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Effective and efficient ozone use on cooling water systems

Gina, Nomcebo Nombuso

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EXECUTIVE SUMMARY

This dissertation reports on the effective and efficient use of ozone in cooling water treatment systems. The study focuses on proving that ozone treated systems will:

(1) Improve compressor energy consumption;
(2) Improve the heat exchangers efficiency through limited scale deposition and fouling;
(3) Reduce water consumption; and
(4) Encourage or support corrosion at high concentrations compared to when cooling water is chemically treated.

For this study, data log readings from compressor heat exchanger approach temperatures were used for energy saving calculations and equipment efficiency (scaling). Using conservation of energy principles and municipal power costs, it was found that over four years, R425 991 was saved. Conventional chemical cooling water treatment systems showed high approach temperatures, resulting in high scaling rates and high energy consumption in the compressors. In contrast, ozone cooling water treatment systems showed a lower approach temperatures which resulted in lower scaling rates and lower energy consumption in the compressors.

Also, for this study data log readings from cooling water flow rates and weekly water quality analyses were used for water saving calculation and corrosion predictions. In ozone cooling water treatment systems, there was a reduction in makeup water use confirming water savings. According to Mosugelo (2010) water quality is a bigger contributor to corrosion than ozone is. In cooling water treatment systems with good quality makeup water, ozone treated systems were found to have lower corrosion rates in the heat exchangers than conventional chemicals systems.

It can be concluded that effective and efficient use of ozone in cooling water treatment provides triple bottom line benefits (economic, social and environmental). Environmental benefits include effluent disposal reduction, water and energy conservation. Social benefits include safety and health impacts. Ozone treated cooling water systems are a technically practical, cost-effective and sensible alternative when compared to conventional cooling water treatment systems.