



Thermal imaging cameras monitor overhead lines in Delhi metro railways

The FLIR E50 thermal imaging camera is an extremely versatile tool that can be used for a multitude of different applications.

Every day millions of commuters use the metros of Delhi. The Delhi Metro Rail Corporation (DMRC) sees to it that they are all arriving timely on their destination. Being service oriented and caring about their customers: that is what DMRC is all about. In order to keep the metro network up and running at all times, DMRC is using FLIR thermal imaging cameras.

The Delhi Metro is a rapid transit system serving Delhi, Gurgaon, Noida and Ghaziabad in the National Capital Region of India. The network consists of seven lines with a total length of 189.63 kilometers with 142 stations of which 35 are underground. It has a combination of elevated, at-grade and underground lines and uses both broad gauge and standard gauge rolling stock. The Delhi Metro is built and operated by the Delhi Metro Rail Corporation Limited (DMRC). The metro has an average daily ridership of 1.8 million commuters and the DMRC operates around 2,700 trips daily between 6:00 and 23:00 running with an interval of 2 minutes 30 seconds between trains at peak frequency.

Predictive maintenance using thermal imaging

This large and intensely used network needs to be maintained well, to prevent the network to be worn due to the intense use, causing mayhem for millions of commuters. That is why the maintenance crews were already using thermal imaging cameras as part of the predictive maintenance program. Generally speaking all electronic equipment and components heat up before they break down. These potential problems will be clearly shown in a thermal image. By detecting this rise in temperature in an early stage using FLIR thermal imaging cameras, the maintenance crews can plan repairs and prevent costly failures and downtime. To that end all components of



Early detection of rises in temperature helps DMRC to prevent costly failures and downtime.





What is a section insulator?

Section insulators are used on the overhead lines system (catenary structure) of railways to electrically isolate and separate sections for maintenance without having to turn off the entire system. The overhead line system is broken into electrically separated portions known as sections. Section insulators are also used extensively on change overs and can be used in conjunction to isolate sections in separate phases being fed by different feeder substations.

the railway network are regularly inspected by maintenance crews using a FLIR E50 thermal imaging camera. These periodic inspections play a crucial part in the DMRC's preventive maintenance program.

Installation of a thermal imaging camera

When recently problems occurred in the metro railway network, which caused huge delays, DMRC suspected the problem was caused by the section insulators. The DMRC maintenance crew therefore installed one of their FLIR E50 thermal imaging cameras in an IP66 rated protective enclosure with Germanium infrared window to monitor the problematic section for an entire work day. Protected from adverse weather conditions by the protective enclosure the FLIR E50 thermal imaging camera was able to safely record the infrared radiation emitted by the section insulators and provide thermal

images with each pixel corresponding to a non-contact temperature measurement.

The Composite Video Out of the FLIR E50 thermal imaging camera was linked to a Digital Video Recorder (DVR) with capacity of one Terabyte in order to record the data. After monitoring the section insulators for an hour the system writes a video file. These hourly video files were used to correlate temporary rises in temperature with the time of day, network load and other factors to determine the cause of the problem.

Causes found in thermal data

The installation of the protective enclosure with thermal imaging camera and DVR was done by FLIR products distributor M/s NNK International and DMRC staff. They performed the installation during the night to prevent hindrance to the metro users.

Tests were conducted at sites where the problems were severe and the results were recorded during the instances when the pantograph passes the section insulators. It was observed that factors like system load and environmental conditions played a big role in the deterioration of the section insulators. To further attribute the problem the thermal imaging camera was used to monitor the instances when the temperature of the section insulators went above a previously set threshold.

Careful analysis of the thermal data has allowed the DMRC to take the appropriate action. This thermal information has also helped DMRC to check the redundancy of its system during different weather and loading conditions for ensuring better services to its commuters.



The FLIR E50 thermal imaging camera is installed in an IP66 rated enclosure.

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