

*New Process Spotlight...*

## Innovation in SPL Transformation – the Industrial Ecology Way

### *Spent Pot Lining as a Valuable Commodity*

By Phil Black, Regain Materials

Despite all the efficiency improvements, emissions reductions, and energy savings in aluminum smelting, there remains a fundamental problem—what to do with spent pot linings (SPL)? When pots are dug out and relined after their useful service life, the hazardous waste generated is generally stored temporarily in huge quantities (about 2.5% of annual aluminum metal production) by many smelters, who are hoping for an eventual solution. Depositing the toxic SPL materials into landfill creates a long-term liability for future generations to deal with. Integrity of early landfills is suspect, with groundwater contamination by leaching SPL resulting in expensive clean up into “safer” landfills. Landfill of SPL is now banned by environmental regulators in many countries, so smelters with an eye on the sustainability of their future operations and community health and safety need to find other solutions.

One option is to send the SPL to cement companies, who can use the fluorides, sodium, and carbon in beneficial ways for cement manufacture. But the variable nature of pot diggings (containing bath, metal prill, sodium impregnation, and refractories) makes it a difficult raw material that can adversely affect cement-making processes. Another use is in rockwool manufacture, but only part of the SPL can be used in this way. Some complex chemical processes have been developed that crush and then mix the SPL with large volumes of other materials. These processes remove the cyanides and metal salts, but produce two to three times the volume of residue, the majority of which is of little value except as a filler material that must be disposed of legitimately in yet another landfill.

But who wants to transport toxic waste around the country, or across the ocean, when the potential liability for contamination of land, sea, and transport infrastructure creates just another problem? The Basel Convention for Control of Transboundary Movement of Hazardous Wastes and their Disposal, adopted by the Conference of Plenipotentiaries in Basel, Switzerland, requires

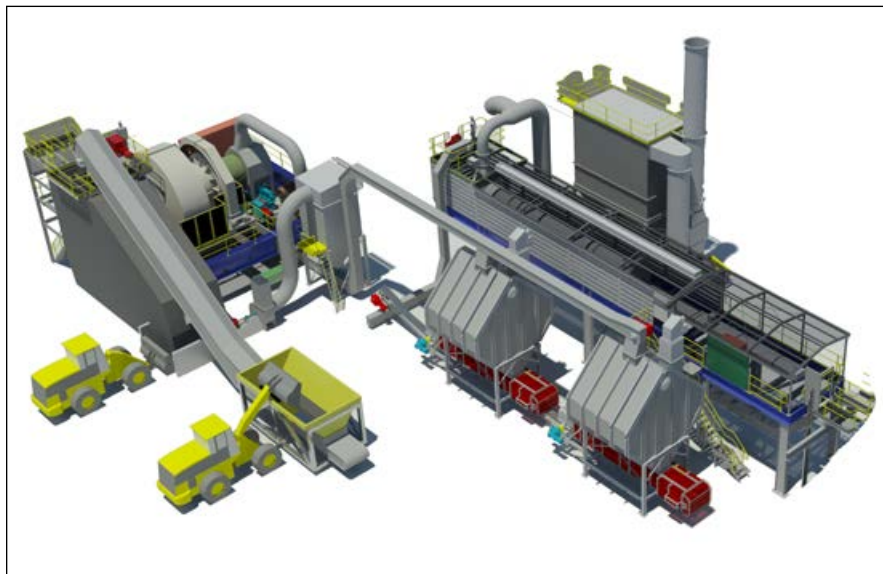


Figure 1. Typical 20,000 tpa capacity SPL processing plant by Regain.

stringent protocols to be observed, but many smelters in countries that are signatories to this convention are still risking safety, financial, and reputational damage by transferring their problems to someone else's backyard.

There is the problem of the explosive nature of gases given off by SPL when it comes in contact with moisture. Some years ago an SPL explosion on a bulk-loading ship in Canada killed two workers and injured eight others, and 15-tonne hold covers landed on nearby shipping—total damage bill a reported \$30 million. With constant emission of flammable gas and the risk of spontaneous combustion from metallic sodium, transport of raw SPL is a high-risk activity.

