Automatic quality controls with FLIR A320 ensure that the cars produced at Ford Genk work perfectly

The FLIR A320 is an affordable and accurate non-contact temperature imaging and measurement tool.

FLIR A-Series thermal imaging cameras: accurate, reliable and maintenance free

The Ford Motor Company is originally an American multinational corporation as the automaker was founded by Henry Ford in June 1903. Ford introduced methods for large-scale manufacturing of cars and large-scale management of an industrial workforce using elaborately engineered manufacturing sequences typified by moving assembly lines. Henry Ford's methods came to be known around the world as Fordism by 1914.

The Ford Group is currently the second largest car producer in the U.S. and the fourth-largest in the world based on number of vehicles sold annually. Ford has 110 production facilities worldwide, spread over 25 countries. One of these production facilities is located in Belgium: Ford Genk. With its over 10,000 employees Ford Genk accounts for more than 60% of all the car production in Belgium.

Arthur Knuysen, head of the quality control department at Ford Genk, takes a look at the test results.

The programmable logic controller (PLC) compares the measurement data from the thermal imaging cameras with previously defined parameters.

Since it was founded, the Ford Group has always been looking for modern ways of working, developing new automated solutions for production issues. One of the relatively recent innovations is the addition of thermal imaging cameras from FLIR to the testing range at Ford Genk.

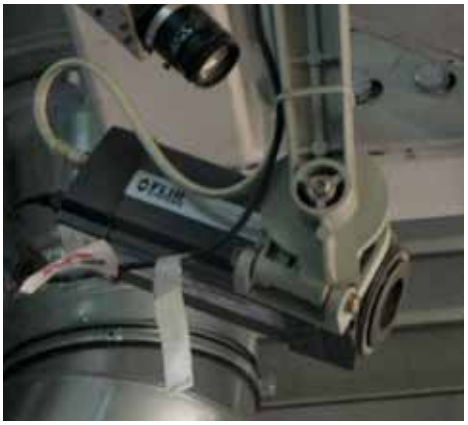
Every car is tested

"Our testing range is developed for testing many different parts of the car", explains Arthur Knuysen, head of the quality control department at Ford Genk. "The testing range includes a vibration test, a ramp test, a test to see whether the emblems are

properly located, a test for the windscreen wipers and a test for the lighting, just to name a few. For these tests eleven regular cameras and three thermal imaging cameras are used. The entire range of tests lasts about 25 seconds. Every car that leaves this factory has to undergo these tests to make sure that every car that reaches the client meets our stringent quality standards."

