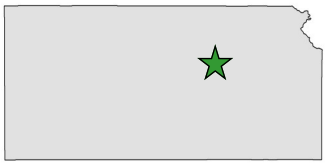
2018 Case Study

CIRCUIT RIDER

Intern: Chengyao Gao
Major: Mechanical Engineering
School: Kansas State University



Company background

The Kansas State University Pollution Prevention Institute 2018 circuit rider intern worked to help food processors, manufacturing companies, and a hospital reduce their use of energy, water and natural resources.

Project background

The intern analyzed water and electric bills for each participating facility to determine baseline consumption trends. He then conducted one- or two-day site visits at seven facilities in eastern, south central and southwestern Kansas to identify and research pollution prevention projects, and collect data. In the final analysis for each project, the circuit rider recommended source-reduction strategies, and quantified potential savings in water, energy usage and costs.

Incentives to change

According to the EPA, industry was responsible for 22 percent of all greenhouse gases emitted in 2016 in the United States, the equivalent of more than 1,432 million metric tons of CO_2. Roughly one-fourth of these greenhouse gases are indirect emissions resulting from off-site power production.

Like most industries, food processors, manufacturers and hospitals are looking for ways to reduce their environmental footprint and become more efficient. Reducing product waste, energy use and water use are some of the easiest ways to cut pollution and costs while making businesses more profitable. But many industries do not have the time and manpower to conduct these assessments. By collaborating with the Pollution Prevention Institute, seven different industries were presented with feasible methods of reducing potential fiscal and environmental costs related to energy and natural resource use.

Projects reviewed for P2 potential

Air-conditioned area cracks correction
During a site visit to a dairy farm, the intern analyzed the connections between areas with different temperature requirements. Gaps were identified between chilled and non-chilled spaces, increasing the energy required to maintain colder temperatures where needed. The intern recommended strategies such as filling small gaps and purchasing air curtains to cover doorways. These actions could reduce energy usage by 6,666 kWh annually, saving $606 in annual energy costs.

Compressed-air leak repairs
The intern conducted compressed-air audits at one manufacturing company and one flour processing company. He utilized an ultrasonic detector (UE9000) from UE Systems to identify leaks and record dB values for the leaks. Using a leak survey app, developed by the same company, he calculated annual savings obtained from repairing the leaks. In addition, the intern calculated a simple payback period for one of the companies based on its cost to repair compressed-air leaks identified during previous audits. A combined savings from fixing identified leaks totaled 298,395 kWh and $40,638 saved annually.

LED lights
One dairy company and one aerospace manufacturer were interested in replacing their T8 fluorescent lamps with LED lights to reduce energy usage and improve the quality of light in certain work areas. The intern conducted lighting

surveys while on site and documented the number of each type of fixture, its energy requirements, illuminance at ground level and on work surfaces, and the distance between each fixture and the ground or work surface. While one of these projects was not recommended based on savings alone, it may still be a desired change because of increased illuminance that will contribute to a safer, more productive work environment. Combined savings from the LED lights projects totaled 94,123 kWh and $8,697 annually.

Occupancy-sensing light switches

The same dairy company asked the intern to evaluate the feasibility of installing occupancy sensors for five different areas in its plant. The intern mounted HOBO data loggers above the door frames to monitor lighting and occupancy in each area over a 24-hour period, and analyzed the data using software developed by HOBO. Based on research of available occupancy sensors suitable for size and conditions of the areas considered, the intern created a lighting plan using a combination of passive infrared and dual-technology sensors, along with in-wall and ceiling switches. To show the sensors would adequately cover the areas in question, the intern developed scaled diagrams of the spaces identifying appropriate locations for each sensor and highlighting the overall coverage given the proposed layout. Installing occupancy sensors as recommended could save 23,925 kWh every year, reducing the facility's annual energy costs by $2,011.

Steam traps

The intern worked with two facilities to evaluate energy loss related to malfunctioning steam traps. At one of the facilities, a hospital, the project was initially identified and implemented by a 2009 intern. In early 2018, the hospital decided to upgrade all steam traps and the intern calculated the project saved $575,900 and 137,000 MMBtus with a payback period of approximately 6 months. At a food ingredients manufacturer the intern utilized an ultrasonic detector (UE9000) from UE Systems to identify the malfunctioning steam traps, however there was not sufficient information available to calculate steam loss, so additional energy usage and costs could not be calculated. Therefore the data presented below represents the findings for the hospital only.

Solar panels

The intern also observed that one of the dairy facilities participating might benefit from the addition of solar panels to its barn. The barn is cooled with electric fans during the warmer months, and that energy could be provided by solar panels, potentially reducing the facility's energy costs and emissions resulting from energy generated by traditional power plants. However, the intern determined the savings would not sufficiently offset the cost of installing solar panels, so the project was not recommended at this time.

Summary of 2018 P2 circuit rider intern recommendations

Project description	Annual estimated environmental impact	Annual estimated cost savings	Status
Air-conditioned area cracks correction	6,666 kWh	$606	Recommended
Compressed-air leak repairs	298,395 kWh	$40,638	Recommended
LED lights	94,123 kWh	$8,697	Recommended
Occupancy-sensing light switches	23,925 kWh	$2,011	Recommended
Steam traps	137,000 MMBtu	$575,886	Recommended
Solar panels	2,880 kWh	$262	Not recommended
Total savings	425,989 kWh 137,000 MMBtu	$628,100	
GHG reductions	7,963 metric tons CO_2e		

[1]Does not include projects "not recommended" or with "more research needed"
[2]EPA P2 GHG Calculator with Cost, May 2014