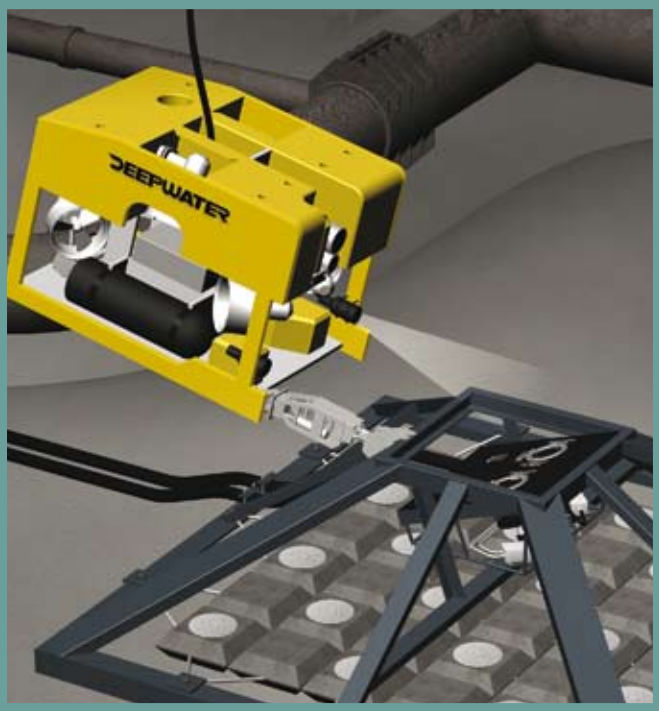
Deepwater Corrosion Services Inc.

Light powered cathodic protection monitoring in deep water

SUNSTATION



DEEPWATER

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Overview

The Polatrak® SunStation provides an improved, low-cost cathodic protection monitoring solution for any subsea application where ROV-assisted surveys are conducted. Cathodic protection monitoring equipment is permanently mounted to the asset, so no probes or monitoring instruments are required on the ROV. Also, since SunStation requires only visual inspection, a specially qualified inspector offshore is no longer necessary. The SunStation provides a real-time readout of CP performance, **activated and powered by the lights on the ROV**.

Available one, two, or three-channel configurations, SunStation can output data from any Polatrak instrument. Anode currents, for example, can now be read directly, in real numbers, as can current density.

This system can save an operator significant sums in reduced inspection time every season, and the improved quality and repeatability of fixed monitoring data over conventional probe-based surveys has never been available until now.

The readouts should be strategically placed at locations where ROV intervention is required; CP inspection is achieved whenever the ROV visits. The mounting panel around the unit bears inspection point location information and the designation of each channel.

Key design points

1. Provides repeatable accurate data and eliminates the operator error associated with CP Probes. Fixed instruments don't move or suffer the same calibration problems as portable devices.
2. Provides positive real-time verification of electrical continuity or isolation, because each channel has its own reference ground.
3. Eliminates the hassle of ROV-interfaced probes.
4. Allows monitoring of the truly critical locations on the asset where an external probe placement would be impossible.
5. Reduces cost and eliminates wear and tear on ROV systems. Reduces the specialized offshore manpower required for CP inspections.
6. Leverages ROV presence by providing CP status as a matter of course during any intervention. ROV visits are video-documented, and the ROV lights provide system power.
7. Easy to retrofit with ROV, using the RetroClamp.

A first-generation SunStation as recorded by the inspecting ROV.

The new SunStations house the readout and solar panels separately.

Applications

While the SunStation is a breakthrough for providing power in deep water, its main applications have all been for measuring cathodic protection. We use it to monitor CP in three locations: on structures, pipelines, and on anodes (when attaching to either of the former is too difficult). Here are some specific applications for CP monitoring with SunStation (pictured below):

1. **Subsea trees and manifolds** Using zinc reference electrodes (called V-String Electrodes) at key locations on the manifold, the SunStation CP Test panel is mounted at a place convenient for the ROV to interrogate the readouts. CP Inspection is achieved anytime an ROV is in the area.
2. **Unburied pipelines and deepwater flow-lines** The self-contained SmartClamp monitoring station comprises a SunStation fitted to Deepwater's RetroClamp. It can be installed by diver or ROV on any tubular > 8 inches diameter.
3. **Anode Pod Monitoring** The SmartPod anode pod with built-in SunStation monitor is a retrofittable cathodic protection system. Measuring the CP at the anode allows just as comprehensive an understanding of the performance as an inspection of the asset itself – here, two subsea trees.
4. **Offshore Pipelines** SunStation can also now be housed in a buoyant glass sphere and attached to the pipeline via RetroClamp. CP levels can be interrogted by ROV or AUV.
5. **Buried Deepwater Pipelines** The SmartStation comprises Polatrak dual reference cells (Zn and Ag/AgCl mounted on retrofittable clamps) and a pair of SunStation monitors mounted into a low-profile over-fishable instrument housing, which could also be used as an anode sled (in retrofit applications). This system can be installed and interrogated by ROV.

