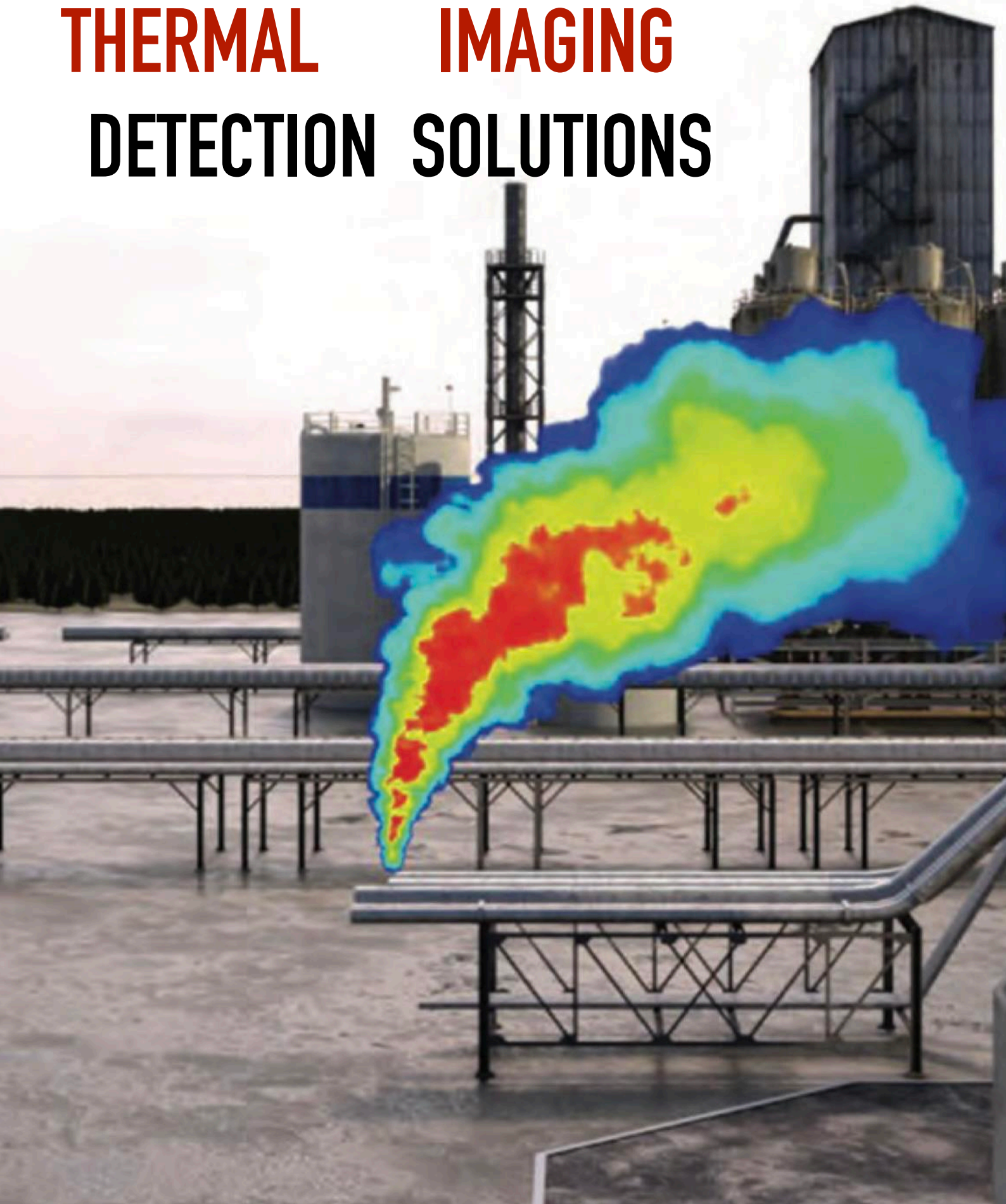
INDUSTRIAL

THERMAL IMAGING

DETECTION SOLUTIONS



Industrial Thermal Imaging

Thermal Imaging

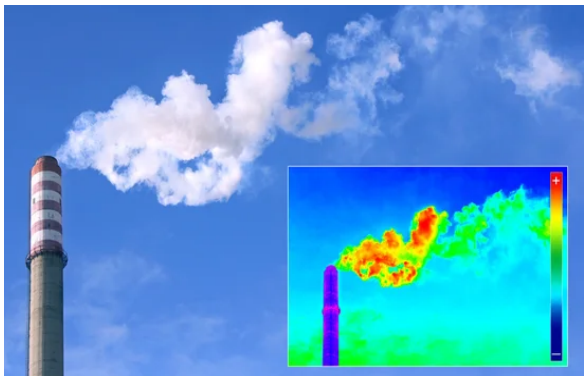
A screening method by IR Thermography.

Thermal imaging is the **technique of using the heat** given off by an object to produce an image of it or to locate it. In essence, a thermal imaging camera measures variations in heat, or infrared radiation, and represents the heat as different **colors in an image**.

Thermal imagers are useful to monitor any mechanical and electrical equipment. This includes pressure vessels, weld monitoring, glassware manufacturing, plastic injector molding, and more. Accurately track process temperatures with infrared cameras.

This style of imaging is used by many industries from medical, law enforcement, to plumbing and electrical. For instance, electricians use thermal imaging to detect hot spots in electrical systems which can indicate dangerous faults.

This method is based on triage techniques employed in the medical field and uses the test results obtained by an infrared thermographic camera and ultrasonic thickness gauge as determination criteria. Aiming at evaluating the wall thinning caused by aqueous corrosion due to sludge in pipes, an infrared thermographic camera was used to conduct studies to find a method for detecting sludge inside a pipe and a method for measuring the distribution of wall thinning. Testing conditions, signal processing, etc., were developed and adapted for actual pipes, and their validity was confirmed.



APPLICATIONS:

- Industrial Manufacturing Field,
- Security Field, Home & Outdoor,
- Electric field,
- Energy and Petrochemical field,
- Environmental Monitoring and Forest Fire Prevention,
- Automotive Night Vision Field,
- Medical,
- Research & Development,
- Spectral imaging for agriculture,
- Plastic inspection.

What are the two types of thermal imaging?

Thermographic cameras can be broadly divided into two types based on sensor used:

- **Cooled** infrared detectors
- **Uncooled** infrared detectors.

