Fact Sheet

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Reducing Water Consumption: Conductivity Control at Harris Broadcast Communication Division

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Figure 1: Rinse Tank 2 with conductivity controller and solenoid bypass switch mounted under overhang

The Harris Broadcast Communication Division (BCD), located in Quincy, Illinois, manufactures radio and television transmitters including High Definition TV and High Definition Radio. Harris Corporation and its employees are dedicated to conducting business as stewards of the environment.

As environmental stewards, Harris was interested in conserving water in their parts cleaning and coating operation. Many of the parts and components used in the production of communication equipment require coating to protect the components from the environment. To accomplish this, Harris uses a multi-stage immersion parts washing system composed of an aqueous cleaning bath, tap rinse #1, an aluminum etching bath, tap rinse #2, followed by a series of process baths to pretreat the metal for finishing. This operation operates 10 hours per day, 5 days a week. Rinse tanks #1 and #2 flow tap water continuously at the rate of about 6500 gallons per day. These rinses were the focus of this project.

The Opportunity

Harris contacted the Illinois Sustainable Technology Center (ISTC) for assistance to reduce water use. ISTC has previously worked with Harris on pollution prevention (P2) and energy efficiency (E2) projects. ISTC recommended contacting the Illinois Environmental Protection Agency (IEPA) Intern Program to employ an intern for the summer to manage this project and to work on additional projects for Harris. Harris hired Alex Dunker, a junior engineering student at Southern Illinois University- Edwardsville (SIUE). For his first assignment, Alex recorded baseline water usage and conductivity levels of wastewater discharged from rinse tanks #1 and #2.

Harris Baseline data:

- 6,520 average gallons per day rinse water discharged.
- Rinse 1 Conductivity: 346 µS/cm
- Rinse 2 Conductivity: 708 µS/cm
- Tap Water: 350 µS/cm

The baseline data indicated that the conductivity of Rinse #1 was the same as the incoming tap water and that Rinse #2 was approximately double the conductivity of the incoming tap water. This confirmed that an opportunity existed for the introduction of conductivity control into the process to conserve water and save money.

Conductivity Control Technology

Conductivity control is a proven technology utilized to varying degrees within industry. This technology is based on the premise that water's conductivity is directly correlated to its contamination. In other words, as water becomes dirtier, the conductivity increases. Harris's conductivity control system consisted of 1) a control box (the "brain" of the system); 2) a sensor in the rinse tank, and 3) a solenoid installed in the water line that regulates the flow of water into the tank. The conductivity controller regulates the amount of water used to rinse parts by sensing the conductivity (level of contamination) of the water in the rinse tanks. The controller is programmed to maintain the conductivity level within a defined range. When the conductivity readings exceed the setting at the high end of the range, a message is sent to the solenoid to open the water valve and flush the tank with fresh water until the sensor in the tank senses that the conductivity level has been reduced to less than the lower conductivity setting. When this occurs, a message is sent to the solenoid to close the water valve. This operation is repeated as necessary to maintain the conductivity level of the tank to within the limits established by the operator.

ISTC has found that in many cases when a constant overflow is used in rinse tanks, the conductivity level in rinse tanks is near the conductivity of the incoming water. Generally, the conductivity in the rinse water can exceed levels twice the conductivity of incoming water without affecting coating adhesion.
The automated conductivity controller saves water in multi-stage parts washers, by calling for water only when the conductivity level in the tank exceeds preprogrammed levels, instead of continuous overflow without regard to process needs or production loads. Constant overflow rinses may also not be shut off during breaks, production down time and weekends, contributing to excessive water use.

Pilot Project Setup

A Hach sc100 Conductivity Controller was selected for this project. Prior to the installation of the Hach sc 100, water meters were installed on the water lines feeding rinses #1 and #2. Water meter readings were taken daily for a period of one week to establish the baseline water use.

Figure 2: Conductivity controller and solenoid bypass switches

The Hach sc 100 Conductivity Controller is supplied with two sensors and a control unit with necessary cabling to connect the sensors and the control unit. Harris maintenance personnel installed the control unit on the front of the tank and placed a sensor in rinse tanks #1 and #2. Solenoids were installed in the water lines that feed each of the tanks. Emergency solenoid electrical controls were wired next to the controller so that the conductivity controller could be over ridden if necessary. Additional physical bypass valves were plumbed so that the solenoid could be bypassed in case of electrical failure. These bypasses were installed to ensure that production would not be effected if a problem developed with the conductivity controller.

Figure 3: Solenoid & meter installed in water supply lines

The conductivity controller was programmed to open the solenoid when the conductivity reached 600 µS/cm in Tank 1 and 700 µS/cm in Tank 2. Water was flushed into the tank through the water meter and solenoid until the conductivity in the tank was reduced to the low set point. Then the solenoid was signaled to turn off by the controller unit.

Results

During this pilot project, the upper level conductivity controls were slowly elevated until the operator was no longer comfortable with the levels of conductivity in the rinse tanks. No coating failures were observed, but there was a concern that failures could occur if the levels were raised any further.

	Avg/Day Before CC (GAL)	Avg/Day After CC (GAL)	Avg/Day Saved (GAL)	% Reduction	Production Days
Tank 1	3,638	167	3,471	95%	260
Tank 2	2,882	567	2,315	80%	260
Totals	6,520	734	5,786	88.70%	

Rinse	Annualized Water Saved (GAL)	Loaded $/GAL	Annualized Total $ Saved	Simple Payback (Months)	GHG Reduction (Lbs CO2)
Tank 1	902,577	$0.0057	$5145		
Tank 2	601,863	$0.0057	$3431		
Totals	1,504,439		$8575	5.7	3,381

This pilot project demonstrates that using a conductivity controller dramatically reduces the amount of water used in cleaning parts, reduces greenhouse gas emissions, and saves money. The savings identified in this fact sheet reflect those typically seen through the introduction of conductivity controllers.

For more information about water or energy conservation, consult additional ISTC Publications and Fact Sheets located at www.istc.illinois.edu.

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