A New Safety Image

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Marine engineers and electrical technical officers would be generally aware that infra red (IR) camera thermal imaging has been utilised as a maintenance tool for some considerable time. In the recent past, most SPE members will have seen infra red thermal imaging professionals on board their ships taking and recording IR images of electrical components such as switchboards and distribution board panels for the purpose of routine survey for Class and company requirements.

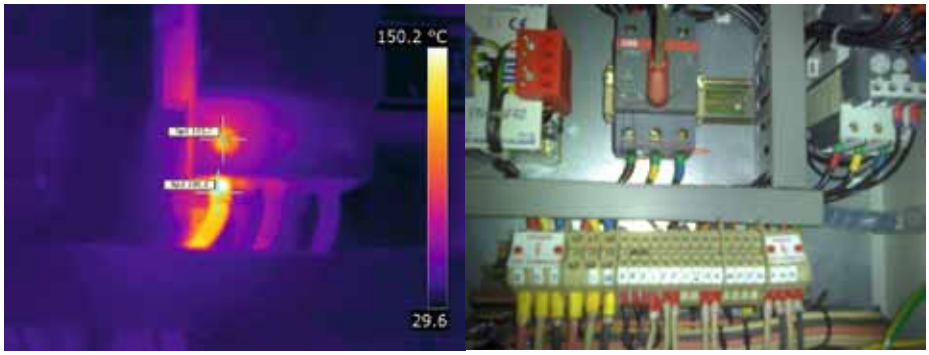
Typically carried out on at least a five year basis (annually on FPSO *Crystal Ocean*) a full switchboard and distribution board IR Thermal Imaging Survey is an extremely valuable process helping maintenance personnel identify problem areas such as hot joints, loose connections and damaged components before further damage occurs. This allows timely change out before further damage to adjacent components or switchboard infrastructure can occur with possible fire and other potentially disastrous consequences.

The following Figures are some examples of the IR images from a recent full survey carried out on FPSO *Crystal Ocean*.

In late 2009 the maintenance team on board the *Crystal Ocean* was tasked with constructive input into the 2010 Roc Oil KPI plan for the Basker Manta field. Being aware that a significant causal factor in engine room fires is the release of flammable fluids onto hot surfaces we wondered if IR images could be taken of high threat areas in the general engine room and used as an improvement point for overall vessel safety.

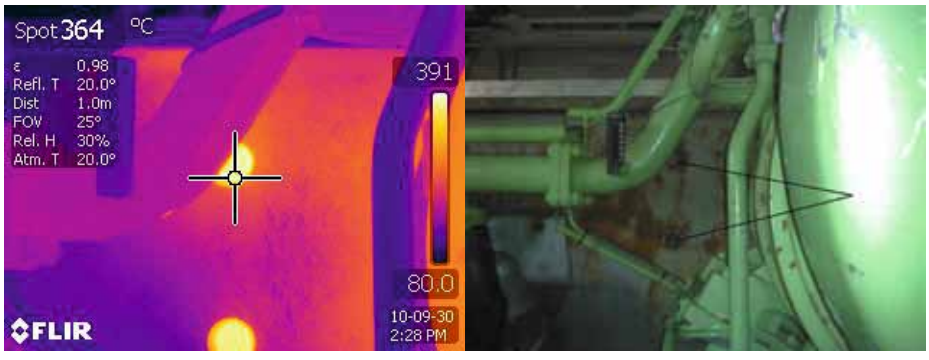
This particular point is not a new principle, in fact a report from Det Norske Veritas (DNV) (2000) reported that between 1992 and 1997, two-thirds of the 165 ship fires that it researched started in the engine room and of these 56% were caused by oil leakage onto hot surfaces.