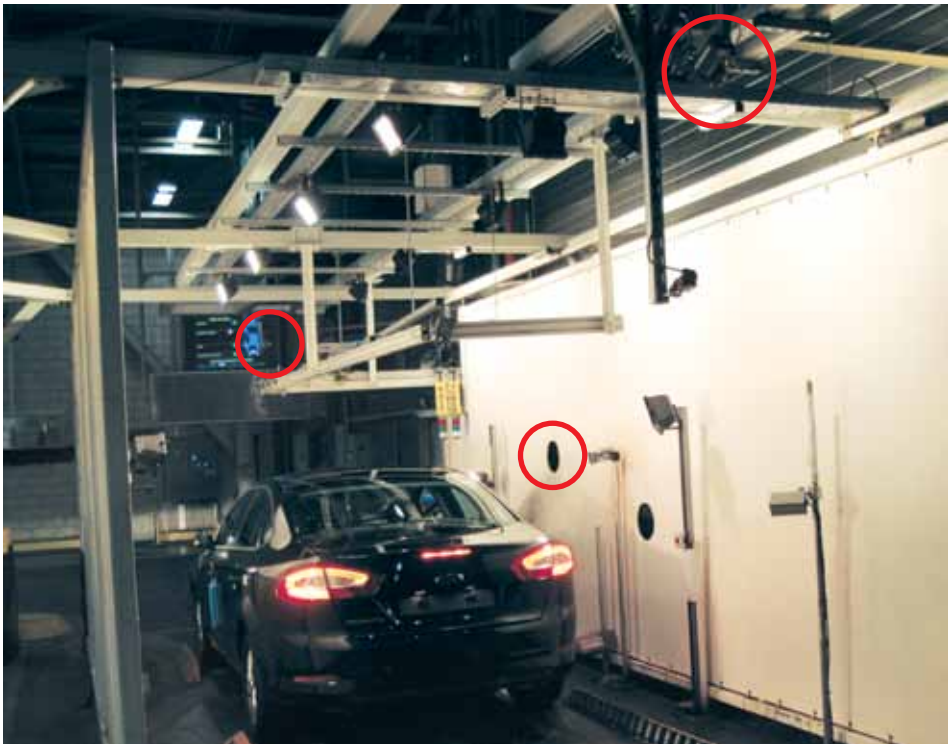
FLIR A320: affordable and accurate

The thermal imaging camera Arthur Knuysen has chosen to perform these quality tests is the FLIR A320. The FLIR A320 thermal imaging camera offers an affordable and accurate temperature measurement solution with clever built in features like analysis, alarm functionality and autonomous communication using standard protocols. The FLIR A320 camera also has all necessary features and functions to build distributed single- or multi-camera solutions utilizing standard Ethernet hardware and software protocols.



This FLIR A320 thermal imaging camera is used to check the front window heating system for defective heating elements.

For each car model that has front window heating, the heating system is a bit different, that makes it difficult to test.

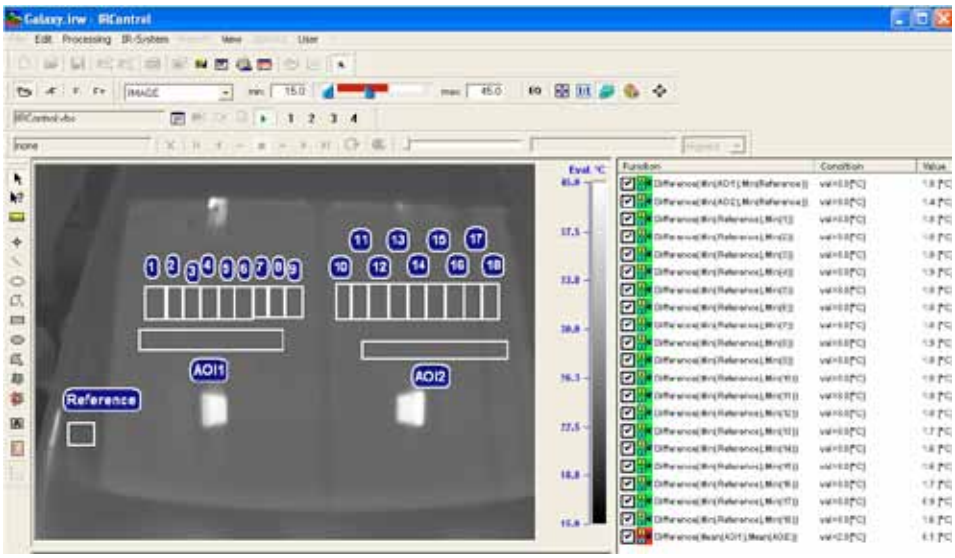


Ford Genk has three FLIR A320 thermal imaging cameras for testing the front window heating system, the rear window heating system and the air conditioning system. The locations of the thermal imaging cameras are marked in red.

Spotting subtle temperature differences

The A320 is designed to deliver accurate thermal images and repeatable temperature measurements in a wide range of automation applications. The A320 can spot subtle temperature variations thus finding and resolving problems quickly and effectively, which can save a lot of money.

