SERVICE NOTE

satamatics
putting you in control

CPMS
CATHODIC PROTECTION MONITORING SERVICE

A *MICRO TELEMETRY* SOLUTION FOR OIL & GAS

MONITOR THE PERFORMANCE OF IMPRESSED CURRENT CATHODIC PROTECTION SYSTEMS AROUND THE WORLD, FROM ANY LOCATION VIA THE INTERNET

The Satamatics Cathodic Protection Monitoring Service (CPMS) is an end-to-end solution, one of Satamatics *Micro-Telemetry* Services monitoring valuable anti-corrosion systems on oil and gas pipelines.

- Generates continuous updates on the operational reliability of cathodic protection systems
- Reduces the cost and frequency of field maintenance and inspection visits
- Simplifies compliance with regulatory environmental impact and security requirements

The CPMS measures the operation and effectiveness of remote impressed-current cathodic protection systems along a pipeline, transmitting data and alarm-condition reports to a central monitoring and control site via the Internet. Constant monitoring of the system's performance significantly enhances 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 the fear of vandalism or terrorist activity – the system plays a fundamental role in 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, the CPMS analyses the operation of the rectifier itself and also monitors the rectifier enclosure's intrusion alarm. Power for the CPMS 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 CPMS can also be deployed at distant locations along the line. In this mode, pipe voltage potential, leakage current and the effects of high-tension lines and electrified rails passing overhead are the main concern. Out-of-limit potential level on the pipe can indicate corrosion levels that are threatening pipe integrity, and analysis in conjunction with leakage current can indicate a breakdown in the pipe's protective coating.

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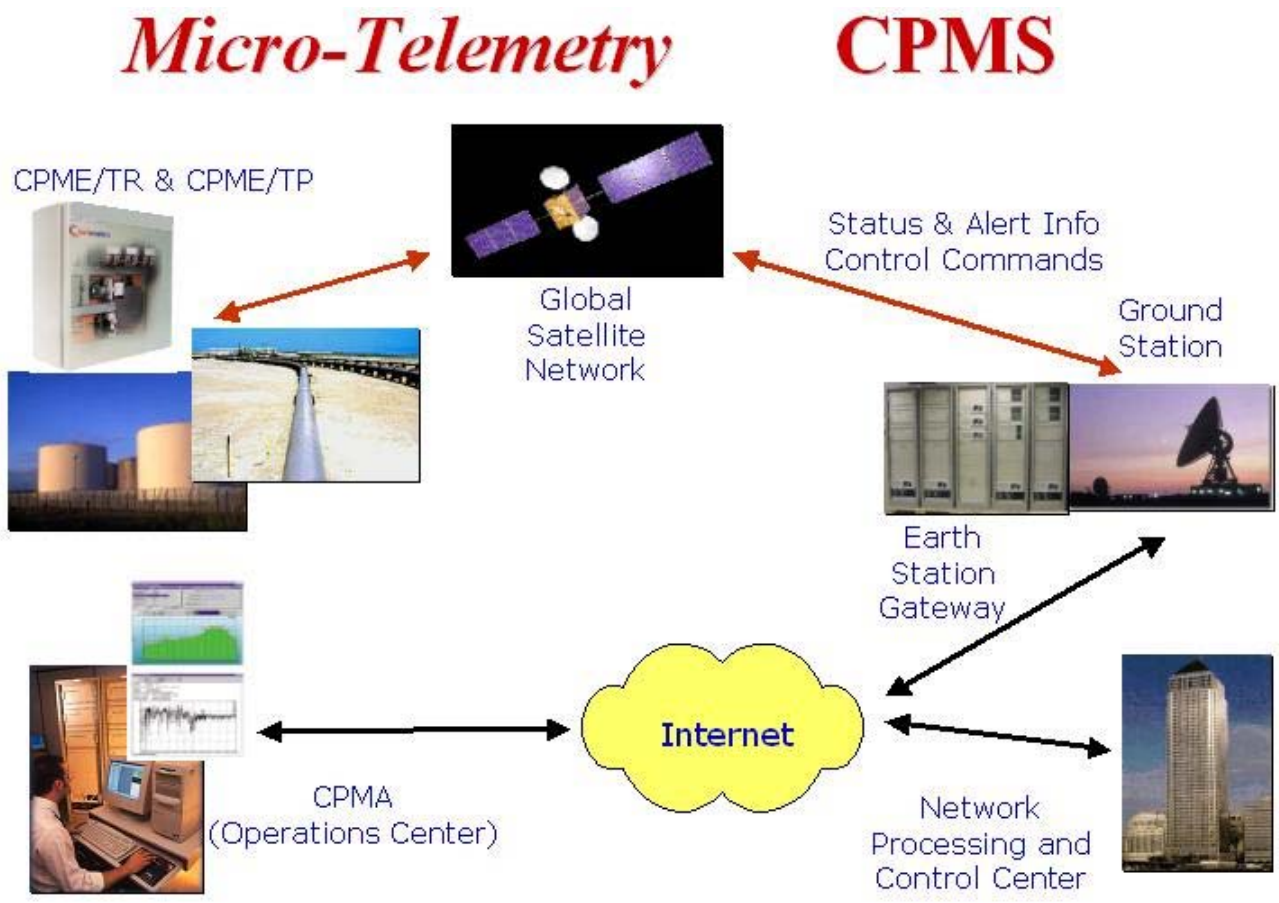
HOW DOES THE CPMS WORK?

