FOTRIC Petrochemical Industry Solutions

Smart Manufacturing | Safe Production | Intelligent Maintenance

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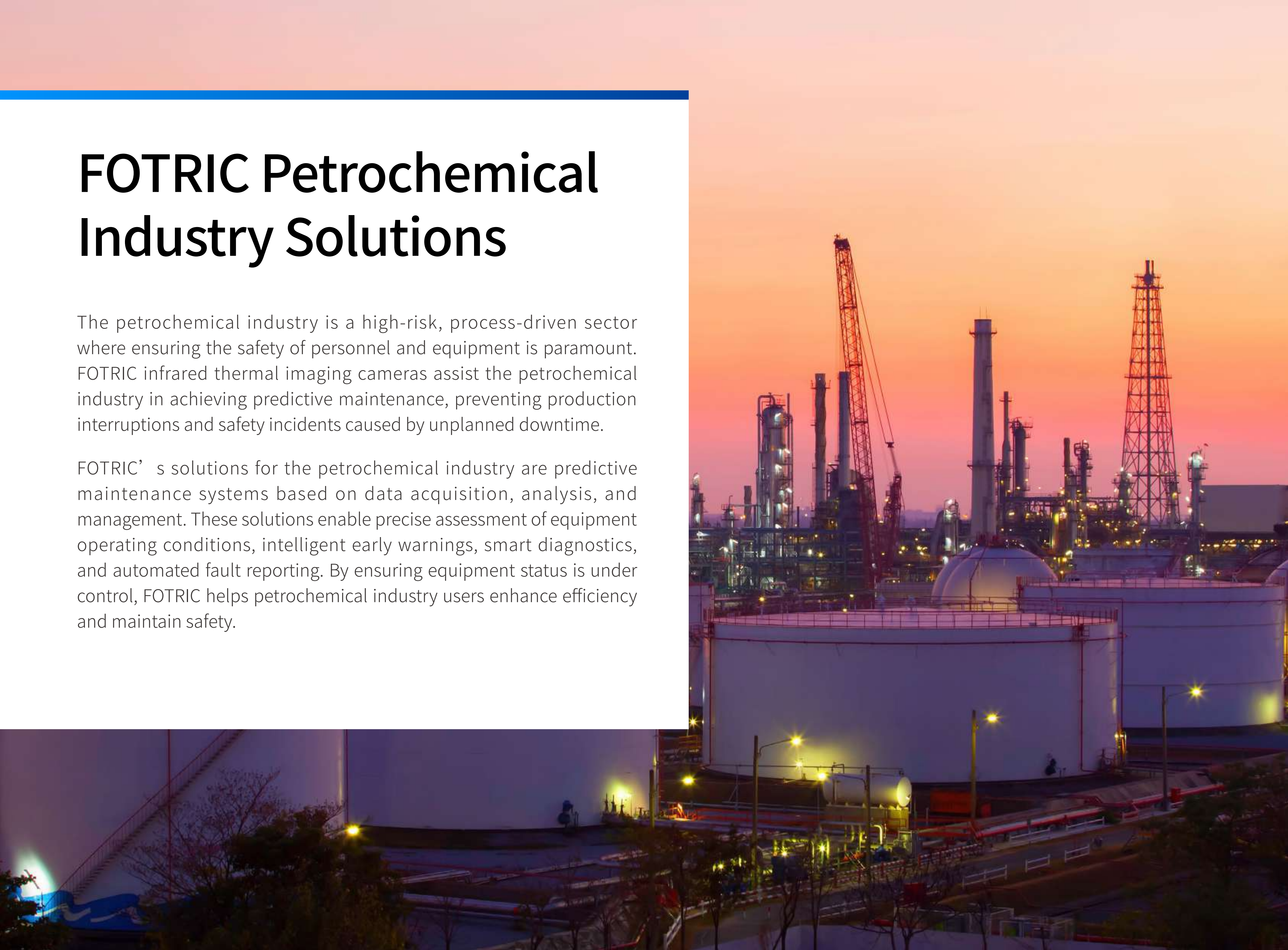
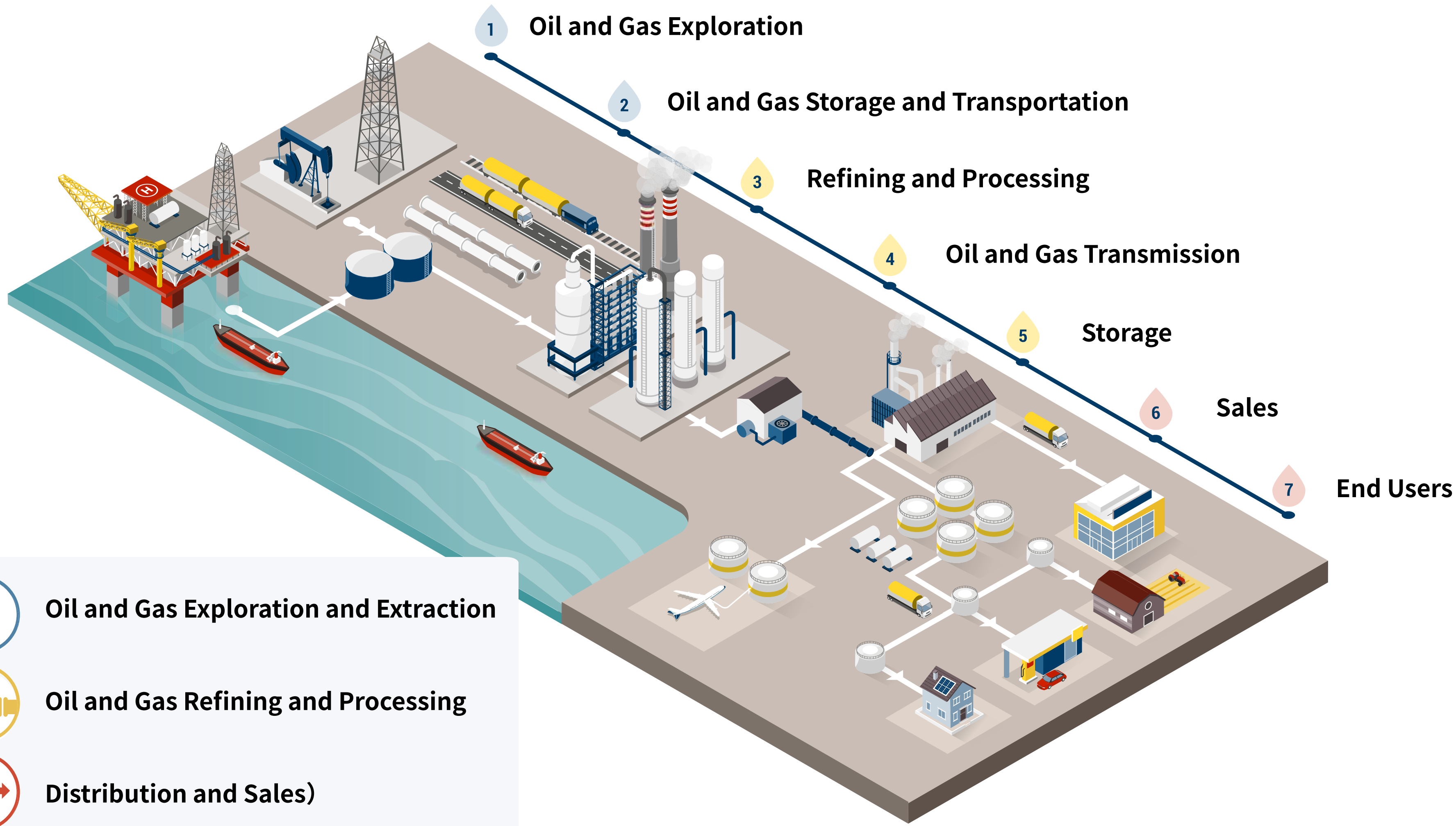
The petrochemical industry is a high-risk, process-driven sector where ensuring the safety of personnel and equipment is paramount. FOTRIC infrared thermal imaging cameras assist the petrochemical industry in achieving predictive maintenance, preventing production interruptions and safety incidents caused by unplanned downtime.

