

Application of Thermal Camera - Gasifier Defect Diagnosis

1 Application Background

Gasifier is the most representative device of the coal chemical industry, and its normal temperature inside the furnace is usually above 1300°C as a high temperature and high pressure reaction vessel. The gasifier lining is constantly being flushed by the high temperature gas and molten slag, the lining will continue to thin and fall off, causing the heating of the gasifier wall surface as well as the reduction in the strength of the gasifier shell, thus leading to unsafe device. Therefore, monitoring the surface temperature of the gasifier wall is an essential part of the device safety precautions.



2 Pain Points in the Industry

The current gasifier is mainly using thermocouple detection cables for temperature monitoring, which has the following main disadvantages:

- High costs. The use of thermocouple detection cables for temperature monitoring requires the deployment of a large number of thermocouple detectors in the furnace, and one gasifier even requires the deployment of dozens of cables, with high device, construction, and maintenance costs.
- It is not intuitive. The thermocouple temperature measurement is the point temperature measurement. Only the temperature at the point is displayed. Moreover, the thermocouple is contacting with the furnace wall, which has heat conduction and reacts slowly to the temperature rise phenomenon.

3 Advantages of Thermal Cameras



Remote, non-contact temperature measurement

With non-contact temperature measurement, the temperature information of the gasifier can be obtained in all-weather and real-time. It is easy to check and compare the heat characteristics of each gasifier, and accurately visualize and locate problems without interrupting device operation.



More intuitive and agile for temperature measurement information

The temperature information is visualized. Through the large screen of the monitoring room, the thermal imaging of the surface temperature of the gasifier wall can be seen in real time. The hottest spot on the screen or area is automatically captured to make problems directly visible and improve efficiency.



Support high and low temperature alarms

All-weather monitoring of the highest temperature, lowest temperature and average temperature, the automatic alarm threshold can be set as needed. If the temperature is abnormal, the thermal camera supports an automatic alarm and captures on-site images.



Secondary development support for forming customers' unique advantages in collaboration

It provides a secondary development SDK to support users for secondary development, empowering them to form unique advantages; Alarm messages can be pushed through the IO port, serial port, or other various methods to assist customers in the action linkage and development of automation devices;

With the 485 interface, support customers to customize the PTZ base



4 Application of Thermal Camera in Gasifier Fault Diagnosis:

By analyzing the infrared thermal images and combining them with macroscopic inspection, the gasifier faults are roughly divided into several categories, and each defect has obvious characteristics on the thermal image.

▪ Heating shape

- Lining cracks

On the infrared thermal image, it may appear as a strip-shaped heating area or an irregular heating area with one side longer than the other.

- Lining falling off, bulging, gas leaking, etc.

A circular or square heating area on the infrared thermal image

▪ Temperature

The order of the different types of defects in terms of temperature values from highest to lowest is:

Falling off> hollow> interlayer gas leaking > bulging> cracking and thinning

Temperature change gradient

- Lining falling off

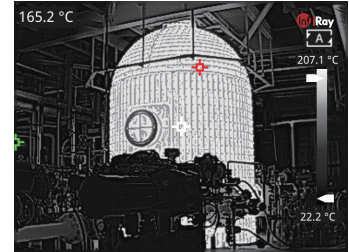
It appears on the infrared thermal images as:

Falling off area: the temperature increases significantly and the surrounding temperature decreases significantly.

Thinning area: the temperature changes more uniformly without sudden temperature increase or decrease.

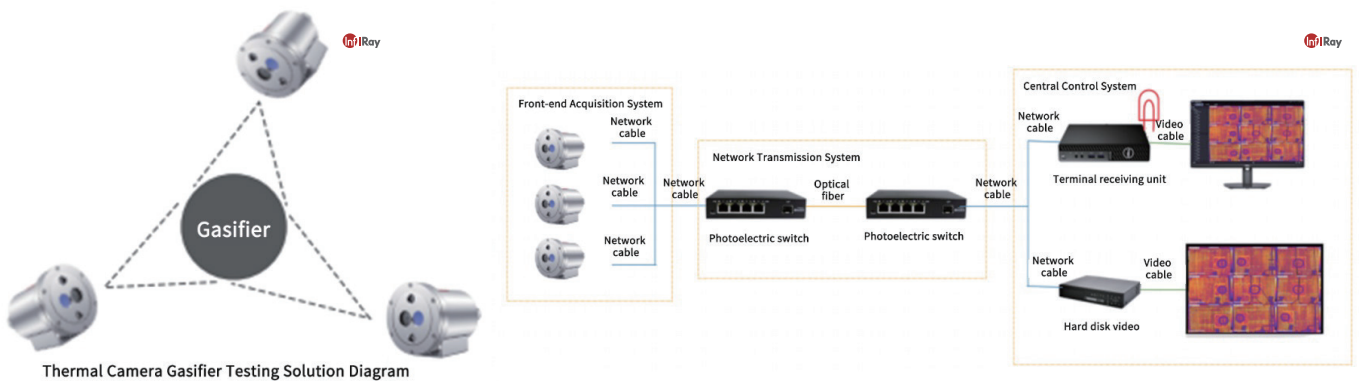
- Hollow defects

It appears on the infrared thermal images as: moderate temperature, even variation, and not too large range, etc.



