



## Thermal imaging inspections help optimize steam transport at Royal Vopak

*When transporting high volumes of hot gaseous or liquid chemicals through a network of pipes the quality of the pipework insulation is of vital importance for the system to work optimally. Both for financial and for environmental reasons heat leakage needs to be avoided at all costs. Inspections with FLIR thermal imaging cameras can help detect heat leakage so imperfect insulation can be repaired and the process can be optimized.*

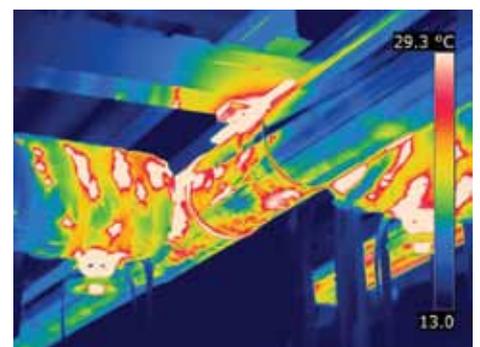
*One of the companies that realized the importance of pipework inspections with FLIR thermal imaging cameras is Royal Vopak, the world's largest provider of storage facilities for bulk liquids. At the Vopak storage facility in Vlaardingen, the Netherlands, steam is transported at 170° C through a network of pipes with a total length of over 1 kilometer. To determine the exact amount of energy loss during that transportation process Vopak hired the Dutch thermographic consultancy agency Thermografisch Adviesbureau Uden BV to do a thorough survey of the pipework insulation.*

Vopak provides storage and transportation facilities all over the world and for just about every possible type of chemical. Whether it's liquid or gaseous chemicals, oil products, petrochemicals, biofuels, vegetable oils or Liquefied Natural Gas (LNG), Vopak offers complete storage and transshipment solutions at 80 terminals in 30 countries, covering and connecting the world's major shipping lanes. Vopak offers more storage capacity than any other independent tank terminal operator in the world.

According to the management trainee responsible for energy projects at the Vopak terminal in Vlaardingen, Tim Hoogstrate, there are several reasons why his interest in thermal imaging surveys was peaked. "We use steam to prevent the vegetable oil we handle at this terminal from solidifying. To transport the steam to the vegetable oil tanks we have a network of steam pipes that is over 1 kilometer in length that spans the entire terminal. Since all pipework insulation is subject to degeneration over time we need to know where the pipework insulation has to be renewed."



*Thermographer Ralf Grispen uses the FLIR P660 thermal imaging camera to inspect pipework insulation.*



*Heat leakage due to failing insulation clearly shows up on the thermal image.*



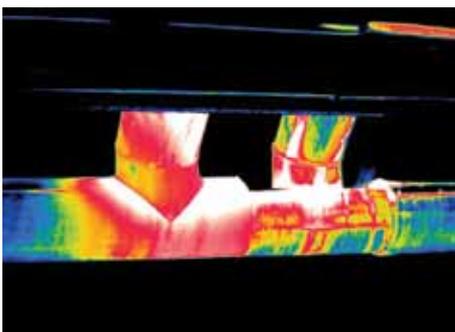
### Minimizing energy loss is hot

This information is not only important for financial reasons, explains Hoogstrate. "Obviously minimizing energy loss is a hot topic nowadays, for both environmental and financial reasons, but security is also a factor here. If the insulation is faulty the external surface of the pipes can become dangerously hot. And since the pipeline stretches throughout the terminal accidents can happen all too easily."

The task of providing Hoogstrate with the required information fell on Ralf Grispen and Rob Huting, thermographers at Thermografisch Adviesbureau Uden. "Using thermal imaging cameras for pipework insulation inspection is nothing new, but in this case the client needed something more: a calculation of the exact amount of energy loss that is caused by each individual insulation failure. That made this assignment a very interesting challenge", explains Grispen.

### 'Not an easy task'

According to Grispen acquiring accurate thermographic readings was not an easy task. "Any thermographer will tell you thermographic inspections of metal surfaces such as these pipes can be quite challenging. Due to the high reflectivity of metal surfaces you have to painstakingly choose your angle in order to avoid infrared reflections that ruin the thermographic readings and each piece of pipework has a different emissivity value due to varying levels of oxidation."



*Emissivity and infrared reflection made it an interesting challenge for Grispen to provide the level of accuracy needed for the energy loss calculation.*

To solve these problems Grispen had to pull out all the stops. "I used every thermography trick in the book. Not only did I choose my angles carefully and correct the readings for the reflected apparent temperature, I also used thermographic calibration paint and calibration tape to ensure that every reading was accurate."

### 'FLIR P660: accurate and easy to use'

One factor that made his job easier was the thermal imaging camera he used, explains Grispen. "We used the FLIR P660 thermal imaging camera for the inspections. The FLIR P660 is highly accurate and provides crisp thermal images at a resolution of 640 x 480 pixels. It's also easy to use, with several outstanding special features such as voice comments, automatically embedded GPS coordinates and such that make my life as a thermographer a lot easier."

Although the camera is very easy to use, Grispen was very glad that he had not just bought the camera, but went through the extensive FLIR thermographic training as well. "FLIR provides training in co-operation with the Infrared Training Center (ITC), the world's leading educational and training resource for thermal imaging professionals. The ITC's internationally recognized certification program indicates the level of training as a Level 1, Level 2 or Level 3. I have attained Level 2 and one of my colleagues even completed the Level 3 training course and I must say that we needed every bit of training we received to be able to provide the accurate thermographic data we needed in this case."

### 'Accuracy of readings is vital'

The accuracy of the readings was a vital requirement for Cyril Vallen from the energy loss consultancy agency Xellins. "I cannot stress enough how important it is that the thermal data is accurate. I have highly advanced mathematic models to my disposal that can be used to accurately determine the exact amount of energy that is lost at each problem area, but if the thermal data I feed into my models are incorrect then the outcome of the calculation is completely useless. Even extremely small deviations below 1 °C can seriously influence the outcome."



*The inspection revealed about 150 problem areas that were extensively documented using the highly accurate FLIR P660 thermal imaging camera.*

Together with Grispen and his colleagues Vallen spent several nights at the terminal, looking for problem areas. "We found about 150 sites that warranted further investigation. The analysis is not completely finished yet, but I can reveal that in several locations the insulation defects can be called severe. To put it in some kind of perspective: in several of these 150 locations the financial effect of the energy loss is similar to tossing one or more high quality flat-screen televisions in the trash each year."

### 'Couldn't have done it without FLIR'

With the information from Vallen's calculations Hoogstrate can accurately determine the cost of each problem area and, combined with a repairs quotation from an insulation specialist, he can then immediately see whether repairing the insulation in that particular location is worth his while. According to Grispen this would not have been possible without the extremely accurate FLIR P660 thermal imaging camera and the extensive training FLIR Systems provided. "There simply is no other thermal imaging camera supplier that provides the same level of service and product quality as FLIR Systems", Grispen concludes.

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

**FLIR Commercial Systems B.V.**  
Charles Petitweg 21  
4847 NW Breda - Netherlands  
Phone : +31 (0) 765 79 41 94  
Fax : +31 (0) 765 79 41 99  
e-mail : flir@flir.com  
www.flir.com