

ENVIRO TECH

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Perasan[®] (15%) Use in Zero Discharge Energy Plant

Trip report for Energy Plant, Crows Landing, CA

Purpose: The purpose of our trip to the Energy Plant on March 03, 2005, was to determine the current performance of the Perasan[®] (peracetic acid) biocide cooling tower treatment program. The previous program consisted of adding sodium hypochlorite continuously along with intermittent slug doses of isothiazolin.

Background: The Energy Plant is a 20 MW waste-burning conversion power plant. Cooling water is used to condense steam on the exhaust side of the LP turbine. The cooling water treatment program utilizes a zinc/polymer program for corrosion protection. The cooling tower is run at 3 cycles of concentration based on silica. The cooling water blow down is sent to a cold lime softener at a rate of 60 gpm, then an RO. The RO permeate is sent back to the cooling tower at a rate of 40 gpm and the RO reject (about 20 gpm) is evaporated in the stack flue gas and used as a fly ash dust suppressant. Cooling tower parameters are as follows:

Recirculation rate: 16,000 gpm
System volume: 70,000 gallons
pH: 8.2 to 8.4
conductivity: 7000 to 15000 umhos
delta T: 20 F
water makeup rate: 200 to 250 gpm (40 gpm of which is RO permeate)

On February 20, 2005, the bleach feed was discontinued. On February 22, we began a Perasan[®] treatment program which consists of effectively continuous feed of Perasan[®]. From Feb 22 to 27 the Perasan[®] was dosed intermittently for 10 minutes every 3 hours, and from Feb 28 to March 3, the Perasan[®] was fed continuously. The daily feed rate for both programs was 1.6 gpd.

Test results: During the first program of frequent slug feed, the Perasan[®] residual ranged from 0.95 to 0.02 ppm. During the second program of continuous feed, the Perasan[®] residual varied between .06 and 0.02 ppm.

Total aerobic plate counts were run the first day of treatment and on March 3, 2005, and after 10 days of treatment. The plate counts (colony forming units per ml) were as follows:

Feb 22, 10:00 am before Perasan[®] treatment: 55,000 cfu
Feb 22, 11:00 am after Perasan[®] treatment: 5,200 cfu

March 3, 9:30 am during continuous level feed: <1,000 cfu
March 3, 10:30 am after 10 min Perasan[®] dose 540 cfu

A visual examination of the cooling tower indicates excellent micro-biological control as all surfaces are free of slime and the water has very good clarity. Figures 1 and 2 (below) are pictures of the cooling tower basin and support structures before and after Perasan[®] feed. The pictures show that the cooling tower is very clean and free of scale or biofouling.

Economics: Salts contributed by bleach have a negative impact on the environment and affect cooling water economics. Based on the mass balance of annual bleach use and blowdown, the bleach adds about 24,000 lbs. of salt/solids (see note 1) every year (out of a total salt/solids load of 220,000 lbs). The bleach also adds alkalinity and increases the need for sulfuric acid. Since cooling water blow down is run through an RO, bleach adds to the cost of operating the RO. RO membranes need to be replaced periodically due to continual flux loading (lbs. of salt removed per square foot) which decreases membrane life. Since bleach adds approximately 11% of the total solids loading, eliminating bleach would add to membrane longevity by 11%. Note that the reduced solids load would also offset the RO power and O & M cost requirements by 11%.

Conclusion: Based on total aerobic plate counts and visual examination, the Perasan[®] program is performing very well and is economically competitive with bleach-based programs at a pH of 8.2-8.4. The calculated chemical costs are similar to the bleach and isothiazolin program but have the added benefit of less overall operating cost. It was decided that the feed program would discontinue the continuous feed method and resume the intermittent slug feed method every 3 hours. We will continue to monitor and document the performance of the Perasan[®] program.

NOTE 1: Sodium hypochlorite ultimately adds 2.2 lbs of salt for every gallon used. The plant uses approximately 6000 gallons of bleach per year for a total salt (solids) contribution of 24,000 lbs. Consider that each gallon of sodium hypochlorite adds approximately 0.62 lb of equivalent hydroxide alkalinity to the water matrix. In order to maintain the pH regime required for effective corrosion control, the extra alkalinity requires 1.9 pounds of sulfuric acid to neutralize. All things considered, each gallon of sodium hypochlorite using a sulfuric acid adjustment regime adds approximately 4 lbs. of salt.

NOTE 2: Perasan[®] is a liquid equilibrium mixture of 15% peracetic acid, 22% hydrogen peroxide, and 16% acetic acid. Other peracetic acid products are not amenable for these applications due to their high acetic acid concentrations, because the acetic acid converts to acetate and accumulates to become microbial nourishment. The decomposition products of Perasan[®] are carbon dioxide and water. Perasan[®] adds no measurable conductivity to the treatment stream. Perasan[®] is EPA registered for use as a cooling water microbiocide, as well as for numerous other uses such as pulp and paper white water, RO membrane sanitizing, and has FDA approval for direct food contact without a water rinse.



Picture 1: Cooling tower basin and support structure (before), Sep 22, 04



Picture 2: Cooling tower basin and supports (after), Mar 03, 05