CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

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Project Number

J1824

Project Title

Green Clean: A Comparison of Cleaner Effectiveness and Electrical Conductivity

Abstract

Objectives/Goals

The purpose of this project was to determine if there is an industrial cleaning chemical as effective as sodium hypochlorite (bleach), but with a lower electrical conductivity (EC) than bleach. It was hypothesized that the potassium based cleaners would have a lower EC but would clean as well as the sodium based cleaner.

Methods/Materials

The three cleaning chemicals tested were sodium hypochlorite (NaClO2 - bleach), potassium hydroxide without bleach (KOH), and potassium hydroxide with bleach (KOH NaClO2). The chemicals were diluted to their normal usage concentration and their electrical conductivity was measured and recorded. The cleaners were then tested on three common surfaces found in a food processing plant: stainless steel, plastic conveyor belt, and rubber conveyor belt. The surfaces were coated with carrot pulp for 18 hours and then rinsed with water. A control swab was taken on each area of each surface. A portion of each surface was then sprayed with four squirts of cleaning chemical. After waiting 5 minutes, the cleaners were rinsed off and swab samples were collected from each area. These samples were tested with an ATP bioluminometer. The data from the ATP meter was collected and recorded to determine which cleaner cleaned the best.

Results

The results for the electrical conductivity test were: Bleach - 148,000 ms, KOH with bleach - 18,200 ms, and KOH without bleach - 9,760 ms. The KOH with bleach was the best cleaner on all 3 surfaces and KOH without bleach was second best on two of the three surfaces. Thus, the results supported the hypothesis. The potassium cleaners worked better than the sodium cleaner (bleach) and had a significantly lower EC than the bleach.

Conclusions/Discussion

The groundwater in the San Joaquin Valley has a high salinity level. This is a problem because it can kill crops. Sodium hypochlorite is the most common food processing plant cleaner. This project attempted to find a cleaner with a lower electrical conductivity than bleach that is still as effective as bleach. The results supported the hypothesis that there are cleaners that can clean as well as bleach, but with a lower EC than bleach. Because of the large differences between the ECs of the cleaners, the potassium based cleaners are better choices environmentally.

Summary Statement

This project tested 3 industrial cleaning chemicals to determine if cleaners with lower electrical conductivity (potassium based) would clean as well as higher EC cleaners (sodium based).

Help Received

Qualified Scientists Joe Purcell, Jamie Salcedo, Tracy Parnell, Rosemary Lopez and Glen Betz for supervision and help with the chemicals and testing. Mr. Walker for the safety equipment, and my mom and dad who provided me with transportation and guidance.