


Eka Purate Worry-Free  
Chlorine Dioxide Technology  
**OXIDIZES AWAY CAUSES OF  
SLIME AND CORROSION**



# Oxidize Away Causes of Slime & Corrosion

A compact  $\text{ClO}_2$  generation system arms paper machines with reliable protection against deposits from water borne metals and bugs.

By Martin Koepenick, Innova



**The application of controlled, extremely small dosages of chlorine dioxide is never more than one third of what's employed for drinking water purification. By contrast, even modest dosages of chloramine biocide treatment have been associated with corrosion.**

**A**s an alternative to traditional biocides, there is a trend in papermaking, especially with alkaline systems, to switch to oxidizing biocides. A range of oxidizers, including chlorine dioxide ( $\text{ClO}_2$ ), combined halogen oxidants, sodium hypochlorite and peracetic acid have shown promising results. However, in some cases high dosage levels of oxidizers have blocked performance of other chemicals, and in other cases, chloramines have contributed to unwanted side effects, even including vapor-phase corrosion.

Often, the key to success is not only the chemistry, but also having the right experts ensuring that there is close monitoring of the oxidizer application. Low application doses can be highly efficient. This ensures that the biocide application is cost effective and does not interfere in any way with other valuable chemicals and additives, not to mention degradation of equipment.

Eka Purate, which is fed from a compact  $\text{ClO}_2$  generation system — usually placed close to a paper machine — has proven that as little as 0.1 lbs/T (less than 33% of the required dose for safe drinking water) is enough to effectively treat a papermaking system. Once free from the worries of slime and deposit build up the papermaker can focus on and realize speed increases, quality gains, reduction in chemical costs, and preventive measures against corrosion.

According to Eka's Bruno Bolduc, market specialist, who has put over a dozen Eka Purate systems in place in Europe, three U.S. mills are well into trials to employ the compact  $\text{ClO}_2$  units.

"A safe, worry-free system that delivers clean incoming water is assured with Eka Purate," says Bolduc. "Traditional systems are often sited far from the paper machines, and can be a headache in terms of manpower and cost. Our approach is to install on-line oxidative reductive potential (ORP) probes in concert with the Eka Purate system. In all cases, our customers are witnessing paper machines with

reliable protection against deposits from water borne metals and bugs.”

*Note: ORP can be used to control bugs instead of off-line testing like bug counts that can take 48 hours to incubate for traditional biocides.*

Heinz Moritz, production manager at M-real Zanders Reflex mill in Duren, German, said, “Creativity at the wet end is easier when Eka Purate is applied as the biocide. All the interferences caused by the myriads of slimicides, defoamers, odor control agents, and more are eliminated and we can implement new process ideas more easily as a result. Silica nanoparticle systems perform better at lower dosages. Filler increases can occur more easily. The list goes on.”

MD Papéis’ Santista mill, located in Cubatão, São Paulo State, Brazil, producer of 60,000 tpy of printing and writing grades and flexible packaging, decided to switch from a monochloramine-based system.

Caio Mori, Eka’s business development manager in Brazil, explained, “Because monochloramine is a persistent chemical and can be harmful, MD Papéis Santista began looking for a way to which would reduce the toxicity in the effluent. Eka Purate, now in place for nearly one year, provided the level of treatment efficiency desired without the persistent problems, and also helped with paper machine runnability.”

The Sanista mill continuously monitors their effluent to maintain parameters, assuring that they meet legal requirements.

## CLEAN SYSTEM WITHOUT INTERFERENCES

Scott Auger, market manager, Eka Purate, in North America, noted, “When you form your sheet with cleaner, pretreated water, the focus is on optimizing performance, not on the interferences caused by traditional biocides. In addition, downtime caused by corrosion is not an issue.”

Adds Jim Anderson, Eka Purate market specialist, “Cleaner process water significantly reduces the buildup of costly deposits on papermaking fabrics and equipment. Choosing chemistry that does not contribute to corrosion associated down time also pays off in the long run.”

Eka Purate is employed for a wide range of applications in pulp and paper, including catalase, influent, effluent, PM white-water and fluorescence removal.



