

European waste to product concepts – iron-based alloys from electric arc furnaces

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Abstract – Large amounts of waste materials or by-products are generated from the metallurgical industry. Furthermore, end-of-life consumer goods such as batteries and municipal waste add to this burden. These waste streams pose a great environmental risk and are simultaneously a potential resource for value extraction. The resource-poor Europe is in pursuit of technical and business strategies, and policy instruments, in favour of sustainability. In 2015, the European Commission published a circular economy package with a goal to minimize waste, and to increase energy and resource efficiency within the EU, for sustainable growth. This paper looks at European strategies for a circular economy and a zero-waste approach, applied to iron-based alloys leaning towards ferro-alloys, covering both primary and secondary resources.

Electric arc furnaces (EAFs) are identified as best available technologies for primary production of a majority of the ferro-alloys, as well as in some cases for ferro-alloys recovery from waste streams. Examples of EAF/SAF-based production of iron-based alloys leaning towards ferro-alloy production covered in this paper include FeMn40 (Batrec), FeSi20 (Conti arc), Fe90 (Redmud), Fe90 (Bottom ash), and SAF treatment of Zn-containing flue dust for pig iron production and Zn recovery. An outlook to new EAF centres in Europe centralising waste treatment/blending is provided. The close co-operation between researchers from university and experienced industry engineers is key to application-based R&D and to optimization of industrial processes. With such co-operation, developments covering the entire size spectrum from lab- and technical-scale up to pilot- and industry size research may be realised.

Keywords: electric arc furnaces, waste-treatment, zero-waste, ferro-alloys, circular economy



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