Steel is used worldwide and in New Zealand for a number of uses. Steel is used mainly in the construction industry. This is because of its strength and durability. Throughout the world over 700 million tonnes of steel is produced each year. In New Zealand about 675000 tonnes of steel is produced each year. Most of this is used in New Zealand with about 90% of the steel used in New Zealand being produced in New Zealand while the rest is exported.

In New Zealand steel is produced at the Glenbrook mill 40km from Auckland. This mill was established in the 1960's and has been continually updated ever since.

New Zealand has a rich source of iron compounds from which steel is made. These are found in the black iron sands on the west coast of the North Island. These were first noticed by James Cook himself.

Traditionally iron is obtained from iron sands by a blast furnace. Over 95% of the worlds iron is obtained this way. In a blast furnace the iron sands are reacted with carbon. This carbon can be in the form of coke of charcoal. When this reaction occurs at heat the iron oxide is reduced to iron and carbon is oxidised to carbon monoxide or carbon dioxide. The iron oxides are reduced as the iron in the iron oxides goes from a lower oxidation number to a higher one. The opposite happens with the carbon. 1

The reactions are

$C + O_2 \rightarrow CO_2$

$C + CO_2 \rightarrow 2CO$

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

The problem with the New Zealand iron sand is the presence of titanium oxides. These titanium oxides get involved and inhibit the process of iron production. They do this as they block up the holes in the blast furnace by which the iron is removed. The iron is in a molten form and is removed through holes in the furnace. However it is these holes that the titanium oxides block.

Up till the 1920's the blast furnace was tried in New Zealand. While some iron was obtained it was uneconomical due to the problems described above with the titanium oxides.

A new method was needed that prevented this and also removed any other impurities present in the iron sands or that are formed from the iron making process. This method involved the use of a rotary kiln. A rotary kiln is almost 100 metres long and has holes in the side of it at uniformed points. Purified treated iron is poured into these kilns. In these kilns the supply of air is controlled. This is to control what is formed The carbon that reacts also produces heat which is used to fuel the process. The temperature is also controlled. By controlling the temperature the iron production is maximised and the holes are not blocked by titanium compounds. 1 2

The iron formed then goes into a melter for further purification. From here the even more purifiesd iron goes into a ladle where oxygen is blown in using the Klockner oxygen manchette process. This it to help remove other impurities. The iron produced is then developed into various steel products. 2