

Sensornet's Dynamic Cable Rating (DCR) system provides system coverage at all points along your transmission and distribution cable circuits ensuring increased integrity and performance for the entire network.

## DCR outputs

- Conductor Temperature Calculation
- Real Time Thermal Rating
- Offline Prediction & Cable Rating
- Alerts in the event of hotspot/fire
- Seamless system integration (e.g. SCADA, ventilation control, electrical relay)

## CLOSE THE MONITORING GAP

With conventional technology there is a gap between what the operator believes is occurring in the network and what is actually happening. This can result in reduced asset lifetime, or in severe cases cause system failures such as hot spots, fire, or insulation breakdown. Sensornet's revolutionary technology overcomes the limitations of measurement technologies available today thus closing the monitoring gap and improving system integrity and safety.

## MONITORING GAP

Offline cable rating solutions are based on static models and cannot take into account changing environmental conditions (e.g. soil thermal resistivity, change in ambient temperature).

In the event you need to increase load in emergency situations or system maintenance, you are not able to actively measure if the cable rating is being exceeded.

Conventional DTS technology can not offer the temperature resolution required for dynamic cable rating at long distances (e.g. > 5km).

## SENSORNET DCR SOLUTION

Continuously monitors all points along the network, providing real time temperature measurement and dynamic thermal rating calculations.

Sensornet cable rating calculates conductor temperature at all points along the cable and can predict cable ratings over a 48 hour period.

The Sentinel DTS can measure with a resolution of better than 1°C at 30km in less than 1 minute (or <0.1°C at 30km in 1 hour).

# DYNAMIC CABLE RATING – SPECIFICATIONS

## BENEFITS OF DYNAMIC CABLE RATING

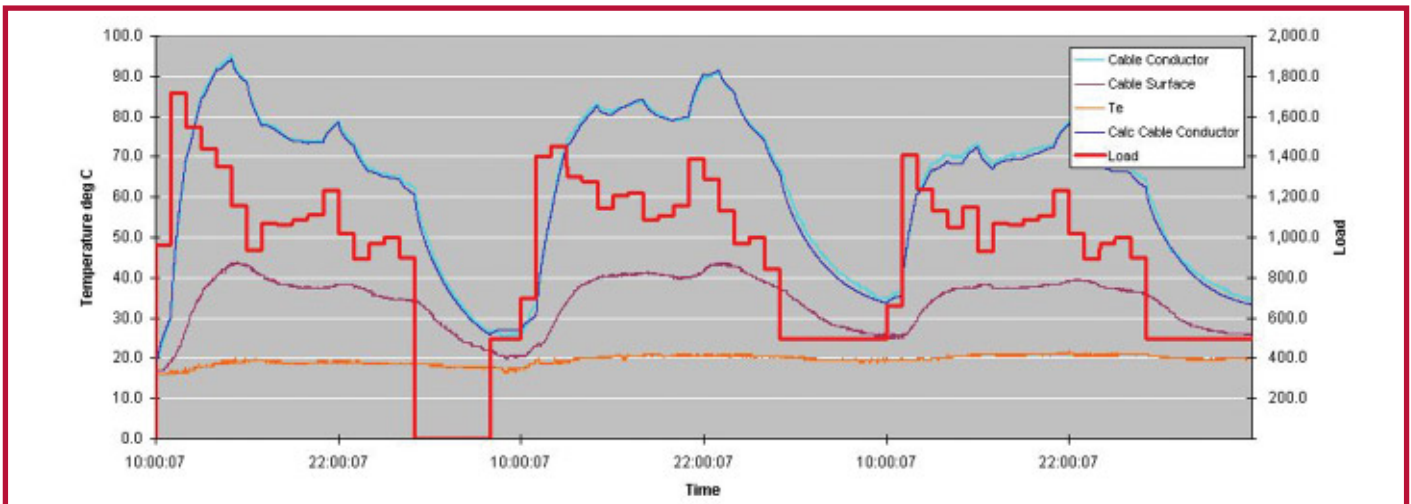
The Sensornet DCR provides benefits at all levels of the organisation, from the operational level to asset management.