FOTRIC’s solutions for the petrochemical industry are predictive maintenance systems based on data acquisition, analysis, and management. These solutions enable precise assessment of equipment operating conditions, intelligent early warnings, smart diagnostics, and automated fault reporting. By ensuring equipment status is under control, FOTRIC helps petrochemical industry users enhance efficiency and maintain safety.



Contents

The Industrial Chain of the Petrochemical Industry



- Oil and Gas Exploration and Extraction
- Oil and Gas Refining and Processing
- Distribution and Sales)

Petroleum, also known as crude oil, is a viscous, flammable, dark brown to black liquid extracted from deep underground. It is a mixture formed through the long-term evolution of ancient marine or lake organisms. The properties of petroleum vary depending on its origin. Its density generally ranges from 0.8 to 1.0 g/cm^3, it is soluble in organic solvents but insoluble in water, although it can form emulsions with water.

Petroleum is a complex mixture primarily composed of hydrocarbons. The main elements in petroleum are carbon, hydrogen, sulfur, nitrogen, and oxygen, with carbon and hydrogen being the most significant. Carbon makes up 83% to 87%, and hydrogen accounts for 11% to 14%, while the total content of trace elements does not exceed 1% to 4%.

The freezing point of petroleum ranges from -60 °C to 30 °C , and its boiling point spans from ambient temperature to over 500 °C . To process petroleum into usable products, it must first undergo distillation to obtain various fractions with relatively narrow boiling point ranges. Distillation separates petroleum into fractions based on differences in the boiling points of its components. These fractions are commonly named after petroleum products. For example, the fraction obtained through atmospheric distillation at temperatures below 200°C is known as gasoline (naphtha) fraction. The fraction obtained between 200 °C and 350 °C is called kerosene, while fractions with boiling points higher than 350 °C undergo vacuum distillation, and the boiling points are converted to their equivalent under atmospheric pressure. Fractions distilling at 350 °C to 500 °C under vacuum are known as lubricating oil fractions, while the residues above 500°C are called residuum.

Further processing of petroleum raw materials results in the production of olefins (ethylene, propylene, butadiene), aromatics (benzene, toluene, xylene), acetylene, naphthalene, and other compounds, which are essential raw materials for synthetic polymers. Petroleum products are highly diverse and serve various purposes, with thousands of products being produced. According to the GB/T 498-2014 standard system, petroleum products are classified into five main categories, with petroleum fuels accounting for more than 90% of total petroleum production.

Category	Description
F	Fuels
S	Solvents and chemical raw materials
L	Lubricants, industrial oils, and related products
W	Wax
B	Asphalt (or specify a different description if applicable)

Refinery Classification: Primary, Secondary, and Tertiary Processing Units

Types of Refineries:

Fuel Oil Refinery

Produce gasoline, kerosene, light and heavy diesel, and various types of industrial fuel oil.

Fuel-Chemical Refinery

In addition to producing various types of fuel oil, it also produces various types of lubricating.

