GREEN PLAINS HOLDINGS II, LLC.

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COMPANY BACKGROUND

Located two miles west of Lakota, Iowa, Green Plains has been producing ethanol since it opened in 2002. Initially under Global Ethanol, Green Plains has retained the capacity to produce approximately 50 million gallons of ethanol per year. The plant expanded in 2006, which enabled it to generate twice the initial amount of ethanol. In addition to ethanol, the facility markets dry, wet and modified distillers grains, corn oil and syrup. The facility occupies 230 acres of land and employs 55 people.

PROJECT BACKGROUND

Ethanol production requires large quantities of water throughout the process for both cooling and production. Green Plains' commitment to low-impact production has placed the company well within the industry standard for water utilization. This is accomplished largely through water reuse throughout various processes in the facility. To help reduce Green Plains' water usage further, the intern's focus was on performing a water balance. Identification of water allocation throughout the plant preceded an assessment of water conservation techniques.

INCENTIVES TO CHANGE

Green Plains pumps its own water for use on the facility's site. The water is extracted from the Silurian-Devonian and Prairie du Chien-Jordan aquifers to the water tower at the plant. The high volume of water required to run the plant puts strain on pumping systems, driving up electrical and maintenance costs. Since the water comes from a well, chemical costs associated with purifying the water also provide incentive to conserve. By decreasing water consumption, operating costs will decrease and the stress on systems will also diminish, all while preserving natural resources, reducing greenhouse gas emissions and stimulating profit.

RESULTS

Water Softener Regeneration: Two water softeners treat water for use in the boiler. They regenerate about once every day and a half and the resulting water shows no sign of hardness. Reducing the frequency of regeneration could save on salt, water, pumping cost and the chemicals that treat the water used in regeneration. It was found that the softeners could sustain regeneration less frequently and still produce boiler-quality water.

Green Sand Filter Discharge: While conducting the water balance, calculations showed a significant variance from the amount of water treated for use and the amount used in production. This water was traced to two filters in CO_2 scrubber equipment. Both filters had valve leaks that were intended to be closed except during regeneration. One leak was reduced from an average flow of 102 gallons per minute to three gallons per minute, saving 140,000 gallons of water per day. Further savings through reuse of green sand backwash is being investigated.

Cooling Water Chemical Treatment: Sulfuric acid is used in the cooling towers for pH control. Sulfuric acid is costly and can pose a health risk to workers. The intern investigated the feasibility of using carbonic acid, which is naturally generated in the CO_2 scrubbers, for pH control. While carbonic acid would appear to be an economical and safe replacement for sulfuric acid, further research is needed to determine the practicality of this application and other opportunities for using the carbonic acid.

Leak Repair: Repairing leaks in steam pipes and pump seals could reduce make-up water required to each system. Leak repair would also contribute to savings on chemical treatment costs, discharge volumes and electricity required to pump the fluid.

Reverse Osmosis (RO) Optimization: Two RO units treat filtered well-water on site. It was determined that worn membranes were preventing one unit from operating efficiently. Replacing the membranes and implementing a preventative maintenance plan would keep both RO units and associated components operating consistently at optimum efficiency. These measures could increase recovery and promote water, chemical and electrical savings.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
332.07	1.67	16.78	0.03	0.80	0.04

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WATER SOFTENER REGENERATION	$1,906	74,543 GALLONS	IMPLEMENTED
GREEN SAND FILTER DISCHARGE	$17,715	51,254,456 GALLONS	IMPLEMENTED
COOLING WATER CHEMICAL TREATMENT	--	SULFURIC ACID SAVINGS	INVESTIGATING
LEAK REPAIR	$21,809	6,786,507 GALLONS 81,784 KWH	RECOMMENDED
REVERSE OSMOSIS OPTIMIZATION	$14,537	21,159,384 GALLONS 54,510 KWH	RECOMMENDED