Cooled infrared cameras typically operate slightly under room temperature. If the sensor does not cool off, the sensor risks being flooded by its own thermal radiation, causing the sensors to be blinded. Because of this need to cool off, cooled thermal cameras are integrated with a device called a cryocooler. Thermal cameras that use cooled image sensors are more expensive to manufacture, require more maintenance, and consume more energy for ventilation. Furthermore, when starting up the camera, a wait time of up to several minutes may be needed for it to cool down before it can be used. Even though cooled equipment may be bulky and expensive, they can produce crisper, higher resolution images than uncooled cameras.

Uncooled infrared cameras do not require expensive and bulky cryocoolers. The sensor in an uncooled thermal camera is stabilized at or close to room temperature, using less complicated temperature control elements. These sensors can stabilize the changes of resistors, voltage, and power when infrared radiation causes the temperature to rise. Despite their lower resolution and image quality in comparison to cooled cameras, uncooled thermal cameras are smaller and more economical.

What's the difference between infrared and thermal imaging?

Active IR systems use short wavelength infrared light to illuminate an area of interest. Some of the infrared energy is reflected to a camera and interpreted to generate an image.

Thermal imaging systems use mid- or long wavelength IR energy. Thermal imagers are passive, and only sense differences in heat.

What is thermography in NDT?

Thermography is a non-destructive testing method used to detect and measure small temperature differences to help find deterioration in assets and plant sites.

Thermography can support the maintenance of industrial plants and equipment with its fast and cost-effective application.

Choosing the right INFRARED camera for your application:

► **Emissivity & Reflection**
Thermal imagers which allow the operator to set the emissivity and reflection is the one to pick if you are planning on using the thermal imager for any application. In essence, emissivity is the efficiency with which an object emits infrared radiation. To ensure correct temperature readings, thermal imaging cameras today have in-built emissivity settings for a wide range of materials.

