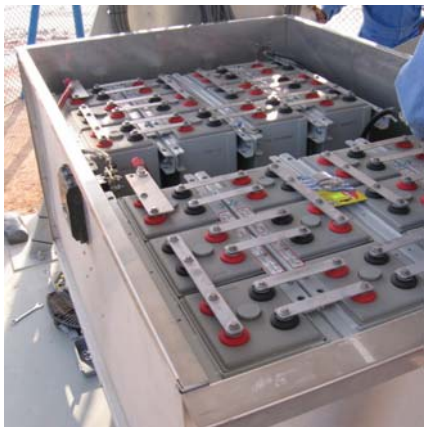
SunWize Power & Battery

Using Solar for Cathodic Protection

SunWize® Power Stations provide reliable power for the protection of key oil field assets

Cathodic protection (CP) controls the corrosion of a metal surface and is used extensively in the oil and gas industry. Cathodic protection systems are most commonly used to protect steel, water, and fuel pipelines, wellhead casings and tanks, steel pier piles, and offshore oil platforms.

Buried metal structures will experience a galvanic reaction with the ground due to the difference in the electrical potential of the structure and the ground. This reaction results in the loss of surface material from the structure to the ground and turns the structure into an anode and the ground a cathode (current always flows from an anode to a cathode). The loss of material (ions) eventually leads to corrosion of the metal structure, which can lead to a mechanical failure and can be extremely costly.



Battery bank is housed in a stainless steel enclosure.

An effective way to provide protection is through a CP system using impressed current. In such a system, a "sacrificial anode" is placed in the ground close to the structure being protected. Current is then impressed into the anode, releasing surface ions into the ground. Those ions flow into the nearby structure, reversing the electrical reaction for that structure. This turns the structure from an anode to a cathode. The anode is now the sacrificial piece of metal while the structure, acting as a cathode, is protected.

As an example we will discuss five large-scale CP systems for wellhead protection using SunWize® Power Stations which were designed for a desert environment and for easy installation.

SunWize Power Stations are built with heavy-duty, galvanized steel structures and support bases. The entire system, including the solar array, battery bank and controls, are integrated onto the structure, so the only required site preparation was pouring a concrete pad. The structure, with a fully deployed solar array at a 35° tilt angle, can withstand continuous 90 mph winds according to standard yield analysis as dictated by the American National Standards Institute and ASTM (American Society for Testing and Materials) International. The batteries, proven to withstand desert temperatures, are housed in stainless steel enclosures broken down into flat panels for ease of shipping and installation.

The microprocessor-based CP controller is a sophisticated power supply that integrates both solar controls and cathodic protection into a single unit. The solar controller operates in three modes: bulk mode with full available solar current charging the batteries, absorption mode with the batteries regulated at an elevated voltage to equalize the cells and float mode providing standby power and preventing self-discharge of the cells.

The CP controller can also operate in three modes: CC (constant current) where the current is tightly regulated and the voltage varies depending on soil conditions, CV (constant voltage) where the voltage is tightly regulated and the current drifts with varying soil conditions, and RC (reference cell) where a reference voltage is provided. The reference voltage is based on a sample measurement of the local soil as read through a dedicated soil resistance measuring device, and current is adjusted based on soil conditions.

SunWize Power Station is mounted on a concrete pad.

Providing a constant current, constant voltage or a reference voltage is a challenge to a CP controller, since the resistance of the ground changes daily as moisture content changes. In parts of the world, this change can be significant on a seasonal basis as the climate moves from periods of drought to periods of rain.

The CP controller includes a DC/DC conversion circuit that automatically adjusts the output of the system in a manner that insures the appropriate regulation. The

appropriate flow of current is the key to consistent protection of the pipeline.

SunWize built and tested the systems in our Kingston, NY factory. The systems were successfully commissioned at the remote desert sites in less than five days and will provide the required CP of the wellheads for many years to come.

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