Points Condition Monitoring

A flexible and intelligent solution to maximise availability and reduce costs...

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The Business case for monitoring points...

Points Condition Monitoring (PCM) 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.

In head to head trials to compare system performance and accuracy, the CDSRail PCM system has consistently outperformed other products both in terms of earlier warning of failure and reliable alarm information. Key references are available from railways where these systems have assisted a targeted approach to fault finding and maintenance by offering qualified information regarding asset deterioration.

PCM architecture...

CDSRail employ a modular, integrated architecture for all applications, using common hardware and software components and believe in providing customers with the skills & tools to generate targeted information on asset health and performance. All hardware and software can be owned by the customer and operate within secure railway networks. In general, a monitoring system comprises of the following elements:

Sensors
Are installed in the infrastructure, often inside the signalling equipment cabinet or building to non-invasively measure key parameters relating to asset condition and performance – for example, switch machine motor current, relay status, or power supply voltage.

Data Acquisition
This hardware is installed in the infrastructure (e.g. Signalling equipment room) and records real time measurements from the sensors. Information is stored locally and can be communicated remotely via a number of methods – including wireless data connection or fixed network. CDSRail design and manufacture their own range of data acquisition solutions, specific for railway applications which is a key factor in successful project delivery and the ability to respond to customer driven developments.
CDSRail Point Condition Monitoring:
A flexible and intelligent solution to maximise availability and reduce costs...

Typical Area overview screen has simple traffic light indicators to show the health of each site

Database server & client software
The server receives remote information from multiple data acquisition units and stores this in a database. All incoming data is analysed to determine asset condition and alarms announced accordingly – including SMS or Email alerts if required. Remote users can access the CDSRail server using a simple browser style interface on a variety of internet enabled devices. Information is presented using efficient traffic light style indicators to show the source of alarms, and powerful graphical analysis tools allow users to investigate the root cause.

Modular system – allows new assets or applications to be added at any time

PCM Parameters...
A key strength of the CDSRail proposition is its flexibility. With Points Monitoring, customers first select the level of monitoring they wish to apply; PCM ‘Lite’ measures switch machine motor current and timing, and a typical system is contained entirely in the signalling equipment room, PCM ‘Advanced’ can include options for force, hydraulic pressure and other measurements, but generally requires sensors and data acquisition equipment to be installed trackside.

PCM Lite

- Motor Current
- Operation time
- Ambient temperature

The most cost effective form of Point Monitoring uses analysis of the switch machine motor current and operation time to identify faults and anomalous behaviour. Motor current is measured non-invasively using a Hall Effect sensor which requires no electrical connection to the signalling system, ambient temperature is also logged. For PCM Lite, all equipment is installed into a relay room or equipment case meaning that no track access is required. Other measurements available at the same location such as supply voltage or spare relay contacts can be easily incorporated into the PCM system.
PCM Advanced

- Motor Current
- Operation time
- Ambient temperature
- Operating Force
- Hydraulic pressure
- Rail temperature
- + Many others

For Electro Mechanical switch machines, analysis of the motor current can reliably detect a high proportion of failure modes. However for Electro hydraulic machines where the motor drives a pump, and is effectively decoupled from the turnout, a more detailed view can sometimes be gained from measuring the operating force or hydraulic pressure.

To measure operating force, an electronic ‘Load-pin’ replaces the existing link pin in the drive rod.

The relevance of these advanced monitoring parameters is dependent on switch machine and turnout type and in most circumstances a track possession is required to fit the sensors. Advanced systems are generally only specified where the additional cost can be balanced against the benefit of enhanced fault detection such as critical junctions.

Versatile hardware

For Data acquisition, CDSRail have cost effective options for centralised monitoring of a large population of assets in a small geographical area – e.g. a station equipment room using the modular Atlas Rack based data acquisition system and distributed monitoring of smaller numbers of assets over a wider area – e.g. monitoring of several key assets at each location using a compact MiniLogger unit. Customers are free to choose the hardware architecture that best suits their overall strategy.

Intelligent alarming and clear indications

To ensure that the system offers enough warning to allow safe maintenance access to be scheduled, without producing excessive false alarms CDSRail use specialist algorithms to assess any deviation in the operating characteristics of the points, and generate an alarm when these move outside of a knowledge based reference.

This allows anomalous behaviour to be identified quickly, without the need for expert ‘tuning’. In comparative trials, held by leading rail operators, these techniques have proven to offer significant additional warning, and can identify small changes in condition, which are
likely to be overlooked by basic methods of detection.

Site Overview shows immediately which assets are in alarm.

Alarms are presented using a simple traffic light principle, at log on, monitoring sites where an alarm has occurred are highlighted as red, whilst those operating correctly are green. A site overview screen then shows which points which have generated alarms, and from here the operator can click through to a diagnostic screen for each point end, which shows the movements that have caused the alarm and links to a graphical profile viewer for more detailed analysis.

Diagnostic screen shows detailed statistics for each swing

Powerful graphical analysis

For Points Condition Monitoring, one of the key features of the CDSRail software is the profile viewer, which allows data recorded by the system to be plotted against time for detailed analysis. Multiple profiles can be precisely time-aligned and viewed on a common graph for comparison.

Unlike some similar systems, all graphical information is presented in a data rich format which captures all measurement points and allows users to quickly zoom in to an area of interest, changing the axis scaling to show more detail.

To assist fault diagnosis, the monitoring system separates each profile into a number of segments that indicate at which stage in the point movement an unusual characteristic has been found.

Profile viewer tool – allows users to precisely overlay data for comparison and zoom into areas of interest

Flexible trial options

For rail organisations new to condition monitoring, a small trial project, when managed effectively, will inform the strategy of the organisation for implementing asset monitoring on a wider scale and provide positive evidence on which the business case can be built.

CDSRail have a range of flexible options to enable customers to trial proven systems cost effectively and extensive experience in establishing and professionally managing asset monitoring trials. Success is achieved through a structured approach to project delivery and supporting clients throughout the trial to ensure optimal use of the system and maximum benefit.
CDSRail Asset monitoring checklist

<table>
<thead>
<tr>
<th>Supplier</th>
<th>System</th>
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<tbody>
<tr>
<td><strong>The ability to deliver...</strong></td>
<td></td>
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<tr>
<td>CDSRail have an excellent record for delivering condition monitoring projects on time and budget, with references from leading railways</td>
<td>Modular...</td>
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<tr>
<td>CDSRail offer equipment that is both modular and scalable to accommodate anything from a single point end or track circuit to hundreds in a single location.</td>
<td></td>
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<tr>
<td><strong>Ongoing development...</strong></td>
<td>Configurable...</td>
</tr>
<tr>
<td>CDSRail have the skills and resource to support expansion and development and offer clients effective training &amp; support tools</td>
<td>Using intuitive configuration tools customers can rapidly add new assets or monitoring modules with no loss of data.</td>
</tr>
<tr>
<td><strong>Putting customers in Control...</strong></td>
<td>Flexible...</td>
</tr>
<tr>
<td>CDSRail can deploy the central server into the client organisation and provide tools and training to enable the client to extend and configure their system independently.</td>
<td>CDSRail systems cover multiple applications, and include rack based and MiniLogger hardware options.</td>
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<tr>
<td><strong>Technical Support...</strong></td>
<td>Proven...</td>
</tr>
<tr>
<td>CDSRail operate a dedicated helpdesk and offer a full spares/warranty service</td>
<td>CDSRail solutions are in operational use with leading rail organisations around the world.</td>
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