



**AKSHAY KULKARNI**  
CHEMICAL ENGINEERING  
IOWA STATE UNIVERSITY

**COMPANY PROFILE**

Hach is one of the world's leading companies in providing water testing equipment and innovative water testing methods. Hach was founded in Ames, Iowa, in 1947 and is now a global provider of water analysis and testing products. The headquarters is currently based in Loveland, Colorado. The Ames branch concentrates on manufacturing and shipping more than 100 reagents and powdered chemicals used for testing water. The Ames plant employs about 450 people and operates three shifts daily to ensure that the demands of the customers are met.

**PROJECT BACKGROUND**

Having limited existing data on water consumption, Hach tasked the P2 intern with conducting a facility-wide water balance and identifying opportunities to reduce process water usage and improve the quality of wastewater discharges. Once water use trends were determined, the intern focused on identifying water use reduction opportunities in the plant. The intern also analyzed the impacts on hazardous waste sources as a result of water reduction recommendations.

**INCENTIVES TO CHANGE**

As an ISO 14001 certified company, Hach is committed to understanding water use throughout the facility and implementing water conservation practices where possible. In addition to the environmental benefits of tracking and reducing water use, there are significant economic benefits associated with reduced city water purchasing and post-use treatment costs.

Hazardous waste reduction is a key objective of the Environmental Management System at Hach. In addition to improved environmental impacts of reducing hazardous waste, reduced disposal costs can add a significant cost savings for the company.

**RESULTS**

**Flowmeter Installation:** Installing flowmeters with a totalizer feature at strategic locations throughout the facility would provide cumulative water consumption data for tracking water use. A spreadsheet with visual analysis tools was developed for tracking the data from the flowmeters. It is expected that tracking and understanding water use in the facility will result in improved conservation practices with estimated annual savings of 650,000 gallons of water and \$4,800.

**High Pressure Water Gun:** Equipment cleaning is a critical component to maintaining the company's high quality standards. However, there is great potential to reduce water use by altering the water hoses used to clean the equipment. Application of high pressure and low flowrate spray nozzles is recommended to replace the conventional water hoses currently used for cleaning. The spray nozzle not only reduces the water usage in the cleaning process eightfold, but also allows for more time-efficient cleaning. Using these nozzles would result in annual savings of 866,764 gallons of water and \$2,202 in associated costs.

**Solenoid Valve:** Observations and results from the water balance indicated areas within the plant where water usage reduction opportunities exist. The flow through the city water line that supplies water to reactors for cooling is controlled by a manual valve. The valve is often left open when cooling water is not required. It is recommended that an automatic programmable



solenoid valve is installed that would result in annual savings of 900,000 gallons of water and \$2,290.

**Cooling Loop Installation:** Installing a closed-loop, glycol cooling system could significantly reduce current water usage for cooling reactors. Furthermore, operators would have more control over the temperature of the coolant and be able to consistently maintain cooling temperatures. Implementing a glycol cooling loop could benefit production in addition to saving water. The implementation of this recommendation could result in annual savings of 1,728,000 gallons of water and \$4,396.

**Recycling Water to Vacuum Pumps:** Two liquid ring vacuum pumps run 24 hours a day, seven days a week utilizing city water. Recycling water back into the water feed line for these two pumps could result in significant savings. Further studies are recommended to verify the viability of this strategy. If implemented, this recommendation could result in annual savings of approximately 1,632,960 gallons of water and \$4,154.

**SOP Modification and Employee Training:** Modifications to standard operating procedures (SOPs) will result in reduced water usage, improved handling of hazardous waste, and reduced waste generation. Changes to SOPs include instructing operators on efficient rinsing strategies and establishing clear guidelines on when employees must collect hazardous waste. This will eliminate any ambiguity of how much cleaning needs to be performed until all the hazardous waste is collected and the rest of the rinse is safe to drain.

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
WATER USE ANALYSIS	\$5,600 (one time)	-	IMPLEMENTED
FLOWMETER INSTALLATION	\$4,800	650,000 gallons	RECOMMENDED
HIGH PRESSURE WATER GUN	\$2,202	866,764 gallons	RECOMMENDED
SOLENOID VALVE	\$2,290	900,000 gallons	RECOMMENDED
COOLING LOOP INSTALLATION	\$4,396	1,728,000 gallons	RECOMMENDED
RECYCLING WATER TO VACCUM PUMPS	\$4,154	1,632,960 gallons	RECOMMENDED
SOP MODIFICATION AND EMPLOYEE TRAINING	\$590	78,000 gallons	RECOMMENDED

