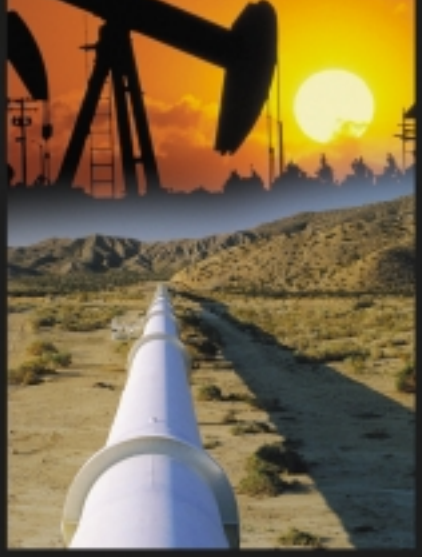
## OIL & GAS SERVICES



# PETRO-CAT

CATHODIC PROTECTION
MONITORING SYSTEM

satamatics
putting you in control

# PETRO-CAT

## CATHODIC PROTECTION MONITORING SYSTEM

### Monitor Cathodic Protection Rectifier Systems around the globe - from any location via the Internet

The Satamatics PETRO-CAT service is an end-to-end service solution for the remote monitoring of valuable anti-corrosion systems for oil and gas pipelines.

- Continuous updates on operational reliability of Cathodic Protection Systems
- Reduced costs and frequency of field maintenance and inspection
- Regulatory environmental impact and security compliance

PETRO-CAT measures the operation and effectiveness of the remote Cathodic Protection System, transmitting data and alarm-condition reports to a central monitoring and control site. Constant monitoring of the system's operation and effectiveness via PETRO-CAT can significantly enhance physical inspection without the cost of additional personnel. With the tightening of environmental protection regulations - due to concerns about the failure of aging pipelines, and regarding vandalism or terrorist activity - PETRO-CAT is integral to meeting mandates for the constant monitoring of pipeline operation.

### Secure, up to the minute reports of rectifier unit status and pipe corrosion threats

When co-located at the rectifier, PETRO-CAT analyzes the operation of the rectifier itself and monitors the rectifier enclosure intrusion alarm. Power for the PETRO-CAT unit would typically be the same as that supplied to the rectifier, with a backup battery.

To determine the effectiveness of the anti-corrosion system, a solar powered, stand-alone PETRO-CAT can also be deployed at distant locations along the line. In this operation mode, pipe voltage potential, leakage current and the effects of high-tension lines and electrified rail passing overhead are the main concern. Out-of-limit potential level on the pipe might indicate corrosion levels that threaten pipe integrity, and analysis in conjunction with leakage current could indicate a break down in the pipe protective covering.

### How does PETRO-CAT work?

First and foremost, PETRO-CAT is an end-to-end service solution. It is based on a tried and tested integrated system of remote sensing equipment, web-based application software and satellite communications.

- Useful and actionable information - exception reporting
- "Plug and play" - eliminates requirements for specialized hardware, software and training
- Effective solution designed for low operational costs

A PETRO-CAT Remote Terminal Unit (RTU) monitors operational and alarm conditions at each rectifier system's location on the pipeline, with this information being relayed via the Satamatics Telematics Satellite Network to the PETRO-CAT Service Center. A secure database server - the PETRO-CAT Information Server - is maintained at the Service Center, to allow analysis and verification of the collected information. The server formats information as a web page. This PETRO-CAT Control Center Information Application can then be accessed - via the Internet - by authorized personnel at the pipeline operations center using a standard web-browser. Alternatively, existing information systems, such as databases and decision support systems, can access information using a state-of-the-art XML interface over the Internet.

### PETRO-CAT RTU

The PETRO-CAT RTU is an easily installed, self-contained unit that is located beside the rectifier system and along the pipeline. It is an intelligent unit, which can be programmed to perform logic operations and initiate specific actions, with these operational scripts analyzing levels and frequency of occurrence against settable thresholds. At a rectifier location, the RTU typically measures, analyzes and acts on the following parameters:

- Rectifier AC input voltage
- Rectifier DC output voltage
- Rectifier DC output current
- Potential voltage between pipe and ground

When located down the line from the rectifier, the RTU is used to analyze the effectiveness of the rectifier and aberrations due to high-tension electrical lines or electrified rails. It is typically configured for:

- Potential voltage between pipe and ground
- Leakage current from the pipe to earth

The PETRO-CAT RTU continuously monitors the required parameters - and periodically collects and stores the data - and also time-stamps each entry over a defined period. PETRO-CAT reports the minima and maxima of each parameter for the period, with user-defined alarm conditions reported immediately.

The RTU can be polled remotely to provide immediate access to operational and performance information, while operating parameters - such as alarm thresholds and alarm state definitions - can also be changed remotely via the Satamatics Telematics Satellite Network. Opto-isolator sensors monitor the various parameters and, as an option, PETRO-CAT can also support rectifiers equipped with internal sensors, which typically utilize 4-20mA current loops for telemetry purposes.

