

MAGNESIUM ROADMAP - 2004

PRIORITIES FOR DEVELOPMENT OF MAGNESIUM TECHNOLOGY AND APPLICATIONS IN UK

INTRODUCTION

Global production of magnesium is currently around 400K MT annually. Although this is small compared to engineering metals such as steel or aluminium, magnesium is still an active global industry, which is predicted to grow significantly over the next 10 years.

In recent years, the major volume consumption of magnesium has been for alloying with aluminium to make a range of structural alloys, particularly for aluminium cans. However, structural applications for specific magnesium based alloys, particularly as diecastings has become a growing proportion of total use and in 2004, it is predicted that diecasting will become the major use of magnesium.

Over the last 10 years, growth in this sector has averaged 12%p.a, and is predicted to continue at around 8% p.a. for the next few years. Most of this growth is due to increased use in transport applications driven primarily by the need to reduce weight and improve fuel efficiency of road vehicles.

While most recent growth has been in diecasting, there has been limited use of magnesium for many years as sand and gravity castings, and as wrought products such as extrusions, forgings and sheet. These have typically been speciality applications for aerospace, high performance automotive or military.

The development of more efficient electrolytic reduction processes in the developed world, and the increased availability of Mg from low cost production in China have resulted in the basic price of primary magnesium falling to the same levels as that of primary Al. This opens opportunities for further development of Mg applications in a range of commercial uses for which it has not been previously considered.

There has been an upsurge of interest in R&D of magnesium alloys and applications focussed in Europe, North America and Japan. In Europe, most development is concentrated in Germany.

While the potential for magnesium use in UK is similar to that in other industrially developed European countries, UK participation is disproportionately low. Main reasons for this are:

- The relatively small and fragmented supply base for magnesium products in UK
- Lack of knowledge of the attributes of magnesium alloys and the current “state of the art” of magnesium technology in UK industry, particularly amongst potential users outside the major traditional aerospace and automotive manufacturers.

At the IOM Materials Congress in 2000, the newly formed Light Metals Division initiated a process to establish a “roadmap” for Mg for submission to the UK Materials Foresight Panel. An initial focus group meeting lead to the selection of 4 key areas for more detailed review by small ad-hoc working groups. Key areas were:

- Mg in commercial transportation
- Mg in aerospace and high performance transportation
- Wrought magnesium
- Light weight mobility aids for an ageing population

Information was collated and summarised by the Light Metals Division Committee and disseminated at the IOM Congress 2002 and also in 2002 in the form of a “Business Driver/Issues/Technology Requirements analysis via the IOM Foresight interface.

It is unfortunate that this information was not available to the Foresight Materials Panel when its report “Materials: Shaping our Society” was published in December 2000, since this dismissed magnesium in a single paragraph concerning light metals as follows:

- Industry Structure: Consideration of light metals is concentrated on aluminium as although magnesium has important and growing applications, its main use is likely to remain as an alloying element in aluminium alloys for many years to come.

This was published at a time when structural uses of magnesium-based alloys were already beginning a renaissance, particularly for transportation applications, and significant growth was predicted worldwide.

Since no later review is available from the Materials Panel, it is particularly important that the significance and development of magnesium usage is recognised and publicised. To that end, the Light Metals Division committed to update the roadmap information for magnesium in 2004. As part of that exercise, a Magnesium Workshop was held at Brunel University in September 2004 at which the previous roadmap recommendations were reviewed and discussed. This was followed up by a questionnaire to attendees plus additional interested parties. (ie, approx 70 academic, industrial and technology provider participants). Based on discussions and analysis of the returns, a series of updated roadmap recommendations have been compiled and are presented below.

KEY AREAS FOR DEVELOPMENT

Feedback from discussions and questionnaires highlighted an overriding need, in the UK, by academics and industrialists alike, for more information on all aspects of magnesium technology and applications. A formal network was mooted as the best way to achieve this. This need has been incorporated, where appropriate in the updated “Business Driver/Issues/Technology Requirements” analysis shown in appendix 1.

From the point of view of magnesium technology, the following 3 key areas were recommended for further development:

- Mg in commercial transportation applications
- Mg in aerospace and other high performance transportation applications
- Magnesium for medical and personal mobility aids

Within those key areas, major development priorities are summarised in appendix 2.