

Spain

MagForum 2019

M. O'Driscoll

A sunny Bilbao/ES beckoned the leading lights of the world magnesia market to gather and discuss the industry's latest trends and developments at IMFORMED's MagForum 2019, at the Occidental Bilbao during 13–15 May 2019. Over 200 attendees from across the magnesia minerals supply chain enjoyed the sumptuous Welcome Reception kindly sponsored by MAGNA-Timab Magnesium.

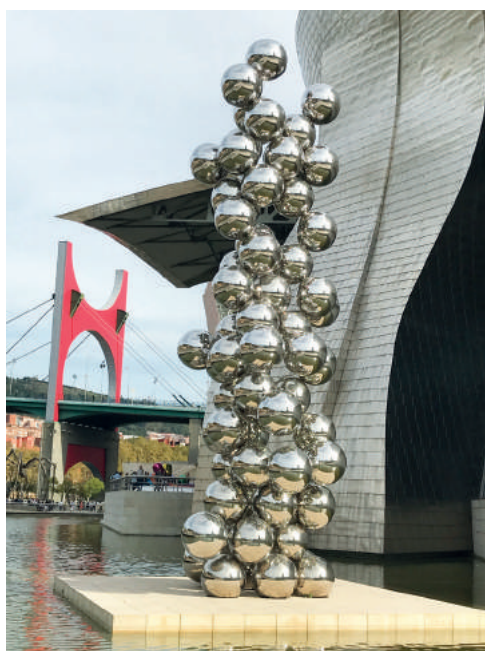


Fig. 1
Guggenheim Museum of Bilbao

From mine to steel mill

Mike O'Driscoll, Director, IMFORMED/GB, opened with a brief introduction on the diversity of magnesia by source, grade, and markets before highlighting recent developments in China, the industry response to supply challenges, steel market outlook,

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and corporate movements. "While recovering to some extent, it is still a mixed bag, some uncertainty remains over future Chinese supply and there is continuing interest in developing alternative sources outside China. Trends in the refractories industry to evaluate use of new and alternative materials and product formulations will continue as will increased refractory recycling and use of recycled material" concluded M. O'Driscoll. He also suggested that sluggish steel market growth in the West may increase magnesia diversification into speciality markets, pushing alternative processing and calcining technologies, while better steel prospects in Asia will lure refractory player investment and supply opportunities. Guillaume Bonnet, Commercial Director, Magnesitas Navarras (Magna)/ES, presented **Magna: From the Mine to the Steel Mill** reviewing Magna's history and development of magnesite deposits to date, now wholly-owned by Groupe Roullier, and planning to celebrate its 75th Anniversary in 2020. G. Bonnet explained how research and innovation are at the heart of Magna's strategy as it focuses on sustainability the efficient use of energy and natural resources.

In 2018, Magna sold a total of 280 000 t of all products, of which refractories were almost 80 %. Magna's Spanish operations, including feed from its new Borobia mine, produced 200 000 t of dead burned magnesia (DBM) in 2018, and 240 000 t of mixes.

In Brazil, Magnesium do Brasil (50 % owned by Groupe Roullier), produced 50 000 t of Caustic Calcined Magnesia (CCM) in 2018. However, with a new 30 000 t/a cap-

acity Polysius vertical shaft kiln and new 36 000 t/a capacity mixing plant, refractory sales in 2019 are estimated at 36 000 t.

Uptick in magnesite ore trade – a new supply scenario emerging?

In her excellent **Global Supply of Magnesia in 2019: A New Landscape for the Next Decade?**, Alison Saxby, Director, Roskill Holdings/GB, reviewed the types of magnesia and sources, shifting trade patterns, and supply trends for CCM, DBM, high grade DBM, Fused Magnesia (FM), China, with thoughts on the future supply situation.

Of interest were A. Saxby's comments on the increasing trade in magnesite ore: "Still small scale in overall magnesite supply, but some in reaction to shortages in Chinese magnesia supply."

In particular, attention was drawn to Pakistan exports which have increased from 6000 t in 2014 to 80 000 t in 2018, mainly to India but also to Greece and China in 2018, and are forecast in total to reach 95 000 t in 2019.

With regard to China, A. Saxby thought that Chinese supply may "normalise" by 2020, and said: "CCM and DBM sources are coming back on line in China, inspections will still take place and supply disruptions will occur, and maybe more are planned in the future."