**Heinz Moritz, production manager at M-real Zanders Reflex mill in Duren, Germany.**

## BENEFITS OF THE SMALL-SCALE CLO<sub>2</sub> OXIDIZING ALTERNATIVE

- Raising water to level of added value chemical--eliminating need for traditional biocides
- Fewer unscheduled and scheduled downtime
- Reduced sheet defects
- Reduced corrosion due to biofilm/slime elimination
- Less scale as it oxidizes iron, manganese and sulfides
- Increased performance from advanced chemistries at lower dosages
- Lower costs for equipment cleaning and replacement
- Wastewater treatment runs smoother; no carryover effect
- Effective for inactivation of viruses, bacteria, spores and parasites
- Microorganisms do not build up resistance towards CLO<sub>2</sub>
- No formation of toxic organic halogens (THM and AOX)
- Active as a biocide within a broad pH range 4 - 9
- Increased redox potential – leads to elimination of anaerobic pockets in the system — no H<sub>2</sub>S
- Used on water everywhere in the production cycle where contamination from microorganisms might occur, ranging from feed and process water to waste, cooling, and white water
- Creating a runway for innovation

## LEARNING FROM DRINKING WATER

Application of chlorine dioxide at modest dosages is becoming the de facto standard as the method of purifying drinking water for municipalities. It’s only logical that paper mills, being huge consumers of water, would look to this technology to purify, as well as employ this kind of preventive maintenance approach for equipment.

Because the challenge today is to run smoothly at even higher speeds with far more filler content, and for many, alternative fibers help papermakers meet the needs of faster printing presses with entirely new inks. Under these conditions, you certainly don’t need multipliers of interferences. Just as some of the equipment manufacturers have found ways to help papermakers shift to preventive maintenance, that’s what Eka Purate and other chemical concepts should do.

Other than the fact the same chemistry is employed, the difference between bleaching and Eka Purate is signifi-

cant. In one case, you employ huge volumes of chlorine dioxide. In the other, you employ drops in the bucket, and very tightly dosed, monitored and controlled application. The main point is that Eka Purate is a control system. You remove the noise to be more effective doing other things.

A lot of innovative thinking went into taking know-how from large-scale generation to smaller scale units that run worry-free where the water comes into the mill, and nearby the paper machines.

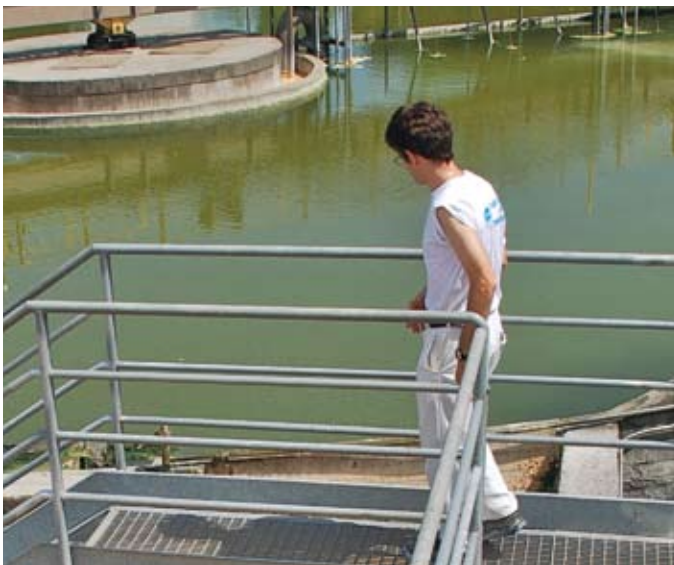
“With the Eka Purate innovation, we have studied how to do this on site in a very safe way,” Auger pointed out.

“Even though ClO<sub>2</sub> is proven, tried and true for large scale bleaching operations, this does not mean that small-scale generation has no impact on the work environment in another part of the mill. Safety is always about local, specific situations; not simply the technology put in place,” Auger added.