### Benefits to Asset Manager

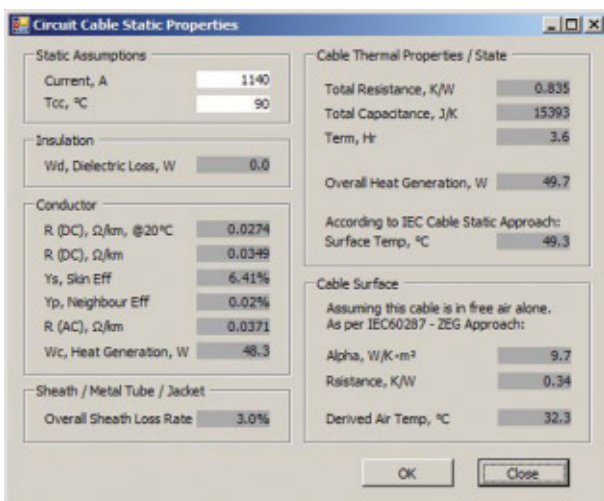
- Improve safety of infrastructure and for personnel
- Enhance system reliability
- Increase capacity of system
- Improved asset lifetime management

### Benefits at Operational Level

- Early warning detection of hotspot, fire detection in tunnels.
- In the event a minor fault develops, preventative maintenance action can be taken prior to failure. All points are being monitored and so there is complete integrity.
- During peak loading conditions the network can be run closer to the true cable ratings safely and with less risk of exceeding ratings.
- In the event cable rating are exceeded for short durations this will be monitored and can be used in asset lifetime calculations.



Validation test results



DCR image for cable static properties

## THERMAL MODEL

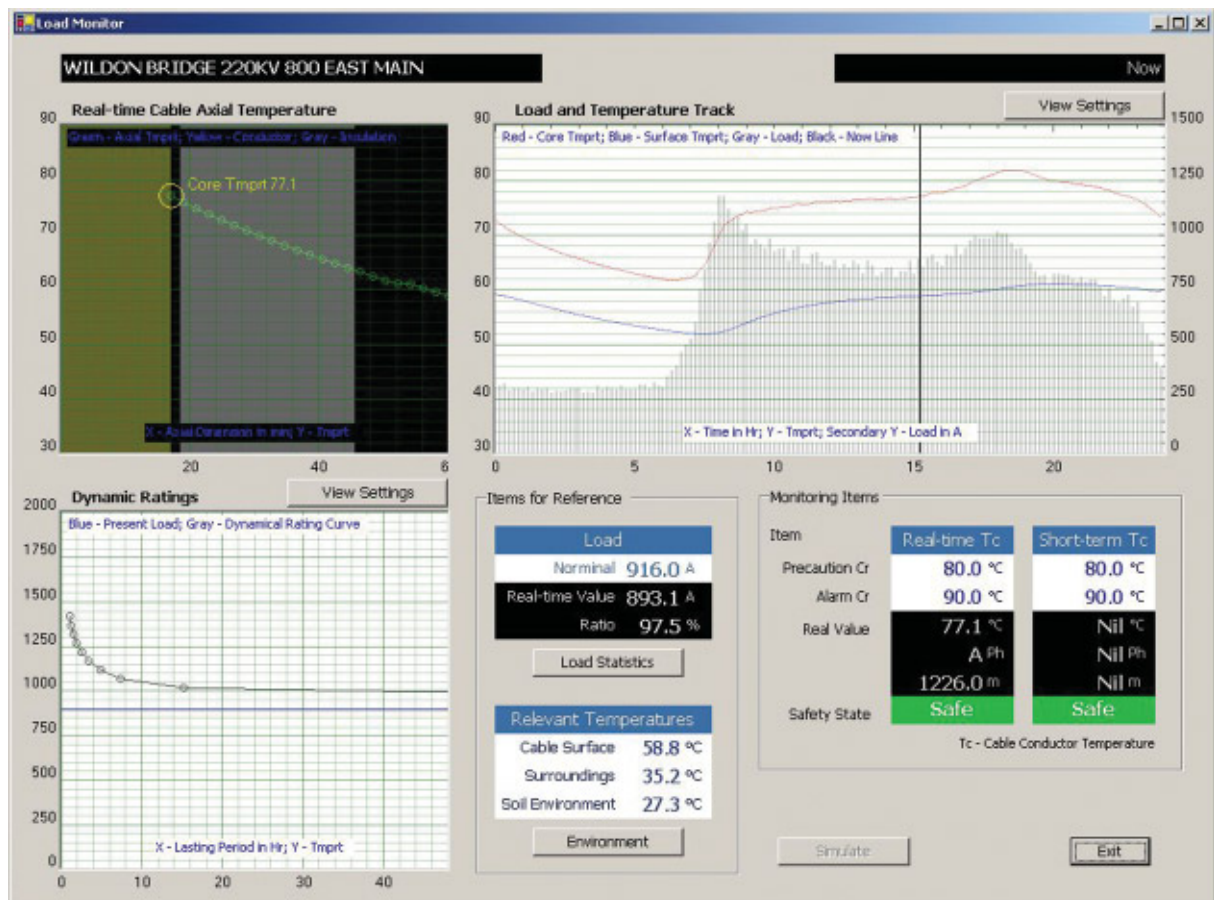
The thermal model used in the Sensornet DCR is designed in conjunction with leading experts in the field of cable rating. The model comprises algorithms compliant with the IEC60853 & IEC60287 standards and additionally incorporates much of the development carried out by CIGRE working group. The model has been validated in a laboratory testing regime (results available on request).

