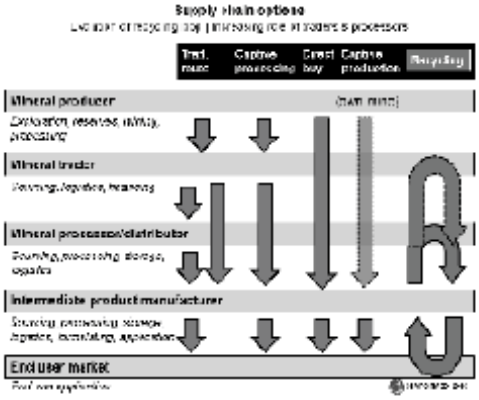
BUSINESS SECTION

RECYCLING OF REFRACTORY MINERALS

A Reality Check

Industrial minerals are the basis of manufacturing industry, present in products such as glass (100%), paper (50%), paint (50%), and automobiles (100-150kg/car).



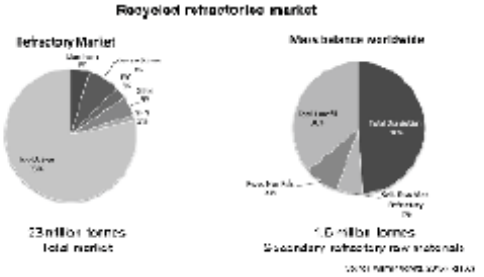
With a welter of pan-European recycling initiatives and legislation on the go, experts suggest a reality check for the future of recycling. Core to understanding what makes sense, is an appreciation that there are simple and complex cases in the value chain. Most importantly, there are limits prolonging the life of minerals, and that there is no one-fits-all recipe for value chains.

All materials are equal: no "secondary" stigma

Many experts feel it's time to steer clear of labelling raw materials as "Primary" or "Secondary", and instead have them branded as "v-type" (virgin raw materials) or "r-type" (raw materials based on used products being recycled). In doing so, the still widely perceived stigma of a used product somehow having a lesser value would be minimised. But the fact of the matter remains that end users testing the material would still require details of the material's original source. There is a possibility of "downcycling" of recycled materials used in low cost applications, far away from their original use, and "upcycling" of recycled materials used in higher value applications, and even possessing properties absent in v-type raw materials. The biggest problem anticipated today is that v-type material is declining in quality while rising in price.

Suggested opportunities in the business of recycled materials as opined by the experts are:

- the offering to end users of r- or v- type materials on an equal basis;
- the development by end users of products incorporating r-type materials, thus enhancing their future recyclability; increasing responsibilities of the recycling companies; and
- linking the material flows and the parties involved at each stage to co-operate.



Recycling of Refractories

It is an acknowledged fact that there has been a significant increase in usage of recycled refractories over the last ten years, initially driven by environmental considerations and the escalating cost of virgin refractory raw materials. Also locally sourced recycled material and price stability have also fuelled growth. Several EU regulatory frameworks, such as EU Waste Shipment Regulations, EU Waste Framework Directive, and REACH are in vogue, requiring more work on definitions to give clarity for the recycling sector.

As per experts like Melvyn Bradley of LKAB Minerals', the market for recycled materials will continue to grow, while strategic partnerships are critical to maintain the supply chain." He also added that a strong focus is required to improve sorting techniques.

As per Werner Odreitz, Purchasing Director, Secondary Raw Materials, RHI AG, about 7% of world refractories consumed are recycled for secondary raw materials (SRM), amounting to about 1.6m tonnes. Refractory markets using RHI's refractory SRM – at about 100,000 tpa in total – are steel (79%), cement/lime (10%), nonferrous metals(4%), glass (4%) and others (3%).

The challenge still remains of separating and sorting refractory breakout material whose recyclable yield can be influenced by the type of steel made, and the presence of nozzles, fines, hydrated brick, high alumina castable, and bricks stuck together.

Processing companies have become increasingly important and closer co-operation between the production plant, the processor, and the supplier has become necessary to increase the consumption rate of secondary raw materials.

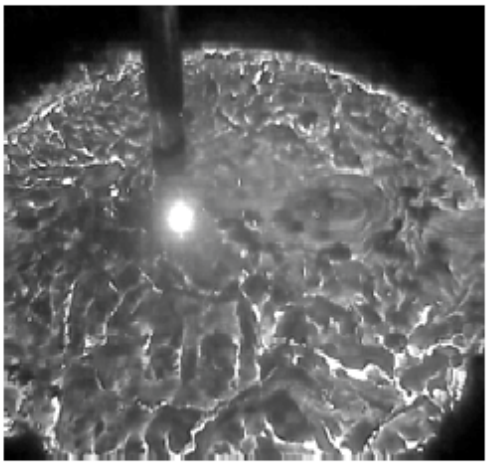
In this context, one of the key areas of technical advancement in mineral recycling is laser-based sorting. Christian Bohling, CEO, Secopta GmbH, explains Laser Induced Breakdown Spectroscopy (LIBS) in refractory recycling, acknowledging challenges in refractories such as heterogeneous structure, many different matrices, and "difficult" conditions, but also offering solutions in LIBS and showing how it can analyse a wide range of materials.

Defref SpA and Acciai Speciali Terni, one of the world's leading stainless steelmakers have worked together on a project aimed at no landfill disposal of waste material coming from refractory breakouts, decreased consumption of lime in steel production, metal recovery, and overall sustainability.

The project started in January 2013, and came to fruition in February 2014; in 2015 almost 19,000 tonnes of refractory material was reprocessed from EAF, ladles, and AOD vessels, as well as 1,330 tonnes of steel.

Recovered magnesia and dolomite was reused by AST in slag conditioning, saving an estimated 15,300 tpa of lime consumption, with recovered alumina sold to external outlets.

As per Dr Cord Fricke-Begemann, Group Manager, Materials Analysis, Fraunhofer-Institut für Laser Technik ILT, "Inline laser analysis of minerals enables high-grade recycling, and such innovative laser approaches open up new perspectives for the minerals industry. The slag chemistry is all-important and dictates its value and potential uses. The challenges are in non-destructive identification and sorting of refractories.



LIBS analysis of liquid slag. Courtesy Dr Cord Fricke-Begemann

(Source: IMFORMED **Mineral Recycling Forum 2016** www.imformed.com)