

The Glenbrook Steel Mill is distinctive because it is designed around the natural iron sand resources of Waikato North Head, processing 1.2 million tonnes of iron sand per year. This exclusive raw material means that their manufacturing process cannot be modelled using most commercially available computational packages. For this reason New Zealand Steel must seek out customised tools in order to continue improving their manufacturing processes. New Zealand Steel has attended MISGs a number of times, finding value in the clarification of potentially costly industrial processes.

## PAST CHALLENGES

### 2011 NZ Steel Challenge

*Recovering Vanadium during the production of steel from iron sand*



Ironsand contains a number of other contaminants, such as carbon and metalloids. The carbon is needed for later in the production process, but the metalloids must be removed as their presence increases processing costs.

Some of these contaminants are also valuable, such as Vanadium, a precious metal used to produce high strength alloys, lithium-ion batteries and superconducting magnets. The goal is to recover these metalloids without compromising the steel production process.

MISG used differential mathematics to show that Vanadium can be recovered cost effectively by maximising the oxidation of vanadium while minimising other negative consequences. The MISG outcomes provided improved understanding of the industrial process and the ability to optimise containment extraction with minimal impact on production processes.

New Zealand Steel are now gathering data to be used to validate and optimise the models prior to implementation.

**2008 NZSteel Challenge** - NZ Steel uses empirical formulae to determine how long coils must remain in the furnace, to ensure each coil is heated fully. This formula was determined when the furnace was commissioned, and the relevant data used to construct them was lost. The MISG were challenged to re-determine all the methodology behind the original formula. MISG provided formulations that were then validated through numerical simulations.

**2006 NZSteel Challenge** - Rolling steel coil production introduces many technical complications. The MISG developed a statistical model for these cold-rolled products, describing the relationships between mechanical properties and processing parameters. This allowed NZ Steel to reduce product failure.

**2005 NZSteel Challenge** - NZ Steel challenged MISG to better describe the relationship between mechanical properties and the processing parameters in the production of steel coils. The MISG demonstrated that such relationships do exist, and provided a suite of models for each of the relevant metallurgical properties. This has provided a useful tool to reduce testing failure rates and for the development of new products.

Case study prepared by