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 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; 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 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.

**CREDITS**


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