"The three FLIR A320 thermal imaging cameras installed at Ford Genk test the temperatures of front window heating elements, rear window heating elements and the air conditioning vent outlet", explains Knuysen. "There's one mounted in the front of the car, pointed at the front window, another mounted behind the car to monitor the rear view window and the third is pointed at the window of the car door at the right hand side, to measure the temperature of the air conditioning vent output."



The control system Rato supplied for the rear window cannot be used here. Instead, the FLIR A320 records the maximum and minimum temperatures within the designated squares and the PLC compares these readings with previously determined parameters.

The measurement data collected by the thermal imaging cameras are sent to the programmable logic controller (PLC), which compares the measured temperatures to previously determined parameters. If the recorded data is within those parameters then the car gets the green light to proceed. A screen next to the test site will display either a red or a green sign. If a red sign is shown the car must go to the repair department. If it is green the car can proceed to the next step in the testing range.

No more human errors

The Ford company policy is to use automatic testing systems as much as possible, according to Knuysen. "Before these automatic systems were installed at Ford Genk the cars were checked by hand, but that means that the quality control is susceptible to human error. Automatic testing systems are much quicker and more reliable. FLIR thermal imaging cameras are the perfect tool for such tests, for they are accurate, reliable and maintenance free."

The thermal imaging camera behind the hole records the temperature of the air coming out of the air conditioning vent.

This FLIR A320 thermal imaging camera is used to check the air conditioning system.

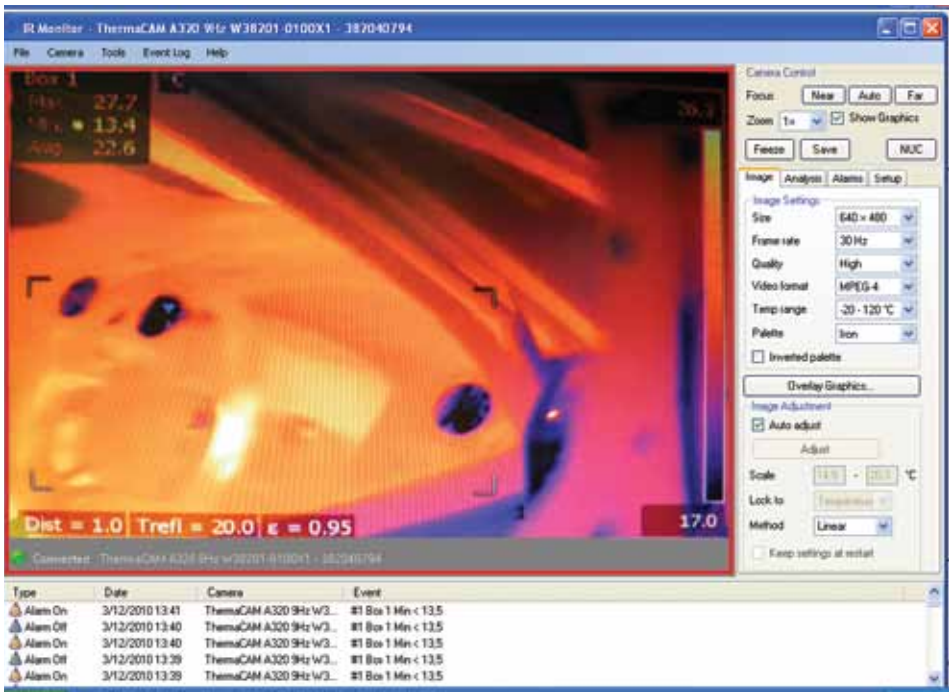
It started with the air conditioning test. "We were looking for a way to objectively test whether the air conditioning system was functioning properly, when we found that our colleagues at a Ford factory in Spain were using FLIR A-Series thermal imaging cameras for that purpose." To check the air conditioning system the test-driver opens the front right window and turns on the air conditioning at full power. The thermal imaging camera accurately records the temperature of the air emitted from the air conditioning vent and if the recorded temperatures deviate from the previously determined parameters it is sent for repair.

The screen next to the FLIR A320 thermal imaging camera that's pointed at the front shows the progress of the test.

