

Intern: Coen Osborn
Major: Chemical Engineering
School: Kansas State University



Company background

Vektek manufactures hydraulic clamps and valves. There are two sites, one in Emporia, Kansas, and the other in St. Joseph, Missouri. The Emporia plant manufactures mainly hydraulic parts, but does make pneumatic products also. Vektek's hydraulic clamps are used for a variety of purposes. There are two product lines, one is meant to operate on a 5,000 psi pump and the other for operating on a 1,000 psi pump, though both products are capable of applying the same force. This allows Vektek to sell parts internationally and parts that function in space. Due to the vast purpose and product line, Vektek's products are used by most companies to make their products.



Project background

The intern was charged with identifying and reducing waste streams, including hazardous waste, wastewater, air emissions and heat loss. The disposal streams focused on were coolant lost directly and indirectly in computer numerical control, or CNC machines, the hard chrome plating baths, the black hard coat and black oxide plating baths.

Incentives to change

Vektek currently has 39 CNC machines that heavily use a coolant that contains VOCs. These are a danger to the environment and employee health, so using less would be beneficial. All three metal surface processes contain some form of hazardous compound. Reducing their use and time spent around these chemicals would promote employee health. An additional incentive would be to reduce hazardous compounds usage, leading to less of these compounds being needed and more money saved.

PROJECTS REVIEWED FOR P2 POTENTIAL

LED lighting

There are 194 fluorescent lamps in the main warehouse (776 tubes). Currently, lights are being used until every tube in a lamp goes out. The entire lamp is then replaced with an LED lamp and tubes. A cost analysis for immediate replacement of all fluorescent lamps was performed. A total of \$4,787 will be saved annually, along with 119,301 kWh and 125.58 MTCO₂e.

Coolant use reduction

All lathes and mills use the same coolant when cutting metal. Vektek wants to extend the life of its coolant to cut down on usage and disposal. Capturing the coolant that is lost because it clings to steel was one method of recovery. Another was to filter and reuse coolant. The plan is to install a mesh that catches steel scraps but allows coolant to flow into an oil capture bin. This will then be poured back into the machine for continued use. The used oil will be vacuumed out and filtered with a 1 micron filter to remove any steel suspended in the liquid. If Vektek can achieve a one time reuse from the coolant the annual savings will be \$31,779 with 1,040.54 lbs of VOCs being reduced.

Air leaks

An air audit throughout the warehouse floor was performed. Each of the 39 machines have an air hose junction that was examined. Around half of the junctions were leaking. The common cause was poor upkeep of the connection joints. A plan was formed to clean and put thread seal on each of the junctions that are dirty and lacking tape. If this is done properly, Vektek will save \$1,250 a year and 31,166 kWh of electricity.

Effluent-free wastewater system

Black hard coat and black oxide metal plating are similar but separate processes involving dipping parts in hazardous substances and rinsing with water. The intern identified an effluent free system as a way to reduce the usage of hazardous substances in these processes. This process also reduces the amount of hazardous compounds used in the black hard coat process. In the existing black hard coat process, parts must be run through the process twice, but this new process requires only one dip instead of two. This reduces their use of

PROJECTS REVIEWED FOR P2 POTENTIAL, CONTINUED

Cr-8, a strong oxidizing agent, by half, as well as their use of fresh water. This will save 797 lbs of hazardous waste and 138,736 gallons and would result in \$942 saved in wastewater and \$4,726 saved in Cr-8 cost, for a total of \$5,668 annually.

Chrome bath life extension

The hard chrome plating process has one tank that has levels of steel and iron rising. A growing concern at Vektek is contamination in the tank. So Vektek reached

out to Surface Technology Environmental Research Center, or STERC, to look for chromic acid recovery. Instead STERC stated that the contamination levels are around half the maximum instead of almost at the maximum. This will allow Vektek to use the tank for another nine years, which is a four-year improvement. This reduces 300.72 lbs of hexavalent chromium and 2.71 lbs of PFAS a year.

SUMMARY OF 2022 P2 INTERN RECOMMENDATIONS

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
LED lighting	119,301 kWh 125.58 MTCO ₂ e	\$4,787	In progress
Coolant use reduction	1,040.54 lbs VOCs	\$31,779	Recommended
Air leaks	31,166 kWh 32.81 MTCO ₂ e	\$1,250	Recommended
Chemical reduction for surface treating processes	27,806.47 lbs Cr (6) BHC: 1,376 gallons BO: 618 gallons	\$0	Not recommended
Effluent-Free Wastewater System	138,736 gallons of water 797 lbs hazardous waste	\$5668	Recommended
Chrome bath life extension	300.72 lbs Cr (6) per year 2.71 lbs PFAS per year	\$0	Implemented
Total^{1,2}	158.39 MTCO₂e 138,736 gal of water 1,100.43 lbs hazardous waste	\$43,484	

¹Does not include projects "not recommended" or where "more research needed"

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

MTCO₂e calculated from USEPA April 2016 P2 GHG Calculator with Cost