron began production of magnesium from sea water magnesia. This was the first time that magnesium had been extracted from sea water and also the first time that a commercial ingot of any metal had been obtained from this natural resource.

VW Group Increases Market Share as European Car Sales Fall

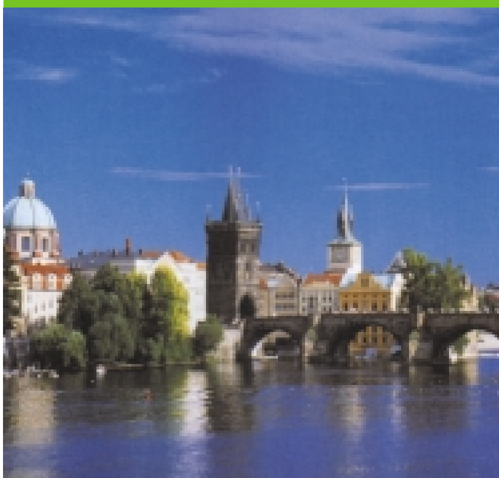
Provisional sales estimates by ACEA indicate that European car sales fell by 1.7% in the first 6 months of 2001 compared with the same period last year. Against this falling trend, sales from BMW, DaimlerChrysler and the Ford, VW, and PSA Groups all exceeded last year's results.

The PSA Group was the biggest group winner in the period, with increasing sales of the Peugeot and Citroen brands giving the group a 7% increase in the first 6 months sales. These figures come as the Group signed a letter of understanding with Toyota, to jointly develop and build an entry level baby car. The plan is to produce up to 300,000 cars for the two manufacturers from 2005.

Skoda, the Czech Republic based subsidiary of the VW Group, was the biggest single brand winner with sales in the period increasing by 22%. The VW Group, Europe's biggest car manufacturer, increased its overall market share from 18.2% to 18.9%.

Magnesium Elektron

Green Light and a 5 Year Contract for Magnesium Elektron's New Recycling Operation



Magnesium Elektron has been granted environmental approval for the recycling of magnesium process arisings at their new recycling plant in the Czech Republic. Approval from the Ministry for the Environment is a major step forward for ELEKTRON in establishing what will be the largest magnesium recycling operation in mainland Europe.

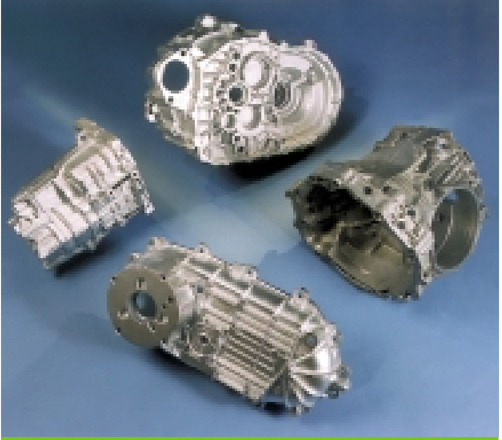
The approval follows a period in which environmental experts from both local and regional authorities considered an Environmental Impact Assessment, detailing the operation's emissions and waste streams. The manufacturing plant, due to come on stream in January 2002, will comply with both the Czech Republic and European environmental standards.

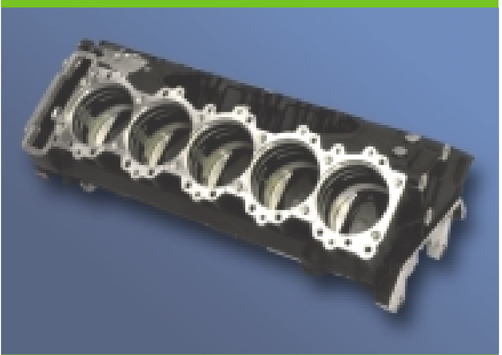
The news comes as Magnesium Elektron announced that it had entered into a recycling partnership with one of Europe's largest die casting foundries which will secure volumes for its new recycling centre in the Czech Republic until 2005.

The die casting foundry is a major supplier of magnesium castings to the automotive industry and recently carried out a full economic assessment of internal and external recycling costs which was driven by an increasing demand for its products. As part of this assessment, Magnesium Elektron worked with the foundry and set out future recycling costs based upon modifications to the flow of materials within the die casting foundry and alloy ingot production at Magnesium Elektron's new plant in the Czech Republic.

Together, the two companies were able to significantly reduce recycling costs and have now entered into a partnership agreement in which Magnesium Elektron will recycle up to 3,000 tonnes of magnesium per annum which equates to 30% of the new plant's 10,000 tonnes per annum capacity. For the die casting foundry, the agreement secures a guaranteed supply of proven, high quality ELEKTRON alloy ingot, and enables future demand fluctuations to be managed by a third party.

Both companies have worked together since 1997, with Magnesium Elektron recently being awarded Class A Supplier status for product quality and delivery performance. The two companies are currently evaluating other areas of co-operation as a means to minimise total operating costs.





Alloy Diversification Will Bring New Challenges

Magnesium Elektron expects the number of alloys being used in the magnesium die casting industry to increase significantly over the next 5 years as magnesium becomes specified for more demanding applications in the automotive industry.

Currently, the industry operates with 3 alloys: AZ91D, AM60B and AM50A. Certain new applications are expected to require increased ductility and better deformation characteristics which could be achieved by reducing the aluminium content of the current AM series of alloys. However, a reduced aluminium content will narrow the freezing range of this alloy group, reducing overall die castability.

A number of magnesium producers are also involved in the development and application of high temperature and creep resistant alloys for use in powertrain applications. At the 2001 SAE conference in Detroit, Ford, GM, Noranda and DSM all presented properties of high temperature die casting alloys currently under development.

The trend in alloy development, which is welcomed to support the growing application of magnesium, potentially means that within a 5 year time frame, the industry will be required to manage the recycling of 5 or 6 alloys, all of which will need to be recycled to the standard high purity specifications. Segregation, flexibility and process control in the management of process arisings will become increasingly important challenges that will require close co-operation between the magnesium die casting and recycling industries.

Magnesium Conferences in 2001

Automotive Circle International
Fortschritte mit Magnesium im Automobilbau
18/19 September 2001
Bad Nauheim
Germany

Die Casting - Fonderie Sous Pression
18/20 September 2001
Paris
France

EFM
9th Magnesium Automotive and End User Seminar
27/28 September 2001
Aalen
Germany

Materials Week 2001
International congress on Advanced Materials and Processes
01/04 October 2001
Munich
Germany

China Magnesium Association
2001 China Magnesium Forum
10/12 November 2001
Beijing
China