The DCR is extremely flexible and different algorithms can be utilised according to the specific environment taking into account:

- Differing cable constructions and sizes
- Cable configuration (e.g. trefoil, flat formation)
- Sensing cable integrated into power cable
- Sensing cable installed on outer surface
- Cable environment (buried, tunnels & culverts)

The user interface is extremely versatile and user friendly and it is very simple to adjust the parameters according to different cable types and changing conditions.

# DYNAMIC CABLE RATING – SPECIFICATIONS



Sample DCR screenshot

## REAL TIME THERMAL RATING

The cable route can be divided up into the required number of zones according to the cable environment such as differing depth of burial, variation in backfill. A real-time thermal model for each cable zone runs continuously providing calculated values for the conductor temperature and temperature in the vicinity of the cable (e.g. soil temperature).

These real-time thermal models provide the input for ratings calculations. These calculations can be initiated by a user request or generated automatically according to predefined schedule and used to populate system ratings databases.

As standard the following rating calculations will be output but can be customised according to your specifications:

- 24 hours
- 6 hours
- 20 minutes
- 3 minutes

## OFFLINE RATING CALCULATIONS

In addition to the online real time thermal rating, the cable rating prediction algorithm can be used offline to help you plan the operating procedures effectively (e.g. during cable maintenance where there can be increased load) without risk of exceeding the cable ratings.

## HOTSPOT DETECTION, FIRE ALERTS AND VENTILATION CONTROL

In the event of a hotspot or fire along the cable path, the DCR will detect this in real time and will communicate this to the control system, so that the appropriate action can be taken immediately (e.g. evacuation of tunnel, shutdown ventilation in appropriate section) before any substantial damage to equipment or personnel occurs.

