



GEM
Gas Energy Mixing By CWT

CASE STUDY

CITRUS JUICE PROCESSING

INTRODUCTION

Clean Water Technology Inc. (CWT), the creator of the Gas Energy Mixing (GEM) System, offers the most advanced primary treatment system on the market. The GEM System provides superior reduction of total suspended solids (TSS), biological and chemical oxygen demand (BOD/COD), fats, oils and grease (FOG) and turbidity and at the same time provides complete expandability in terms of flow and the level of contaminant loadings.

CHALLENGE

A prominent citrus juice processor in Florida was paying extremely high fees, surcharges and fines to the city for their water usage and contaminant discharge levels. The existing treatment with wastewater flowing directly to an anaerobic digester was unable to meet the discharge limits or the varying flow volumes resulting in excessive chemical usage and continuous fines for discharge violations. During the processing of citrus juices, sugars in the wastewater discharge become dissolved solids resulting in high BOD and fines for pH excursions. Biodegradation is generally the preferred method of treatment to capture the dissolved solids. However, to make biodegradation a success and fit within the expected ROI and budget, they first needed to pre-treat the wastewater to neutralize the waste stream, remove FOG, TSS and as much BOD/COD as possible. Lastly, the Client had only a 12'x12' area for the primary treatment system.

TESTING AND DEMONSTRATION

After researching primary treatment technologies, the Client discovered that the GEM System offered advantages over traditional DAF designs and requested an evaluation report. Wastewater samples were forwarded to the CWT in-house laboratory to confirm the performance of the GEM System in this application. The results met all of the discharge limits. CWT engineers presented additional benefits including a reduced footprint, lower operating costs, higher output consistency, drier sludge, faster response times, adjustability within seconds to changing waste stream conditions, flow expansion capabilities without adding to the footprint and faster and less expensive installation compared to traditional DAF designs. In addition, the dissolved oxygen left on the stream will benefit the biological treatment.



SOLUTION

CWT engineers developed a process diagram, estimated operating costs and a proposed layout for addressing the pretreatment requirements. This plan proposed an Equalization or EQ tank prior to the GEM System 20/75 that would address flow volume spikes and allow for neutralization in a bypass configuration. Effluent would be pumped to the GEM System at a constant rate and then into the anaerobic digester before discharge to the city sewer. Chemical injection of polymer and flocculant came from mixing tanks directly to the Liquid Solid Gas Mixing (LSGM) heads. Polymers were injected into the water at various pressures prior to each head where the centrifugal force created in the LSMG heads uncoiled the polymer offering more surface area to the waste particles. Simultaneously, the system is pressurized as it saturates 100% of the waste stream with air. This pressure makes the chemical mixing very efficient, reducing chemical usage. When the floc enters the flotation cell at atmospheric pressure, the entrained air expands inside the floc pushing out excess water and forming a drier sludge. Clarification is very efficient since solid liquid separation

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occurs in the LSMG heads with the simultaneous growth of large porous flocs and bubbles. The effluent discharge has a high dissolved oxygen level for enhancing the biological digestion of remaining contaminants.

TABLE 1: GEM Effectiveness on Influent from Citrus Juice Processor

PARAMETER	INFLUENT	EFFLUENT	PERCENT REDUCTION
TSS	1,700 ppm	25 ppm	99%
COD	16,000 ppm	9,000 ppm	44%
TURBIDITY	1,480 NTU	11 NTU	99%
FOG	1,520 ppm	7 ppm	99%

ECONOMICS

Operations: The cost effective, easily operated GEM System provided the Client approximately 35% to 45% in chemical savings over traditional technologies according to the Client's estimates. Sludge treatment including storing and hauling was reduced by 50% from traditional technologies.

Pretreatment: Due to the highly efficient removal of contaminants by the GEM system and the high dissolved oxygen (DO) levels left in the stream, the biological treatment specified for the client was reduced to a smaller size and resulted in a savings of \$250,000 for the equipment.

Surcharges: After installing the full wastewater treatment system, the Client was able to re-use their wastewater for irrigation of their orange groves. No more surcharges or fines are being paid to the city.

Sustainability: With the GEM System, the client has the ability to adapt to future growth by increasing the flow volumes as needed without changing the footprint of the GEM System. From a specification of 10,000 gallons per day, the system can grow to process 105,000 gallons per day with no additional capital expenditure. The level of contaminants can increase as water conservation procedures are implemented and the GEM System will still maintain the same results. The performance of the GEM System will not be affected by the increased level of contaminants in the stream. In addition to the reduced footprint, other savings related to the advanced efficiencies of the GEM System include reduced chemical usage, the ability to utilize higher grade chemicals and reduced sludge costs (storage, hauling and disposal) compared to traditional DAF technologies.

EXPERIENCE

CWT's successful implementation of the wastewater treatment solution for this Client resulted not only from the innovative design of the GEM System but from CWT's experienced engineers with many proven installations in a variety of industries worldwide including bakeries, frozen foods, canneries, dairies, tanneries, rendering, laundries, cosmetics, condiments, dressings, seafood and various juices, drinks and concentrates. References for your specific application are available upon request.

Being only as good as our last project requires 100% commitment to the success of each and every project.



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