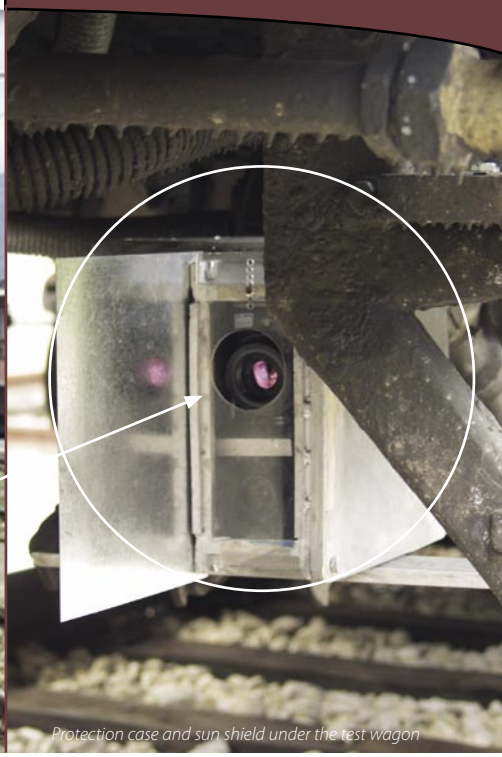
FLIR APPLICATION STORY

FLIR Systems ThermaCAM™ E-series



Protection case and sun shield under the test wagon

Opening up the Corridor: Serbian Railways use FLIR Systems E-series camera for maintenance and inspection of passenger wagons wheel parts

The Serbian national railroad company, uses infrared thermography to keep network power supply and signalization up and running, and to inspect brakes and bearings of locomotives and wagons.

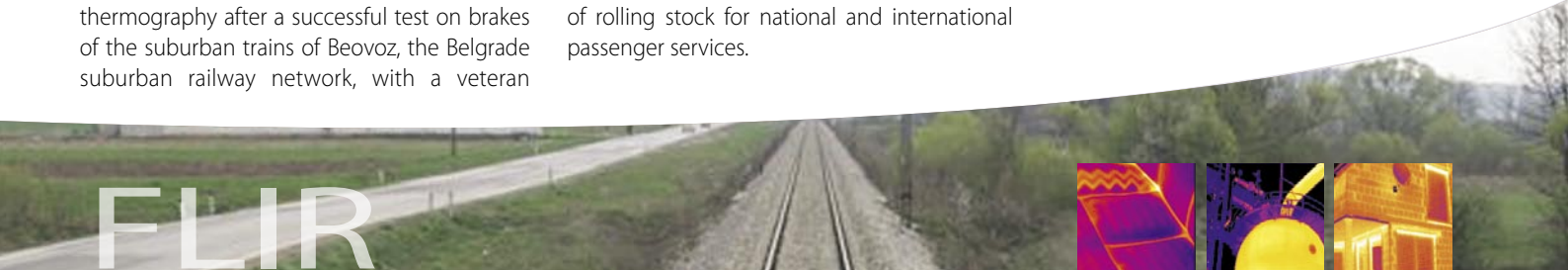
The "Pan European Rail Corridor 10" is an important railroad linking Germany and Austria to the South Slavic countries, Greece and Turkey (see map). It makes up a large part of the legendary Orient Express route. The rebirth of "corridor 10" prompted Serbian Railways (ŽS) to implement huge investment programs for maintenance and renovation of its rail infrastructure and rolling stock.

Serbian Railways acquired a FLIR Systems ThermaCAM E-series camera mainly for inspection of its electrical installations and signalization, a standard application for this camera model in the railway business. The railway company became convinced of infrared thermography after a successful test on brakes of the suburban trains of Beovoz, the Belgrade suburban railway network, with a veteran AGEMA 900 infrared camera delivered by the local FLIR Systems distributor.

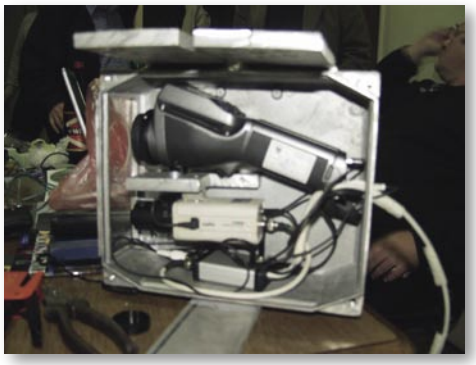
New maintenance application

The Serbian Railways maintenance engineers were soon faced with problems of another kind: passenger wagons bearings suffered from persistent oil leaks. Moreover, they started to leak again after repair and a certain amount of duty time. It became clear that the leaking had nothing to do with the type of lubricant used. And classic chemical, mechanical and linkage tests did not contribute to resolve the problem. The leak issue became quickly acute due to safety concerns in view of the rising traffic on the Serbian tracks and hence the intensive use of rolling stock for national and international passenger services.

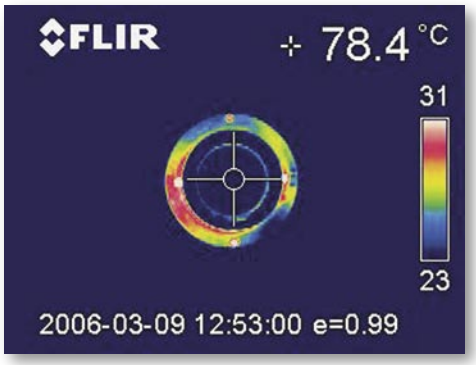
Bearings on FAG FE9 test bed, ThermaCAM E-series linked to laptop



The ŽS experts chose infrared thermography as the most suitable non-destructive testing method, able to measure and visualize temperature developments over entire surfaces and over a defined amount of time. A set of bearings, lubricated with the same greases, was tested on a specific (FAG FE9) test rig for roller bearings lubricants. The test showed considerable differences in the heating behavior of the used and new bearings. But it became clear that the bearing had to be tested in real operational conditions to obtain convincing data on the leak origins.



Field test setup: ThermaCAM E-series in housing



Heat development of new and old bearing, showing increased heat on outer ring

Finding leak origins

The ŽS, the Belgrade-based Goša Research Institute and lubricant manufacturers joined forces to set up a relevant test procedure. The buildup consisted of the FLIR E-series camera placed in a protection housing together with a CCD visual camera and linked to a mileage counter and a data acquisition system. The housing was then mounted under a test wagon. With a video output and an image frequency of up to 50 Hz, the ThermaCAM E-series infrared camera was able to scan the temperature of a bearing in operation.

The technicians conducted two-day testing on a 360 km long track with numerous stops. Rising temperatures in the bearings during service gave way to changes in the physical condition and viscosity of the grease. The hot zones, caused by mechanical overloading in the system, led to the oil leaks.

The test findings enabled ŽS to adjust the maintenance procedure of its passenger wagons and to make it more environmental-friendly: overall, wagon rejection due to grease problems has been diminished by factor four while the quantities of grease used could be considerably reduced.

Generating five-digit savings

"Infrared thermography has been the most effective and efficient way to find and remove the causes for the bearing problem", says Dragan Jankovic, project leader and then Assistant Director of Supply Department of Serbian Railways: "the tests on the bench, followed by the test in operation, showed us that bearings which had been endured to high loads during a longer period, generated two times more heat during the tests than new bearings, and directed us to find the reasons for the behavior of the bearings in an inadequate service." But it has also been an efficient test, he adds: "based on a wagon maintenance day average cost of EUR 400, we estimate our savings at more than EUR 100,000 per year, or 270 less rejected wagons, following the critical period one year ago."

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Thermogram of the bearing during field test

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