5 Deployment Mode Diagram

According to the pipeline situation around the gasifier, a total of 3-4 explosion-proof thermal cameras are deployed around the perimeter and installed in a wrap-around manner to ensure that there are no dead spots for monitoring.









6 Recommended Models

Infiray

Online fixed focus temperature measuring thermal camera —AT31F/61F

It measures temperature for visible reading and analysis









-  A variety of focal length lenses available: meet the measurement requirements of different scenes
-  I/O alarm output: linkage with external alarm devices
-  Rich back-end interfaces: easy to integrate into various monitoring systems
-  SDK for multiple platforms: supporting secondary development
-  Equipped with an explosion-proof PTZ camera to meet the needs of flammable and explosive scenes

Infiray

Online auto-focus temperature measurement thermal camera —AT31/61

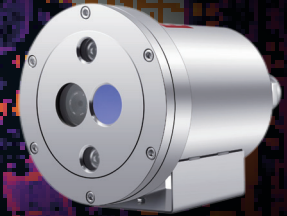
It measures temperature for visible reading and analysis








-  Automatic focusing: more convenient field application
-  Equipped with multiple network protocols: real-time temperature monitoring and exceptional pre-warning
-  Comprehensive software functions: linkage with external alarm devices
-  SDK for multiple platforms: supporting secondary development
-  Equipped with an explosion-proof PTZ camera to meet the needs of flammable and explosive scenes

Infiray

Explosion-proof dual-spectrum bullet camera —SFB4

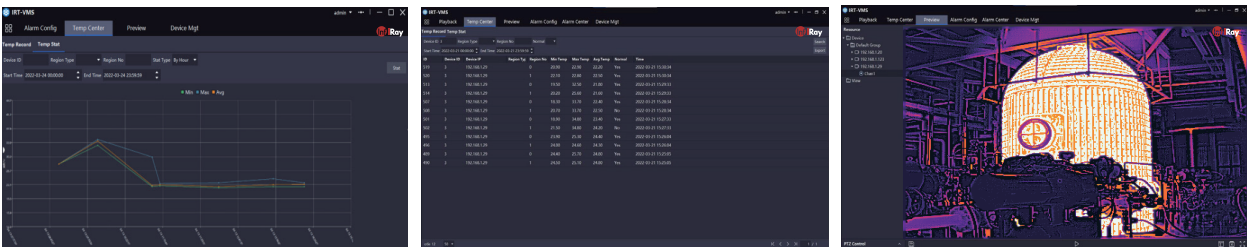


-  Double explosion-proof certification: meet the needs of flammable and explosive application scenes
-  IP68 ingress protection rating: corrosion-proof, explosion-proof, dust-proof, water-proof
-  Support over-temperature alarm, temperature difference alarm, area temperature alarm and other alarm modes
-  Dual-spectrum imaging of visible light and thermal imaging with rich temperature detail
-  Support standard ONVIF and GB28181 interface protocol: SDK available

7 Software Solution

It is recommended to use with IRay's professional temperature measurement and monitoring software

- It supports networking of multiple devices to be connected to the software platform and enables preview of up to 64 real-time pictures for responsible staff to check the monitoring pictures of the multiple devices deployed
- Palette selection and configuration of measurement tools are supported, which can be flexibly and easily applied to provide a simple way for temperature data collection at the backend
- Automatically generate temperature data curves and temperature reports for effective analysis of the monitored objects' temperature change in the area
- In case of temperature abnormality, the alarm can be triggered in time. The audible and visual alarm module sends an alarm, and the software background will take pictures of the incident in the process
- Linkage with the firefighting module can automatically trigger the control of the firefighting system, automatically deal with the hidden disasters to prevent the occurrence of deflagration accidents



8 How to Take an Infrared Thermal Image of Premium Quality?

Please refer to the following suggestions for using a thermal camera to take an infrared thermal image of premium quality:

- The explosion-proof PTZ camera is recommended to adapt to the harsh environment on site and ensure reliable operation of the device
- Different focal lengths are selected according to the installation distance of the gasifier to ensure that the largest proportion of the gasifier in the screen and no missing position
- As the temperature of the gasifier is generally high, it is more accurate to choose the temperature measurement level of 0-550°C. Also, the focal length is adjusted according to the temperature measurement distance to ensure clear imaging of the measured object
- Use automatic measurement first, and then enable the temperature width stretch function. Manually set the temperature width to the minimum and include the previously measured temperature range to enrich the image details

