

# CEM India 2017 - Conference and Exhibition on Emissions Monitoring

## Applications Of Infrared Thermography for Visualization of Harmful gases for Environment

By

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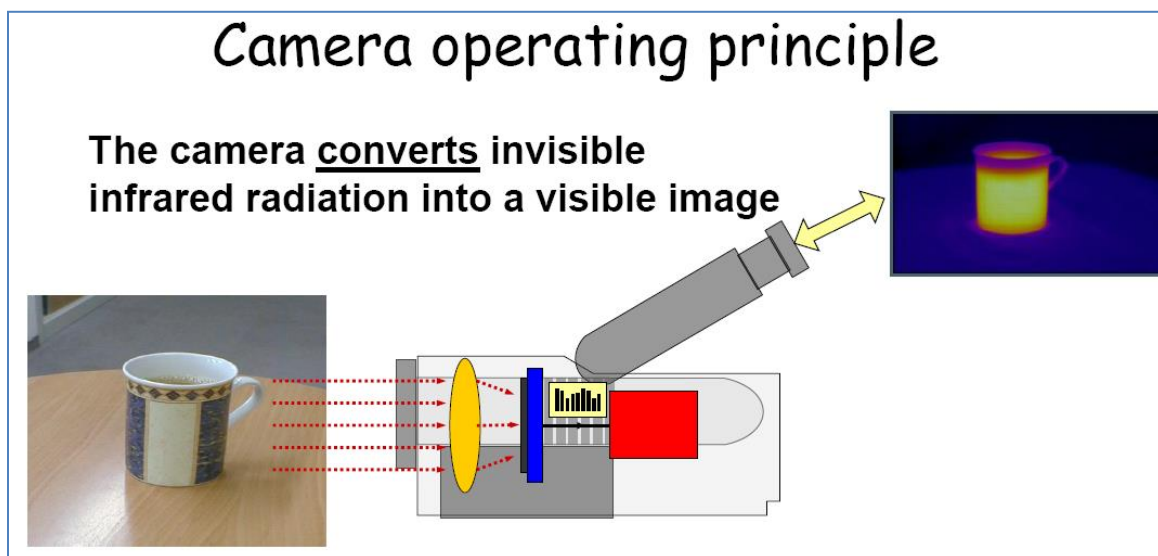
### Introduction:

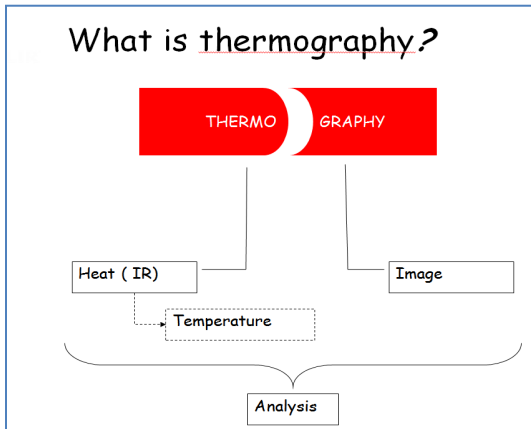
The paper presents infrared Thermography applications for Visualization of Harmful gases for Environment. The paper follows below pattern of explanations:-

- Basics – IR Theory
- Application:
  - Applications- Energy Efficiency with case study
  - Applications- Environment- SF<sub>6</sub>, CO, VOC visualization
  - Other low cost products for Energy Efficiency and Environment & technology
  - Power Analyzers
- How to select a suitable camera?
- FLIR- An Introduction

### Method/Approach

#### Basic IR Theory





All objects above absolute Zero emit Infrared radiations. Purpose of Infrared Camera is to convert those IR radiations to electrical signal which gets converted to picture. Hence, Thermal imaging, also called Infrared Thermography, is the production of “heat” pictures through which temperature measurements can be done accurately, without any physical contact to the object/instrument in operation.

In Electromagnetic Spectrum, as explained in Fig, Infrared is surrounded by visible light and Microwaves.

