The metal refinery in South Africa processes nickel and copper ores into pure metals. As a result of corporate emission targets, the site needed to take action on CO₂ emissions. Electricity consumption was also an issue, with a constrained supply and electricity costs forecast to rise by around 15% each year for the following three years.

ABB’s energy consultants had carried out work at a number of the client’s sites, with positive results, and had also been nominated as ‘Contractor of the Year’. Based on this previous work and reputation for excellence, ABB were asked to investigate the metal refinery to help save energy and reduce emissions.

**Solution**

ABB spent a week on site, investigating the complex processes involved in metal extraction and purification, as well as the site utilities.

Savings found at the site included:

- £186,000 per year by changing the feed temperature in one section of the nickel refining process. The fluid would be moved from one area of the site to another, and heated prior to transport. However, this heating was unnecessary, as the fluid would be cooled upon arrival at its destination. By minimising or eliminating the heating process, both heating and cooling costs could be eliminated. This measure could be implemented at zero cost, and would more than cover the cost of the study.

- At least £115,000 per year by initiating a steam trap maintenance programme. Steam is distributed around the site, but the maintenance regime for the distribution network could do with improvement. A number of faulty or leaking steam traps were noted around the site, losing high pressure steam. Steam leaking from a high pressure main can be particularly expensive, so by taking action on this recommendation, substantial savings are possible. In addition, high pressure steam leaks can pose a serious health risk, both in terms of burns and noise levels.
Savings of over £111,000 per year were possible by fixing leaks in the compressed air distribution system. Compressed air is distributed around the site, at high, medium and low pressures.

Compressed air is generally the most expensive form of energy used on site, and leaks can have a particularly high cost. The leaks noted could be fixed for a relatively low cost, with savings paying for the cost of repair in less than a year. In addition to the financial savings, this measure has health and safety implications - a leak of compressed at 8 bar could cause serious injury, as well as hearing loss.

About £100,000 could be saved each year by fitting the scrubber extraction fans with variable speed drives. The boiler flue gas is scrubbed to remove sulphur, and a pair of 700kW fans are used to extract the flue gas. These fans are generally throttled to reduce the flow, wasting energy. By reducing the fan speed using a variable speed drive, flow rates could be reduced, whilst improving control and cutting electricity consumption.

Around £270,000 could be saved each year by addressing boiler performance deterioration. After analysing boiler performance data and investigating on-site, boiler performance was found to deteriorate with a reasonably predictable pattern. This was primarily caused by a low capacity in the boiler water softening system; by increasing the capacity of this system, boiler performance deterioration could be minimised, reducing coal consumption, shut down periods and maintenance requirements.

The variety of recommendations made by ABB will allow the site to cut energy costs significantly, whilst reducing emissions. In addition, the measures noted above result in reduced maintenance requirements at the site, and reduced health and safety risks.

Benefits
- Energy savings of £2.8M per year identified
- Savings equivalent to a 21% reduction in site energy costs
- Exceeded corporate mandated targets by more than 4 times, identified savings of 74,000 tonnes of CO₂ annually
- Improved process control
- Reduced maintenance costs and requirements
- Improved health and safety