Fuel-Lubricant Refinery

It mainly produces fuel oil and chemical products.

Fuel-Lubricant-Chemical Refinery

A comprehensive refinery that produces various types of fuels, chemical raw materials or products, and also produces lubricating oil.

Primary Processing

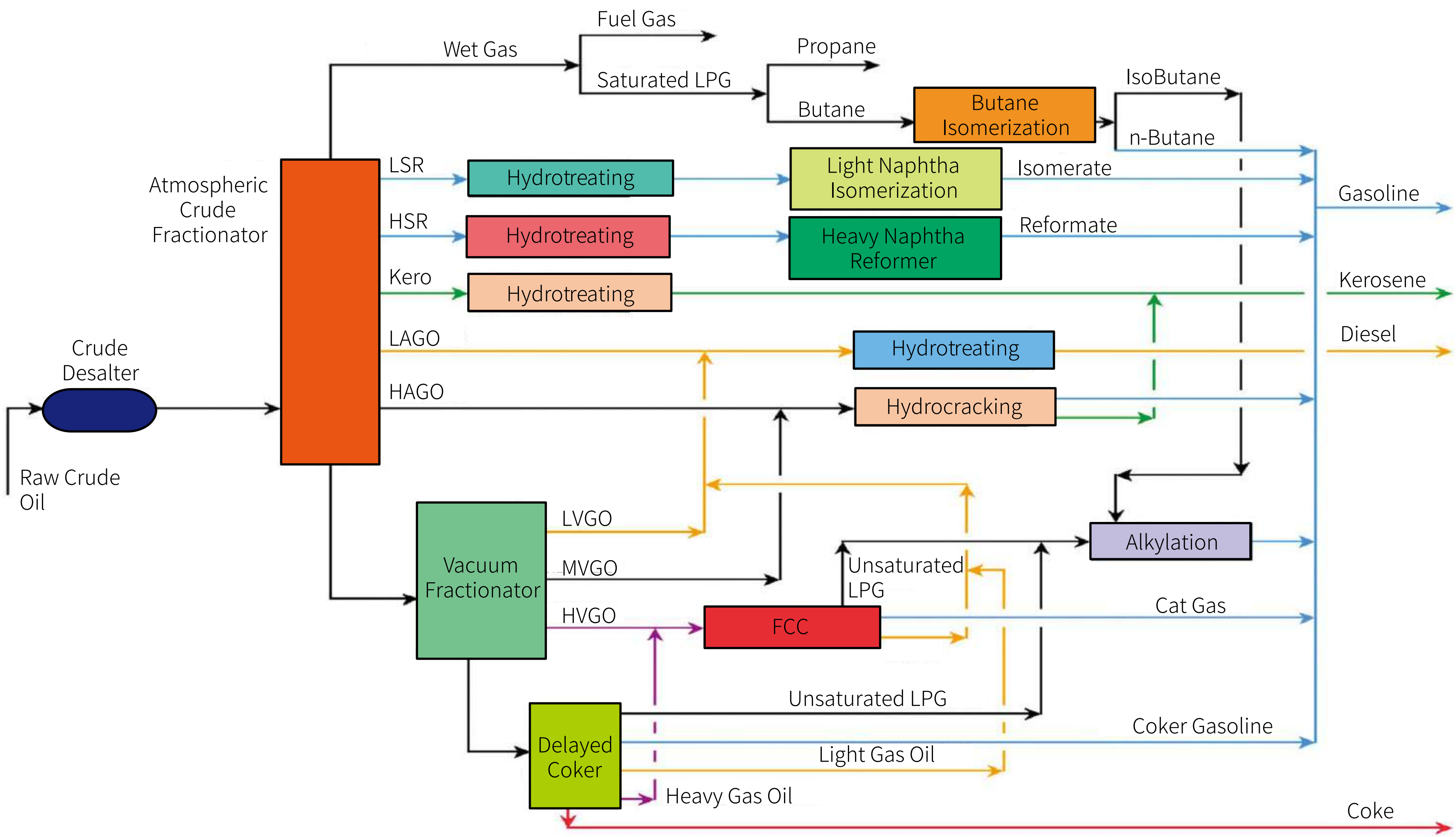
The process of separating crude oil into different fractions based on their boiling points using distillation methods. This is commonly known as crude oil distillation and includes crude oil pretreatment, atmospheric distillation, and vacuum distillation.

Secondary Processing:

The process of converting heavy fractions and residue oil into light oil through various cracking processes. This includes thermal cracking, visbreaking, catalytic cracking, hydrocracking, and petroleum coking.

Tertiary Processing:

The process of further processing various gases produced during secondary processing (i.e., refinery gas processing) to produce high-octane gasoline components and various chemicals. This includes alkylation, isomerization, and other processes.


Fuel Gas
Wet Gas
Propane
Saturated LPG
IsoButane
Butane
Butane Isomerization
n-Butane
LSR
Hydrotreating
Light Naphtha Isomerization
Isomerate
Atmospheric Crude Fractionator
Gasoline
HSR
Hydrotreating
Heavy Naphtha Reformer
Reformate
Kero
Hydrotreating
Kerosene
LAGO
Hydrotreating
Diesel
Crude Desalter
HAGO
Hydrocracking
Raw Crude Oil
LVGO
Alkylation
Vacuum Fractionator
MVGO
Unsaturated LPG
HVGO
FCC
Cat Gas
Unsaturated LPG
Coker Gasoline
Delayed Coker
Light Gas Oil
Heavy Gas Oil
Coke

Vacuum Distillation Unit

Refinery Position

- The "leading" unit of the refinery
- The first oil processing unit
- Provides raw materials for subsequent processing units; if it stops, it leads to a shutdown of the entire refinery.

