

## NEW ZEALAND ALUMINIUM SMELTER

RIO TINTO'S DRIVE FOR EFFICIENCY AND LOWER ENVIRONMENTAL IMPACT



Based at Tiwai Peninsular, New Zealand Aluminium Smelters is New Zealand's only Aluminium smelting operation. The plant, which is part of the RioTinto Alcan group, produces approximately 300 000 Tonnes of high grade Aluminium per annum which is exported to customers in Asia, Europe and the USA.

As New Zealand's single largest electrical consumer, using about 15% of the national energy production, NZAS is always focussed on process optimisation, energy efficiency, and ensuring minimal impact on the environment. A recent upgrade project undertaken on the Vertical Direct Chill (VDC) casting machines in the Metals Products plant is an excellent example of this commitment.

At NZAS, the VDC casting machines are the mainstay apparatus for Aluminium Ingot and Billet production. Molten Aluminium is poured into moulds and then cooled by passing the molten aluminium into a water bath or ingot coldwell. The optimum specification for the water temperature in the coldwell is extremely tight with a target of 23OC +/- 3OC.

The cooling water is a combination of water recycled from the process and make up water pumped directly from bores on site. Control of the water temperature at the Coldwell was achieved using a number of fixed speed circulating and make up pumps, and cooling towers fitted with fixed speed fans. 18 pumps and fans, varying in size from 22kW to 55kW form the heart of the cooling system. A complicated PLC program was used to stage the correct combination of pumps and cooling to keep the water temperature as close to specification as possible. With variables in the system such as ambient air temperature, ambient water and bore temperature, and the digital nature of the operation of pump and cooling fans, this has always been a very difficult target to achieve.

The NZAS Metal Products engineering team spent a number of months evaluating the existing process and decided that this was the perfect application to

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*Paul Falkner, Project Engineer, Metal Products Project Engineering team NZAS*

change the control philosophy to be fully variable. SD700 variable speed drives were fitted to all the pumps and fans, and a new control system implemented.

Pre and Post Implementation case studies were undertaken by the NZAS team to quantify the benefits. The three major areas measured were:

- **Electricity Usage and Efficiency** - Prior to implementation the VDC and No. 2 Ingot machine was using 9100kW.hr per day. Post implementation the energy consumption has dropped a staggering 5140kW.hr per day to 3960kW.hr per day.

- **Make Up Water Usage** - In 2007 the VDC and No. 2 used 220,000,000l of water. 2010 year to date (5 months) the same machine has used only 45,000,000l of water. At this rate the of consumption the total yearly water usage will be less than 50%.

- **Pump Start Ups** - Some of the pumps have been starting up to 39 times per hour during periods of casting. This has been reduced to less than 1 start per hour.

Don Faulkner from Metal Products Project Engineering team comments "The benefits of this plant upgrade have been phenomenal. We have seen improvements in all the areas that we expected and more. Obviously there has been greater consistency in our finished product, significant energy savings, and a massive reduction in our makeup water usage but there have been some hidden benefits as well. With the reduction in pump starts we have seen a massive increase in mechanical pump reliability. The project has been so successful we are just about to embark on the second stage. We will definitely be using SD700 variable speed drives for this stage as well!"



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