Typical parameters, with related alarm points, would include:

| ITEM | Operating Value | Alarm Point |
|---|---|---|
| Ac input voltage | 220Vac | 176Vac |
| Dc output voltage | 84Vdc floating | 67Vdc floating |
| Dc output current | 13.7A | 11A |
| Dc voltage pipe to earth | -1.5Vdc | -1Vdc |

Connections to the sensors are made within the rectifier unit and directly to the sacrificial element in the ground.

The RTU's Programmable Processing Unit is supplied with a 10-bit A/D converter as standard, with a 12-bit A/D converter available as an option for higher-precision measurements.


The PETRO-CAT System also reports back the rectifier operational status and intrusion alarms, including the following, while other status options are available:

- position of the on/off switch in manual rectifier systems
- the commanded on/off operational state in remote-controlled rectifier systems
- intrusions to the Rectifier Cabinet and RTU enclosure

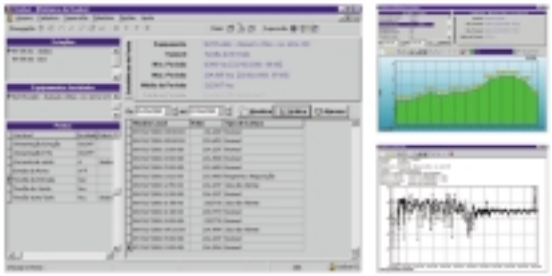
The RTU has a back-up battery and charging system, to enable continuous transmission in the event of a failure in the ac power feed. Optionally, there is a solar powered charging unit available. The complete PETRO-CAT RTU, including the Programmable Processing Unit, Satamatics Satellite Terminal and back-up battery module, is enclosed in a tamper-proof, all-weather environmental steel enclosure. Measuring 50cm x 50cm with a depth of 20cm, the RTU weighs 30kg and draws less than 1.5A at 220Vac.

## PETRO-CAT CONTROL CENTER INFORMATION APPLICATION

The PETRO-CAT Control Center Information Application allows an operator to monitor a network of remotely-located rectifiers simply and quickly. Generally, the information is presented as alarms and processed data logs. However, the Application provides modules to record information about each rectifier system. This data could include such items as exact location, maintenance group responsible and contact numbers, manufacturer, automatic or manual control, etc. All the information is organized in a series of reports and graphs, for quick and easy review by control center personnel. It can be viewed in a graphic format, displaying a plot of values against thresholds over time, or as text shown in a log. The Information Application also allows various parameters at the RTU site, such as alarm points and measurement period, to be changed remotely.

Customized graphics depicting the transportation and storage facilities can be incorporated as part of the presentation, for a visual orientation and location of specific rectifier systems within the network. It is possible to provide a GIS client to link into other facilities management systems for more information, or to automatically update facilities databases. In addition, this same application platform is the basis for other Satamatics Oil & Gas Services, enabling several services to be combined into a unified monitor and control system.

Designed to operate on a PC using a standard web browser, the Control Center Information Application incorporates standard administration and security features. These include assignment of login and password access, and association of identified Rectifier Systems with designated personnel. In this way, remote monitoring can be segmented into sub-groups, such as geographical location or distribution network. Personnel can be assigned monitor and control access only for those Rectifier Systems for which they are responsible.

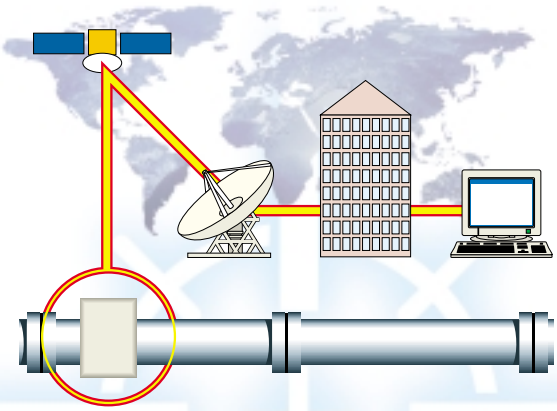


## PETRO-CAT APPLICATION SERVER

Located at the Service Center, the PETRO-CAT Application Server is a communications processor that interfaces with the Satamatics Telematics Satellite Network, a database server for storage and formatting of information for each monitored Rectifier System, and the host for the Control Center Information Application web site. The Server controls the communications flow and presentation of information - its communications with the Satamatics Data Center, and with a user's Control Center, are all based on the latest Internet technology, employing secure virtual links to safeguard all information. Through this approach, users gain the power of an Oracle-based server, but without the capital investment, and without the operational and maintenance costs.

## SATAMATICS TELEMATICS SATELLITE NETWORK

The Satamatics Telematics Satellite Network provides global coverage enabling PETRO-CAT Systems to be installed all around the globe. This satellite link is part of a communications network infrastructure established and controlled by Satamatics for linking the PETRO-CAT RTU and the Application Server. This is a secure network, with communications from the RTU being sent via satellite to the Satamatics owned and operated Satellite Gateways, located at earth stations around the world.



## SATAMATICS OIL & GAS SERVICES

In addition to PETRO-CAT, Satamatics provides a wide range of services and applications for the Oil & Gas Industry. These can be deployed independently or integrated into a comprehensive monitor and control network.

- Storage Tank Level
- Process Flow Monitoring
- Valve, Timer and Motor Control
- Pressure and Temperature Gauging
- Compressor Vibration
- Seismic and Terrain Movement

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