Technical Route

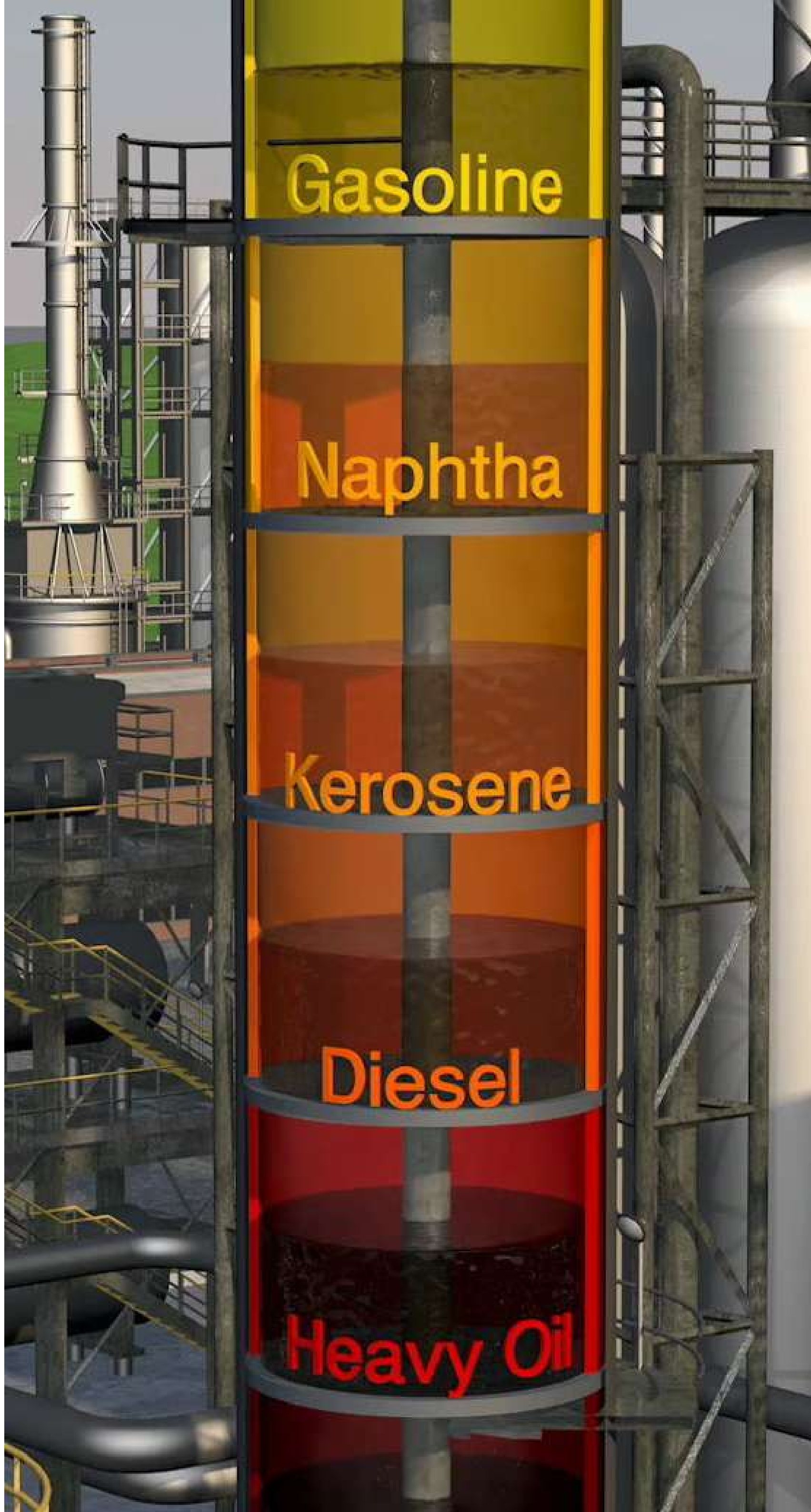
Crude oil heat exchange → Electro-dewatering → Crude oil heat exchange → Initial distillation → Initial bottom oil heat exchange → Atmospheric furnace → Atmospheric tower → Vacuum furnace → Vacuum tower