### POTENTIAL CAUSES FOR DRYER CAN CORROSION — A LABORATORY STUDY

The most common location where corrosion manifests itself is on dryer can surfaces, but it has also been a problem in the dryer hood vents, pocket ventilators, “mini-hoods” used for ventilation, dryer fabric turning rolls, vented rolls within the dryer fabric run (used to exhaust moisture away from the dryer fabric), dryer can doctor blades and doctor blade holders, plus the high humidity area above the press and forming sections at the wet end of the paper machine.

Significant vapor phase corrosion, mostly on dryer can surfaces and metal in the dryer section, has been detected at



**Burgo Toscolano returns water to Italy’s Lake Garda cleaner than it arrived. They employ a customized water treatment system, including Eka Purate, instead of traditional biocides.**

several mills using chloramines for microbiological control.

Most of the reported corrosion has been in the first part of the dryer section, and usually on the surface of the dryer cans. But it has also been seen on dryer fabric carrying rolls and exhaust systems in the high humidity section above the dryer cans.

The assumption is that severe corrosion is somehow related to the components of the initial vapors that are released

### FAQ about Corrosion in the Dryer Section:

#### What is the most common cause of corrosion on dryer can surfaces?

Pitting caused by a high moisture environment. The sheet carries water; water carries chloride; water evaporates. Chloride accumulates on the dryer surface in high concentration, causing corrosion. Chloramine is a very stable oxidizer, which gets carried in the web through sheet pressing into the drying section, where heat will increase its aggressiveness by 100X.

#### How costly can this damage be, requiring how much downtime?

Replacement of damaged dryer parts typically add up to \$50,000- \$250,000 and require excessive downtime to install; typically three days per roll.

#### What about dryer hood vent issues, or vented rolls with dryer fabric runs?

Venting equipment is more at risk because it handles the aggressive concentrated vapors in high flow configuration where surface erosion is likely to occur.

#### How serious is corrosion above the wet end and press section?

Not always related to biocide chemistries. It has a lot to do with proper building ventilation to handle moisture evacuation. Once started, it is difficult to control, and will inevitably cause holes and defects in the sheet.

#### What biocide approach is advisable to eliminate corrosion concerns and run cleaner overall?

- Go back to traditional biocides, yet face all the interferences slowing down productivity and minimizing effectiveness of advanced chemistries.
- Run a dual program with oxidizer and biocide.
- Run hydantoin with hypo to stabilize the chemistry.
- Consider monochloramine chemistry, but be mindful of pH levels and other issues, such as corrosion
- Run low, controlled dosages of chlorine dioxide.

(evaporated) from the whitewater in the sheet. Because the corrosion is variable, it's been difficult to get actual mill data to determine a root cause.

With this in mind, a lab experiment was conducted to collect the initial whitewater vapors, which were boiled out of the whitewater.

With this technique (Figure 1), testing of a variety of oxidizer treated whitewaters could be done, measuring the chemical differences in the condensed vapors.

Specific experiments were designed to determine the amount of Total Chlorine (HACH DPD Method) in the condensed vapors of Clear White Water from several alkaline fine paper machines in North America.

**“The dosage and concentration of chlorine dioxide from Eka Purate generators is so modest, it’s like comparing a few drops of water to a waterfall. There is no similarity between bleaching with chlorine dioxide and biological control at the wet end.”**

— Scott Auger, Eka Chemicals

Whitewaters were boiled out for 60 minutes to produce condensed vapors. The Total Chlorine content of the condensed vapors was then measured. In both studies (Figures 2 and 3), the amount of Total Chlorine in the condensed vapors increased significantly in the whitewater treated with increasing levels of chloramines.

The amount of Total Chlorine in vapors from the ClO<sub>2</sub> treated whitewater remained low, about the same as the levels with no oxidizer treatment. Because ClO<sub>2</sub> is a gas, it’s logical that it would not be part of the condensed vapors. This may be part of the answer as to why ClO<sub>2</sub> has never caused any dryer section vapor phase corrosion in the 25+ years that it has been in use as a paper machine biocide.