In conclusion, A. Saxby said: "China will remain the most significant magnesia supplier, and its domestic market will continue to grow, albeit at lower rates. There will be opportunities for ROW producers, especially HGDBM producers and potential growth of magnesite direct ore shipment."



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Fig. 2
Round table discussions

Magnesia consumption in steel and lime production

Can We Survive without Magnesite?

by Jose Cruz Zirion, Director Procurement & Logistics, Sidenor/ES, was a superb analysis of the Spanish steelmaker's application of magnesia refractories in its processes. Sidenor, which produces specialist steels and is the market leader in Europe, has a total meltshop capacity of just over 1 Mt/a steel from two Spanish plants, the main one at Basauri (EAF, continuous casting), and the other at Reinosa (EAF, ingot casting). The company consumed just over 11 000 t of refractories in 2018, of which 84 % were magnesia-based. "Ladle refractories consists of MgO-C bricks at the hot face (wear lining) and high alumina or burned magnesia bricks behind (permanent lining)", said J. C. Zirion.

J. C. Zirion acknowledged the industry's use of alternatives to magnesia: some steelmakers use alumina based materials or dolomite

in the wear lining of the ladle. But he said: "For high quality applications, alternative products imply changes in parameters of the steel production process and, possibly, will affect the performance of the material. So, for special steel manufacturing, the current magnesia-based refractories are really a good choice in terms of general performance."

Refractories in Lime Production by Wes Gabler, Global Category Manager Procurement, Lhoist/US, reminded the audience with a useful video clip of Lhoist's activities in mining and calcining huge volumes of carbonate rocks in the Europe and the USA, before outlining the group's refractories used in some 150 kilns.

W. Gabler examined the range of main kiln types used by Lhoist with a special focus on refractory use by the Preheater Rotary Kiln (PRK) and Parallel Flow Regenerative Kiln (PFRK). Both kilns require refractories of DBM purity of min. 95 % MgO, the PRK

requiring 100–150 t in the burning zone and the PFRK requiring 350–400 t in the preheater and burning zones.

W. Gabler highlighted the impact of issues such as high raw material prices owing to the Chinese situation, limited availability outside China, high delivery times, increased global demand across all industry, supplier consolidation, reduced competition in refractory producers, and environment concerns.

"Lhoist supports China's attempts to make their supply chain sustainable", said W. Gabler. W. Gabler saw industry opportunities in quantifying magnesia properties against substitute materials; improving sorting and disposal of spent refractories for recycling; increasing supply sustainability and value through existing and new supplier development; and ensuring prolonged lifetime of refractories.

How do we see the magnesia "society"?

The Future of the Magnesia World by Gustavo Franco, Chief Sales Officer, RHI Magnesita/AT, reviewed the latest developments at RHI Magnesita, including the "ongoing" negotiations on the proposed acquisition of Kumas/TR, before taking a somewhat philosophical but entertaining view on the future of the magnesia industry. G. Franco looked at the world as an interaction of society and available resources, with demography, economy and technology as influencing factors. He then focused on the magnesia "society" from three different angles: market, financials, and technology. G. Franco then smartly turned the spotlight on the audience and their take on the magnesia society by asking a series of topical questions to which delegates could respond via their mobile phones on an audience interaction app.

"Recycling", "sustainability", and "environmental footprint" dominated the audience-generated word-cloud, while magnesia producers outside China were the clear beneficiaries of escalating prices in China. Security of supply and meeting specifications just edged over pricing as the main concerns for purchasers, as future DBM prices were largely estimated to be USD 700–800/t and for FM USD 800–1000/t.

The market outlook, G. Franco urged, should perhaps be about the future interaction be-



Fig. 3
Informal networking

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tween the magnesia society and the available magnesia resources.

G. Franco identified several factors shaping the future:

- application of 4.0 tools to resource mapping and product specifications;
- special application prices will rise;
- stability of supply and long predictability will succeed;
- quality requirements will increase;
- environment-friendly becoming a must;
- major investments to ensure availability to high purity magnesia.

Keys to success

Fundamentals of the Magnesite Business: Key Factors for Success by Nicolás Gangutia, Managing Director, Ganmag/ES, was a very comprehensive dissection of the three pillars of the industry summarised as “knowing the market, listening to the stones, and feeling the process.” Armed with these fundamentals one can then understand the costs in the magnesite business and navigate through regulations and compliance.

