



SUPERIOR WATER CONDITIONER INSTALLATION IN GOLD MINING

CUSTOMER: ELDORADO GOLD owns; Qinghai Dachaidan Mining Ltd CHINA

OPERATIONS

Qinghai Dachaidan Mining Ltd CHINA is a gold mine in China, operating at about 11,000ft in a very cold and very dry part of the world. Part of the operation involves roasting ore at around 650C and converting the off gas to sulphuric acid; we produce about 250 –300 tonnes of acid a day.

Cooling the off gas and acid is a significant part of the process requiring a cooling tower and pumping equipment circulating approximately 2260 m³/hr of water through DN600 and DN500 pipework. This water is circulated through 6 primary (Alfa Laval) plate heat exchangers, each around 120m² made up of between 116 to 135 individual plates, depending on which unit we're talking about. Installed in the pipe work **we have two large Superior Magnetic water conditioners, ACV-20-AC-6660-24 1512m³/hr DN600 and ACV-20-AC-6640-24 1452m³/hr DN500.**

During the first 12 months or so of operation, we operated the cooling system as a closed circuit only adding water to make up for losses in evaporation. This operating method lead to very high concentrations of predominately calcium and magnesium (and some chlorides), concentrations far too high for the Superior conditioners to be expected to work and concentrations far too high for the chemical anti-scalant addition system to work (Ciba antiprex 11). As a result, we encountered severe scale build up in all heat exchangers, effectively blocking flow thus cooling, jammed valves and non-returns, pump impeller scale and around 90% blockage of the packing in the cooling tower. During that 12 months we were shutting down the roasting plant approximately every three months to strip and de-scale the heat exchanger plates, a process that would take up to and in excess of 30hrs with equivalent gold production losses worth well over \$500k each time.

At the time of our first major shutdown, ie, after we had run for the 12 months or so, the “penny had dropped” as to the what we were doing wrong with the water cooling circuit, we needed a bleed off system to maintain TDS levels, the calcium and magnesium concentrations, at levels, as we have found, below 500ppm.

By maintaining these levels of TDS, the **Superior Magnetic conditioners** are able to do their job of changing the ionic nature of the salts to prevent them from precipitating out as hard scale build up, rather they precipitate out entering a state of suspension. What we find now is a soft, muddy residue called aragonite which is the precipitated calcium and magnesium (and other salts) within the system, usually on the bottom of the cooling tower, an area of low flow. We also find a small amount of this on the heat exchanger plates when they are stripped for routine cleaning, a job that only needs to be done approximately once every 10 – 12 months. This residue is easily cleaned off with a high pressure water blaster taking a fraction of the time previously taken by acid washing and manually scraping. We no longer add chemical anti-scalant.

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Initially, I was very sceptical of the claims made regarding magnetism and its effects on water. I do not profess to understand the chemistry or mechanics of the process however, I am convinced the system deserves merit. They are not the panacea for every water problem and must be operated within their limits, ie TDS and COC (cycles of concentration) need to be considered to achieve optimum performance from the magnets.

I believe they have been cost effective in our operation, especially when I consider we no longer add expensive anti-scalant, nor are we required to stop the plant due to cooling issues. The maintenance required for clean-up of the sludge (aragonite) is easily incorporated into a routine plant stoppage.

I hope the above is of some assistance.

I have not addressed other options for the removal of precipitated solids as we do not have the need other than manual removal annually. I know you have centrifugal separators, blow off valve arrangements, etc.

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