CLEAN WATER TECHNOLOGY

CASE STUDY

BIODIESEL PROJECT

More than a decade of research and development by a network of soybean farmers, backed by an environmentally responsible food processor, a local soybean association and the formation of a farmer (majority) owned firm, resulted in the construction of a biodiesel facility in the central United States. Using soybean oil as its primary feedstock, the facility planned to produce 40 million gallons of biodiesel and 30 million pounds of food-grade glycerin annually. Since construction on this facility had not yet begun, CWT was asked to analyze similar streams from an existing facility and provide a sustainable wastewater solution to comply with State regulations.

CHALLENGE:

There were three specific streams reviewed by CWT:

- Stream 1: The "hot well" stream from the biodiesel operation proved to be the most challenging. Inconsistencies due to manual monitoring and operation of the influent made proper and consistent treatment of the wastewater extremely difficult. The stream produced approximately 5 gpm with a pH of 9. An 800 gallon equalization (EQ) tank was in place.

- Stream 2: The "wastewater stream" from the biodiesel operation proved to be less challenging. This stream was comprised of the hot well, glycerin room and storm drains from the tank farm area. Producing 25 gpm with a pH of 5.5, the wastewater had been treated through an 8,000 gallon and a 20,000 gallon EQ tank, run in series. The processor was hauling six tanker trucks of wastewater a day to a site over 85 miles away.

- Stream 3: While the "Protein scrubber" from the crush process produced low levels of TSS, FOG and COD, further reduction of TSS was required since this stream was being discharged to the sanitation district. The 70 gpm stream was relatively consistent with an acceptable pH of 7. The EQ tank was sized at 1,600 gallons.

Using these findings to plan for several biodiesel facilities within the Central U.S. proved useful in designing the optimal treatment strategy. It was imperative that the primary treatment process removed a high level of solids since all streams were going to the sanitation district. An inferior primary treatment system would enable solids and oil to transfer to the sanitation district, putting the company out of compliance which would also result in increased discharge fees. In addition, since the plant planned to install a future secondary treatment system, any excess TSS or FOG could result in disruption of biological treatment or the blinding of membranes if an MBR were used. This would result in costly mechanical issues, maintenance expenses and potential fines by the sanitation district.

GEM Unit 25/75

SOLUTION:

Samples of each stream were forwarded to CWT's in-house laboratory for testing. The results demonstrated that the GEM (Gas Energy Mixing) System would effectively treat all streams. A demo unit was set up in only half of a day and produced (lab expected) true field results.

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- Stream 1: Although the dosing rates were elevated compared to the other streams analyzed (due to influent loading), the modifiable mixing capability of the GEM System's Liquid Solid Gas Mixers (LSGM's) was critical to the successful treatment of this high strength stream. Use of the GEM System was highly recommended.

TABLE 1: GEM Effectiveness on "Hot Well" Water from Diesel Facility			
PARAMETER	**INFLUENT**	**EFFLUENT**	**PERCENT REDUCTION**
TSS	2,700 ppm	15 ppm	99%
COD	28,670 ppm	2,490 ppm	91%
Turbidity	4,185 NTU	22.5 NTU	99%
Based upon the above data and testing, FOG removal was 99%.			

- Stream 2: The chemical dosing rates on the "wastewater stream" from the biodiesel operation were very low. It was verified that the GEM System would efficiently treat this stream.

TABLE 2: GEM Effectiveness on "Wastewater" from Diesel Facility			
PARAMETER	**INFLUENT**	**EFFLUENT**	**PERCENT REDUCTION**
TSS	141 ppm	16 ppm	88%
COD	2,690 ppm	820 ppm	69%
Turbidity	352 NTU	30 NTU	91%
Based upon the above data and testing, FOG removal was 99%.			

- Stream 3: The "protein scrubber" stream from the crush process produced low levels of TSS, FOG and COD. However, since this stream discharged to the sanitation district, TSS needed to be reduced. The dosing for this stream was also relatively low and produced highly de-waterable solids as did all streams reviewed.

TABLE 3: GEM Effectiveness on "Scrubber" Stream from Crusher Facility			
PARAMETER	**INFLUENT**	**EFFLUENT**	**PERCENT REDUCTION**
TSS	166 ppm	8 ppm	95%
COD	835 ppm	585 ppm	30%
Turbidity	116.5 NTU	24 NTU	79%
Based upon the above data and testing, FOG removal was 99%.			

To ensure ease of operation, and reduced chemical usage, CWT also recommended that a 20 mesh mechanical screen be installed prior to the EQ tanks for removal of coarse solids.

ECONOMICS:

HAULING: From the Biodiesel facility alone, a combination of Stream 1 (Hot Well) and Stream 2 (Wastewater), the processor was sending 6 trucks per day of wastewater to a site over 85 miles away. Since it was determined that these streams were easily treated by the GEM System, the processor was able to save the cost of hauling and disposal of 36,000 gpd of wastewater.

SURCHARGES: Utilizing the GEM System to treat Stream 3 (the water from the protein scrubber at the crush facility), the processor was able to reduce TSS to an acceptable level thereby reducing fees and surcharges, in addition to addressing any fines they had been paying.

ENERGY, CHEMICAL, SLUDGE COST REDUCTIONS: Other savings related to the advanced efficiencies of the GEM System included reduced footprint, reduced chemical usage, reduced energy consumption, and reduced sludge-related expenditures when compared to traditional dissolved air flotation (DAF) units.

The System was brought online in February 2008. To date, the client is extremely satisfied with their selection of the GEM System. For more information contact CWT at www.cleanwatertech.com.

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