Energy Savings Opportunities for Plastic Tube Manufacturing Facility

The **Industrial Assessment Center** at **West Virginia University** (IAC-WVU) has discovered opportunities to decrease annual energy usage and annual cost for Saint-Gobain Life Sciences located at Akron, Ohio. The assessment team focused on the plastic tube manufacturing processes as well as the energy utilities feeding them. The recommendations at this facility may serve as a template for potential savings at similar facilities.

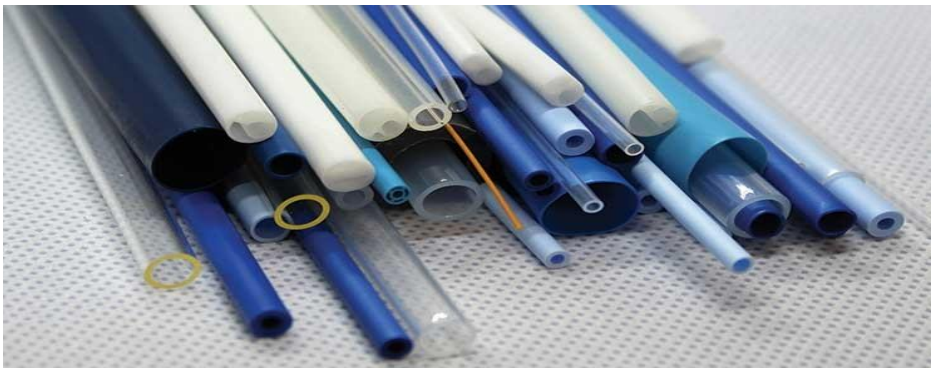
Company Background

The Saint-Gobain Life Sciences facility located at Akron, Ohio is one of the world's leading producers of engineered, high-performance polymer products, and serves virtually every major industry across the globe.

Summary

As a result of the assessment, energy efficiency recommendations were made for improvement. Opportunities for saving energy were identified with respect to efficient use of VFDs on extruders and chiller compressors, installation of economizers on air conditioning units, replacement of metal halide lamps with LEDs and installment of occupancy sensors, reduction of chiller energy consumption by increasing the set point temperature, improvement of the controls and storage on the air compressor, repair of compressed air leaks, installation of energy recovery ventilators to recover heat from exhaust air, insulation of hot surfaces on boilers mills, and extruders, replacement of V-type drive belts on motors with cog belts, establishment of repair/replace decision policy through motor management system, usage of outside air for air compressor intake, reduction of compressor pressure set point, installation of economizer for preheating the boiler feed water, analysis of vibration on equipment, and adjustment of air to fuel ratio for boiler.

Twelve of the seventeen recommendations made by the team are planned to be implemented, resulting in the reduction of energy consumption by 616,819 kWh of electricity and 519 MMBtu of Natural gas (14% and 0.9% of the annual electricity and natural gas respectively) and an annual cost saving of $39,682 (13% and 0.43% of the annual electricity and natural gas cost respectively).



Plastic Tube Manufactured Through Extrusion Process
**This picture is for representational purpose only*

Energy Conservation Analysis

In general, the management and employees at the facility are energy conservation oriented and follow many good practices to save energy. For example, the plant uses an efficient lighting system and occupancy sensors in the office areas. The assessment team was pleased with the level of energy efficiency awareness amongst plant personnel.

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

Benefits at a Glance

The planned implementation measures will result in annual electricity and natural gas savings of 616,819 kWh and 519 MMBtu respectively, resulting in an annual cost savings of $39,682.

Average Payback is 18 months. Implemented recommendations will reduce carbon dioxide emissions by 1,409,480 pounds.

Lighting Replacements

The assessment team suggested LEDs lamps in the place of metal halide lamps. The plant personnel realized the value of occupancy sensors in the efficient use of lighting. Further, upgrading lighting with LEDs outside the plant and installing occupancy sensors in the plant and office areas has increased the efficiency of the lighting system. As a result, these recommendations have significantly reduced energy usage.

Process Equipment

The air to fuel ratio of natural gas run boilers has been adjusted to increase the efficiency and reduce fuel consumption. The controls and storage on the compressor have been improved to minimize the electricity consumption. VSDs have been installed on the chiller compressors and the hot surfaces of the boilers and mills have been insulated. 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 replacing the drive belts with cog belts, installing economizers for preheating boiler feed water, reducing compressor set point, establishing repair/replace decision policy through motor management and using outside air for air compressor intake. The software tools MotorMaster+4.0, Process Heating Assessment and Survey Tool (PHAST) and 3E Plus were employed to analyze, calculate the excess air and efficiencies for current and proposed scenarios and determine how much insulation is necessary to improve process efficiency. The facility was encouraged to use this tool as a part of their continuous improvement.

Natural Gas Savings

The facility was recommended to install energy recovery ventilators to recover heat from exhaust air, economizers to preheat the boiler water and adjust the air to fuel ratio for the boilers.

Preventive Maintenance

Electrical motors are widely used equipment in plastic manufacturing facilities. The assessment team recommended vibration analysis on the motors as a preventive maintenance procedure. By performing vibration analysis regularly, the motor efficiency can be improved, thereby reducing the energy usage of the motors. The assessment team also recommended the use of a repair/replace policy for motors. By performing motor analysis regularly, the motor efficiency can be improved, thereby reducing the energy usage of the motors. This recommendation would also help the facility to determine if they had to purchase a new motor or rewind the existing ones.

Assessment Savings Tabulated

The following table presents the annual cost savings that will occur at the Saint-Gobain Life Sciences facility due to different recommendation that are planned for implementation. The energy conservation opportunities that were identified in the assessment and are planned to be implemented will reduce annual electric natural gas usage by 616,819 kWh and 519 MMBtu per year. This translates into an annual cost savings of $39,682 and an annual reduction in CO_2 emissions of 1,409,480 pounds.

Recommendations Planned to be Implemented

Assessment Recommendations	Annual Resource Savings		Total Annual Savings ($/yr)	Capital Costs ($)	Simple Payback (months)
	MMBtu	kWh			
Install Economizers on the Air Conditioning Units	-	137,520	8,186	20,034	30
Replace the Metal Halide Lamps with LEDs located Outside the Plant and Install Occupancy Sensors in the Plant and Office Area	-	113,788	7,560	7,967	13
Improve the Controls and Storage on the Air Compressor	-	86,971	6,754	7,949	15
Install Variable Speed Drives on the Chiller Compressors	-	111,342	6,079	10,000	20
Repair Compressed Air Leaks	-	56,140	3,729	1,600	6
Insulate Hot Surfaces on Boilers and Mills	-	28,421	2,311	1,566	9
Establish Repair/Replace Decision Policy Through Motor Management	-	28,165	1,750	372	3
Use Outside Air for Air Compressor Intake	-	16,680	1,108	1,828	20
Reduce Compressor Pressure Set Point	-	11,218	746	60	1
Install Economizer for Preheating the Boiler Feed Water	287	-	626	4,034	78
Perform Vibration Analysis on Equipment	-	26,574	507	700	17
Adjust the Air to Fuel Ratio for the Boiler	232	-	326	1,500	55
Total	**519**	**616,819**	**39,682**	**57,610**	**18**