BRIDGESTONE AMERICAS TIRE OPERATIONS

SAMUEL HARTMAN
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

COMPANY PROFILE

Bridgestone is the world's largest manufacturer of tires with a presence in more than 150 countries worldwide. They also produce a variety of other rubber products such as conveyor belts, hydraulic hoses, and golf equipment. The company was started in 1931 and has since formed a reputation for the high quality of their tires. The Des Moines, Iowa, facility produces their Firestone brand tires for industrial agriculture. Operating 24 hours a day, 5 days a week, with more than 1,300 employees, this large scale operation is a major component of the Bridgestone agriculture division.

PROJECT BACKGROUND

Tire manufacturing is a complex process with multiple steps requiring large amounts of water, steam, and heat. In recent years Bridgestone's Des Moines plant has used more than 100 million gallons of water annually, costing the company more than $700,000 every year. Bridgestone's mission for continuous improvement focuses on lowering their environmental impact, which includes reducing water and energy usage in manufacturing. By the year 2020, Bridgestone is aiming for a 35 percent reduction in water usage from 2005 levels.

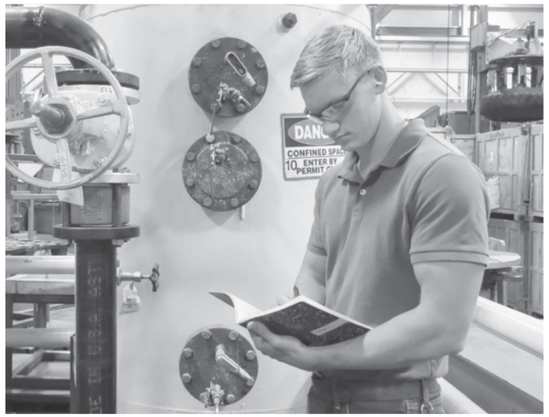
INCENTIVES TO CHANGE

The long-term corporate environmental vision emphasizes improvements in three key areas: "being in harmony with nature," "valuing natural resources," and "reducing carbon dioxide emissions." Bridgestone acknowledges that the rising world population will continue to increase the demand for energy and natural resources. With this increased resource demand and possible challenges resulting from climate change, the company has set in place many benchmark goals to achieve a more sustainable future. Adding to the incentive for improvement is the cost savings associated with reducing water and resource usage.

RESULTS

Reverse Osmosis: The curing system represents a key opportunity for water conservation due to its high usage of steam and hot water. It was discovered that roughly 15 percent of the steam and water from the curing process is overflow water that is relatively clean and at 140 degrees Fahrenheit. This water could be better utilized for its heat and even filtered through a reverse osmosis (RO) system to be reused as boiler feedwater. This would reduce the demand for city feedwater and energy to heat the water, and greatly reduce boiler blowdown because RO water contains much fewer minerals and impurities. With less blowdown, the boilers will require less water and heat input to produce the same amount of steam.

Curing Overflow as Service Water: Another way to utilize a portion of the curing overflow water would be to add it to the service water reservoir. The service water is used for cooling and previously required city water to make up for evaporation at the cooling towers. Because the service water does not have strict quality requirements, overflow water can be added directly without any filtering. This would eliminate the need for adding city water to the service water system.



Pump Monitoring: Leaks and discharges account for another 15 percent of water loss from the curing system. These leaks drain through plant tunnels and currently get sent to the city wastewater treatment plant. In addition to the large expense associated with treating the wastewater, it is also a major loss of heat and water that has to be made up by adding more steam to the system. The amount of water coming from the tunnels could be monitored by installing current-transducers on the pumps. Tracking the amount of water being pumped would allow major leaks to be identified and repaired in a timelier manner, resulting in less loss through leaks and more overflow water that could be reused.

AC Condensate Recovery: There are many air conditioning units on the roof that are constantly disposing of condensation through the storm water drain. Several of these units are near a cooling tower which currently uses city water to make up for evaporation. This condensate water could be pumped into the cooling tower and reduce the amount of water needed to be added to the system.

Ecology Tank to Pond: The ecology tank collects about 30,000 gallons of wastewater per day from the curing tunnels and delivers it to the city wastewater treatment facility. Testing of samples from the tank showed this water could be processed through the on-site settling ponds, saving treatment chemicals and costs. In order to safely redirect this water to the pond system a continuous monitoring and control system would be required. An automated system would continuously monitor the flow before allowing the waste stream to flow to the ponds.

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
REVERSE OSMOSIS	$107,550	6,212,907 gallons water 195,840 therms	RECOMMENDED
CURING OVERFLOW AS SERVICE WATER	$9,299	1,656,587 gallons water	IMPLEMENTED
PUMP MONITORING	$9,547	734,400 gallons water	IN PROGRESS
AC CONDENSATE RECOVERY	$398	73,715 gallons water	RECOMMENDED
ECOLOGY TANK TO POND	$43,281	6,885,000 gallons water	RECOMMENDED