GREEN PLAINS SUPERIOR, LLC

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COMPANY BACKGROUND

Green Plains Superior LLC is an ethanol production facility in Superior, Iowa. The plant produces more than 50 million gallons of ethanol annually, while consuming upwards of 18 million bushels of corn. Along with ethanol, the company produces and sells dried distillers grains, wet distillers grains, and syrup, all of which are byproducts of the ethanol production process and are used as livestock rations. The company is a subsidiary of Green Plains Renewable Energy Inc. and currently employs 43 individuals in two daily shifts, who maintain the facility's constant, year-round operation.

PROJECT BACKGROUND

At Green Plains a ring dryer is utilized to dry wet distillers grains into dried distillers grains, a valuable commodity. This dryer consumes up to 30 percent of the plant's natural gas usage. An energy audit on the ring dryer would create a benchmark of natural gas usage and help identify opportunities to optimize efficiency of the drying process through equipment modifications and parameter changes.

INCENTIVES TO CHANGE

Green Plains Superior strives for continuous process improvement in the areas of efficiency, energy consumption and waste management. The company diverts all waste from the landfill, no water is expelled to the sewer, and all byproducts are reused or sold. Presently, continuous improvement and savings efforts focus on process and equipment efficiencies.

RESULTS

Vacuum Leaks: Vacuum leaks in the ring dryer were detected using an ultrasonic leak detector and recorded for maintenance follow up. Most of the detected leaks originated from the access panel seals on the ring dryer. Regular maintenance of the seals, including proper installation and regular replacement, would improve efficiency and reduce natural gas usage by 4,300 therms annually.

Air Preheat: Modification of a cooling water return pipe line through an existing heat exchanger would allow preheating of process air during cold winter months and mild fall or spring weather. This would also divert some of the heat load from the cooling towers. This modification would be effective most of the year, with the exception of warm summer months during which the air is minimally heated.

Air Heater Tuning: The air-heating burner utilized in the ring dryer will be scheduled for a combustion test report and tuning to verify the actual efficiency of the air heater and add accuracy to the energy balance model. Currently, the ambient temperature set-point is entered into the burner management system biannually. An automated temperature sensor for the system would regularly adjust the set-point based on actual ambient temperature, increasing efficiency.

Dryer Enclosure: A large difference in gas consumption of the ring dryer exists between cold winter days and hot summer days with similar production rates. Part of the dryer structure has been enclosed to avoid start up and freezing issues the company was experiencing in the winter. Enclosing the remainder of the dryer structure would further reduce the heat lost to cold winter temperatures and improve safety for maintenance workers during harsh weather conditions.

Moisture Reduction: A decrease in total moisture being dried could produce considerable savings in natural gas consumption. Adjusting the centrifuge set-points and syrup flow rates would yield lower input moisture into the dryer. A 1 ton per hour decrease equates to a 1.5 percent reduction in the moisture content of the mixed product going to the dryer. Diverting 1 ton of water per hour from being evaporated in the dryer could result in significant savings in natural gas costs.

Dryer Optimization: Optimal loading of the dryer means that as the loading of the dryer increases, the gas used per ton produced of dry product and consequently the cost to dry per ton decreases. The study of the dryer system showed a significant increase in gas efficiency as loading increased, with maximum loading being the most efficient and having the lowest MMBTU per ton value. Full loading with no split stream was shown to be the most efficient condition. It is recommended that the plant operate the ring dryer under the most efficient operating conditions to take advantage of the lowest cost per ton to dry the product.

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
2538.00	2.59	1570.00	3.93	11.90	0.20

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
VACUUM LEAKS	$7,400	4,300 THERMS	RECOMMENDED
AIR PREHEAT	$10,600	19,900 THERMS	RECOMMENDED
AIR HEATER TUNING	$29,000	54,250 THERMS	IMPLEMENTING
DRYER ENCLOSURE	$220,000	410,000THERMS	RECOMMENDED
MOISTURE REDUCTION	$77,400	144,700 THERMS	RECOMMENDED
DRYER OPTIMIZATION	$659,500	1,300,000 THERMS	RECOMMENDED