

# AWESOME FACTS

on agricultural water conservation and efficiency

## Automated Irrigation Gates: Maximizing Water Delivery While Reducing Water Loss

### FEATURES & BENEFITS

Surface water irrigation districts can reduce delivery losses and improve their efficiencies by adopting some low-cost techniques for automating system operations.

A good place to start is right at the gate.

As part of the Texas Project for Ag Water Efficiency, the Harlingen Irrigation District developed and tested its own prototype auto-gate made of lightweight aluminum and featuring push-button controls. The efficiencies were immediately apparent: the auto-gate was considerably easier to operate and produced results in a fraction of the time needed to manually change the original heavy wooden gates.

Since then, HID has replaced its manual gates with 37 automated gates, all custom-made and installed by district staff. The auto-gate design uses readily available, off-the-shelf components for a surprising low cost of \$3,500 per gate (including actuators and controllers). Adding the full complement of supervisory control and data acquisition (SCADA) features brings the total cost to about \$10,000 per gate — still well below the price tag for commercially available automatic gates.

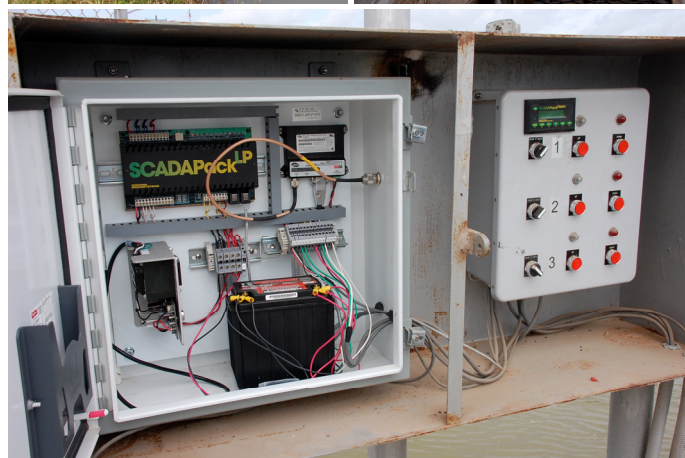
As an added value, the time and costs for the district to build and install its own automated gate system qualified as a “local match” for cost-sharing grants from the Texas Water Development Board and the U.S. Bureau of Reclamation.

Detailed instructions for the gates, along with parts lists, drawings, and other supporting information, are posted at TexasAWE.org. HID’s auto-gate plans and specifications have been adopted by El Paso Irrigation District and Lower Colorado River Authority for use in their conveyance systems.

### TECHNICAL DETAILS

The primary sub-assemblies of the auto-gate system are the gate assembly itself and the actuator, including motor and controls for raising and lowering the gate. In addition, each gate requires a set of controls; more than one set of controls can be incorporated in each control box.

- **The gate** is constructed of 3/8-inch aluminum plate, reinforced horizontally with 2-inch x 2-inch aluminum angles bolted to the plate with 1/2-inch stainless steel bolts. The gate can slide smoothly up and down within



Clockwise from top left: HID auto-gates at work; actuator; control box

the aluminum frame using a bearing surface and seal provided by ultra high molecular weight (UHMW) plastic strips.

- **The actuator** — the mechanism that moves the gate up and down — is a 12-volt DC off-the-shelf device similar to those used for “slide-out” room extensions on recreational vehicles. The motor operates a screw assembly that extends or retracts linearly, making it well suited to handle the movement of canal gates.

- **The control box** consists of a rated enclosure with internal circuitry to operate relays and external controls for manual operation of the gate. A three-position external switch enables selection of off, automatic, and manual modes. The gate can be raised or lowered when in manual mode by means of two external pushbuttons, each with an indicator light.

Solar panels and/or wind generators supply power to the actuator — ideal for remote areas not served by power lines.

Water level sensors, telemetry, and control hardware (such as SCADA) can be used for full automation, allowing remote operation of the gate. HID’s auto-gates are also equipped with sensors that monitor water levels. With these sensors, district staff can set the gates to automatically open or close in response to changed levels, a feature that helps keep the entire irrigation system charged and at an optimal performance level.

Telemetry and SCADA are discussed in *AWEsome Facts* ID-02-13, available online at [www.TexasAWE.org](http://www.TexasAWE.org); click on “Resources,” then on “Fact Sheets.”

#### ADDITIONAL INFO

Irrigation district personnel can learn the efficiencies of automation over manual methods for controlling flow and managing canal levels at the Rio Grande Center for Ag Water Efficiency, part of Texas AWE. The Center, built around a simulated canal system complete with automated gates and



Above: Water level sensor  
Below: Training in auto-gate operations at the Rio Grande Center for Ag Water Efficiency



telemetry, offers hands-on training in auto-gates and district automation for a nominal charge. Training sessions can be scheduled on request. Call 956.423.7015.

A 3-minute video demonstrating “In-District Water Management Efficiencies” is available at [www.TexasAWE.org](http://www.TexasAWE.org).

#### CREDITS

Al Blair, P.E., PhD, A.W. Blair Engineering, *Low-Cost Automatic Gates for Irrigation Canals*, prepared for Harlingen Irrigation District under a Texas Water Development Board Innovative Technologies for Agricultural Water Management and Flow Measurement grant, 2010. Available online at [www.TexasAWE.org](http://www.TexasAWE.org); click on “Resources,” then on “Technical Reports & Specs.”

HID’s automated system was made possible in part by funding from the Texas Water Development Board and the U.S. Bureau of Reclamation.

#### About Texas AWE

The Texas Project for Ag Water Efficiency (Texas AWE) focuses on affordable and achievable methods for conserving irrigation water through on-farm applications and in-district delivery systems.

Texas AWE was developed and is managed by the Harlingen Irrigation District (HID) with grant funding by the Texas Water Development Board as one of two 10-year Agricultural Water Conservation Demonstration Initiatives in Texas.

Starting in 2004, HID and its project partners have gathered data on ways to manage agricultural water more efficiently. On-farm demonstration sites have proven how new irrigation technologies can conserve water and produce good crop yields, while in-district automation and networked telemetry showcase how water management can support irrigation efficiencies at the farm level.

Project findings are shared on the project website ([TexasAWE.org](http://TexasAWE.org)) and at the Rio Grande Center for Ag Water Efficiency through hands-on training and workshops for producers and district personnel. The Center is also the only site in Texas to offer flow meter calibration for producers and other districts.