

Electrochemical Process for Recovery of Zinc and High-quality Steel from Galvanized Ferrous Scrap

When galvanized scrap is melted in a steelmaking furnace, the zinc that it contains volatilizes and ends up in the dust captured in the baghouse, or in plant waste waters. Either of these results in cost penalties to the steel

producers, who could avoid these costs if the zinc coating could be economically removed from scrap prior to melting. In the absence of a commercial dezincing process, most iron and steel making operators are putting zinc-coated steel into their furnaces and absorbing the costs because of the high quality of the underlying steel.

In 1987, Argonne and its industrial partner, Metal Recovery Industries, U.S. Inc., undertook the development of a new technology for converting galvanized scrap into clean scrap for steel making.

The research led to the selection of stripping in hot caustic and the subsequent electrowinning (removal) of zinc from the caustic solution as the most cost-effective approach. As shown in the schematic of the dezincing process on the following page, zinc-bearing, loose, shredded scrap is charged into the rotary electrolytic reactor containing a hot (70° to 90°C [158° to 194°F]) water solution of about 20-32% sodium hydroxide. The zinc dissolves into the hot caustic. Clean (black) scrap is removed, rinsed, and recycled. The pregnant electrolyte is then pumped into a second cell, where the zinc is electrolytically removed from the solution. The liquids recovered from washing and filtration are sent to make up tanks (not shown in the schematic) for eventual return to the leaching tank. The process consumes no chemicals other than drag-out losses and produces only small quantities of wastes. Concentrations of zinc, lead, aluminum, and other coating constituents (except nickel) on the loose scrap are reduced by at least 98%; zinc is reduced to below 0.1%.



The upper picture show the exit of the dezincing rotary drum where dezincing steel transfers from the drum to the first stage rinse tank. The picture at the left shows the electrowinning cells in which zinc is recovered from the dezincing solution. The regenerated dezincing solution is then recycled to the dezincing rotary drum.

The technology has been successfully transferred to industry. Commercial deployment of the technology is being undertaken by Meretec Corp. Full-scale plants are operational in East Chicago, Indiana and in Sidney, Australia.

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