Other potential applications are endless, as the SunStation can be connected to any device with DC output (see the diagram on the reverse of this brochure). In the realm of cathodic protection, the SunStation could be used to monitor CP on FPS/FPSO moorings or as an external readout for internal locations (soft tanks, center wells, up inside annular spaces of turrets or I-Tubes, etc). The instrument is rated to either 300m or 3000m, and has an ultra-bright LED readout that is easily visible from any viewing angle.

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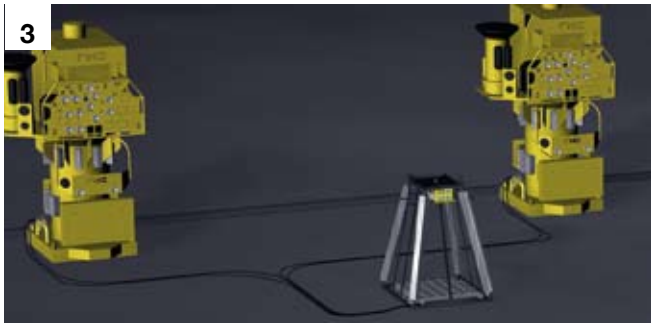

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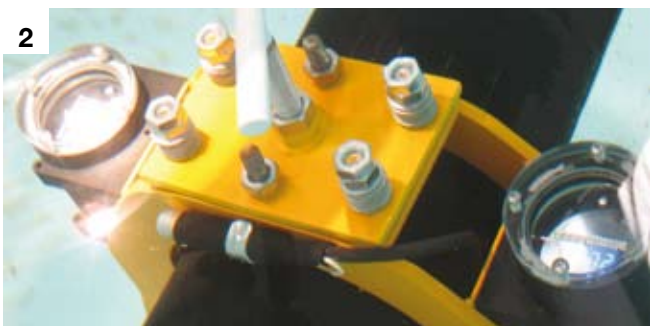

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Compatible instruments

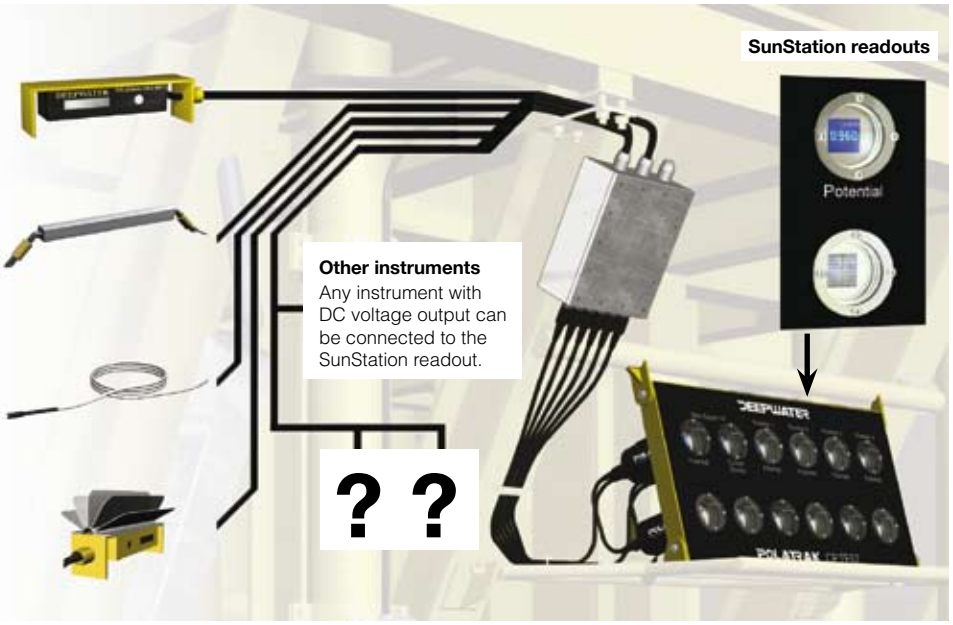
Compatible instruments

Dual Reference Cell (DR-2)
The DR-2 has one Zn and one Ag/AgCl reference electrode for increased accuracy. It can be welded to a structure, or retro-fitted with an ROV-friendly clamp.

Monitored Al Anode (MA-1)
The MA-1 allows operators to see how efficiently their anodes are performing by monitoring performance and consumption – like an anode 'fuel gauge'.

Zinc Reference Electrode (V-String)
The V-String is a multi-purpose zinc electrode, designed to be ultra-rugged and dependable. A basic, long-lasting reference for cathodic protection readings.

Current Density Monitor (DR-2 CD)
The DR-2 CD measures cathodic protection potential (like the DR-2) and current density. With these two pieces of data, polarization can be measured.



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