

2019 Case Study

CIRCUIT RIDER

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Company Background

The Kansas State University Pollution Prevention Institute 2019 circuit rider intern worked to help five manufacturing companies and two city departments reduce their use of energy, natural resources and chemicals.

Project Background

Each company was contacted and a pre-assessment performed to determine the project needs. On-site visits were scheduled and conducted to identify and research pollution prevention projects. Each visit resulted in a final report with proposed P2 recommendations along with the potential environmental, economic and social impact of the recommended changes.

Incentives to Change

According to the EPA, between 1970 and 2018, combined emissions of six key pollutants dropped by 74 percent while the U.S. economy grew 275 percent. Although this demonstrates efficiency improvements in industry through emission control and operational change, significant areas for improvement remain as well as the need to continue optimizing use of our planet's natural resources. Reducing all sources of waste not only benefits the environment, but also results in more profitable businesses and healthier communities.

Many industries do not have the time or resources to evaluate pollution reduction, although the improvement could result in significant positive impact to company operations and economics. By raising awareness and presenting innovative and feasible alternatives, the Pollution Prevention Institute assists small business to reduce potential fiscal and environmental costs related to their current processes and practices.

Projects Reviewed for P2 potential Energy/Natural Resource Reduction

Compressed air-leak audits

The intern conducted compressed-air audits at four of the six facilities and identified one implemented air-leak project from a previous intern. She utilized an ultrasonic detector from UE Systems 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 companies implement their own leak-detection programs. Combined savings from fixing identified leaks totaled 589,992 kWh, and \$79,707 annually.

Light audits

Two facilities were evaluated for LED replacements of current fluorescent tubes. LEDs last about 66% longer, contain no mercury or other hazardous substances, are the most energy-efficient alternative and use more directional lighting – resulting in more surface illuminance with the same amount of lumens. Using mostly retro-fit LED tubes, the two projects netted estimated paybacks of three years or less and a total of 117,774 kWh saved annually.

Solar energy

Taking advantage of solar energy can generate large savings. Solar pool heating is the most cost-effective use of solar energy in many climates. The system includes a solar collector, a device through which pool water is circulated to be heated by the sun, and can provide four to 10 months of warm water temperatures in sunny states such as Kansas. Solar power can also be used to generate energy and it was recommended as future work for most companies to evaluate the implementation of solar panels as the price of solar implementation decreases in the coming year.

Heat recovery

An improvement opportunity for boilers is recovering energy from boiler blowdown. The thermal energy lost when blowdown is discharged from the boiler can be recovered using two methodologies: flash steam recovery and makeup water preheating. One of the city departments could have seen estimated savings from this opportunity of 0.3–2.0% of their annual steam system fuel.

Water reduction

Evaporation is a source of resource and energy waste from pools, not only water lost, but in the natural gas used to heat the water. A pool cover can reduce evaporation by 90% and also reduce boiler usage. Savings from covering an Olympic-sized pool eight hours a day can reach 83,000 gallons/year and 11,776,000 Btu.

Hazardous Material Reduction

Material exchange/optimization for TSCA VOC and/or HAP reductions

All of the companies the intern assisted had chemicals that were evaluated to identify opportunities for hazardous material reduction. Solvents, paints and landscaping treatment products were analyzed and alternatives found

to replace them. Solvents with xylene, toluene and MEK were recommended to be replaced with an exempt-VOC solvent – acetone – and, for its optimization, recovery units to recycle the solvent and reduce the amount of hazardous waste and purchasing costs. Replacement of MDI and toluene-based paints with less-hazardous alternatives had potential to reduce 18.3 tons per year of hazardous air pollutants (HAPs).

Reducing the waste generated from 1,750,000 cotton-tips that a facility uses annually to clean parts was also evaluated. Reducing handle size and changing the process by adhering to plunger cans can reduce waste generated by evaporation and excess absorption of solvent from each cotton-tip left in open solvent containers during the work shift. Not only economically beneficial, reducing air emissions exposes employees to fewer chemicals and improves safety and quality of life at work, in addition to reducing and meeting regulatory requirements. At the city pool, a disinfecting alternative using hydroxyl-based oxidation processes could potentially reduce the amount of chlorine needed to maintain the water's health standards by up to 5,280 lbs. per year.

Summary of 2019 P2 intern recommendations

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
Air-leak audits	589,992 kWh	\$79,707	Recommended/ Implemented
Solvent and paint replacements and reductions	15.2 tons VOCs, 19.1 tons HAPs, 6.5 tons other waste, 1400 gallons water	\$77,378	Recommended/ Implemented
Additional material replacement and reduction	2.9 tons HAPs, 2.3 tons VOCs, 3.8 tons waste	\$11,035	Needs Further Research
Cotton-tips waste reduction	1,439.47 lbs. of solid waste	\$4,690	Recommended
LEDs Replacements	117,774 kWh	\$13,759	Recommended
Solar Heater	16,065,637 ft ³ natural gas	\$69,242	Recommended
Total¹	707,766 kWh, 15.2 tons VOCs, 19.1 tons HAPs, 7.2 tons other waste, 1,400 gallons water, 16,065,637 ft³ natural gas	\$244,778	
GHG reductions^{1,2}	1,578 metric tons CO₂e		

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

²EPA P2 GHG Calculator with Cost, Apr. 7, 2016