Integrated Remote System for Monitoring Point Machines

Rationalize preventive maintenance and reduce costs
Background & Introduction:

Traditional monitoring is currently being reinvented to meet today’s more stringent safety requirements and quality standards. Modern monitoring processes must include not only the capacity to receive data on critical points of the process or service chain, but also the possibility of predict potential problems that might jeopardize a system’s operation or even the physical safety of the people around it. It is within this context that Thinking Forward XXI designed its TFSIM system with the aim of providing a support tool for the maintenance of electric motors and their associated parts.

In 2005 TMB (Transports Metropolitans de Barcelona), and the UPC (Polytechnic University of Catalonia) signed a collaboration agreement to develop a monitoring system for point machines.

Once the functionality, robustness and non-interference of the prototype were validated TMB and UPC jointly registered a patent of the technology in 2009. In order to install and use “the invention”, it was necessary to industrialize the prototype, in order to:

▶️ In 2010 TMB and UPC signed an agreement for transfer of commercial rights of the patent to “Thinking Forward XXI”.
▶️ ”Thinking Forward XXI S.L.” is a company created as a spin-off of the UPC and it was set up by the engineers who developed the prototype.
▶️ ”Thinking Forward XXI”, industrializes the prototype and consolidates all the features. They also made the development of the necessary drivers for the other point machine technologies.

Thinking Forward XXI is today a consolidated company with more than a 30% of his income dedicated to the investigation and development areas. Thinking Forward XXI SL continues to conduct R&D both to adapt its current system to different markets and technologies and to create new predictive maintenance systems.

Key Features:

Prevent breakdowns: Because of the critical nature of the point machines and its relationship with the safety of trains and the impact on the service when there is a breakdown it’s very important to anticipate the failures of engines that come to certain conditions of behaviour. TFSIM is able to do this, so the technical team can do the maintenance works or change of engine in advance to a real breakdown of service.
The prevision of Thinking Forward is that with a TFSIM implantation of 100% in the rail network, the times of breakdowns can be reduced in about 65%. The experience in one real rail network demonstrates that with a TFSIM implantation of 50% in the rail network, the times of breakdowns are reduced in 45%.

**Predict failures**: Possibility to predict failures by monitoring the parameters degradation in several graphics.

The experience in one real rail network demonstrates that with a TFSIM implantation of 50% in the rail network, the reliability has been improved in 40%.

**Error diagnose**: Too often it has been difficult to determine the reason of a sudden and occasional breakdown of an engine, generating unnecessary actions and don’t avoiding the repetition of the problem. With TFSIM is possible to determine the causes and therefore solve the problem with less time and with the security of not reproduce it.

**Rationalize maintenance**: TFSIM monitors different parameters of point machines in real-time, and reports alarms in case of change of operating conditions and parameter degradation so it’s possible to adjust the preventive maintenance activity to the real needs.

**Optimize energy resources**: With TFSIM we are able to detect extra power needs by the engine and therefore do some changes to the clutch parameters and improve the total energy consumption.

**Architecture of the system**

- **Control Center**
- **TFClient**
- **TFServer**
- **ECON**
- **DAEN**

Control Center and Signalling

Communication using a VLAN of the general purpose Customer

2 wire communication through wires not used in the...
The TFSIM system has two main components, the DAEN/SPDR and the ECON. Together these devices create a network for the collection and concentration of data, which are then analysed, stored in a database using the TFServer, and displayed via TFClient, a user interface that can be accessed remotely from any Web-Enabled device. The tool can be used in all kinds of point machines independently of its manufacturer. The solution uses existing infrastructure, avoiding having to install more cables, optical fibre etc.

DAEN/SPDR

The DAEN/SPDR is a device for collecting and processing environmental, mechanical and electrical data on railway point machines and their components.

Among other parameters it records:

- The status of the detector blades, providing readings with a resolution of 0.1 mm
- Voltage
- Motor current
- Power consumption
- Operation time (Duration of the movement manoeuvre)
- Humidity, presence of water inside machine
- Grade of adjustment of the device which checks the position of the switch rails
- Temperature
- Vibration

ECON

The system TFSIM uses a device called ECON, capable of gathering information of 32 different machines. He takes charge of the concentration of information and his later sending to the TFSERVER in order that this one transmits them to the database, as well as of supplying energy to the different modules of acquisition.

User Interface (TFServer & TFClient)

TFSIM measures key parameters related to the performance of switch machines and turnouts in real time at every movement. Intelligent analysis of the data collected allows the system to identify deterioration in condition before a failure occurs. This provides a vital time-frame in which maintenance work can be scheduled to restore performance.

TFServer receives remote information from multiple data acquisition units and stores this in a database. All incoming data is analyzed to determine asset condition and alarms announced accordingly. Remote users can access the TFClient server using a simple browser style interface on a variety of internet enabled devices.

Information is presented using point machines schemes moving in real time, and position indicators to show the source of alarms, and powerful graphical analysis tools allow users to investigate the root cause. TFSIM allows anomalous behavior to be identified quickly, without the need for expert ‘tuning’.
Alarm management and Graphical analysis:

For Point Machine Monitoring, one of the key features of the TFSIM software is the possibility to register all principal and specific parameters corresponding to each type of engine. On the basis of the established parameters, alarms are generated when one of them approaches critical values of functioning.

TFClient also is able to generate reports and graphs in order to be able to follow the evolution of the engine parameters and its right function. It can show the most relevant graphs for every type of engine as well as introduce a range of dates to be able to visualize the historical data of behavior and extract conclusions for future maintenance actions.

Contact:
Thinking Forward XXI S.L.
c/Degà Bahí 62 Local
08026 Barcelona (SPAIN)
T: +34 938 023 379
www.tfxxi.com
info@tfxxi.com