### EFFICIENT OXIDIZING AGENT

Just as on-site generation of chlorine dioxide has become a preferred approach to disinfecting drinking water and industrial wastewater treatment, Eka Purate® technology is finding acceptance in papermaking processes globally for its bactericidal and slimicidal efficiency, which helps processes run more smoothly and equipment last longer. Corrosion, which can be common in the dryer section, is actually minimized because of this application of low (and controlled) dosages of chlorine dioxide. ■

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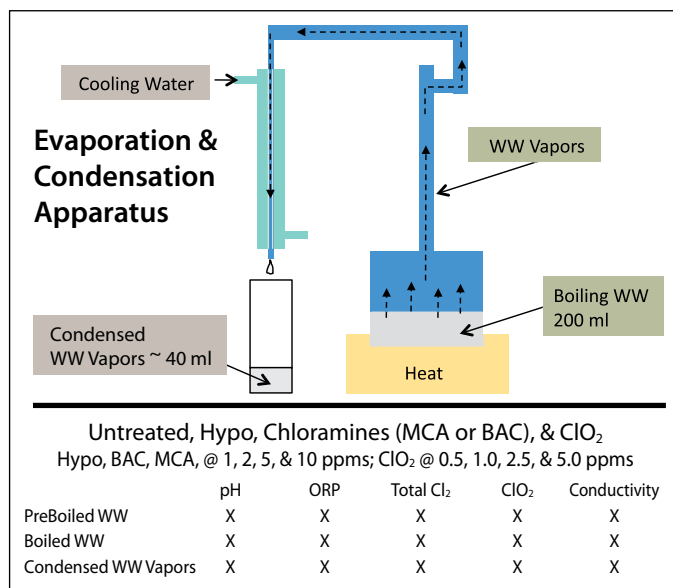


Figure 1.

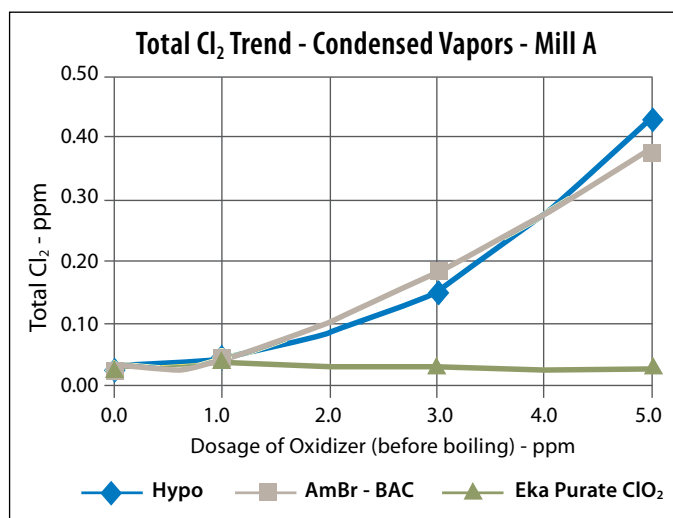


Figure 2.