"After we heard from the Spanish colleagues about the FLIR A-Series we contacted Rato, a FLIR distributor here in Belgium, and after some initial testing we set up the air conditioning test as it is now", continues Knuysen. "And I must say: it works perfectly! That's why we decided to expand our thermal imaging camera testing facility to the front and rear window heating systems as well."

FLIR A320: 'Quite impressive'

Knuysen was quite surprised to see how much he could do with the FLIR A320 thermal imaging cameras. "Especially the solution Rato supplied for the rear window heating test is quite impressive. They supplied us with a software solution that integrated the existing FLIR software with a



The temperature of the air coming out of the air conditioning vent that the FLIR A320 has recorded is sent to the PLC for comparison with previously determined parameters.

This FLIR A320 thermal imaging camera is used to check the rear window heating system for defective heating elements.

The test driver switches the rear heating elements on at full power.

The special software tool that Rato supplied Ford Genk with compares the temperature measurements the FLIR A320 thermal imaging camera made along the purple lines.

piece of programming code that allows us to very accurately determine whether the heating elements are working."

Using that tool the FLIR A320 thermal imaging camera records the temperatures along a vertical line. "If all the heating elements function normally then the resulting graph should follow the correct pattern. If one or more heating elements do not function properly then it will clearly show up on the graph", explains Knuysen.

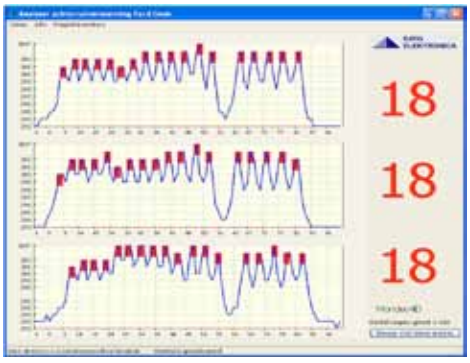
Certain quality

"Before this solution was supplied by Rato we used another system with square measurement areas instead of one vertical line. We measured the temperature for each square and if one would be below a previously set value it would be recorded as defective, but the system wasn't perfect. Due to heat dispersion in the rear window sometimes a car with one defective heating element would pass the tests.With the new method this doesn't happen anymore, so we can be completely sure that the customer receives a car that has a rear window heating system with completely functional heating elements."

Ford is one of the few car manufacturers that produce cars with heated front windows. To make sure the driver's vision isn't obstructed by the heating elements the front window contains hundreds of little vertical heating elements instead of a few big horizontal ones. But according to Knuysen that made it difficult to set up a testing method. "For every type of car we produce here at Ford Genk the front window heating elements are a little bit different. Combined with the fact that the front window heating consists of many small heating elements this means that we cannot test the front window in the same method as we use for the rear window. That's why we work with several square measurement areas. If any of those areas doesn't heat up quickly enough the front window heating system is recorded as defective."

Each car has an individual profile

The results of the tests are all simultaneously recorded in the Quality Control System (QCS) at Ford Genk. Knuysen explains: "For each car that is ordered at Ford Genk a vehicle identification number (VIN) is created. When a car enters the testing range a bar code reader records the bar code on the car and the system automatically knows which car it is. It even knows whether it has to check the front window heating, as not all car types we produce here at Ford Genk have that useful feature. As the car undergoes each test the PLC forwards the results to the QCS and all those results are recorded on one central server. Only if all the tests are passed with a positive result will the car become available."



The temperature readings result in a graph that should have exactly as many peaks as the car's rear window has heating elements. If one of these peaks is missing on the graph that indicates a defective heating element.

The FLIR A320 thermal imaging cameras are a really useful tool for quality inspections, concludes Knuysen. "It's amazing what you can detect and visualize with FLIR thermal imaging cameras. Not only are they accurate and dependable, they are also affordable and maintenance free."

For more information about thermal imaging cameras or about this application, please contact:

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