THE USE OF MONOCHLORAMINE FOR MICROBIOLOGICAL CONTROL IN HIGH DEMAND SYSTEMS

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As more cooling water systems utilise makeup water sources with high levels of organic and process contamination, more robust biocides are demanded. The oxidising demand must be satisfied before the oxidising agent can react with biological matter and show free residual. In contaminated systems or under high pH conditions, the high demand may render oxidising biocide programs costly or even ineffective. Oxamine® (proper Buckman technology for MCA generation) is a strong, MCA-based oxidiser capable of reducing microbiological contamination problems in high demand water and it is not susceptible to pH or ammonia levels as regular oxidisers.

1. INTRODUCTION

- Insight in the actual performance of equipment that is subject to fouling, can lead to operational benefits.
- The amount of fouling is usually impossible to measure directly, so an indirect performance measuring method must be used. The analysis uses a normalized heat transfer coefficient U as basis for the performance or fouling, calculation.
- Various methods to arrive at U are evaluated.
- A closely related benefit calculates the optimum time to clean an exchanger, based on the projected change in the performance index. This involves that determination of the potentially lost energy or product yield versus the cost of cleaning.

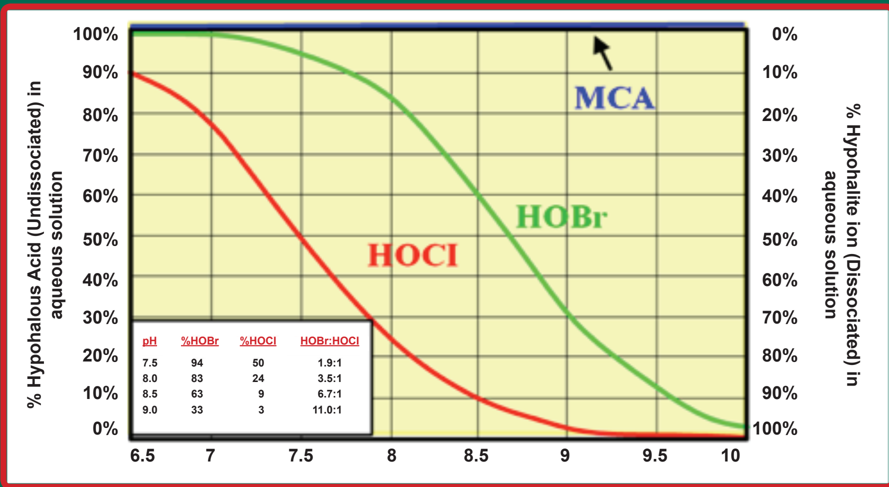

Figure 1 - Illustration of evaporator 2nd stage performance index over time, showing three cleaning cycles.

2. STUDY CASE

In a cooling system serving the distillery plant at a sugar and alcohol facility in Brazil, water coming from the cooling tower goes directly to plate exchangers that serve the fermentation tanks and then to a distribution tank of approximately 500 m^3 at the top of the distillery plant (Figure 2). From the distribution tank, the water flows to tube exchangers of the distillery by means of gravity feed. From here it returns to the cooling tower.

The 2009 harvest started with conventional microbiological treatment based on two non-oxidising biocides and a bromine-based oxidising biocide. After difficulties with the conventional program, the plant decided to change to chlorine dioxide. This program was also troublesome on account of the frequency that the plate heat exchangers needed cleaning, the increase in chloride levels in the recirculating water, and the high cost because of the high dosage rates required to maintain the chlorine residual in the water