Raw Material

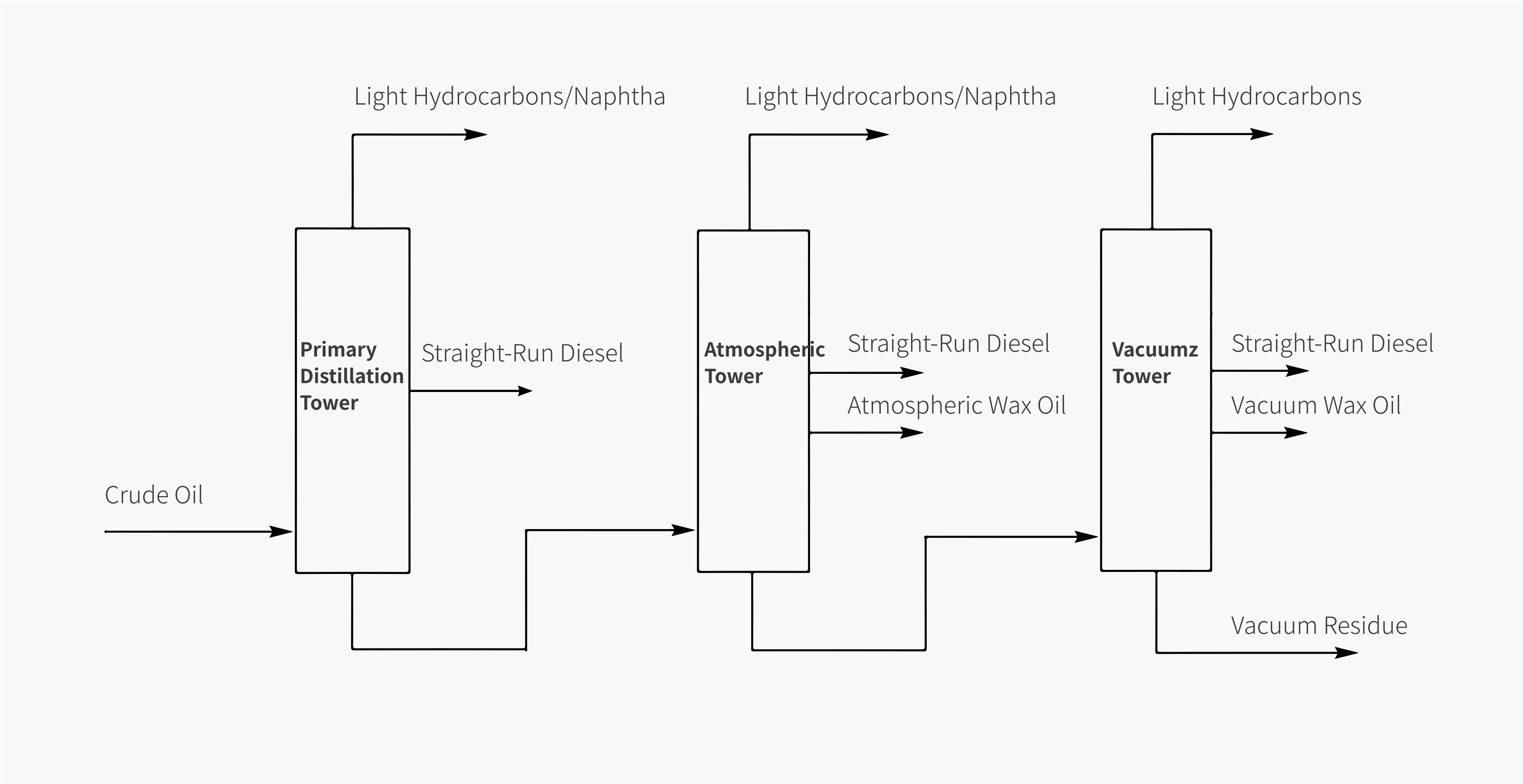
- Crude Oil

Product

- Non-condensable gases → Sent to the heater
- Straight-run naphtha → Sent to the reforming unit
- Straight-run diesel → Sent to the diesel hydrotreating unit
- Straight-run wax oil → Sent to the catalytic or hydrocracking unit
- Vacuum residuum → Sent to the delayed coking unit



Three-Stage Gasification Process



Delayed Coking Unit

Refinery Status/Position

Refinery "Waste Treatment" and "Upgrading Low-Quality Feedstock to High-Quality Products" Unit

Technical Route

Heat Exchange of Vacuum Residue - Coking Furnace - Coke Drum - Fractionation Tower - Rich Gas Compressor - Absorption-Stabilization System - Double Desulfurization System - Caustic Washing System

