





A victory for the green guys

All that was needed was a better way of dealing with spent potlining – but it was by no means simple, as Monica Callon discovers.

Like most metals, aluminium travels a long road between the mine and the ingot bar, generating some by products that require special attention. What to do with one of them – spent potlining (see panel, below right) – has baffled the industry for 25 years. Today, thanks to Rio Tinto Alcan, a revolutionary new process is wrestling this knotty environmental issue to the ground – safely, sustainably and economically.

Quebec's Saguenay–Lac-Saint-Jean region is the heartland of aluminium smelting for Rio Tinto Alcan, with six hydroelectric power plants and four aluminium smelters. The complex is also home to the Arvida Research and Development Centre (ARDC). This is where, for nearly two decades, the best minds have been tackling the industry's spent potlining (SPL) challenge.

“When we started looking at this back in the early 1990s, we never dreamed we might develop a new industry standard,” says Francois Tremblay, general manager at the ARDC in Jonquiere, Quebec. “All we knew was that we had to figure out a better way of dealing with spent potlining.”

Marc Balthazar (right), SPL plant manager, and Jean Leroux, operator, prepare to transfer liquid in the plant.

The answer wasn't just to find an environmentally sustainable way to dispose of spent potlining, which contains traces of potentially dangerous substances such as cyanide and fluoride. The team at ARDC discovered they could actually reclaim valuable materials from what had previously been considered a toxic waste. They learned that the leftover carbon could make an excellent fuel for cement plants. Caustic soda is an essential ingredient in alumina refining, as is Bayer liquor, and so could be reused. And fluoride, though potentially hazardous on its own, has many practical applications, such as in calcium fluoride, a compound used in high precision optical equipment.

Early tests showed promise. But what works in the lab doesn't necessarily translate into a viable industrial process. So, step by step, Rio Tinto Alcan engineers began scaling up the technology. From Jonquiere, the R&D moved to Quebec City's Centre for Mineral Research under the supervision of the Arvida team, where

A potted history

Aluminium begins life as bauxite ore which is refined into alumina, the raw material that is transformed into aluminium. Electrolysis, the last stage of the transformation, takes place in a “pot” lined with refractory bricks and carbon blocks. These materials gradually deteriorate and eventually require disposal and replacement once they are completely “spent”.

A supervisor conducts daily meeting with team of operators.



“We’re extremely proud to have pioneered this technology, not only does it create jobs and economic spin offs in the region, but it also delivers a sustainable and economically competitive solution to a longstanding environmental challenge.”

a pilot trial in 1993 proved the process worked in larger batches. Tests on different types of SPL followed in 1999. By 2004 engineers were fine tuning the technology’s operating parameters.

The end result? Low Caustic Leaching and Liming (LCLL), an innovative closed loop process that transforms SPL into several inert by products offering a high potential for recycling and reclaiming.

The first step of this advanced recycling process grinds the used bricks and blocks into a fine powder. Next the powder is washed and filtered to separate it into its constituent parts. The resulting solid product is inert, making it safe for transport and reuse. Third, the liquid from step two is treated at high temperatures and pressures to break down all traces of cyanide. Finally another heat assisted operation evaporates and crystallises the remaining liquid to extract fluoride.

The SPL treatment process was now complete – in theory. However technical specs aren’t enough to convince environmental regulators and the existing measurement techniques took 24 hours or more to

Maintenance workers adjust pump in hydrocarbon section of new plant.



perform. “That wasn’t good enough,” explains Bruno Boutin, production manager. “We had to be able to demonstrate on the spot that our product was environmentally safe.”

Once again the ingenuity of Rio Tinto Alcan engineers proved to be up to the task. They developed a unique method to generate a reliable reading in less than an hour. “This meant

operators could quickly tell if something was wrong and correct the problem,” Boutin adds.

At last Rio Tinto Alcan’s LCLL process was almost ready for prime time. Engineers continued to tweak safety procedures. This included preventing the powdered SPL from becoming airborne, ensuring potentially explosive gas by products were