

Intern: Joey Malecki
Major: Chemical Engineering
School: Kansas State University



Company background

Koch and Co. is an American wooden cabinet and door manufacturer based in Seneca, Kansas (SIC 2434, and NAICS 337110). It employs more than 700 people in 12 plants located in three different states. It was started in 1989 by three brothers with a mission to “create world-class doors and cabinets with the focus on providing a quality product, that was made in the U.S.A., at an affordable price.” Four of the company's plants are located in Seneca and produce a wide variety of cabinet and door SKUs through various manufacturing processes. There are many elements of vertical integration, as Koch and Co. controls the manufacturing process from lumber to shipping and distribution.



Project background

Three main directives were given to the intern at the start of the internship. The first was to locate and quantify air leaks within the plants. The second was to reduce the solvent waste associated with cleaning paint machinery. The final task was to reduce the solid waste produced from wiping down certain stains, reduce the hazardous air pollutants, or HAPs, found in the paints used, and reduce paint waste.

Incentives to change

Part of the company's manufacturing process involves staining and painting wood. This requires the use of many solvents, volatile organic compounds, or VOCs, and HAPs, which results in solid/hazardous wastes that need to be disposed of properly. Currently, there is concern surrounding VOC emissions, which are at 220 tons/year for the main plant. The yearly limit is 245 tons, and Koch and Co. would like to not be as close to this limit as they currently are. There is also concern that the amount of paints and solvents used are much higher than expected, meaning there is more waste than anticipated. Many of the solutions to these problems will reduce costs, such as reducing the amount of new materials purchased.

PROJECTS REVIEWED FOR P2 POTENTIAL

Air leak repair

All four plants used compressed air throughout the plant, supplied through a network of pipes and hoses. Some older machines and parts have developed leaks through bad connections or cracked hoses. A simple leak can cost the company more than \$1,000 depending on energy costs, and many can be fixed simply by tightening the connection or using a sealant. This exercise was considered a quick, cheap fix that could save money and electricity.

Project status: Recommended

- Net annual savings – \$78,359
- Capital cost ~ \$2,700
- Payback period – less than one month
- Environmental impacts
 - 1,375 MTCO₂e saved based on reduced electricity waste
 - 1,305,991 kWh reduced energy
- Other expected benefits
- Reduced noise pollution
- Reduced strain on air compressor

PROJECTS REVIEWED FOR P2 POTENTIAL, CONTINUED

Solvent distillation

Koch and Co. was considering the implementation of a solvent recycler before the internship began, and tasked the intern with ensuring all necessary research was carried out before a final decision was made. The VOC emissions were approaching a limited amount according to the company's permit, and the installation of a distiller was being proposed as a solution that could address the VOC emissions while saving the company money by recycling used solvents. The intern's main objectives were to research the amount of VOCs that could be saved, the potential payback period, how would it be implemented and the strength of the recovered solvent.

Project Status: In Progress

- Net annual savings – \$200,969
- Capital cost – \$27,949
- Payback period – about three months
- Annual environmental impacts
 - 60 MTCO₂e
 - 20 tons of HAP
 - 53 tons of VOC
- Other expected benefits
- Gives company more tolerance with annual VOC limits

Solid waste reduction

The intern was tasked with reducing universal waste in the paint area. This waste includes paper spray bed rolls, stain rags and paint filters. All of this waste is sent to the Shawnee County landfill, as it is a lined landfill, which EPA requires for waste that has been contaminated with paint, stains or solvents.

Project status: Needs further research

- Net annual savings – \$11,805
- Capital cost – \$6,800
- Payback period – seven months
- Environmental impacts
 - Approx. 27 tons of universal solid waste reduced
 - 41 MTCO₂e reduced

SUMMARY OF 2022 P2 INTERN RECOMMENDATIONS

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
Air leak repair	1,305,991 kWh 1,375 MTCO ₂ e	\$78,359	Recommended
Solvent distillation	60 MTCO ₂ e 20 tons of HAP 53 tons of VOC	\$200,969	In progress*
Solvent and solid waste reduction	27 tons of universal solid waste 41 MTCO ₂ e	\$11,805	More research is needed
Total ^{1,2}	1,435 MTCO ₂ e	\$272,957	

*Distiller has been ordered but not yet arrived

¹Does not include projects where "more research is needed."

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