



## 'The next inspector is the customer'

FLIR thermal imaging cameras in automotive quality control

*"FLIR has been providing thermal imaging cameras for thermal inspection to the BMW plant in Dingolfing since 1997," explains Robert Halbritter of FLIR Systems' sales partner and integrator, TOPA GmbH. For most of the time, BMW has primarily used the cameras for electro-thermography of switch cabinets and rooms. Hot components indicated a problem and were then replaced. This is still the case today. But now BMW is using FLIR thermal imaging cameras for quality control too.*

New vehicles are subjected to a number of individual and automated quality control measures including analysis in one of ten separate roller dynamometers. Basic functions from signal horn to engine-specific performance are thoroughly tested, as is the BMW Night Vision System, based on a FLIR detector. The entire process just takes a few minutes, during which each correct function has to be confirmed either automatically or by an inspector who sits in the vehicle monitoring displayed inspection data.

The tests vary in both type and duration according to the specification of each model and are programmed to be conducted in an automated sequence.

### Simple, fast and reliable testing

Whilst cost- and time-efficient testing is the common goal, identifying the optimum procedure for each inspection task needs individual consideration. This is the case, for example, when testing the exhaust flaps on the dual exhaust system. Twin tail pipes are a feature of the high performance BMW vehicles with large, 8-cylinder engines. On the BMW M5 model the requirement is different again, as the exhaust flap on the second tailpipe is only activated at a specified RPM.

The reason for this may be at first surprising as it's all about acoustic design but the sound of a powerful engine should be impressive. Therefore a BMW M5 only



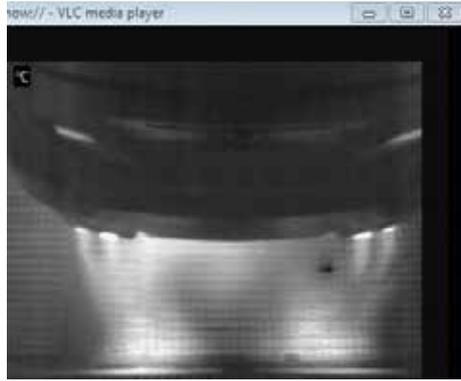
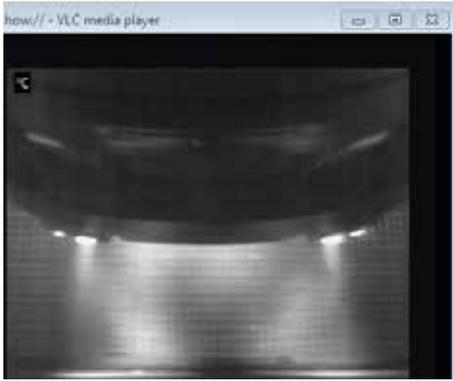
A central solution: TOPA installed a FLIR A310 with 45° wide-angle lenses in each of 10 dynamometers.



A sublime motto: 'Remember! The next inspector is the customer!'

opens the second tailpipe exhaust flap when it is really needed. Of course this feature has to be inspected which is more complicated than it appears at first glance.





Thermal images of the rear end view. Visible on the left: the exhaust flaps open at a higher rpm.

To check the efficiency of this operation thermal imaging cameras – a different brand to FLIR - were initially specified for each dynamometer rig. Their purpose was to visualise the thermal profile of the respective tailpipes in the dual pipe exhaust system.

### FLIR checks exhaust flow

Each system comprised two thermal imaging cameras, mounted to inspect the left and right tail pipes from above and the side. The solution was not only expensive to buy but costs also increased with time as the cameras required frequent repair. After eight years the viability of a new system was therefore evaluated.

Robert Halbritter of FLIR Systems' sales partner and integrator TOPA GmbH, offered a very attractive solution that would halve the cost of new camera hardware. He recommended the use of a single, fix-mounted FLIR A310 with a 45° lens for each dynamometer. The advantage: that which was previously inspected using two cameras mounted on the sides could now be visualised using a single centrally positioned FLIR camera.

This is possible as the field of view of the FLIR A310 with 45° wide-angle lens is capable of showing the entire end of the vehicle from a distance of approximately 2 metres. As a result comprehensive inspection could be conducted by just 10 cameras, one for each dynamometer, instead of the 20 units required by the previous system.

### Simple solution – huge potential

The FLIR A310 generates an analogue thermal imaging video signal with a frame rate of 30Hz. This model is particularly suited to recording exhaust flow as it is simple to integrate and provides easy access to PAL video.

Christoph Hörnlen explains: "The camera also provides multiple connection options." He is responsible for fixed thermal imaging cameras for automation applications at FLIR Systems GmbH. "The FLIR A310 has a digital output for alarms and for controlling external devices. Additionally the data can be transmitted via TCP IP or Ethernet and the FLIR A315 even supports the GigE Vision™ standard as well as the GeniCam™ protocol."

### Careful monitoring

The performance of the exhaust system is checked on a monitor in front of the vehicle which displays a thermal image. From this the inspector can see if the flap is functioning properly from changes in the thermal profile. Even though the FLIR A310 can visualise heat distribution using various colour palettes, the simplest and clearest option is used here: black and white.

The reason for this is the irregularity in air flow of the exhaust streams. A relatively high amount of air is displaced and the exhaust stream does not remain constant. The flow rate also has to be taken into consideration. These are all factors that could be visualised using a wider colour spectrum but could serve to confuse the inspector. In the final analysis all that is required of this test is confirmation that the flap is opening and closing correctly.

### Global market leader

BMW's decision to switch to the FLIR camera solution suggested by TOPA was based on the company's good reputation for quality service and post-sales support. The technical implementation of the solution also played an important role.

"We were often on site and able to support BMW with the installation and calibration of the cameras. This investment represented excellent value for money by comparison with the previous system," explains Robert Halbritter of TOPA.

The reliability of the FLIR A310 speaks for itself. The first camera systems were installed in the autumn of 2011 and have been in operation, around the clock, since then. Although they are not always needed between 23:00 hrs and 05:00 the next day, they are always on – true 24/7 operation. And although a spare FLIR 310 camera has been supplied in case an urgent replacement is required, it has never been used.

The BMW 5-Series, 6-Series and 7-Series are produced in the Dingolfing plant in Lower Bavaria. The BMW 3-Series Gran Turismo has recently been added to this product line as well. Around 18,500 people work at the site.

Contact us for further information on thermal imaging cameras and this application.

### FLIR Commercial Systems

Luxemburgstraat 2  
2321 Meer  
Belgium  
Tel. : +32 (0) 3665 5100  
Fax : +32 (0) 3303 5624  
e-mail: flir@flir.com