



CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s): Alana R. Tessman; Project Number: 36435; Project Title: Testing (EA) Bioremediation for Treatment of Sumps, Percolation Ponds, and Produced Water Intended for Agriculture; Objectives/Goals: The objective of these tests were to determine if a particular type of bioremediation agent (enzyme additive) at the right concentration could effectively reduce toxins in sumps, percolation ponds and produced water intended for agriculture; Methods/Materials: Collected 57L Produced Water(PW)treated for Ag.use. Filled 7 glass aquariums with 4L each PW, aerated 6 bubbles per minute. Added 1/50(EA)bioremediation agent to 3 tanks, 1/25 (EA) to 3 tanks, 1 control tank. Used 100ml glass collection containers. Took acute readings at 24, 48 and 96hrs. Tested samples using TD-500D (Turner Lab) calibrated to local crude. Added 10ml Hexane solvent to control, agitated 2min, got non-detect reading. Switched to TD-3000, added Hexane to(EA)samples,agitated 2min,unexpected clouding,could not calibrate. Tried waiting 24-48 hrs still clouded. Took fresh samples to GeoTech Environ.for VOC/PAH testing using miniPae3000. All non-detect even with smell present. Re-evaluated testing method. Obtained new PW samples from source intended for sumps and percolation ponds instead of already treated PW. Had to learn 'Chain of Command' procedure to obtain water. Currently re-testing at Turner Labs and Geotech. Changed testing procedure using surfactant heated to 'cloud point'(140F) to create homogenized oily water sample instead of using solvent and then manually filtering solids. Testing at Geotech same procedure with new samples; Results: First experiments with treated PW all resulted in non-detect at ppm except control at 0.125ppm. Learned that Hexane solvent can not be used with (EA)bioremediation agent. Researched other testing methods. Currently using untreated new samples of PW, longer testing times, and surfactant 'cloud point' method. Results pending; Conclusions/Discussion: More than 900 percolation ponds exist in the southern Central Valley, most of them in Kern County where I live. Regional water quality regulators plan to issue enforcement actions this year to operators of about 200 local oil field wastewater percolation ponds. If (EA)bioremediation at the right concentration could lower toxicity to acceptable levels this could improve air quality, lower environmental impact and help oil companies deal with their waste. By testing positive to lowering these levels with untreated PW, I could also predict that this particular enzyme additive agent could lower toxicity of PW intended for agriculture; Summary Statement: By using an Enzyme Additive bioremediation agent, I hope to engineer an environmentally safe and efficient way to reduce toxins in produced water; Help Received: I designed the experimental methods and procedures. I worked with a scientist at Turner Labs in Fresno who helped me understand how to use meters and collect viable samples. I also worked with experts from GeoTech Environmental in Long Beach. I took readings with the supervision of these people.