Here comes the sun

Electric actuators were used in a solar-powered automation project at a US oil shale field

A major US oilfield water management company requested help to develop solar-powered control stations for some of its water gathering pipelines in West Texas and New Mexico.

Water, a by-product of oil and gas production, requires careful management. Often known as 'produced water', the product is the largest volume waste stream associated with upstream petroleum operations.

At most oil shale fields, produced water from wells is gathered via pipeline infrastructure before being transferred to temporary storage at either a disposal well location or a central treatment facility.

In order to improve its water gathering operation, the customer worked with automation equipment supplier Wolseley Industrial Group to investigate automated valve technology to control the flow in the high-pressure pipelines.

The customer had specific requirements for the valve application, including the need to control system pressure to and from the well sites, shut down lines in the event of a leak or other failure, and eliminate high maintenance devices such as air compressors and other rotating equipment.

The solution

With a lack of available gas and electricity in the isolated locations, the use of solar power to control pipeline flow was seen as the most effective alternative. It soon became clear that electricity would have to be generated at each control station installed along the water gathering pipelines, so Rotork was contacted to provide IQ3 intelligent electric multi-turn actuators, together with solar panels to power them.

The customer wanted valves and actuators every five miles in off-grid areas, so a solution combining individual solar panels with control stations and Rotork IQ3 actuators was devised by Wolseley Industrial Group. Each control station included an IQ3 actuator to control either a 12- or 16-inch ball valve and each assembly was fitted with solar panels to power either a 24, 48 or 120V DC motor.

The self-contained solar power stations offer an efficient and economical way of powering the control stations, while also preventing harm to the environment and cutting installation costs by removing the need to install power lines along the length of the pipeline.

Rotork was provided with the solar panels and necessary details to correctly size them with the actuators, allowing Rotork Site Services to work on assembling the systems.

Each station was then given its own solar set to create the power needed to actuate single-stage modulating and isolation valves, as well as run a 24V DC programmable logic controller (PLC). A control panel is also used to operate voltage regulators, which monitor battery voltage. The batteries are only charged when the voltage drops below a specified level, to prevent degradation by over-charging the battery.

Rotork engineers were able to help test the valves and confirm they would continue to stroke with no sunlight for at least two days.

Due to the presence of complete sunlight on the day of the test procedures, covers were placed over the solar panels. Battery power was used to stroke the valves fully open and closed five times each day during a three-day period.

When the covers were removed, the batteries began charging immediately and reached full capacity in 2–3 hours.

Rotork's IQ3 actuators include a patented absolute encoder to provide continuous tracking at all times. Even in the event of power loss, the actuator's graphical interface, remote indication and data logger are all maintained and accessible.

The results

Recent technological improvements in the use of solar-powered industrial valve operation mean it is now a practical, reliable alternative for isolated areas.

The water management company now has an innovative and safe solution to assist with transporting contaminants from fracturing sites to water gathering and disposal facilities.

The use of Rotork's intelligent IQ3 actuators in an innovative solar set solution allows the appropriate voltage to safely operate isolation and modulating valves along the length of the pipeline.

For more information:
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Rotork IQ3 electric actuators fitted to 12- and 16-inch ball valves with a solar panel

The use of solar panels allows the IQ3 actuators to operate ball valves installed on a produced water pipeline