## APPLICATIONS

**This amazing technology can be used for multiple applications as listed and explained below :-**

- Predictive Maintenance
- Volatile Organic Compounds (VOCs)  
*VOC are referred to as Organic compounds that easily become vapors or gases. Along with carbon, they contain elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur or nitrogen*
- Visualization of CO leakage  
*Carbon monoxide (CO) emissions can be a significant threat to primary steel manufacturing operations and other industries where CO emissions need to be closely watched. Even the slightest leak in a vent stack or pipe can have a devastating effect.*
- Visualization of SF6 leakage  
*The Gas Detection cameras are infrared cameras which are able to visualize gas. The camera produces a full picture of the scanned area and leaks appear as smoke on the camera's viewfinder/screen. The image is viewed in real time and can be recorded in the camera for easy archiving.*
- Visualization of CO<sub>2</sub> gas leaks in real time  
*Reliable, non-contact CO<sub>2</sub> detection lets plants prevent unplanned outages by allowing them to inspect equipment while it is still online in the course of normal operations. It also helps keep operations safe while moving towards carbon-neutral capture and storage operations.*

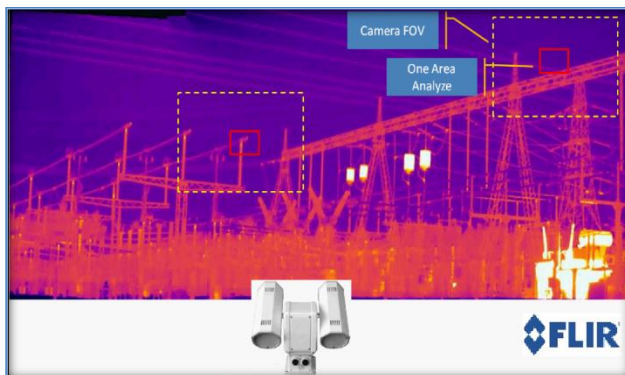
**Thermography is having numerous applications and few broad applications are listed below:-**

- Electrical Hotspot
- Fire Prevention
- Predictive Maintenance
- Aerospace
- Automotive
- Building
- Electronic & Electrical
- Environmental, Geological & Meteorological
- Medical
- Metals, Machinery and Manufacturing
- Petroleum & Petrochemical
- Paper & Textiles
- Research & Development
- Gas Leakage

**Apart from TIC, Other economical products for environment prevention are:**

- Clamp meters
- Digital Multimeters
- Thermometers
- Power Analyzers
- Tachometers
- Environmental Meters
- Electrical Testers
- Inspection Tools
- Power Analyzers

**Sub Station Monitoring for Predictive Maintenance**



Transmission Companies and Electric power utilities are faced with an aging infrastructure, increasing risk of blackouts , costly unplanned maintenance, security threats to remote facilities, and rising costs. Solution to these problems has been found recently through online use of Thermal Imaging cameras, based upon IP. This will improve the reliability of electric power delivery while reducing costs.

## Predictive Maintenance of other Critical Installations

Inspection of Cable Terminations, Joints  
With the help of Thermal Imaging Camera, it becomes very easy to observe the healthiness of these connections over time.

Inspection of Exposed Cables  
Thermal Imaging Camera is very effective tool to check condition of exposed cables due to its capability to just visualize heat.

### Visualization of Hydrogen Gas leak in real time

All Hydrogen based Generators maintain a purity of 95% of H<sub>2</sub>. By adding 3-4% of CO<sub>2</sub> as tracer gas, this new technology can be used to visualize the point where Hydrogen/CO<sub>2</sub> is getting leaked.

*Fig - shows leak in a 4-way valve dryer skid.*



Leak in a 4-way valve dryer skid

## Conclusion

Based upon the detailed discussion on above mentioned topics, it is very clear that this amazing technology, if used properly can help utilities to prevent costly service interruptions and exorbitant Equipment losses, apart from other intangible benefits.

## About FLIR

### *FLIR Systems - The World's Sixth Sense*

FLIR Systems, Inc. designs, develops, manufactures, markets, and distributes technologies that enhance perception and awareness. We bring innovative sensing solutions into daily life through our thermal imaging systems, visible-light imaging systems, locator systems, measurement and diagnostic systems, and advanced threat detection systems. Our products improve the way people interact with the world around them, enhance public safety and well-being, increase energy efficiency, and enable healthy and entertained communities.

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