CF INDUSTRIES

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COMPANY PROFILE

CF Industries was founded in 1946 and is now a leading nitrogen fertilizer producer, with nine production facilities across the United States, Canada, and the United Kingdom. Recently completed expansion projects at the Donaldsonville, Louisiana, and the Port Neal, Iowa, locations have increased the company's nitrogen production capacity by more than 25 percent, making CF the largest nitrogen fertilizer producer in the world.

The Port Neal production facility employs approximately 270 people and produces ammonia, urea liquor, urea ammonium nitrate (UAN), diesel exhaust fluid (DEF), and granular urea.

PROJECT BACKGROUND

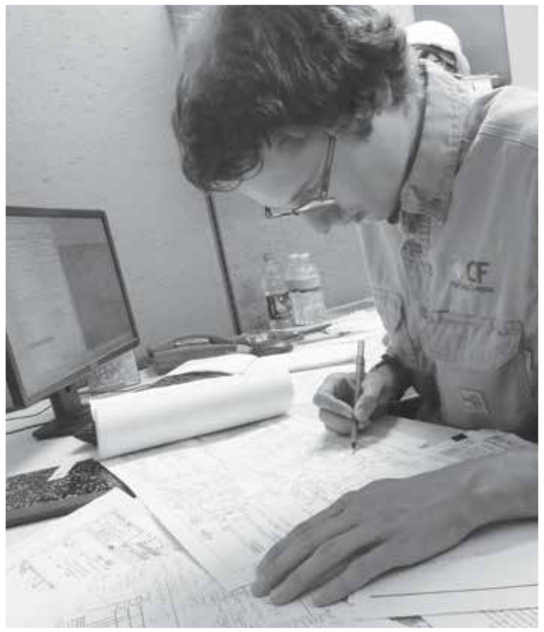
The Port Neal facility operates two nitric acid plants and a UAN plant. Water is currently cycled between the two acid plants and the UAN plant. Some of the water sent from the acid plants to the UAN plant can be recycled back to the acid plants for reuse. The rest of it must be evaporated, while fresh water is brought in to serve as makeup water. CF Industries partnered with Pollution Prevention Services to host a 24-week intern to devise ways to increase the amount of water able to be recycled between the three plants and decrease overall water demand.

INCENTIVES TO CHANGE

Responsible environmental stewardship is a core value of CF Industries. The company regularly invests in capital improvement projects that improve energy efficiency and reduce emissions. They also prioritize a life cycle approach to sustainability, working closely with farmers through the *4R Nutrient Stewardship Program* to support sustainable agricultural practices. This year's P2 intern project builds on CF Industries' commitment to sustainability by focusing on innovative opportunities to increase the amount of water that can be recycled and reused through the fertilizer production process. Solutions will not only reduce the facility's water demand, but will also reduce energy consumption, as less energy will be needed to evaporate the water.

RESULTS

The intern began by developing a rough mass and energy balance to better understand the complex production processes of the plant and how they relate to the overall water usage. Tracing out Piping and Instrumentation Diagrams (P&IDs) of the input and output streams for the processes enabled the intern to identify locations of flow sensors to aid in data collection. The intern then used the data to develop an analysis of the current water cycling process and identify areas of opportunity. The intern researched strategies to increase the rate of water reuse between the processes. The intern also collaborated on a comprehensive review of the plant's steam system.



Steam System Analysis: Steam is used in turbines, heat exchangers, process vessels, pipe/equipment heating, and other various pieces of equipment at the Port Neal site. A detailed study of the plant's complex steam system provides a roadmap to better understanding production needs and uses. This information will enable CF Industries to improve the efficiency of the steam system at the plant and identify additional opportunities to reduce energy usage. Working in collaboration with a third-party consultant hired by CF Industries, the intern collected steam flow, temperature, and pressure data for a study of the steam system. After compiling the data, it was estimated that the plant could potentially reduce steam production, resulting in annual savings of water, natural gas, and water treatment chemicals.

Water Recycling: In the UAN plant the process water being recycled is collected in a holding tank before being pumped back to the acid plants. Test results from the line connecting the tank to the pumps and the tank's atmospheric vent revealed that carbon dioxide gas from the water collection process is being passed from the tank to the pumps, resulting in decreased pump performance. This decreased pump performance can limit the amount of water able to be recycled.

After researching solutions, further testing confirmed that installation of a replacement pump that is capable of handling both liquids and gases could increase water recycling between the three plants by a rate of 17 gpm. This increase in water recycling could save 10.6 million gallons of water annually, along with reductions in associated steam and water treatment chemicals.

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
WATER RECYCLING	$49,602	10,612,600 gallons water 177,284 therms 13.6 tons water treatment chemicals	RECOMMENDED
STEAM SYSTEM ANALYSIS	$740,259	26,702,600 gallons water 2,822,250 therms 34 tons water treatment chemicals	RECOMMENDED