This point was entered into the KPI management plan and accordingly, late in 2010, in conjunction with our annual switchboard IR testing program, All Points Safety were engaged to undertake a thermal image survey of high threat areas in the FPSO engine room. The significant point about this process was that engine room staff, in conjunction with the appointed contractor, All Points Safety were able to identify several areas where lagging had slipped or was in need of adjustment, exposing hot surfaces with temperatures in excess of the flash point of marine gas oil – the current fuel for this installation. Further to this, these areas were able to be immediately addressed allowing follow up imagery to be taken to confirm the corrective measures and hence the reduction in risk was proven. All Points Safety further compiled and presented a full report presented to management, detailing the principle and process behind the risk reduction strategy.



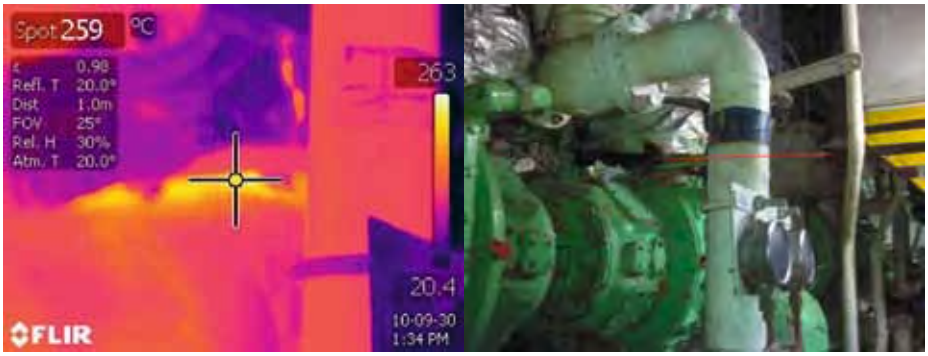
Label	Value	Emissivity	0.98
Ar 1	min 29.6 °C	Reflected apparent Temp	20 °C
Ar 1	max 150.2 °C	Atmospheric Temp	20 °C
Spot 1	115.7 °C	Atmospheric Temp	20 °C
Spot 2	136.2 °C	Relative Humidity	30%

Comments: Engine Room Port Side
SW Cooling Pump # 1 Main Switch, possible poor connection



Label	Value	Emissivity	0.98
Ar 1	min 80.0 °C	Reflected apparent Temp	20 °C
Ar 1	max 391 °C	Atmospheric Temp	20 °C
Spot	364 °C	Distance	1.0 m
		Relative Humidity	30%

Comments: DG 4, A bank exhaust studs. Exposed or uninsulated exhaust studs, will require capping. This is consistent on all diesel generators.



Label	Value	Emissivity	0.98
Ar 1	min 20.4 °C	Reflected apparent Temp	20 °C
Ar 1	max 263 °C	Atmospheric Temp	20 °C
Sp1	259 °C	Distance	1.0 m
		Relative Humidity	30%

Comments: DG 2 Turbo exhaust outlet B. Damaged, insufficient or obstructed insulation exposing the exhaust. This is consistent with all turbo chargers both at the base and upper turbo exhaust outlets. Inspection of insulation on turbo outlets on all 4 DGs is recommended.

Note

With reference to the above examples it should be noted that the detected temperatures of the hot surfaces were above the auto ignition temperature of diesel oil which is 260 °C. The auto ignition temperature is the temperature at which a substance will ignite due to heat and burn without the presence of a flame. Safety of Life at Sea (SOLAS) regulations also stipulate that surfaces capable of heating above 220 °C be properly insulated.

Conclusion

The adoption of this system and technique could provide maintenance staff with valuable tools to improve the safety of their engine rooms. At the same time it provides management with valuable ammunition to prove the integrity management of machinery spaces and provide evidence of responding to and managing risk. We are currently unaware of the process of thermal imaging being used to assess high threat areas on other ships and facilities in either a formal or informal manner. The author acknowledges that DNV offers the service to customers and ship managers on request.

References

Det Norske Veritas. Managing Risk, Engine room fires can be avoided. 2000. ◆