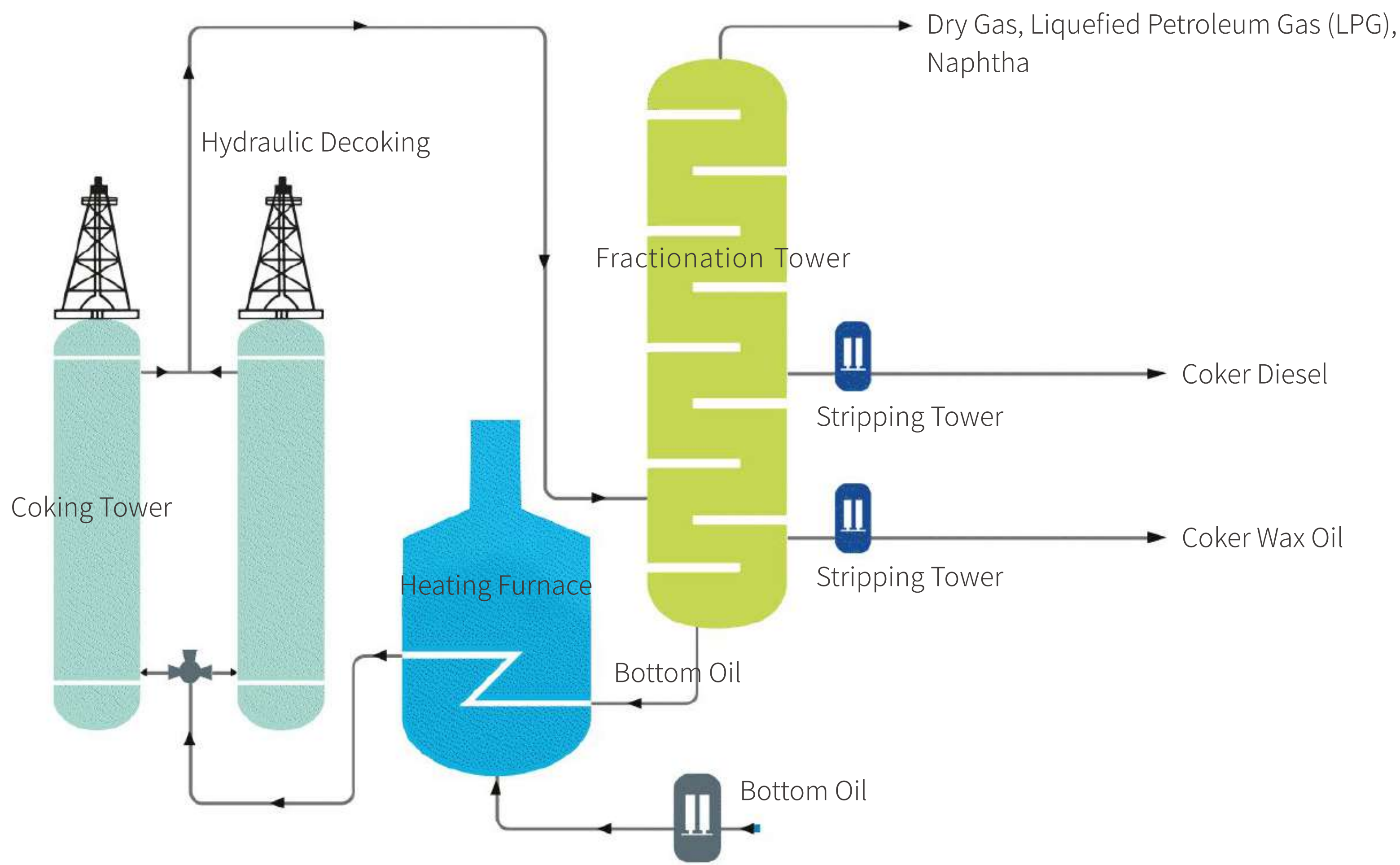
Raw Material

- Vacuum Residue
- Fuel Oil
- Waste Oil

Product

- Non-condensable gases → Sent to the heater
- Straight-run naphtha → Sent to the reforming unit
- Straight-run diesel → Sent to the diesel hydrotreating unit
- Straight-run wax oil → Sent to the catalytic or hydrocracking unit
- Vacuum residuum → Sent to the delayed coking unit

Delayed Coking Process Flow



Fluid Catalytic Cracking Unit

Refinery Status

- The most important secondary processing process in the petroleum refining industry.
- The core process for converting heavy oil into light oil.
- A crucial means to increase the depth of crude oil processing and enhance light oil yields.

Technical Route

Raw materials enter the riser reactor's lower part, mix with high-temperature catalysts, gasify, and react. Oil gas and catalysts separate in the settler and cyclone, then enter the fractionation tower for gasoline, diesel, and heavy oil separation. Cracked gas is compressed for gas separation. Coked catalysts are burned in the regenerator to remove coke and recycled.

