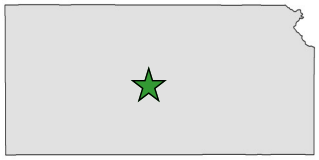
2017 Case Study

Compass Minerals

Intern: Sam Reesor
Major: Chemical engineering
School: Kansas State University



Company background

Compass Minerals (CMP on NYSE), headquartered in Overland Park, Kansas, is a global producer of salt (sodium chloride), plant nutrients, and magnesium chloride. With facilities in the U.K., Canada, and the U.S., as well as its recent acquisition of Produquimica in South America, Compass Minerals closed out 2016 with nearly $2.5 billion in total assets.

The Lyons evaporation plant utilizes mechanical evaporation to separate salt from highly concentrated brine. The Lyons facility employs nearly 130 people and operates 24 hours per day, 365 days per year, to produce food-grade salt, compacted salt for water conditioning products, and salt or mineral products for livestock.

Project background

Water is a key ingredient in the mechanical evaporation process used to produce salt at the Lyons facility. Most of the process water used is part of a recycle loop that goes to and from a brinefield, and this water use is controlled by fluctuations in production. Due to time constraints and amount of water used, the intern's project focused on understanding the water balance of the facility as a whole, and specifically targeted uses of "fresh" water in the plant. All fresh water entering the plant comes from one of three sources: two groundwater wells located west of the plant, one groundwater well located south of the plant, or the city of Lyons. The main uses of groundwater are for cooling of equipment and for wet scrubbers that are part of the dust collection system. The plant uses potable city of Lyons water throughout the facility for domestic use and as a substitute for groundwater as needed.

For these water sources, the intern analyzed the current state of the water distribution system, identified gaps in existing documents and diagrams, and used data collected to find opportunities to reduce water use.

Incentives to change

The EPA identified food processing and manufacturing as a national emphasis area (NEA) for 2017-2018, targeting water and energy reduction. Compass Minerals chose to have a Pollution Prevention Institute (PPI) intern assess water use at the Lyons plant in an effort to support that emphasis. Reports generated by the PPI intern will be a useful reference and training tool for current employees and new hires. Since Compass Minerals receives the majority of its fresh water from pumping wells, reducing water use will directly lead to a reduction in electricity use.

Projects reviewed for P2 potential

<u>Drinking fountains</u>
The drinking fountains located in the plant run continuously and are not refrigerated. Currently, there is no nozzle on the water fountains, and the water discharges vertically out of a 5/8-inch-diameter pipe. Using a 1000-mL graduated cylinder and a stopwatch, the intern determined flow rate through the mill water fountain to be three gallons per minute (gpm). This flow rate equates to nearly 1.6 million gallons of water and $4,700 annually. The intern recommended installing or retrofitting a universal nozzle to restrict the existing water flow. Assuming the new nozzle could match the 0.5-gpm flow rate of similar fountains in the plant, implementation could lead to annual savings of 1.3 million gallons of water and $3,900.

The project was reevaluated by the 2019 P2 intern and measured a combined flow rate of 3.5 GPM for a yearly water use of more than 1.84 million The intern identified two locations for traditional hi-low water fountains that will reduce water usage by 1.7 million gallons per year and reduce 4.1 MTCO2e. The project was implemented in 2020 for a one-time cost of $4,711, an annual savings of $4,600 per year in water cost, and ROI 1.02 years.

Vacuum cooling water recycle

The second project involved reusing compressor cooling water in the power and process building or "the vacuum." In the current system, the compressor cooling water passes through heat exchangers at a rate of 54.3 gpm and discharges immediately. The intern determined the discharge stream is clean and cool enough for use in the control room heat pump and the vacuum's wet scrubber. Current flowrates to the heat pump and wet scrubber are 38.2 and 8.7 gpm, respectively. Upon implementation of this project, Compass Minerals could potentially save 25 million gallons of water and $2,200 annually. The combined 46.9 gpm saved by cycling the cooling water from the compressor to the heat pump and wet scrubber would account for 15 percent of all water used from the west wells.

Mineral scrubber water source

The third recommended project was to use process condensate as feed water for the mineral scrubber located in the mill. Under the current system, the south well supplies the mineral scrubber with water at a rate of 38.5 gpm and has a target output of 180 gpm but is currently pumped at approximately 250 gpm. Switching the mineral scrubber to process condensate would allow Compass Minerals to reduce pumping of the south well to 211.5-gpm, a rate still 31.5 gpm higher than the target flow rate. The warm process condensate water could reduce mineral buildup in the scrubber and increase the current four- to six-week maintenance interval needed to remove the buildup. Further research is recommended to test this theory, but the intern still recommends implementing this project based on water savings potential. Implementation would lead to annual savings of 20 million gallons of water and $1,600. This 38.5-gpm reduction would lead to a 15 percent reduction in south well water use.

Summary - Updated 2021

In total, the remaining recommended projects have the potential to save Compass Minerals 45 million gallons of water, $3,800, and 141 metric tons of CO_2 equivalent per year.

Summary of 2017 P2 intern recommendations for Compass Minerals

Project description	Annual estimated environmental impact	Annual estimated cost savings	Status
Drinking fountains	See 2019 case study	See 2019 case study	Implemented
Cooling water recycle	24.651 million gallons	$2,200	Recommended
Mineral scrubber water source	20.236 million gallons	$1,600	Recommended
Total savings	**44.887 million gallons**	**$3,800**	
GHG reductions[1]	**141 metric tons CO_2e**		

[1] EPA P2 GHG Calculator with Cost, May 2014