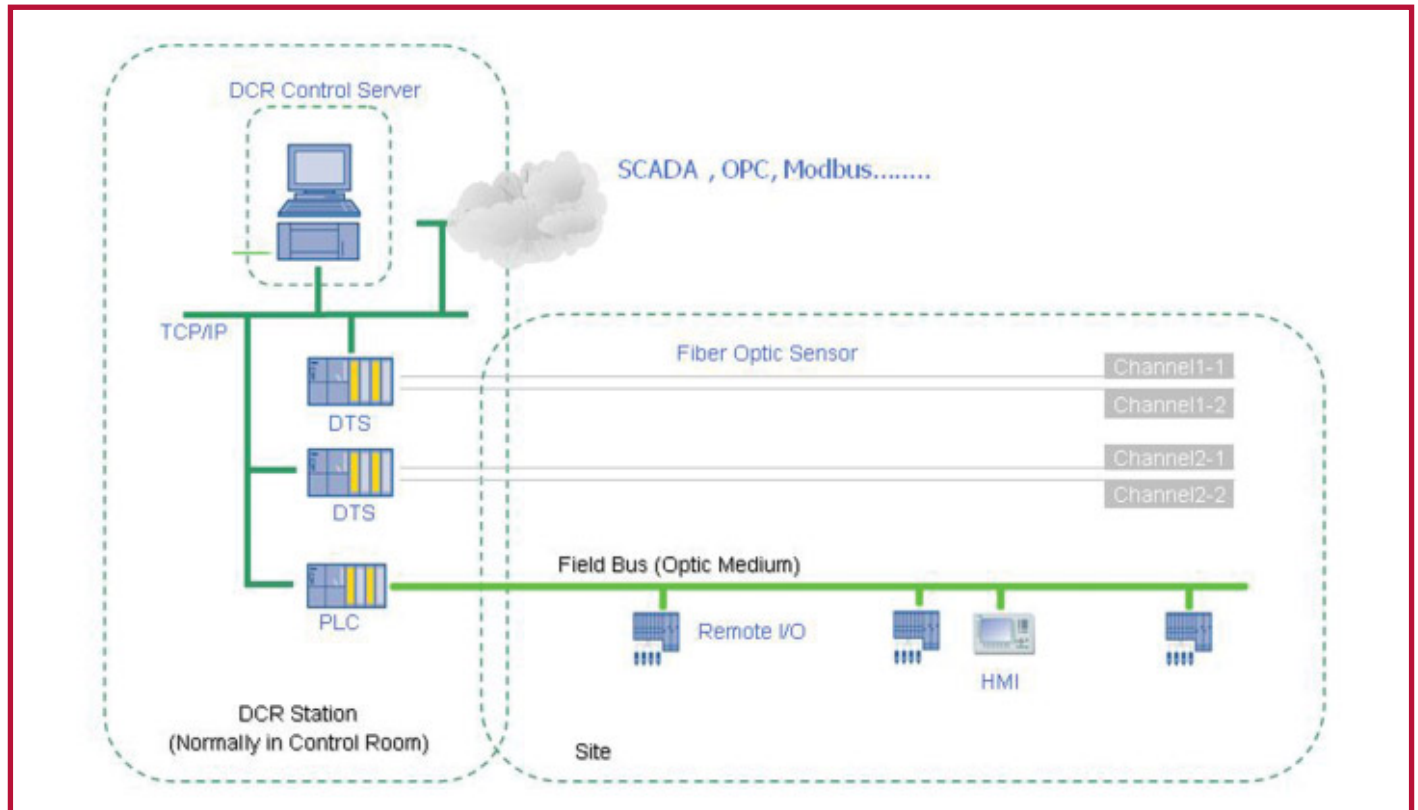
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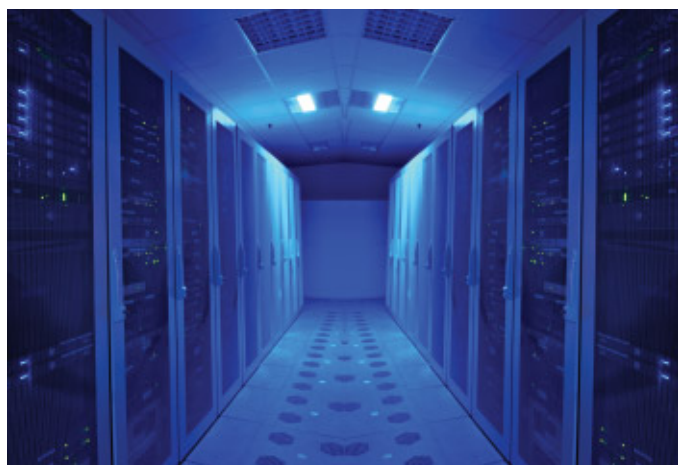
## SYSTEM INTEGRATION AND DATA MANAGEMENT

The Sensornet DCR is designed to integrate seamlessly with existing industrial control systems, providing a fully automated industrial monitoring solution. Currently supported protocols include Modbus, OPC, RS232, and electrical relays. Sensornet can also customise the solution according to your needs.

The DCR system has an onboard database and historical data management which is configured through the user interface according to your needs, allowing you to analyse historical trends and utilise data for asset lifetime calculations.



System Integration



### System Specifications

Maximum Cable Coverage	200km (using multiplexer)
Max no. of DTS systems per DCR	10
Longest Continuous Range	30km
Temperature Resolution	< 0.1°C (see DTS spec sheet for more details)
Spatial Resolution	From 1m
Measurement Time	From 30 seconds
Data Output	Modbus, OPC, Relay Contacts

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