

Worry-Free Chlorine Dioxide Technology



New chlorine dioxide technology

Compact on-site system offers an effective way to control slime formation in wet ends and in process water systems

MARTIN
KOEPEINICK

Micro-organisms find their way into the process through fresh water, additives and raw materials. Under alkaline/neutral papermaking conditions, at temperatures of 40°C to 50°C, and in closed white water systems, they can seriously interrupt operations.

Slime-like deposits that attach to hard surfaces on machines, piping and tank surfaces are caused by aerobic bacteria that produce a mucus capsule consisting of polysaccharides. The capsule protects the cell against harmful conditions such as variations in temperature, pH and lack of nutrients.

Fiber fines and colloidal particles adhere to biofilm and contribute to rapid growth of deposits. When the slime layer thickens, parts of that layer can break loose and cause runnability and paper quality problems. Anaerobic conditions that can occur under thick layers of slime also can cause corrosion. Often, sheet defects and process

upsets are the direct result of the buildup on fabric and felts in the press and dryer section.

Despite these problems, many papermakers continue to believe that that microbiological control is too costly and complex.

POWERFUL OXIDIZING BIOCIDE

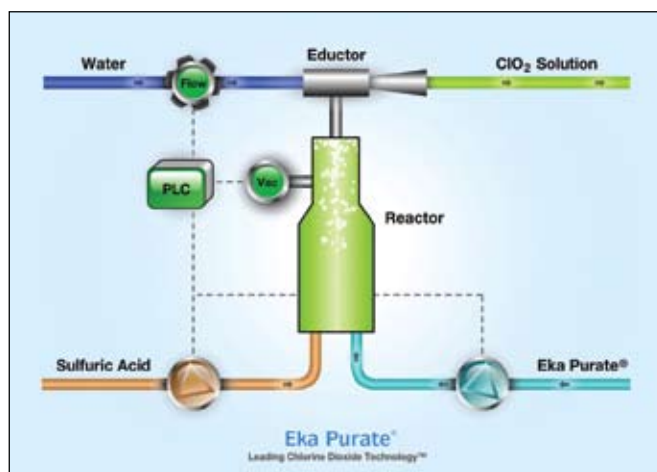
Chlorine dioxide (ClO₂) is a powerful oxidizing biocide and one of several available to papermakers, in addition to combined halogen oxidants, sodium hypochlorite and peracetic acid.

ClO₂ kills slime-forming organisms including aerobic and anaerobic bacteria, molds and yeasts, and removes slime deposits without the environmental problems associated with chlorine and bromine-based systems. It is non-corrosive to papermaking systems and unlike chlorine and bromine delivery systems it is active over a broad pH range.

In the initial oxidizing reaction, chlorine dioxide converts into less reactive chlorite ions that prevent biofilm growth and are thought to remain effective in the water solutions for a longer time as a biostat.

Chlorine dioxide oxidizes iron, manganese, sulfides, humic acids and phenolic compounds. With organic compounds, chlorine dioxide is more selective than many other oxidants and does not form toxic organic halogens.

Because of chlorine dioxide's ability to minimize slime at the onset, the important interactions between nanoparticle retention and drainage systems, minerals, additives and sizing agents can occur with less interference. Not



Eka Purate technology uses a chlorate-based chemistry. Sodium chlorate is reduced by hydrogen peroxide in sulfuric acid to produce chlorine dioxide for fast reaction speeds without harmful byproducts such as chlorine and chloride. The small-scale generator enables a ClO₂ supply from 0.5 kg/hour up to 100 kg/hour.

only can chemicals function more effectively, but also they can reach high levels of performance at potentially lower dosages, because traditional biocides are not clouding their effectiveness.

CIO₂ can also reduce odors that signal that harmful substances are in the air or on surfaces. It is less harmful to clothing and can extend clothing life as wear is reduced by a smoother, less contaminant-ridden flow across the wet end and beyond.

While the benefits of CIO₂ have been known for years, they have been offset by the difficulty in producing a safe, reliable, on-site CIO₂ solution. Now Eka Purate small-scale on-site chlorine dioxide technology offers a straightforward method for controlling slime formation in paper mill wet ends and in process water systems.

ON-SITE OPERATIONS

Chlorine dioxide is a highly soluble gas that hydrolyzes very slowly. Even in diluted aqueous solutions, the relatively small, volatile and highly energetic molecule is very effective as a biocide.

Aqueous chlorine dioxide solution should be generated on-site. However, it is stable enough in water solutions to be stored for several days in a closed container if shielded from light and contaminants.

