Tenfold reduction in SO_2 emissions at Vaal River Gold Acid Plant

The Vaal River East Gold Acid and Flotation (EGAF) plant, which produces sulphuric acid (H_2SO_4) for the uranium leach process, has successfully reduced its sulphur dioxide (SO_2) emissions tenfold, and, on 1 August 2006 received a permanent registration certificate from the North West Department of Agriculture, Conservation, Environment and Tourism (DACET) for the facility *(see box below: About sulphur dioxide)*. SO_2 is produced during the conversion of sulphur from pyrite to H_2SO_4 in the calcining stage of the acid production process. The spent gases produced during calcining are passed via scrubbing equipment before being vented to the atmosphere.

The production process resulting in the emission of SO_2 is known as a 'scheduled process' (one which is listed in the second schedule of the Act, with the potential of releasing noxious or offensive gases). SO_2 emissions are also regulated by the new Air Quality Act, which came into effect on 11 September 2005, partly replacing the now defunct Atmospheric Pollution Prevention Act of 1965. Through the South African National Standards (SANS), the new Act sets guidelines for ambient air quality management and stipulates limits for common pollutants. Nonetheless, the process of emitting SO_2 is still governed by the Atmospheric Pollution Prevention Act until it is absorbed into the new legislation.

At the EGAF plant, SO_2 emissions have been significantly reduced by modifications to the weak acid SO_2 stripper tower, first reported in the Report to Society 2005 *(See case study in Report to Society 2005: Complying with stringent new air quality legislation in South Africa.)* During 2005, a provisional registration certificate was granted by the chief air pollution control officer (CAPCO), on condition that permanent registration is achieved within one year.

Dust management at Vaal River Sulphur Paydam

Efforts to control dust emissions from the Vaal River sulphur paydam, which is being reclaimed to recover pyrite and gold, have been subject to further scrutiny during 2006. *(See case study in Report to Society 2005: Dust management at Vaal River.)*

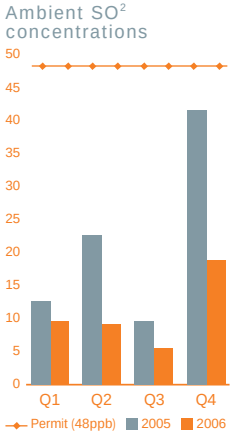
The binding agent ligno-sulphonate, which was sprayed on the surface of the dam during 2005, was found to be ineffective during the rainy season because it is water-soluble. Further research was carried out during 2006 on a number of alternative dust suppressants, the most effective of which was determined to be ridge ploughing. Instead of using ligno-sulphonate which dissolved in the heavy rains, contour ridge ploughing is now being used to create ridged mounds on the flat surface of the dam, thereby also making it less susceptible to wind disturbance.

In respect of dust suppression on the paydam's road surfaces, trials were carried out during 2006 on the use of waste ash from the boilers at the South Uranium Plant. The study revealed that the ash becomes hard when water is applied to its surface, making it an ideal road cladding substance. Following analysis, it has subsequently been approved by the Nuclear Energy Corporation of South Africa (NECSA) and accredited laboratories as an environmentally safe dust suppression agent. Ash has already been deposited at the sulphur paydam, ready for application in 2007.

With regards to monitoring, single dust buckets to monitor emissions have been increased from 17 to 23 and two more wind directional buckets (to ascertain from which direction the dust emanates), have been installed, bringing their total to six. These monitoring mechanisms will be key in determining the dust contribution from mines to the north and east of the paydam – although the extent of this can only be confirmed after monitoring over an entire seasonal cycle has been completed.

Until modifications were made to the weak acid SO_2 stripper tower in July 2006, there had been a number of SO_2 emissions which exceeded the SANS daily ambient guideline limit of 48 parts per billion (ppb) or an ambient limit of 125 micrograms per cubic metre ($\mu g/m^3$) as determined by the Department of the Environment and Tourism (DEAT). The latter is the individual limit specified in order to receive a registration certificate or permit by the CAPCO. It is calculated by dispersion modelling which stipulates how much SO_2 may be emitted into the environment – this in turn is determined by a number of factors, for example, velocity, stack height, stack diameter, geographical location and atmospheric conditions.

Point source emissions from the stack, which are easier to monitor, have been set by the CAPCO at 40 grams per second (g/s). Fugitive emissions (those which do not emanate from a point source) from the thickener (a tank where water is removed from the slurry) and plant leakages are set at 15g/s.



While there is still concern around fugitive emissions, AngloGold Ashanti's South African operations has brought its total emissions from a high of 491.2g/s in February 2006 to 54.2g/s in October 2006, below the permitted total emissions limits of 55g/s.

Says Wessel Van der Westhuizen, senior safety, health and environment officer for occupational hygiene at Vaal River: "The improved efficiency of the weak acid SO_2 stripper tower has been crucial in reducing emissions. This result has also been complemented by stricter control of plant emissions through a permanent stack monitor that gives continuous readings so that we can regulate and manage our emissions. There is also an internal management procedure that covers all the requirements of monitoring, which means that remedial steps can be actioned immediately when limits are exceeded. Ongoing focus is being placed on the management of fugitive emissions by improving total plant efficiency and minimizing leakages.

About sulphur dioxide

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Sulphur dioxide (SO_2) is a colourless gas with a sharp odour. It is produced from the burning of fossil fuels (coal and oil) and the smelting or heating of mineral ores that contain sulphur in an oxygenated atmosphere.

When sulphur dioxide combines with water, it forms sulphuric acid, which is the main component of acid rain. When acid rain falls it can cause deforestation, acidify waterways to the detriment of aquatic life and corrode building materials and paints.

Sulphur dioxide can affect the respiratory system, lung functioning and irritate the eyes, leading to coughing, mucus secretion, aggravation of asthma and chronic bronchitis. Exposure to sulphur dioxide also makes people more prone to respiratory tract infections.