



Mineral recycling is evolving fast



One of the fastest evolving sectors of the ceramic raw materials industry is that of recycling minerals, or sourcing “secondary raw materials.”

The primary drivers of environmental pressure and scarcity of certain mineral resources is reshaping the traditional mineral supply chain. Instead of having a mineral deposit as the main source, traders and consumers are now considering securing specific industrial waste streams to be carefully processed in order to reclaim a range of mineral products.

This trend has created the pursuit of new alliances between waste producers and recyclers, as well as supporting increasing development and marketing of processing and sorting technology to facilitate successful recycling.

IMFORMED’s Mineral Recycling Forum has taken the spotlight to this fast growing industry since 2016. This year’s conference took place in Cologne March 15-16, 2018 where international delegates networked and discussed the latest trends and developments in recycling steel waste, refractories, foundry chromite sand, salt, phosphorus, and fly ash.

The conference was preceded by a well-attended and quite exceptional one-day tour of recycling leader Horn & Co. Group’s facilities at Weitefeld, Hunsborn, and Siegen.

Delegates were able to see first hand how steel and refractory waste was expertly sorted (by both hand and laser based sensor system (LIBS)), crushed, sized, and

packaged ready for customer delivery. Of particular interest was the state-of-the-art analytical laboratory at Hunsborn as well as the operational LIBS unit at Siegen.

“Circularity without sustainability is stillborn”

Proceedings were opened by the keynote “The role of industrial minerals in the circular economy” by Roger Doome, secretary general, IMA-Europe, Belgium.

Doome explained how the circularity of the industrial mineral sector was driven by resource optimization, functional recycling, and recovery of secondary raw materials.

However, he stressed that “Industrial mineral recycling and re-use alone will not be sufficient to meet the demand for raw materials. Circularity without sustainability is stillborn.”

Doome went on to detail industrial minerals use in certain sectors with a view to future recycling, such as in renewable energy, mobile phones, and transport highlighting the EU Raw Materials Initiative and the 2018 measures for “An Ambitious EU Circular Economy Package.”

Waste valorisation examples included limestone processing waste slurry (calcite, wollastonite, dolomite, and silicates) used as filter sand and kaolin waste used to make lightweight materials for construction.

According to Doome, today the industrial minerals sector estimates that

up to 50% of all minerals consumed in Europe are recycled along with the steel, glass, paper, plastic, and concrete they are used in.

He concluded: “Industrial minerals consumption would increase by 50% in the absence of functional recycling. Recycling should be sustainable.”

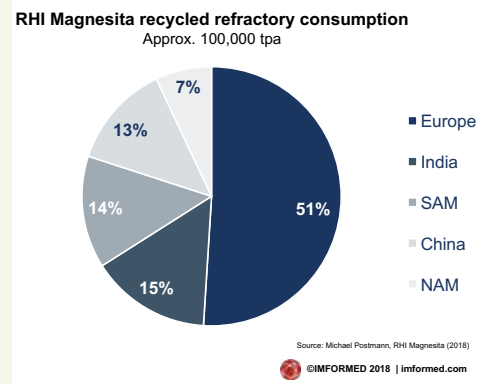
Refractory recycling

“Building a refractory recycling business through the use of PDCA/SDCA methodology” by Mario López, recycling specialist, RHI Magnesita, outlined Brazilian environmental policy and regulations and South American refractory recycling rates, before detailing the methodology involved in creating a sound refractory recycling system.

The results spoke for themselves, with vastly increased recycling volumes and 2017 targets either hit or exceeded. The 2018 action plan includes projects on developing supply and production chains for mag-carbon recycling in Brazil and mag-spinel recycling in Argentina.

In Brazil, total spent refractories are estimated at 50,000 tpa. In 2016, RHI Magnesita recycled 15,500 tonnes. Since the beginning of the project in 2016, some 50,000 tonnes of spent MgO refractories have been recycled, equivalent to 98,000 tonnes of magnesite ore and 3,500 litres of fuel.

In “RHI Magnesita refractory recycling: The past and the future” Michael Postmann,



recycling manager, RHI Magnesita, presented a very frank review of where the company is now and where it wants to be in refractory recycling.

At present, RHI Magnesita possesses only limited crushing/drying capacity for recycling material at various plant sites, and there is no single plant with a sole focus on refractory recycling.

Postmann said: "Use of recycling material is limited due to quality and economics, and RHI Magnesita is using at present around 100,000 tpa of recycling materials in its own products globally."

