

# Endorsing Ozone

*A high rate of success in complex projects globally adds credence to the effectiveness of ozone in the oxidation of cyanide-contaminated wastewater in mineral processing. Ozone oxidation enables rapid and complete destruction of effluent with high cyanide levels.*

One of the biggest challenges in mineral processing is effective treatment of cyanide-containing wastewater. Specifically, the main problem is reducing the toxicity levels of cyanide, according to Brendan Van Wyk, Business Development Manager Industrial at Xylem Inc (South Africa).

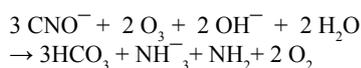
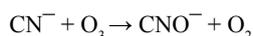
In an in-depth review he has compiled on the subject, Van Wyk notes: "The treatment of cyanide containing waste streams from mining and industrial processes to meet strict discharge limits, while remaining economically viable, poses a challenge for many operations. Most processes require the use of environmentally harmful products and result in the generation of unstable and potentially harmful by-products. For example, the use of ferrous sulphate for the removal of Weak Acid Dissociated (WAD) Cyanides by complexing it to form a ferrocyanide complex."

## The Ozone option

Fortunately, based on results of recent findings in complex projects worldwide, the use of ozone should be considered for the oxidation and total destruction of the cyanide complex in a variety of mineral processes.

In particular, recent trials in Southeast Asia and South African gold mines have demonstrated a 99% reduction of free cyanide and Weak Acid Dissociated (WAD) cyanide complexes with an average dose of 2-3 gO<sub>3</sub>/gCNWAD. Thiocyanide complexes were also destroyed, however, these required between 3 and 4g O<sub>3</sub> / g SCN<sup>-</sup>.

Typically, Oxidising cyanide occurs in two steps to yield bicarbonate and nitrogen:



The reaction time for the entire oxidation process of cyanide requires typically 10 – 30 minutes, where most of the time is required for the second reaction. Characteristically, ozone is unstable and reverts back to oxygen in about twenty minutes under ambient conditions.

## The benefits of ozone oxidation

Universally, in the face of other methods, there is growing approval of ozone oxidation due to benefits it brings to mineral processing, which include low operating costs, improved operator safety and lower level of pollution, and effective water recycling.

## Low operating costs and operator safety

In comparison with other processes, ozone cyanide treatment on-site is considerably cost effective. Implementing other methods is very both costly and time-consuming. For instance, alternate technologies involve the mixing of sulfur dioxide and air with the WAD cyanides to yield cyanates and sulfuric acid. Moreover, lime is required to keep the pH below 9, and a sludge is formed from the precipitation of metal

hydroxides and gypsum, which is not easy to remove. Alternate technologies require the transportation, handling and storage of hazardous chemicals, while still resulting in an effluent that needs to be further treated. This increases the OPEX of these processes, resulting in increased costs of effluent treatment. Ozone is a pure "on site" technology. There is no delivery, storage or handling of chemicals. The treatment allows for very rapid and complete decomposition of cyanides, cyanates and thiocyanates to a non-toxic form. The tailings can be sent directly underground for back fill operations, without needing further treatment, handling and storage - significantly reducing costs.

## Safe and lower pollution levels

From a safety perspective, unlike chemical oxidizers such as sodium hypochlorite and hydrogen peroxide, with ozone oxidation, the operator has no or limited exposure to ozone. Ozone is contacted with the cyanide containing effluent in a sealed pipeline. The ozone is consumed very rapidly, and the effluent exiting the pipe is already partly oxidized and safe for handling. Unlike current processes, there are no secondary pollutants formed in the reaction...

## Water recycling

Due to nontoxic discharge to treatment plants, ozone treatment enables effective wastewater recycling. This facilitates good water management practices on mine sites.

## Convenience

On the whole, in effluent water treatment, there is no margin for error, as lapses can have severe reputational, legal and financial implications on a mining business. Mines are operating in an increasingly regulated environment. In order to comply with some of legislation adequately, they need to adopt technologies that can enable them to reduce their footprint on the environment, while increasing efficiency in mining and mineral processes. Thus, given its effectiveness, ozone oxidation should be considered as a suitable method of treating cyanide-contaminated effluent wastewater.

*You can read more about the study on the effectiveness of ozone oxidation of cyanide-contaminated on the website: [www.ambriefonline.com](http://www.ambriefonline.com)*



*Xylem's ozone generator produces ozone gas on-site from oxygen for treating cyanide-contaminated wastewater*