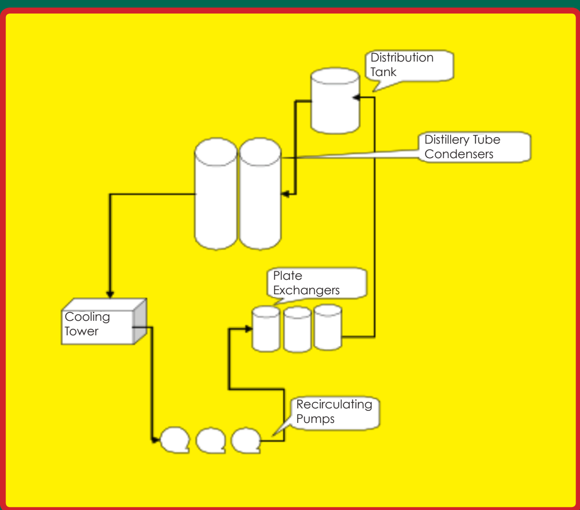

Figure 2 - System diagram

3. RESULTS

With the 2010 harvest season, MCA treatment was used and applied under an intermittent dosing regimen.

During this season, MCA technology was presented to the customer as a definitive solution due to the following:

1- MCA is produced using dosing equipment that enables accurate generation of monochloramine in the diluted mixture.

2- MCA is not sensitive to high organic demand in the system, and it is not necessary to overdose the product and generate high costs, as is the case with chlorine dioxide.

3- MCA does not increase chloride levels nor does it present corrosion risks to stainless steel equipment

4- MCA acts as a powerful cleaning agent, controlling biofouling

5- During the test MCA presented better antibiogram results than conventional biocides commonly used (Table 1)

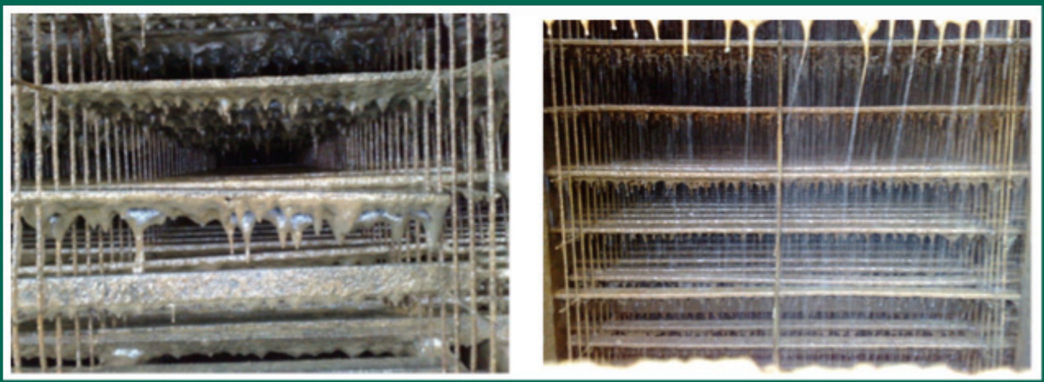

Figure 3: Treatment comparison 2009 (left; without MCA) vs 2010 (right; with MCA)

Product	Dosage (ppm)	Total bacteria (ufc/mL)	Efficiency (%)
Quaternary ammonium polymeric	20	1.4 e^7	23.37
	40	4.5 e^6	75.54
	60	1.8 e^6	90.22
Isotiazolin based product	30	8.7 e^6	52.72
	60	6.9 e^6	62.5
	120	3.4 e^6	81.52
Quaternary ammonium + glutaraldehide	20	9.3 e^6	49.46
	40	2.6 e^6	85.87
	60	2.1 e^6	88.59
Mix of quaternary ammonium compounds	20	8.3 e^6	54.89
	40	2.8 e^6	84.78
	60	1.0 e^6	94.57
MCA	0.5	8.1 e^6	55.98
	1.0	4.9 e^6	73.37
	1.5	2.1 e^5	98.86
Blank	---	1.6 e^7	---

Table 1: Antibiogram efficiency comparison

4. CONCLUSIONS

With the MCA treatment, the following benefits were noted:

1. An increase in the cycles of concentration;
2. Savings in fresh water of up to 87 000 m^3 for the season;
3. Savings of up to $9500 in effluent treatment costs;
4. Energy saving of up to 15 000 kWh for the season;
5. A decrease in the frequency of cleaning the heat exchangers;
6. Elimination of the cleaning of the vertical heat exchanger;
7. Reduction in the cost of corrosion treatment program.