

2021 Case Study

CIRCUIT RIDER

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Company Background

A Kansas State University Pollution Prevention Institute, or PPI, 2021 circuit rider intern assisted a food processor, an aerospace company, greeting card companies and other metal manufacturing companies to reduce their use of energy, water and hazardous chemicals.

Project Background

Each company was contacted to schedule a site visit and a pre-assessment was performed to determine the project needs. On-site visits were conducted to identify and research pollution prevention, or P2, opportunities. A P2 report was provided to each company following necessary research after the visit. The reports contained P2 recommendations along with environmental, social and economic impacts.

Incentives to Change

Implementing P2 projects benefits the environment, the community and employee health. Reducing chemical waste, energy and water consumption are common methods to reduce environmental impact and save money.

Many of the companies the circuit rider worked with did not have time nor dedicated staff to assess P2 projects. By partnering with the PPI, businesses can reduce potential fiscal and environmental costs related to their current processes and practices.

Projects Reviewed for P2 Potential

Compressed-Air Audit

The intern conducted compressed-air audits at six of the eight facilities. An ultrasonic detector from UE Systems was used to identify leaks, and a leak survey app, developed by the same company, to calculate annual savings obtained from repairing the leaks. In addition, the intern recommended to one company to purchase their own UE Systems detector. Combined savings from fixing identified leaks totaled 1,386,749 kWh, and \$56,405 annually.

Water Reduction

One food manufacturing facility had three projects for water reduction. The first two projects listed were recommended by a previous intern. The first project was to add a timer to the urinal trough in the men's bathroom to stop the constant flow of water. This

saves 2,469,085 gallons of water and \$5,502 annually.

The second project was a change to a packaging system. The original system utilized a constant flow of water while the updated system uses a closed-looped system. Five of the 11 packaging systems have been updated, with the sixth system purchased and ready to be installed. This will save the facility 1,118,813 gallons of water and \$2,493 per year. An additional 1,342,576 gallons and \$2,992 could be saved annually if the remaining six systems were updated. The remaining return on investment is 5.17 years. This project is recommended as the facility is motivated to reach their sustainability goals even with the larger return on investment period.

The final project at the facility was to fix nozzles to cleaning hoses to restrict their removal. A reduction from a 0.75 in. nozzle to a 0.375 in. nozzle will save the facility 24,147,924 gallons of water and \$53,815 annually.

Another type of facility did not have proper training done for their operators on their water treatment system. This led to confusion about flow rates and preventative maintenance. The system could reach a recycle rate of 50 percent, but the facility was only at a rate of 10 percent. Properly training their operators would result in 463,200 gallons of water saved and cost savings of \$32,424 annually. The return on investment is 0.17 years.

Natural Gas Reduction

A food manufacturer uses a large volume of heated water for cleaning. A reduction in heated water necessary for cleaning reduces both the water quantity needed and the natural gas used for heating. One facility wanted to reduce their cleaning nozzles from a 0.75 in. to a 0.375 in. With the annual reduction of 24,147,924 gallons of heated water, 8,058,917,835 BTU of natural gas would be reduced as well, saving the facility \$42,282.

Paint Gun Efficiency

The intern evaluated methods to reduce a metal manufacturing facility's paint usage. A previous intern had noted there was adequate training and storage of the paint, verified by the painting gun's manufacturing company. The current intern noted that the facility was using standard paint guns instead of high-

volume, low-pressure paint guns which would increase paint application efficiency by 15%. This would save 2,157 gallons of paint, reduced Xylene emissions by 5,215 lbs., and \$43,404 annually. The return on investment is 0.03 to 0.093 years depending on the gun purchased by the facility.

LED Conversion

The intern conducted lighting surveys at three of the eight facilities and reevaluated a partial implementation of a LED conversion project from a previous intern’s work at another facility. The benefits of LED over fluorescent are that LEDs do not contain mercury or other hazardous substances, have a longer lifespan, and provide more lumens. By installing LED plug-and-play bulbs as well as installing LED panels, the combined annual savings are 758,895 kWh and \$38,089.

Solvent Reclamation

The current intern reexamined a previous intern’s solvent reclamation project at a manufacturing facility. The unit originally recommended was not purchased by the company but has been rerecommended by the

current intern as solvent usage has increased. The unit could recycle up to 90% of the n-butyl acetate solvent a year, reducing hazardous waste disposal costs and virgin chemical purchases, saving the company \$11,062 annually. The return on investment is 0.75 years.

Hazardous Waste

An aerospace facility’s in-house water treatment system utilized a filter press, and the filter cakes are then disposed of as hazardous waste. There is an optimal moisture content for filter cakes for ease of removal, but the differences in filter cake moisture content vary throughout the year due to changes in chemical composition and reduced water pressure from malfunctioning pumps. It was determined that, respectively, improving communication to operators about chemical changes and preventative maintenance on the pumps, to maximize the water pumps’ intended pressure, would lead to the ideal moisture content. This would reduce the volume of hazardous waste by 30,782 gallons annually and save \$7,511 on annual hazardous waste disposal costs.

Summary of 2021 P2 intern recommendations

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
Compressed Air Audit	1,410.038 MTCO _{2e} , 1,386,749 kWh	\$56,405	Recommended
Urinal Trough	15.95 MTCO _{2e} , 2,469,085 gallons	\$5,502	Implemented
Closed-Loop Packaging System	10.12 MTCO _{2e} , 2,461,390 gallons	\$5,485	In Progress
Nozzle Size Reduction	428.58 MTCO _{2e} , 24,147,924 gallons, 8,059 MMBTU natural gas	\$96,096	Recommended
Water System Training	2.99 MTCO _{2e} , 463,200 gallons	\$32,424	Recommended
Paint Gun Efficiency	19.44 MTCO _{2e} , 2,157 gallons of paint 5,215 lbs. of VOC 5,215 lbs. of HAP (Xylene)	\$43,404	Recommended
LED Conversion	798.80 MTCO _{2e} , 758,895 kWh	\$38,089	Recommended
Solvent Reclamation	3.000 MTCO _{2e} , 495 gallons n-butyl acetate, a VOC	\$11,062	Recommended
Hazardous Waste Disposal	30,782 gallons	\$7,511	Recommended
Total ¹	1,386,749 kWh, 28,422,786 gallons of water, 5,215 lbs. of Xylene, 8,059 MMBTU natural gas, 495 gallons n- butyl acetate	\$293,486	
GHG reductions ^{1,2}	2,6899 metric tons CO _{2e}		

¹Does not include projects “not recommended” or where “more research needed.”

²EPA P2 GHG Calculator with Cost, 7 April 2016 & EPA WARM Tool- Version 14, Mar. 13, 2018