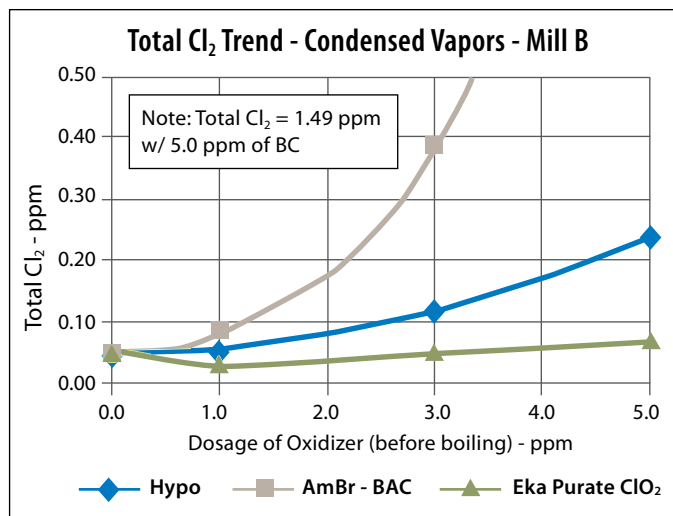
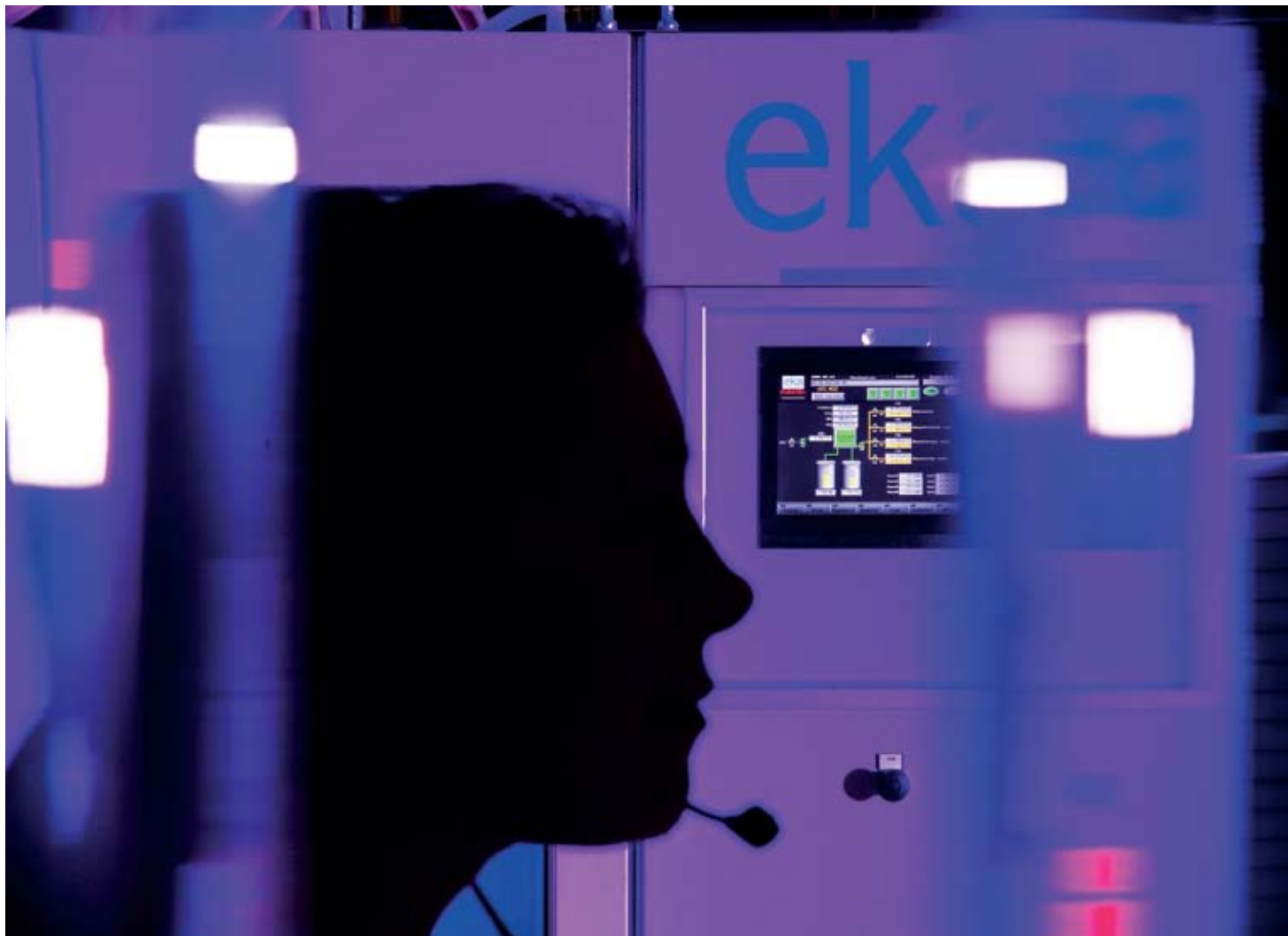


Figure 3.



## 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](http://eka.com).

