

New Process for Hazardous Contaminated Steel Scrap to Produce Clean EAF Feedstock



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Steel scrap contaminated with hazardous components such as asbestos, mercury or hexavalent chrome is widely available worldwide. The processing is not permitted in ordinary steel plants due to legislation for hazardous emissions control. Purified Metal Co. built the first plant in Delfzijl, Netherlands, that is able to treat hazardous ferrous waste. Metallurgical and operational experiences of first industrial campaigns, with asbestos and Cr(VI) scraps, are described in this article. The products are neutralized purified metal blocks with a chemically known composition and carbon content of 3 wt.% that can be used as feedstock for electric arc furnaces.

Steel scrap that is contaminated with hazardous components is widely available worldwide. Such scrap originates from sources all over society; for example, trains, greenhouses, steel structures, industrial installations, maritime objects, oil and gas installations, and civil construction. It can be contaminated with a variety of hazardous contaminations like asbestos, heavy metals such as hexavalent chromium or mercury, and organic components like polychlorinated biphenyls (PCB). Typically, the hazardous components are part of paint and coatings attached to the steel or they are the result of a process; for example, mercury sulfide scaling on the inside of pipelines resulting from oil and gas extraction activities. Also, asbestos can be present in pipeline isolation or gaskets between flanges.

At the end of life of the steel objects mentioned earlier, before or during demolishing, specialist companies either clean the steel and remove the hazardous contamination or dump the contaminated steel object on a landfill without cleaning. Cleaning is often very expensive; dumping is obviously a reprehensible waste of valuable raw material. Unfortunately, contaminated steel scrap is sometimes diluted into regular steel scrap.

The processing of steel scrap that is contaminated with hazardous components is not permitted in ordinary steel plants with basic

oxygen furnaces (BOFs) or electric arc furnaces (EAFs) or foundries with induction furnaces (IFs). These plants are not equipped with the necessary measures to comply with EU and national legislation like a sophisticated offgas system to prevent emissions of hazardous components or a specially designed, fully closed building to prevent diffuse emissions.

Purified Metal Co.

The story of steel with Purified Metal Co. started in 2011 with the initiators Nathalie van de Poel, Jan Henk Wijma and Bert Bult, who have a background in the steel industry. Here the challenge of processing offered scrap still containing small amounts of asbestos was discovered, as it could not be sufficiently cleaned and needed to be disposed of in designated landfills. In cooperation with RWTH Aachen,¹ the initiators validated the process idea that was able to neutralize asbestos and other contaminants into liquid slag. In 2014, Jansen Recycling Group from Dordrecht joined the three initiators and Purified Metal Company B.V. (PMC) was founded.

Market studies on hazardous scrap concluded that in the Benelux countries and in northern Germany there are available quantities that enable a factory with an annual capacity of 150,000 metric tons. This was the basis for a new concept for the