N. Gangutia underlined: “And the big mistake? Due to a high prices trend – 6 years in the last 30 years – is to go to compete against Chinese qualities and prices without market knowledge and no R&D.” Another key element was his call to “Listen to the stones”: “The differing behaviour of magnesite host rock and impurities is more important than the quality of the magnesite”, said N. Gangutia.

Raw material and energy costs were analysed in-depth: “A good energy cost for DBM one step is >EUR 40/t MgO; a bad energy cost for DBM one step is >EUR 55/t MgO”, said N. Gangutia.

Every country or region has its own environmental legislation regarding pollutant and CO₂ restriction. N. Gangutia reminded that the key question is how to adapt the production to overcome these difficulties at the lowest cost.

New synthetic sources: Australia and Jordan

The EcoMag Synthetic Magnesia Products by Dr Tam Tran, Chief Technology Officer, EcoMag Ltd/AU, outlined the status and objectives of EcoMag’s 80 000 t/a Hydrated Magnesium Carbonate project at Karratha, Western Australia.

The project has access to Australia’s largest solar salt bitterns stream (from Dampier Salt) and proprietary technology and is looking to produce a unique range of speciality magnesium products: high purity ~99,5 % (MgO at 99 %); Hydrated Magnesium Carbonate (HMC); Caustic Calcined and Hard Burned Magnesia (CCM/HBM); Magnesium Hydroxide (MDH); Hydrotalcite (HDT); and magnesium citrate, lactate, and other organic esters.

Primary regulatory approval has been received and a bankable feasibility study is complete, with commercialisation as the next stage. 2019 will see detailed engineering and financing feasibility studies, geotechnical study, construction design finalisation, final regulatory approvals, and debt and equity raising. Plant operation is expected in 2020. T. Tran said: “In time, EcoMag expects to be involved in developing materials for pollution control, air filtration, waste water processing, carbon capture, hydrogen storage, next generation batteries, lightweight building materials, and active coatings.”

From Australian Salt Bitterns to the Dead Sea in Jordan – Development and Outlook for Manaseer Magnesia – ManMag by Ahmad M. Samara, Sales Manager, Manaseer Magnesia/JO, revealed the rejuvenation of Jordan’s magnesia source. Using Dead Sea brines and local limestone, ManMag has a production capacity of 60 000 t/a magnesia products. The plant will be switching to natural gas by the end of 2019. CCM is in production now, and commissioning of high grade, 98 % MgO DBM production started in summer 2019, with commercial production end-2019/early 2020.

Established natural sources: Spain – potential and China – continued uncertainty

Spain’s Magnesite Resources, Production and Markets by Manuel Regueiro, Chief of External Affairs & Communication, Geological Survey of Spain/ES, provided a reminder of the country’s importance in Europe’s magnesia supply market. M. Regueiro looked at the geology and mining, production and consumption, uses, reserves and resources, and future trends for Spanish magnesite.

Spain has immense magnesite resources of almost 600 Mt. “Environmental concerns in China will continue to affect production and prices. This might be an opportunity to enlarge the European magnesite market, in which Spain could be a leader”, postulated M. Regueiro.

Chinese Magnesia Supply and Price Trends by Vincent Wong, Business Manager, Refractories Window/CN, was much anticipated by the audience and Wong did not disappoint. A well structured overview of Chinese magnesia supply and price trends provided an excellent picture of the current situation. V. Wong considered that there is still production overcapacity in China; a “temporary capacity recovery” lifted the overall supply volume in Q1 2019 while the dynamite ban has not been as bad as 2018.

Producers are retaining enough stocks currently, leading to a lowering of prices; while high quality magnesite supply still faces shortages and high purity magnesia price remain high.

V. Wong reiterated China’s new pledge for two central government environmental in-



Fig. 4
Networking during the coffee break

spection periods (April–May, Oct.–Nov.) every year for four years, and along with local government inspections, this is likely to disrupt future supply with increasing costs and supply shortages. “Inspections will last into the long term, the key point is how the regulations are implemented”, said V. Wong.