Looking ahead, Postmann said that RHI Magnesita aims to gain access and participate in sourcing of alternative raw materials, to open its product portfolio to use more recycled materials, and develop new products for recycled materials.

A very comprehensive review of Sidenor's strategy and activities was presented by David Maza, R&D - knowledge group leader, Sidenor in "Refractory waste valorisation under Sidenor steel plant strategy" This was illustrated by some superb images and a memorable video clip of a spent refractory wreck-out of a steel ladle.

Maza reviewed the last five years of the company's efforts in refractory waste management, demonstrating how best practices were consolidated in 2014-15, the ISOVAL (isostatic refractory valorisation, eg. nozzles, stoppers, LS tubes) project of 2015-16, to the pursuit of excellence in recycling by 2017.

Today, Sidenor is using emergency ladles totally lined with recycled bricks and manufacturing higher value added

products from recycled isostatic refractories, such as LS tubes.

Foundry sand reclamation

Another important area of recycling in the metallurgical industry is with foundry sands. Chris Wilding, sales director, Omega Foundry Machinery Ltd. provided an excellent summary in "Chromite sand reclamation from foundry waste."

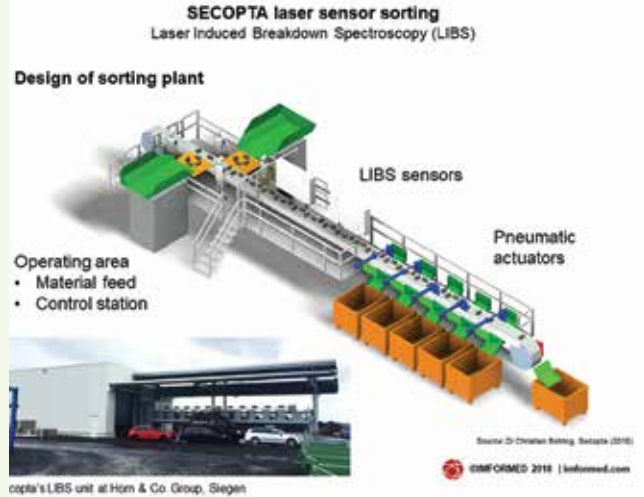
Wilding started with an overview of the chromite sand market, underlining, with a view to the enhanced value of recycling foundry sands, the rather stark outlook of a potential chrome ore deficit of up to one million tonnes in the short to medium term, driven by burgeoning stainless steel demand.

With increased interest in recycling chromite foundry sands for obvious reasons, Wilding explained that for foundry sands to be recycled, a good separation process is required to give >98% purity in the final product.

Omega's process uses a combination of medium and high intensity drum magnets, plus a density separator. Up to 99% purity of chromite sand is achieved with this system, and the sand can be re-used in the foundry from 50% up to 75%. The separated silica sand can also be re-used.

Wilding commented that the chromite becomes more magnetic as it is reused, so it is eventually removed by the ferri-rite magnet.

Of significance for future potential "resources" of chromite foundry sand, Wilding said: "We can also start looking at recovering previously dumped chromite/silica sand deposits in landfill sites." He revealed that Omega was already involved in conducting such work at a site in Turkey.



Sorting with laser sensors

Already familiar to those delegates on the earlier Horn field trip, "Maximising value in recycling: Mining and metal applications by fast inline elemental analysis (LIBS)" by Dr. Christian Bohling, general manager, SECOPTA Analytics GmbH, provided the science and development behind this state-of-the-art laser sensor sorting system.

Bohling introduced the basics of Laser Induced Breakdown Spectroscopy (LIBS), an innovative universal elemental analysis technique.

"For fast inline measurements without sample preparation, LIBS is much more precise than other process measurement techniques like XRF or neutrons," Bohling said.

LIBS is extremely fast, achieving >350 measurements/second, and can be used under harsh industrial environmental conditions for sorting primary and secondary raw materials, such as refractory bricks at Horn's Siegen facility.

About the author

Mike O'Driscoll is director of IMFORMED and has over 30 years' experience in the industrial minerals business. IMFORMED provides conferences and market research for the industrial minerals industry. The latest trends and developments in Chinese & East Asian refractory and abrasive mineral supply and demand will be discussed at China Refractory & Abrasive Minerals Forum 2018, Shanghai, September 10-12, 2018. For details see imformed.com or contact mike@imformed.com.

