Energy Savings Opportunities for Distilled Spirit Manufacturing Plant

The **Industrial Assessment Center** (IAC) at **West Virginia University** (WVU) discovered an opportunity to decrease energy usage and enhance corporate competitiveness for "Smooth Ambler Spirits", a distilled spirits manufacturing facility located in Maxwelton, West Virginia. The assessment team focused on the manufacturing process and energy utilities feeding the processes. The recommendation at this facility may serve as a template for potential savings at similar plants.

Company Background

Smooth Ambler Spirits is a renowned distilled spirits manufacturing company located in Maxwelton, West Virginia.

Summary

As a result of the assessment, several recommendations were made for improvement of such specific areas. Opportunities for saving energy were identified with respect to recover CO_2 from Fermentation process, installation of evaporators for waste minimization of effluent, adjustment of air to fuel ratio in boilers, installation of Variable Speed Drive on the chiller compressor, recovering heat from effluent going to tanker, replace existing fluorescent and metal halogen lamps with LEDs in the plant and office areas and install occupancy sensors in designated areas, preheat combustion air for the water boiler burner, insulate hot water boiler, burner housing and hot water tank, reduce pressure set point for the compressor.

All of ten recommendations made by the team are planned to be implemented, which will result in the reduction of energy consumption by 104,878 kWh of electricity, 1,830 MMBtu of natural gas: an annual cost saving of $59,174.

Drums and Liquid Mash Process,
Smooth Ambler Spirits, Maxwelton, West Virginia

Energy Conservation Analysis

In general, the management and employees of Smooth Amblers are oriented towards energy conservation and follows many good practices to save energy. For example, the plant uses efficient lighting on some of office areas, used on demand water heater and used one VFD. The assessment team was pleased with the level of energy efficiency awareness amongst plant personnel.

The recommendations identified by the team were also discussed with the plant personnel on the assessment day. The plant personnel were encouraged to contact and interface with the WVU-IAC for further discussion and/or clarification required with respect to the implementation of the assessment recommendation.

Benefits at a Glance

The measures that are planned to be implemented will result in annual electricity savings of 104,878 kWh and 1,830 MMBtu of gas.

Average payback is 30 months. Implemented recommendations will reduce carbon dioxide emission by 436,473 pounds.

Lighting Replacements

The assessment team suggested LEDs in the place of fluorescent and metal halogen lamps. The plant personnel realized the value of occupancy sensors in the efficient use of lighting.

Upgrading lighting with LEDs in plant and office areas, and installation of occupancy sensors in designated areas has increased the efficiency of the lighting system. In effect, these suggestions have significantly reduced energy usage.

Process Equipment

The air to fuel ratio of natural gas run boiler has been adjusted to increase the efficiency and reduce fuel consumption. The controls on the compressor has been improved to minimize the electricity consumption. A software tool, AirMaster+ was used to perform the full load calculation of the compressor to determine the performance profile, energy savings and cost savings for proposed unloading controls of the compressor. The assessment team also suggested to recover the heat from effluent, insulate hot water boiler, burner housing, hot water tank and preheat the combustion air for water boiler burner to minimize the waste of natural gas used in the process. The software tools, Steam System Modeler Tool (SSMT), 3E Plus, Process Heating Assessment and Survey Tool (PHAST) were employed to calculate enthalpy, to estimate heat loss due to lack of insulation, and to calculate excess air and efficiency for current scenario respectively.

Natural Gas Savings

The facility was recommended to adjust air to fuel ratio for the boilers, recover heat from effluent going to tanker, preheat combustion air for the water boiler burner and insulate hot water boiler, burner housing and hot water tank. This would help the facility in savings of 1,830 MMBtu of gas annually.

Preventative Maintenance

Electrical motors were widely used equipment in the plant. The assessment team suggested to perform the vibration analysis on the motors as a preventive maintenance. Motor efficiency can be improved by performing regular vibration analysis, thereby minimizing the energy usage by the motor.

Assessment Savings Tabulated

The following table presents the annual cost savings that will occur at the Smooth Ambler Spirits due to different recommendations that are planned for implementation. The energy conservation opportunities that were identified during the assessment and planned to be implemented will reduce annual electrical usage by 104,878 kWh, and natural gas usage by 1,830 MMBtu per year. This makes into an annual cost savings of $59,174 and an annual reduction in CO_2 emission of 436,473 pounds.

Recommendations Planned to be Implemented

Assessment Recommendations	Annual Resource Savings		Total Annual Saving ($/yr)	Capital Costs ($)	Simple Payback (months)
	MMBtu	kWh			
Install Evaporators for Effluent Waste Minimization	-	-	24,050	90,000	45
Recover CO_2 from Fermentation Process	-	-	15,085	15,000	12
Adjust Air-Fuel Ratio for boiler	851	-	5,944	3,000	7
Install a Variable Speed Drive on the Chiller Compressor	-	70,080	4,392	6,660	19
Recover Heat from Effluent Going to Tanker	411	-	2,885	13,900	58
Replace the Existing Fluorescent and Metal Halogen Lamps with LEDs in the Plant and Office Areas and Install Occupancy Sensors in Designated Areas	-	28,926	2,355	1,691	9
Preheat Combustion Air for the Water Boiler Burner	353	-4,487	2,303	10,560	56
Insulate Hot Water Boiler, Burner Housing and Hot Water Tank	215	-	1,509	2,170	18
Improve the Controls on the Compressor	-	8,181	514	1,425	34
Reduce Pressure Set Point for the Compressor	-	2,178	137	530	47
Total	**1,830**	**104,878**	**59,174**	**144,936**	**30**