



Infrared Camera Use for VOC Inspections

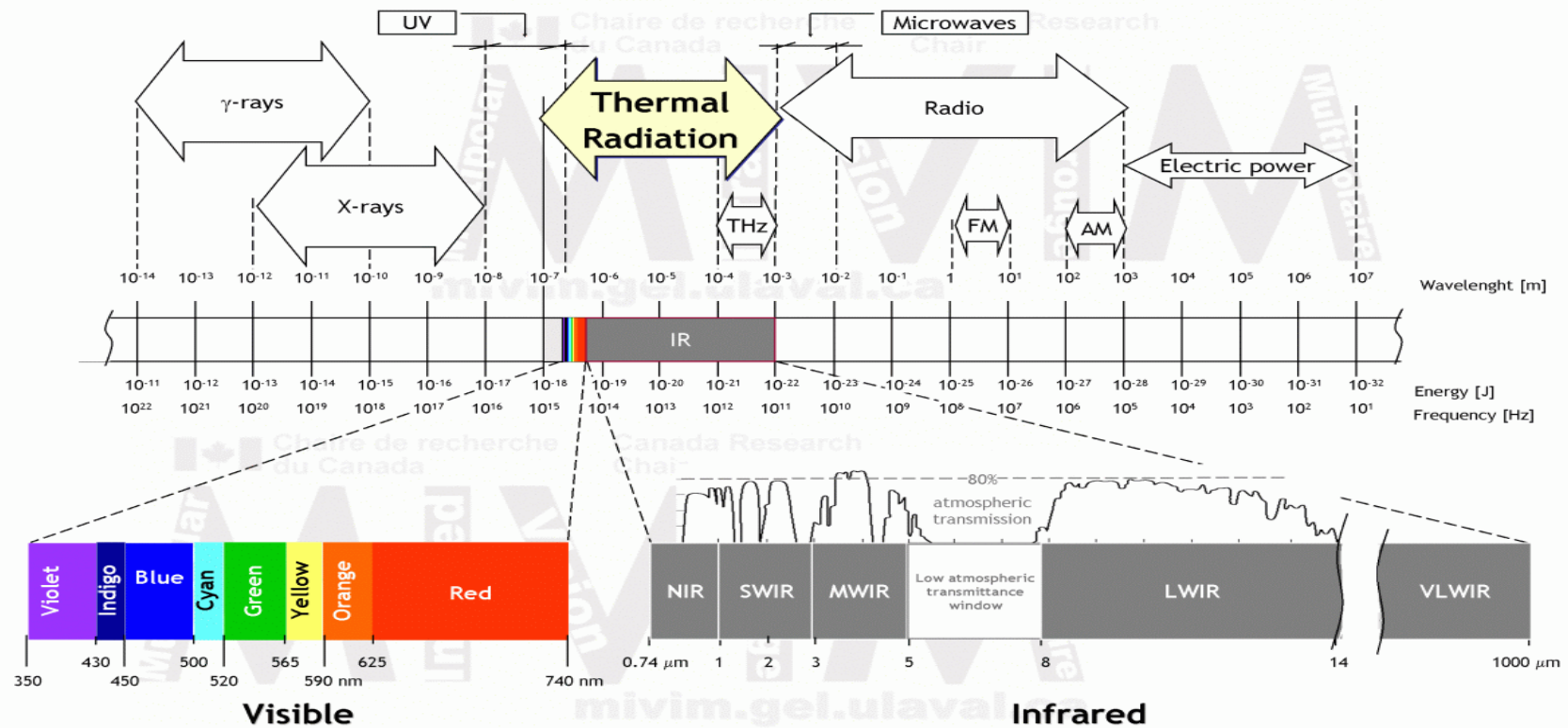
Infrared Camera



Camera Operation

- GasFindIR (“GF”) 320 is battery powered and is cooled to 77°K by liquid helium via a closed-cycle cooler powered with a small compressor. The cooling makes the detector more sensitive to thermal energy at low temperatures.
- The GF 320 requires 5 minutes to cool down the detector after turning of the camera on.

Electromagnetic Spectrum



Infrared Camera Detection

- Camera detection is between 3.3 – 3.4 μm ; the region in which hydrocarbon gases absorb thermal energy.
- Gases detected: 1-Pentene, Benzene, Butane, Ethane, Ethanol, Ethylbenzene, Ethylene, Heptane, Hexane, Isoprene, MEK, Methane, Methanol, Octane, Pentane, Propane, Propylene, SF₆ (Sulfur Hexafluoride)
- The GF-Series cameras also detect: Acetic Acid (C₂H₄O₂), Anhydrous Ammonia (NH₃), Carbon Monoxide (CO), Chlorine Dioxide (ClO₂), Dichlorodifluoromethane "FREON-12" (CCl₂F₂), Ethyl Cyanoacrylate "Superglue" (C₆H₇NO₂), Ethylene (C₂H₄)

Traditional LDAR (Method 21)

- 50% of VOC emissions can come from fugitives
- EPA estimates that failure to identify and repair leaks at petroleum refineries could be resulting in additional VOC emissions of 40,000 tons annually
- 1,000's to 100's of 1,000's of valves and connections must be monitored for leaks
- 95% - 99% of components are not leaking
- 90% of controllable emissions are attributed to 0.13% of components monitored.



