

DESCALING WITH ELECTRICITY

(Based on an article from Engineering Technology, June 1999)

British Steel is the world's third largest steelmaker, with a 58% share of the UK Market and a turnover of £7 billion. Llanwern Works employs a workforce of around 4,000.



Fig 1: As at other industrial sites, emissions are tightly regulated

The site uses the BOS (Basic Oxygen Steelmaking) process for primary steel making. Waste gases, generated in the process, are laden with high levels of dust, which have to be removed before venting to atmosphere. The waste gas cleaning system uses water to scrub gases of fluxes and fine particles.

Waste gases from the furnace pass through a Venturi Saturator where a series of high-pressure water curtains cool larger dust particles by entraining them in water. The gases are further cleaned by high-energy scrubbers which spray water into the gas to remove fine particles.



Fig 2: Steel production at British Steel's Llanwern works

Effluent from the scrubbers is transferred through a series of dirty water launders to the water treatment plant for cleaning. An important part of the BOS process involves the addition of lime at the furnace. This causes the effluent to have a very high calcium content. As water enters the treatment plant it is dosed with flocculent to help settle the solids. Heavier grit particles are removed in the degritter and the resultant effluent transferred into a splitter tank where it is discharged to the clarification plant.



Fig 3: Typical scale formation, before and after Scalewatcher treatment

Lighter solids are settled in the clarifier ponds and pumped away as slurry for re-processing. Cleaned water is recycled to the gas cleaning plant and fresh water make-up is carried out at the clarifiers.

The calcium causes major fouling problems by laying down scale deposition layer by layer.

The problem is further exacerbated by other particles in the effluent also becoming part of the deposition.

Left untreated the dirty water launders, pipework and all associated equipment quickly become fouled with limescale, which would eventually block the system leading to plant closedown.

British Steel estimates that such a closedown would cost £40,000 per hour.

Previously, remedial work had been carried out every three months using high pressure water jetting, manual descaling and also required frequent pipe replacement resulting in high costs.

A *Scalewatcher*[®] unit was installed on to the feed to the No. 1 clarifier.



Fig 4: A typical *Scalewatcher* installation. Note the tightly wound coils in the centre right of the photo.

After three months, an inspection cover was removed some 150 metres downstream of the installation. Instead of rock hard scale usually found in the pipeline, the scale was soft and just a few millimetres thick.

This clearly showed that not only had *Scalewatcher* effectively prevented new scale formation, but was also removing existing deposition.

Site application survey data summary	
Capacity of water treatment system	4,540,000 litres
Treatment rate	14,000 litres/minute (the system recycles every 5.4 hours)
Solids generated	4 tonnes in 17 minutes (per blow cycle per furnace)
Solids generated per day	202 tons
Chemical analysis at the De-Gritter	pH 12.2 Bicarbonate 1891 ppm Calcium 668.3 ppm Sulphate sulphur 6.3 ppm Magnesium 0.2 ppm Iron 0.15 ppm Suspended solids 160mg/L
Cleaning costs	£10k per year
Pipework replacement and labour costs	£20k per year

Colwyn Palmer, Operations Engineer said:

“I was very sceptical when first told about *Scalewatcher*, but when we inspected the pipeline, I was surprised at how much scale had been removed.

We had been looking at other alternatives, but as the *Scalewatcher* system costs only £10 a year in electricity to run, and there are no expensive maintenance or consumable costs to consider, it was the option we chose to take. We are very pleased with the *Scalewatcher* system for this application”.

British Steel, Llanwern has since purchased a further five *Scalewatcher* units.