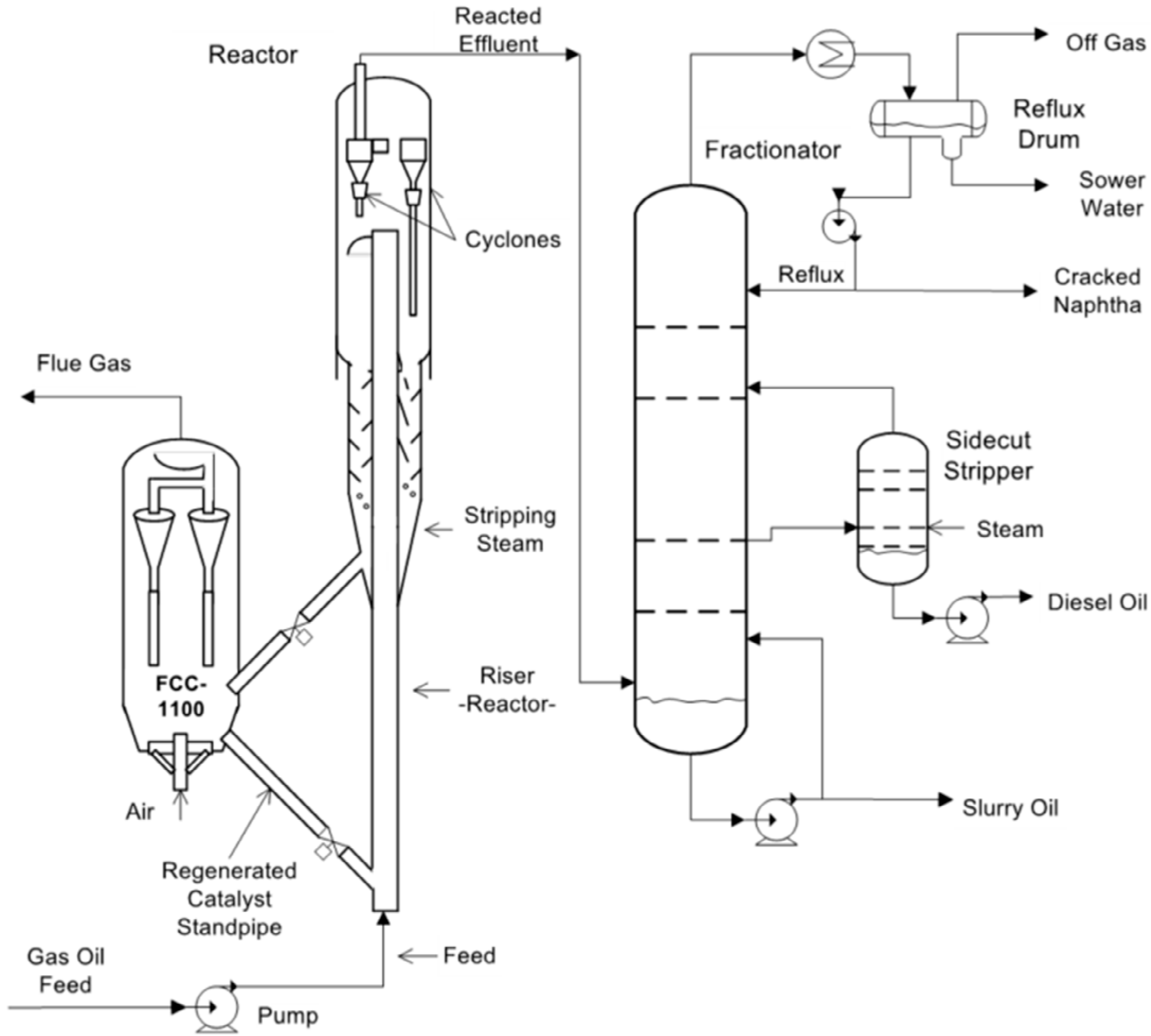
Raw Material

- Heavy oil AGO (Atmospheric Gas Oil)
- Gas (dry gas and liquefied petroleum gas, LPG)
- VGO (Vacuum Gas Oil)
- AR (Atmospheric Residue)

Product

- High-octane gasoline
- Catalytic diesel (LCO)
- VR (Vacuum Residue)
- Oil slurry and coke

The Catalytic Cracking Process



Hydro Refining

Refinery Status

The refinery's role is to utilize the hydrogenation process to improve the stability and corrosion resistance of oil products, resulting in high-quality products, enhancing the quality of finished fuels, and producing low-sulfur and ultra-low-sulfur clean fuels.

Technical Route

Under specific temperature, pressure, and hydrogen, the refining catalyst converts sulfur, nitrogen, and oxygen into H_2S, NH_3, and H_2O. It stabilizes olefins, hydrogenates aromatics and organometallics, and traps metal impurities. The catalyst is key to hydrogenation.

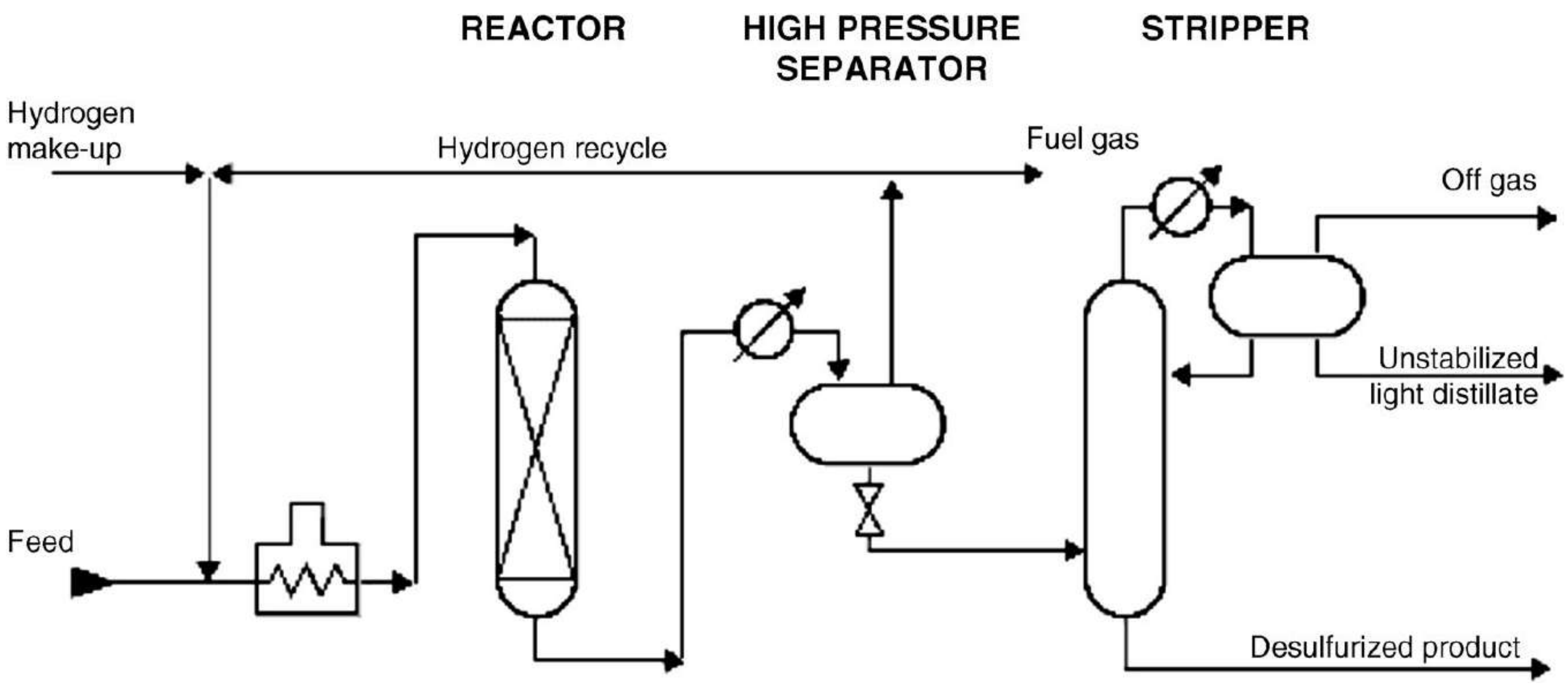
Raw Materials

- Mixed gasoline and diesel (intermediate products from low-quality secondary processing units such as atmospheric distillation units, coking units, etc.)
- Hydrogen gas

Product

- Refined gasoline
- Refined diesel
- Sulfur-containing dry gas

Hydrofining Unit Process Flow



Application Case Analysis

Oil and Gas Exploration, Extraction, and Storage

Fire Prevention Early Warning for Oil and Gas Well Fracturing Pump Trucks

Case Description:

Fracturing enhances oil and gas extraction by using high-pressure fracturing fluid to create underground fractures, improving flow and production. A fracturing pump truck injects this fluid into the well, pushing proppant into the fractures. It consists of a chassis, engine, transmission, pump, and various support systems and can operate independently or in tandem.