SMART LDAR

- The IR camera is gaining acceptance in some industrial sectors as a tool for find-and-fix programs. The Alternative Work Practice To Detect Leaks From Equipment (SMART LDAR rule), is expected to lead to even more use.
- 63.11 (c)(d)(e)
- 60.18 (g)(h)(i)

Fugitive Monitoring

Method 21

- 45 components per hour
- 500 ppm
- Labor intensive
- Intrinsically safe
- Daily calibration (45 min to 1 hour)
- Can put monitoring personal in dangerous situations

Smart LDAR

- 3,000 components per hour
- 30,000 ppm
- Fewer personal needed
- Not intrinsically safe
- Daily calibration & recordkeeping
- Image affected by background & conditions
- Image can be manipulated

IR Camera as an Inspection Tool

- Finds leak sources not previously identified/monitored
- Finds large plumes (safety before entering an area)
- Finds emission sources that cannot be easily reached or detected by traditional means
- Finds emission sources that were previously under reported

Real Life Inspections

Gas Plant LDAR PCE



Real Life Inspections

Sloppy Operators



Real Life Inspections

Vapor Recover Units



Real Life Inspections

Vapor Recover Units



Real Life Inspections Complaints



Real Life Inspections

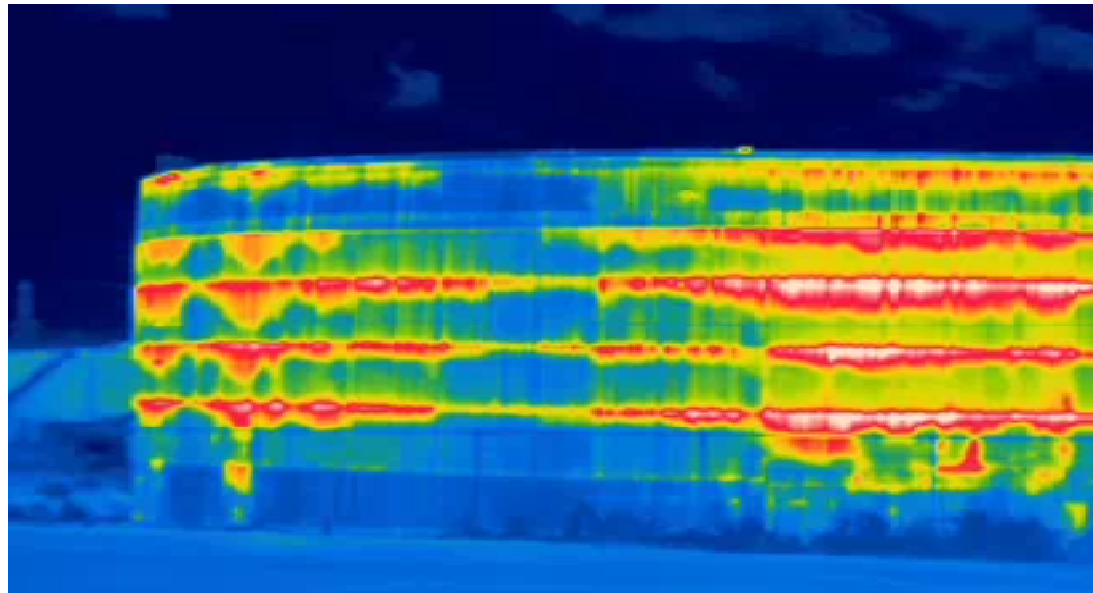


Other Uses

- Vessel levels –
Product levels are clearly visible

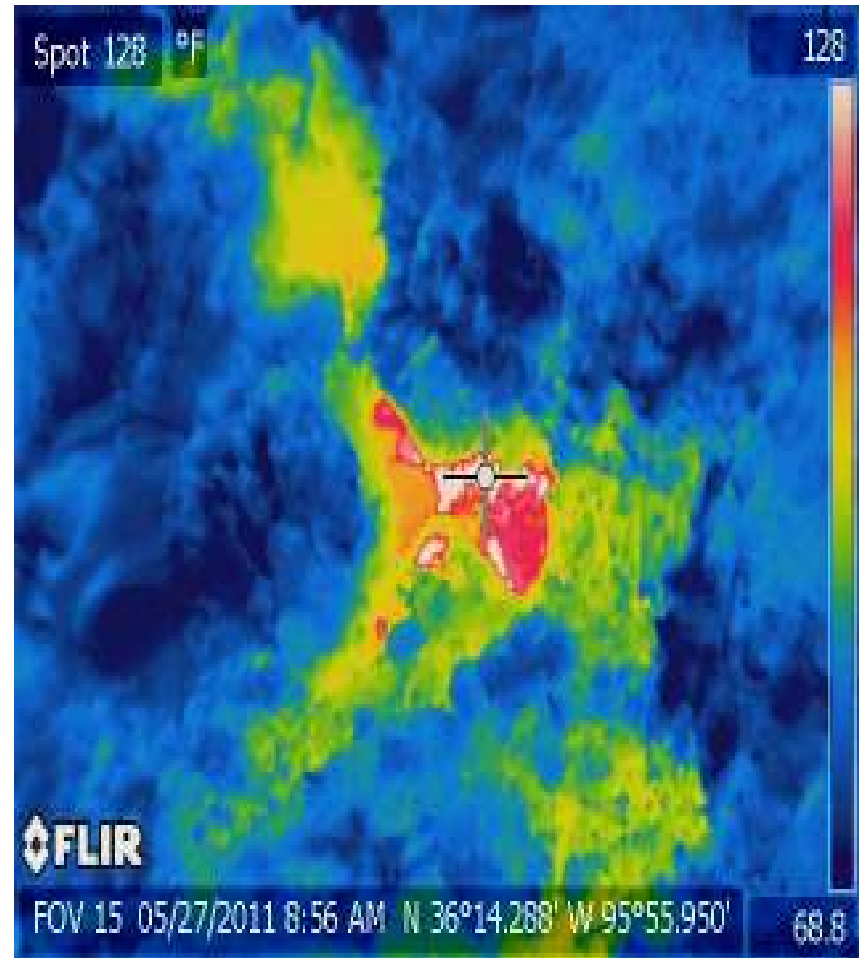
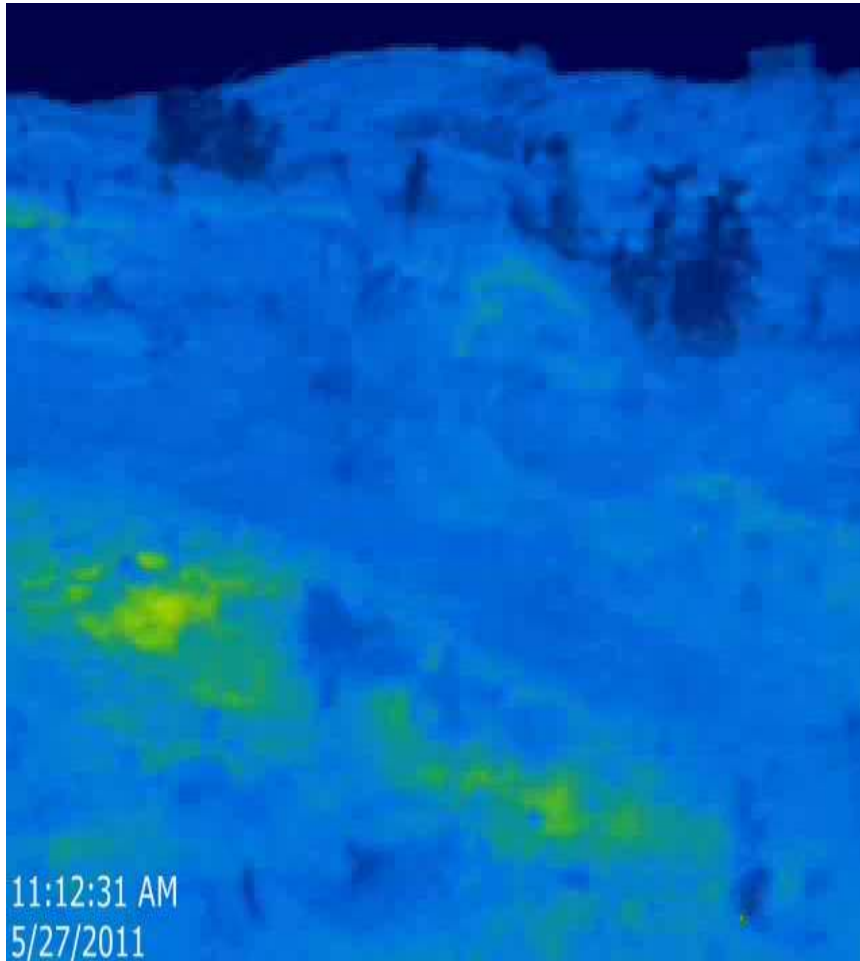


- Refractory-lined equipment -
Refractory breakdown is clearly visible.



Other Uses

Temperature Readings



Other Uses GPS