The same is true for reflection as well. A camera that allows you to adjust the angle while pointing to an object will ensure that the thermal images are free from any misinterpretations caused by reflections.

► **Manual Span & Level Correction**
Automatic thermal imagers set the span and level of the displayed thermal images based on the highest and lowest temperature found on the subject. However, this is ineffective if you want to see only a small spectrum of the temperature range. Manual settings allow you to set your own higher and lower temperature limits so that you can limit the scope of your examination.

► **Integrated Digital Camera**
An integrated digital camera allows the operator to take normal pictures of the subject alongside the thermal pictures. This is extremely helpful when evaluating a complex scene. A visible light picture will help you compare and locate the areas that need attention easily.

► **Picture in Picture**
Picture in Picture mode or P-i-P enables the camera to combine digital and thermal image in one frame. This is helpful when the operator needs better visibility of the subject without compromising thermal imagery.

► **Thermal Fusion**
Thermal fusion combines thermal and digital image to show only the points of interest in a different hue. This method is great at isolating problems.

These are the core features that will help you find a capable thermal imager. With advances in technology, modern thermal imagers come with a variety of comfort features that include Bluetooth capability, normal camera mode, WIFI connectivity, and other ergonomic features.

However, make sure not to compromise on core features for the sake of comfort and aesthetics.

► **Fixed or Portable camera?**
Handheld or portable infrared cameras are one of the most popular types of infrared pyrometer. They are very popular in many industries and applications including HVAC, automotive, building inspection, energy audits, plant maintenance, electrical contractors, insulation experts and many more.

Fixed mount infrared thermometers are commonly used in industrial processes where the thermometer can be mounted in a stationary position.

How to choose a Thermal Camera?

The three major factors that you should keep in mind when buying a thermal camera as a part of cost and quality are:

- ► Detector Resolution,
- ► Thermal Sensitivity.
- ► Wavelengths ranging

The Detector resolution is the number of pixels that the thermal imager can fill in a frame. More the pixels, more detailed the image is going to be!

The standard resolutions are 160 x 120, 320 x 240, and 640 x 480 pixels. A 160 x 120 resolution will have 19,200 pixels while a 640 x 480 resolution will have 307,200 pixels. Going for higher pixel density will give you clearer and more detailed pictures.

The Thermal sensitivity is the smallest degree of temperature change that the thermal imaging camera can measure. If the thermal sensitivity of a thermal imager is 0.05°, it can separate two surfaces having 0.05° of a temperature difference by denoting the colder and hotter surface with different hues of color.

Also, make sure that the range of the thermal imager is sufficiently large so that you don't run into limits, -4°F to 2,192°F is a typical example of a good thermal range.

The Wavelength Range there are three basic types of infrared imaging cameras: short wavelength, mid-wavelength, and long wavelength.

Infrared cameras detect light or heat at wavelengths ranging from 0.7 to 2.5 micrometers (short-wave infrared light), 3 to 5 micrometers (middle-wave infrared light), or long-wave infrared light (8 to 14 micrometers).

SWIR, MWIR, or LWIR camera depends largely on why you need to use it. They all do some things better than others. If you're inspecting agriculture products, paper money, or works of art, SWIR might be the best choice. MWIR cameras are essential safety equipment for manufacturers and industries that use hazardous gasses or for gas utilities to detect hidden gas leaks. Wildlife researchers may use LWIRs to track or record wildlife populations and movements, while military and government organizations may use them for security and defense purposes.

Selection of infrared or thermal?

► **Infrared** thermometers are more precise and can be used to measure the temperature of specific points on an object.

► **Thermal** imaging is useful for detecting temperature variations across large areas or for identifying hot spots in machinery or electrical systems.

Note: all thermal cameras are infrared cameras since they operate in the infrared spectrum. However, not all infrared cameras are thermal cameras, as some infrared cameras may be used for purposes other than thermal imaging, such as surveillance, night vision, or remote sensing applications.