

# **HYDROGEN COOLER CLEANING PILOT TEST**

**Prepared by**

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**Pilot project # 06-0021.95**

**Report**

**April, 1995**

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## HYDROGEN COOLER CLEANING PILOT TEST

### Pilot Test Goals:

Determine the validity of manufacturer claims regarding the effectiveness of a biotechnology (KAM Biotechnology) for removing scale from within the cooling tubes of a hydrogen cooler. If the pilot was successful future plans could include the cleaning of boilers. The product was marketed by ECO-Environmental Inc., of Houston, Texas. Both manufacturer and marketer claimed the product had a pH above 3.7 and would not leave the LCRA with a waste that would require neutralization or have any land disposal restrictions.

The manufacturer attributes the processes saving characteristics mostly to the chemical design of the product and a biofiltration system which would be used to recover the product for reuse.

ECO-Environmental Inc. (ECO), promotes the KAM Biotechnology (KAM) process primarily through testimonial case studies which claim significant savings.

### Summary:

Prior to this pilot test, the LCRA and ECO met at the Sim Gideon Power Plant (SGP) in Bastrop, to discuss the KAM product and the logistics of performing the pilot test. A small hydrogen cooler at SGP was inspected by ECO prior to mobilizing on site on February 21, 1995. On February 20, the LCRA was contacted by ECO stating that the product was being held by U.S. Customs and that they would need to postpone or delay the pilot test by one day. ECO mobilized on site by February 22, 1995, and introduced a product labeled "KAM BRITE" into the hydrogen cooler. At a project "Kick-off" meeting, the manufacturer had indicated that the product would require an 8 hour soak and would be drained at the end of the day.

The MSDS information supplied by KAM indicated that the product had a pH of 3.47 and contained phosphoric acid. After the product had been introduced

to the hydrogen cooler the pH was verified by LCRA. The pH of the product was discovered to be well below 2. The product was immediately drained back into the original product containers and set aside. Following the removal of the product, the cooler was rinsed with fresh water. The rinsate was circulated within the cooler and required considerable neutralization to bring the pH to 7.5. The process generated approximately 100 gallons of rinsate which was eventually drained into several 55 gallon drums. The manufacturer indicated that the manufacturing facility had accidentally shipped a concentrated batch.

The waste water rinsate was then passed through KAM's biofiltration system. The filter consisted of hollow, cylindrical PVC tube, approximately six inches in diameter and no more than 12 inches in length. The cylinder was filled with a charcoal substance and several other "proprietary" biological ingredients. The headspace above the filter media was filled with a sample of the rinsate. The headspace containing the rinsate was then pressurized, forcing the rinsate through the filtration medium.

The recovered product, rinsate and filter medium were all analyzed for total metals by EPA method 6010, Mercury using EPA method 7470, Total Suspended Solids by EPA method 160.2, Oil and Grease by EPA method 413.1 Total Petroleum Hydrocarbons by EPA method 418.1 and pH by EPA method 150.1. No metals were above regulatory levels (Table 1 & Attachment A).

**Table 1: SUMMARY OF RINSATE ANALYSIS**

<b>METALS</b>	<b>Before Filter (Total mg/L)</b>	<b>After Filter (Total mg/L)</b>
<b>Arsenic</b>	<b>&lt; 8.8</b>	<b>&lt; 0.22</b>
<b>Barium</b>	<b>&lt; 0.4</b>	<b>0.02</b>
<b>Cadmium</b>	<b>&lt; 0.9</b>	<b>&lt; 0.02</b>
<b>Chromium</b>	<b>&lt; 2.2</b>	<b>0.06</b>
<b>Iron</b>	<b>1030</b>	<b>&lt;0.13</b>
<b>Lead</b>	<b>&lt; 4.4</b>	<b>&lt; 0.1</b>
<b>Manganese</b>	<b>&lt; 2.2</b>	<b>&lt; 0.27</b>
<b>Silver</b>	<b>&lt; 3.6</b>	<b>&lt; 0.09</b>
<b>Zinc</b>	<b>268</b>	<b>0.19</b>
<b>Nickel</b>	<b>&lt; 8.9</b>	<b>&lt; 0.2</b>
<b>Selenium</b>	<b>&lt; 8.9</b>	<b>&lt; 0.22</b>
<b>Copper</b>	<b>28.5</b>	<b>1.31</b>
<b>Total (ICP)</b>	<b>1330</b>	<b>1.92</b>
<b>Total Petroleum Hydrocarbons</b>	<b>7.9</b>	<b>&lt; 1.2</b>
<b>Total Suspended Solids</b>	<b>6170</b>	<b>15</b>
<b>Oil and Grease</b>	<b>108</b>	<b>&lt; 2.5</b>
<b>Mercury</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>

**All rinsate was stored on site in 55 gallon drums and finally managed as a class II waste by ECO. ECO also took the Kam Brite product back, claiming that it could still be used and was not a waste.**

**During the course of this pilot project, the LCRA did not see any significant biological technology used with this product.**

## **Conclusions:**

**The manufacturer's product was manufactured outside the U.S. and created significant problems related to delivery. The MSDS information that had been provided by ECO did not match the physical characteristics of the product used during the pilot test. The manufacturer's procedures were not followed and a considerable amount of confusion was apparent between the manufacturer and the ECO representatives on site. It appeared that the product cleaned the cooler satisfactorily; however, it did not soak for more than one hour before being drained and returned to the product containers.**

**The biofiltration system appeared to be nothing more than an activated charcoal system. The system was able to reduce all metals significantly.**

## **Recommendations:**

**LCRA will provide a copy of this report to ECO-Environmental for comments. The comments will be included with this report for distribution purposes..**

**Based on the results of this study, no further action is recommended.**

# APPENDIX A