There is an on-site solution for processing of SPL that eliminates all of the problems mentioned—the Regain SPL Process (Figure 1). The Regain process detoxifies the SPL and removes the gas problem. Since 2001, the company has treated more than 180,000 tonnes of SPL and developed a series of boutique products that have been embraced by progressive cement and clay brick manufacturers eager to reduce their energy costs and emissions, increase production, and improve cement strength. Regain is the first company to properly integrate the needs of both the aluminum and cement industries.

Brian McGrath is director of OLM Technical Services, which consults with companies recovering wastes for reuse in the cement industry. As one of Regain's foundation customers in a previous role at Boral Cement, he explains that the Regain Solution is a really significant breakthrough that works for all parties involved. “In the appropriate plant setting, [adding Regain's SPL-derived products] provides an opportunity to reduce the operating temperature of the cement kiln and improve cement quality,” he says. “The lower temperature reduces fuel costs and greenhouse gas emissions. The improved cement quality increases the cement strength enabling greater use of cement extenders like fly ash, slag, and limestone, gaining further reductions in greenhouse gas emissions.”

It comes down to ingenious processing of all of the first-cut and second-cut SPL to present the fluoride and sodium in a mineral structure that enhances cement clinker chemistry. Other carbon and sodium-containing waste materials can also be integrated into the mix. Regain's is a patented detoxification and refinement process that recycles reaction off-gases to provide heat. No residual material is left over, and a conventional baghouse recycles particulates. Emissions are well below license requirements.



Figure 2. Innovative modular design by Regain is a major benefit in locating plants on-site.

*The Cost to Smelters to Completely Transform Their SPL*

Typically Regain supplies the SPL processing plant at no capital cost to the smelter, with processing and material blending facilities on-site in a small area (Figure 2). The smelter provides a shed for under-cover crushing and storage, and minor amounts of utilities to keep

the plant running 24/7. The highly automated plant only requires three operators on a day shift to run, along with contractors to transport the products off-site. Smelters pay a per-tonne toll for SPL processing and removal from site.

Regain handles SPL from the de-lined pot through to final distribution in cement manufacturing plants. All storage, metal separation,

crushing, chemical processing, product manufacture, product marketing, transport, certification, and regulatory requirements are covered. Mature smelting organizations understand the full cost of covering all of these issues and delivering a safe, sustainable solution for SPL with no residual material.

As the environmental leader of a Regain client smelter said, "What we like about Regain is the 'cradle-to-cradle' type scenario," he says. "If [re-use of SPL] is all done right, you can basically write off that liability you've inherited through aluminum making."

SPL can be consumed safely as a transformed material and never come back as a liability. Right now the cement markets are demanding more product than Regain can supply, so Regain is processing as much SPL as the smelters produce and also removing legacy stockpiles.

Regain's ceo, Bernie Cooper, puts it nicely, "Aluminum smelters now have a mature industrial ecology approach to hazardous waste, and their costs today to treat SPL properly are far less than they have been in the past and far less than the future costs to them and the community of cleaning it up later."

For more information, go to: [www.regainmaterials.com](http://www.regainmaterials.com).

Is Spent Pot Lining burning a hole in your pocket?  
Leaching into the ground? Keeping you up at night?

**Regain** WINNING MATERIALS  
PRACTICAL CHEMISTRY

**There is a Safe, Sustainable, Smelter-Ready Solution**

Since 2001, Regain's patented de-toxification process has transformed more than 180,000 tonnes of both 1<sup>st</sup> cut and 2<sup>nd</sup> cut SPL into specialised products that our customers just can't get enough of. By processing within the smelter there is no transport of hazardous wastes, and no gate fee. With established international offtake markets, product end-use disclosure and regulatory approvals in hand, Regain can make your SPL stockpiles "disappear" - for less than you might think.

It's an Industrial Ecology solution that really works. For now, and for the future.

**No Residue. No Risk. No Worries.**

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