Indeed, and combined with the now regular annual winter industry shutdown Nov.–March, China’s magnesite industry looks set to face three regular hits each year. The Liaoning industry’s consolidation with integration to the single entity Liaoning Magnesite Co. Ltd (Liaoning Lingmei) is continuing, and V. Wong said: “If companies do not join [Lingmei] they will be forbidden to sell magnesite.”

On production developments, more than 3 Mt/a of new flotation capacity has been commissioned with a further 7 Mt in construction. Other new capacities include PRCO’s new mine in Tibet (1 Mt/a magnesite); Jiachen’s capacity expansion in Liaoning (1 Mt/a high purity DBM); and West Magnesium (salt lake magnesite for high purity FM/DBM).

V. Wong forecast that the supply situation might meet “huge uncertainties in certain periods”, with prices declining or weak in the coming two months against oversupply market status, but with the possibility to increase again later in 2019.

Chemicals market

Overview of Magnesium Chemicals Market by Samantha Wietlisbach, Principal Analyst Chemicals, IHS Markit/CH, reviewed the chemical markets for magnesite, magnesium chloride, magnesium sulphate, and magnesium hydroxide. The CCM market, for non-refractory applications was estimated at >4,3 Mt in 2018, with construction the largest sector (39 %), followed by agriculture (26 %), chemicals (14 %), environmental (11 %), and others (10 %). Total consumption of magnesium chloride was estimated at 1,7 Mt in 2018, of which 36 % was in construction, mostly Sorel cement. The majority of magnesium sulphate (74 %) is used in agriculture, global production capacity is about 0,9 Mt MgO equivalent.

Japan is the world’s largest producer of magnesium hydroxide, accounting for 36 % world capacity. Global demand is estimated



Fig. 5
Discussion of “hot-topics”

at about 1 Mt/a with environmental applications consuming 66 %, and flame retardants 10 %.

Processing: New flash calcination and sorting

The Calix Process: Update on Applications for Very High Surface Area MgO and Direct Separation of Process CO₂ Emissions was an enlightening duet by Dr Phil Hodgson, Managing Director and CEO, together with Dr Mark Sceats, Executive Director and Chief Scientist, Calix Ltd/AU.

Calix’s vertically integrated magnesite business was explained, with its South Australia magnesite mine of 466 000 t proven and probable reserves, and 25 t/a CFC calcination and CO₂ separation plant at Bacchus Marsh, Victoria.

The produced material is then shipped to customers’ satellite hydration plants: Calix has three so far, in Victoria, Queensland, and the Philippines.

The company has patented the Calix Direct Separation Flash Calciner: a reinvention of the kiln to create nanoactive materials at scale, more safely and affordably than incumbent nanotech processes. The CFC technology heats finely ground minerals (1–100 µm) and can control a fast calcination process to create a highly porous product, with nanoscale honeycomb structures. The use of indirect radiant heating through the red-hot walls of the reactor tube stops furnace gases contaminating the products, and allows for the efficient, direct capture of CO₂ from the processing of carbonate minerals such as limestone or magnesite.

High value applications include as an anti-bacterial agent, in biogas control, water conditioning in aquaculture, and in crop protection. Apart from CO₂ capture, M. Sceats believes there are opportunities for innovation in refractories and ceramics.

“Given grain size, stress and low Young’s modulus, we believe there could be a route for flash sintering without coarsening for very high strength products – using low temperature processing, and sintering in minutes. It may bypass the DBM route for magnesite. The magnesite industry needs a way to remove CO₂ from the process”, said M. Sceats.

In High Capacity Sorting of Magnesite, Jens-Michael Bergmann, Area Sales Manager Europe, MENA/IN, TOMRA Sorting GmbH/DE, introduced the sensor approach in mineral/ore processing and the different types of sensor methods. Benefits for sensor sorting magnesite included: profit from preconcentration and early elimination of waste; de-coupling of pre-concentrating and main treatment plant which allows the main plant to be fed at its optimum feed rate and a consistent grade which is increasing performance; increased production rates; reduction of transport costs; turn the grade of sub-economic deposit into an economic one, and increase mine life.

J.-M. Bergman concluded: “DMS [Dense Media Separation] is not suitable for the removal of dolomite or calcite. Sensor sorting can help to remove various contaminants and the sorter flexibility allows focus on either high product purity or on high recovery.”

MagForum 2020 will be prepared soon!