

Intern: Max Cordry
Major: Chemical Engineering
School: The University of Kansas



Company background

3P Processing LLC is one of five processing houses within Wichita, Kansas, that services aerospace parts. 3P does not manufacture these parts, but is responsible for strengthening, treating and painting the parts. Formerly known as Nex-Tech Processing, it currently serves 18 original equipment manufacturers across 36 states, including military programs for the United States, and employs 170 people at its facility. Though the numbers have since decreased due to the pandemic, 3P filled 63,857 orders and processed 1,936,768 parts (21,639 with unique part numbers) in 2019.



Project background

3P Processing reached out to the K-State Pollution Prevention Institute, or PPI, in 2023 in hopes of reducing paint, solvent and water waste. The intern was instructed to apply Pollution Prevention, or P2, techniques to minimize or eliminate these waste streams. The intern investigated new painter training and covering the process tanks used to treat aircraft parts prior to being painted. The intern also conducted a compressed air audit and investigated the potential replacement of fluorescent bulbs with LEDs.

Incentives to change

While 3P does not explicitly state its environmental commitments, the company is cognizant of several sources of waste throughout the facility. One of 3P's concerns has been paint waste from paint errors, the main cause of part rejection. Profit margins in this part of aerospace are slim, so rework is costly. Many of the paints contain carcinogenic forms of chromium, hazardous air pollutants (HAPs) and volatile organic compounds (VOCs), and any paint waste must be disposed of as hazardous waste. Applying P2 would relieve some stress from the environment while reducing rework cost.

PROJECTS REVIEWED FOR P2 POTENTIAL

Paint transfer

The intern investigated the potential of improving painter training at 3P. New painters currently receive all their instruction from on-the-job training led by an experienced painter. However, experienced painters' varying techniques confused new painters, possibly a factor in the spike in painter turnover. The intern researched a training course from the Iowa Waste Reduction Center, or IWRC, to standardize the training. The IWRC predicted that paint transfer efficiency can increase by at least 12% with proper training, allowing for the potential elimination of 43,693 lbs of paint waste/year, 774 lbs HAPs/year, and 1,522 lbs VOCs/year. This could also save 3P \$64,724/year and prevent the rejection of 1,817 parts/year. In addition, if the improved painter training decreases turnover by as little as 1%, 3P can save an additional \$4,298/year for a total of \$69,022/year. It was estimated that implementation of the new painter training would cost \$14,783, a payback period of 2.6 months.

Process tank covers

3P uses various chemical bath processes to strengthen and protect parts while also preparing them for painting, but none of the process tanks are covered. Most tanks are heated by steam from a boiler that uses natural gas, and vapors were seen evaporating from the tanks. It was determined that 387,217 gallons of water/year were lost due to evaporation, translating to 29,717 therms/year of natural gas and 1,297 kWh/year of electricity wasted. Combined, the water and energy losses were predicted to cost \$19,171/year. Installation of tank covers could turn these losses into potential savings and eliminate 162 MTCO₂e/year. The intern reached out to KCH Surface Finishing for a quote to approximate the cost of installing tank covers. However, the quote could not be obtained before the end of the internship, and there were elements the intern was unable to analyze.

PROJECTS REVIEWED FOR P2 POTENTIAL, CONTINUED

Lighting (LED retrofit)

3P had been replacing its fluorescent bulbs with the more energy-efficient LEDs as the former burned out, but the intern investigated the feasibility of a complete retrofit. The intern estimated that a complete conversion would save \$7,672 and prevent 206 MTCO₂e annually. The cost was estimated to be \$18,104, a payback period of about 2.4 years.

Compressed air audit

The intern noted that 3P uses compressed air at several locations throughout the facility. The intern found and identified 26 compressed air leaks at the facility and estimated that repairing the leaks would save \$18,693 and prevent 151 MTCO₂e annually. The project had a payback period of just over 20 days.

SUMMARY OF 2023 P2 INTERN RECOMMENDATIONS

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
Paint transfer	774 lbs HAPs 1,522 lbs VOCs 43,693 lbs paint	\$69,022	In progress (20% implemented)
Process tank covers	162 MTCO ₂ e 387,217 gal water 29,717 therms natural gas 1,297 kWh electricity	\$19,717	More research needed
Lighting (LED retrofit)	206 MTCO ₂ e 143,283 kWh electricity	\$7,672	In progress (20% implemented)
Compressed air audit	151 MTCO ₂ e 155,773 kWh electricity	\$18,693	Implemented
Total¹	774 lbs HAPs 1,522 lbs VOCs 43,693 lbs paint 299,056 kWh	\$95,387	
GHG reductions^{1,2}	357 metric tons CO₂e		

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