The on-site small-scale compact generator differs from previous chlorite-HCl generators in that it has a fiberglass reinforced plastic reactor from which CIO₂ gas is educted into carrying water through a single water loop. This process is monitored by an on-board PLC that checks redundant interlocks to ensure that CIO₂ is safely formed under a vacuum. The PLC also controls metering pumps to ensure accurate dosage of precursor chemicals.

CIO₂ can be made available to all users safely, efficiently and at a much lower cost than ever before. What's more, a state-of-the-art control system can distribute CIO₂ safely to four feed points in relation to known parameters. Each point is controlled individually and can dose CIO₂ on a continuous, shock or proportional mode. All of this is integrated with the mill's DCS.

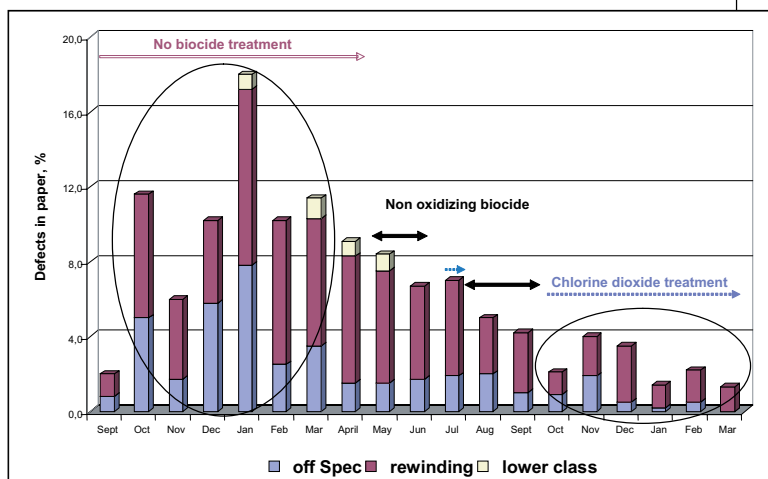
PRACTICAL EXPERIENCE

A paper and board producer in northern Europe was losing productivity because of excessive sheet holes, especially at high grammage. Slime was suspected to be the main cause. A non-oxidizing biocide was added to the white-water system and evaluated as a means to control the microbiological activity and improve the productivity.

Significant amounts of slime had accumulated in the clear filtrate tank. Measurements also indicated a high level of bacterial activity in the broke tower, probably due to long residence time.

After studies of the water system and discussion with the mill team, two dosage points were selected for treatment with chlorine dioxide: the white-water tower and the filtrate tank. The dosage rate averaged 0.1 kg chlorine dioxide/ton of paper in total.

The chlorine dioxide treatment at the chosen dosage points was effective in the water system and on the paper machine. Measurements on microbiological activity in process waters and the broke tower showed a significant reduction in aerobic count and ATP (adenoxine triphosphate) activity. In the white-water tower, one effect of the treatment was a visible difference in the clear filtrate tank. Over a period of time this addition of chlorine dioxide kept the tank slime free.



The most important observation with chlorine dioxide treatment was the effect on the productivity and quality. The improvements following chlorine dioxide addition were significant. Sheet holes on average were reduced by more than 50%. Treatment cost of the system was comparable to the non-oxidizing biocide system and delivered significant additional quantifiable value to the papermaker. 56

Martin Koepenick is president of Innova. Contact him at mkoepen@earthlink.net. In addition, valuable contributions to this article were made by Bruno Bolduc, Purate specialist; Scott Auger, market manager-Purate; and Tom Woodruff, account manager, Purate, Eka Chemicals, North America.

↑
↑
Improvement in paper quality following Eka Purate application.



Cleaner results with inspired insight on site.



No matter what we think up at Eka, you can trust it to enhance not only the quality of your products, but your competitiveness and environmental profile too.

That's why Tapio Pajari is on a European mission for Eka Purate, our patented concept for generating chlorine dioxide on site. Effective on microbes and spores, it removes and prevents the formation of biofilm and slime deposits on surfaces and filters. Always a paper technician at heart, Tapio simply wants mills to experience the immediate benefit of pure water – fewer holes and spots in their finished product, thanks

to cleaner white water and shower spray systems. And of course, increased runnability and lower cost!

The brilliance, Tapio says, is that Eka Purate works with virtually every process he's come across during his twenty years in the business. It also makes good business sense, since the offsite monitoring allows you to concentrate completely on what you do best.

Inspiring paper all over the world is our inspiration. Meet us at eka.com.

eka

Eka Chemicals AB, SE-445 80 Bohus, Sweden. Tel: +46 31 58 70 00
Eka Chemicals Inc. Marietta, Georgia, USA. Tel: +1 800 241 3900
Eka Chemicals (Thailand) Ltd. Bangkok, Thailand. Tel: +66 2 712 7293
www.eka.com

