



Used Aluminium Can Recycling Plant, Warrington

The Novelis aluminium can recycling plant, the only such plant in Europe, was opened in Warrington, Cheshire, in 1991.

The plant produces ingots from used beverage cans. These ingots are transported to a Novelis rolling mill, rolled into sheet which is then supplied to canmakers to be made back into drink cans.

With a current capacity of over 135,000 tonnes each year, the plant has the ability to recycle all the aluminium cans collected in the UK for the foreseeable future, and satisfy the growing demand for aluminium cans in Europe.



Capital investment in the plant alone amounted to £28 million in 1991, of which initially some £5 million was used to install state-of-the-art emission abatement equipment to minimise the impact on the environment. Since opening a further £2 million has been spent upgrading this equipment, in anticipation of legislation.

Novelis is committed to recycling and the environment. But it should be borne in mind that aluminium can recycling also makes sound economic sense. The capital investment and operating costs of a recycling plant are lower than those required to produce aluminium by smelting, as are the consumption of raw materials, energy and the associated greenhouse gas emissions.

The Recycling Process

The can recycling plant uses the latest technology to maximise yield and energy efficiency in the production of quality ingots, with teams of ten employees per shift, casting 15 ingots every 24 hours, 50 weeks of the year. The ingots weigh 27 tonnes and are nine metres long.

The recycling of aluminium cans is a four-stage continuous process:

- Shredding
- Decoating
- Melting
- Casting

Stage 1 — Shredding



Aluminium cans arrive from regional aggregation centres in bales. They are shredded into pieces the size of a walnut in a 1000-horse power shredder with a capacity of 15 tonnes per hour. The shreds are then passed through a double magnetic drum separator to remove steel (cans and/or banding).

Stage 2 — Decoating



Lacquer is removed by blowing hot air (around 550°C) through the shreds on a slowly-moving insulated conveyor. The exhaust gases from the process are first passed through an afterburner, before being used to heat up incoming process air using a heat –exchanger, thus minimising the energy requirements of the system.

Stage 3 — Melting



The hot, decoated shreds are fed into two 90 tonne sidewall melting furnaces. Both furnaces contain submerged stirrers that create a vortex in the pool of molten aluminium and drag the shreds quickly down into the melt. This process achieves rapid melting rates and high yields.

The furnaces have fuel efficient state-of-the-art regenerative burners and burner management systems.

This helps us to reduce the amount of energy used and

used and reduces the impact on the environment. They

are also equipped with jet stirrers, which ensure an even temperature and composition by promoting metal circulation within the furnaces. These stirrers alternate between applying positive and negative pressures, thus blowing out and sucking in the metal. This eliminates the need to open the furnace door to provide mechanical stirring, which again improves the energy efficiency.

Dross, which is a by product of melting aluminium, is removed periodically from the furnaces. This is cooled under a blanket of inert argon gas to prevent oxidation. This increases the amount of aluminium that can be recovered from the dross (a process which takes place off-site).

The molten metal is transferred into a 90 tonne holding furnace where it is treated to remove impurities before casting.

Stage 4 — Casting

Ingots are cast by tilting the holding furnace and pouring the molten metal into a casting unit. The metal is now treated in a two stage process to remove any remaining microscopic non-metallic particles and gases.



Chemical composition and metal cleanliness are tested on each cast. Metal flow from the tilting furnace is regulated by an automated system, which controls the furnace tilt angle, the casting speed, cooling water flow, metal level and water temperature.

As the metal flows into the moulds (measuring 0.6 x 1.85m) it is 'chilled' by jets of cool water being pumped around and through

The base of the mould is then lowered hydraulically and as the metal continues to flow into the mould, the shell is directly cooled by a secondary water curtain. The ingot solidifies gradually during the casting process, which takes approximately three hours.

The finished ingots, each containing approximately **1.5 million** used cans, are then shipped to a mill for rolling into the sheet from which canmakers subsequently produce new drink cans – and the whole process begins again!



Environmental Controls



The plant is currently regulated by the Environment Agency under the Pollution Prevention and Control Regulations 2000.

All the waste gases from the shredding, decoating, melting and holding operations are removed from the plant, and treated in four purpose-built emission abatement facilities. This equipment (two cold dust collection systems and two hot dust scrubbers) represent most of the £7 million investment.

- The cold dust scrubbers are used to remove the exhaust gases from the shredding and conveying operations while the hot dust scrubbers control the gases from the decoating, melting and holding furnaces.
- Both hot scrubbers are fitted with highly efficient acid gas removal systems using either lime or sodium bicarbonate.
- The spent lime, bicarbonate other particulate from the four systems (collectively known as A.P.C. residues) are filtered from the exhaust gases using bag filtration systems.
- Spent lime and bicarbonate are recycled for use in the manufacture of building products.