First and foremost, the Satamatics CPMS 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

The CPMS monitors the impressed current potential at remote defined locations on the pipeline, This information relayed via *Micro-Telemetry* Service to a Operations Center. In addition, control commands can be sent from the Operations Center to remotely configure and control cathodic protection operations. In addition, control commands can be sent from the Operations Center to remotely configure and control cathodic protection operations. A secure global network of satellites and Internet connections link the remote sites with the Operations Center.

As apart of an end to end solution, CPMS includes remote location monitoring equipment and an information analysis and presentation application for the Operations Center Remote location components are designed specifically for Transformer/Rectifier (TR) sites or Test Post (TP) sites along a pipeline.



CPME/TR

At the Transformer/Rectifier (TR) location, CPMS uses specialized equipment designed to monitor not only the performance to the TR, but also status and alarm conditions relative to input ac power and security alarms for unauthorised intrusion.

The following signals are measured in the standard CPME/TR unit:

- "Instant Off" Potential: -5Vdc to +5Vdc
- "Polarized" Potential: -5Vdc to +5Vdc
- TR Output Current: -100mV to +100mVdc (across external shunt in TR)
- TR Output Voltage: 0Vdc to 100Vdc
- TR Primary Input Power: 0Vac to 300Vac RMS

Remote control for discrete actions:

- Control of primary OFF/ON switch for Automatic TR
- Remote control of steppable adjusting TRs.
- 4-20mA output module for analog control.
- Pipe potential set-point for Automatic TRs with variable output control.

CPME/TP

Monitoring at a Test Post is done to check the level of the Pipe to Soil potential on the pipeline at that location. The Instant Off potential may be the only measurement taken when the pipe is monitored at intermediate Test Posts between TRs. Generally this measurement is combined with measurements from other Test Posts to give a profile along the whole pipeline at a single instant (day) in time.

Also important is the placing a Test Post where high tension power lines or electrified rail pass close to the pipeline or where a pipeline passes over/through a feature such as a river/culvert. At these locations, anomalies in potential on the pipe can develop affecting the level of cathodic protection.

A test post installation only requires the monitoring of pipe potential and possibly one other parameter. The CPME/TP is thus much smaller than a CPME/TR unit. It also is capable of operating using battery power with a solar cell charger as a TP is typically located far from any power source.

CPMA

Key to CPMS is the ability to access information quickly. Presentation is critical to informed decision making based on the **information** derived from filtering, processing and analysing data received from the remote CP operations location. Typically the Operations Center is looking for long term trends over time by location and a picture along the line as a whole. In addition real time operational exceptions such as changes in status (threshold violation) and alarms require prompt attention.

The heart of the system is a database, a server, from which various defined report forms can be used to present data pulled from the database for presentation. This presentation is in both in text or graphic form and may be integrated into Graphical Information Systems (GIS).

CPMA provides:

- Text Reports on a per CPME basis of all transmissions received.
- Trend analysis for each parameter measured at specific location. Series of graphic reports, one for each parameter measured, showing value vs time.
- Performance effectiveness of CP System. Graphic presentation of value vs distance along the pipeline for each parameter for a specific instance in time.
- Command function for polling of data. Flexible data polling and command functions for remote control will be implemented in a future release.
- Summary CP System status and alarm presentation.
- Data export function (SQL) for uploading to another database for short term solution interface solution for integrating into existing applications.
- Satamatics CP Monitoring Messaging API (messaging format)

Existing users of remote CP monitoring may have already some form of data analysis and presentation. This could be an in house developed proprietary system or a sophisticated bought in asset management system tied into the SCADA system.

In such a case, it is only necessary to establish a communications interface between Satamatics and the Users existing application servers. The interface for passing transmissions between Satamatics Messaging Handling System (MHS) and Users application server is defined. This interface can be put in place by an experienced communications software engineer in less than a day.

In addition, the format for the data received from and the commands sent to CPME is specified in an API document that is being drafted. It is expected that the User will institute the necessary format conversions to conform with the Users application server/database.

SATAMATICS OIL & GAS SERVICES

The Cathodic Protection Monitoring Service is just one of the wide range of *Micro-Telemetry* services and applications for the oil and gas industry available from Satamatics:

- Gas compressor vibration monitoring
- Storage tank level monitoring
- Process flow monitoring
- Valve, timer and motor control
- Pressure and temperature gauging
- Seismic and terrain movement monitoring
- Pipeline pigging – fault location
- Chemical skid monitoring