Operating under high pressure and harsh conditions, these trucks risk oil leaks (diesel, engine, hydraulic), which can ignite on hot surfaces like turbochargers and exhaust pipes. In unmanned well sites with multiple trucks, an unattended fire can quickly escalate, causing severe economic losses.

Recommended Measures:

The Fotric online thermal imaging fire prevention system provides 24/7 real-time temperature monitoring for fracturing pump trucks. Upon detecting high temperatures, it triggers an alarm and sends a relay signal to the DECU3 controller, activating the DSPA fire extinguisher. Thermal video feeds can be centralized for monitoring, with alarms relayed via audible, visual, or emergency communication methods.

Oil Pipeline Accumulation Detection

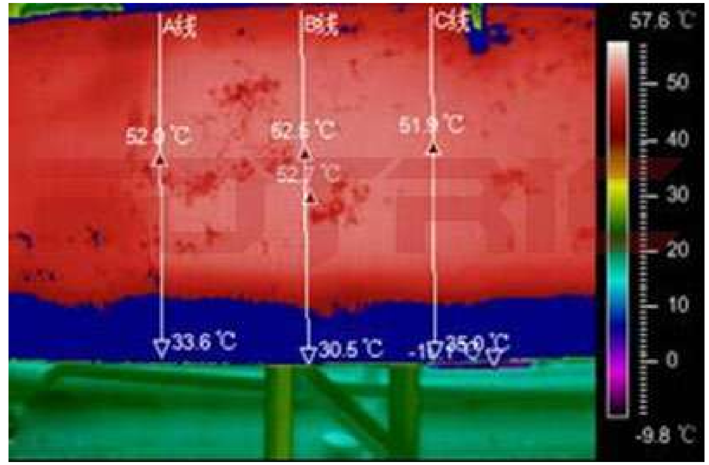
Case Description:

Oil pipeline transportation involves pressurizing and heating crude oil (or petroleum products) to transport it through pipelines from one location (typically an oil field) to another (such as a refinery or terminal). The purpose of pressurization is to provide the crude oil with kinetic energy to overcome geographic elevation differences and pressure losses along the pipeline. Heating is applied to crude oils that are high in wax content, high pour point, and high viscosity (referred to as "three highs") in order to maintain the oil temperature above its pour point, ensuring smooth flow through the pipeline.

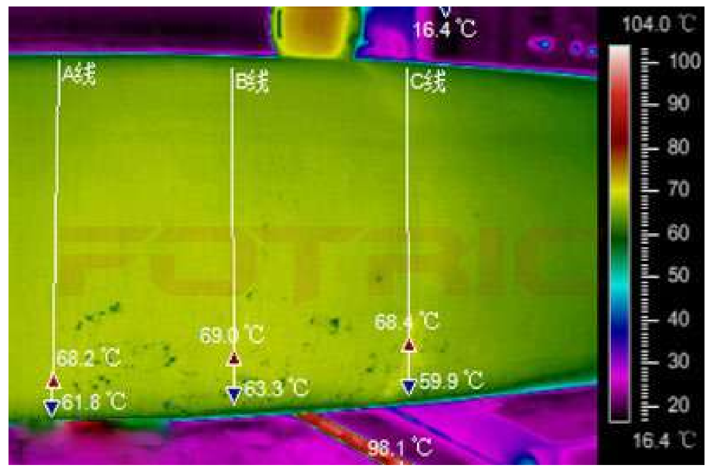
Over time, a mixture of substances such as wax, gums, paraffin, sand, and other impurities can accumulate on the inner walls of the pipeline, forming what is known as "wax deposition." This buildup narrows the internal diameter of the pipe, increases friction, reduces the transport capacity, and negatively impacts the flow efficiency. To improve the pipeline condition, it is necessary to remove the wax deposition using appropriate methods to restore the pipe's diameter, enhance its transport capacity, reduce pressure losses, and lower energy consumption.

Recommended Measures:

Regularly employ infrared thermal imaging technology to monitor the temperature of pipeline segments without insulation. This can help detect areas with wax buildup, allowing for better planning and scheduling of pipeline cleaning activities.



Before cleaning



After cleaning

Insulation Layer Defect Detection in Oil Pipelines

Case Description:

To ensure the smooth flow of "three-high" crude oil (high wax content, high pour point, and high viscosity) in the pipeline, heating is typically applied at the oil pumping station to maintain the oil temperature above its pour point or at an even higher temperature. For energy conservation and cost reduction purposes, insulation is often added to the pipeline's outer shell. Under normal conditions, the surface temperature of the insulation should be close to the ambient temperature, indicating that the insulation is effective and providing good energy-saving and heat retention performance.

However, in cases of insulation defects, the temperature at specific points can exceed 60°C , which is more than 50°C higher than the normal surface temperature of around 50 °C . This significantly undermines energy efficiency and can lead to issues like wax buildup on the pipeline wall surface due to lower external temperatures.

Recommended Measures:

Since the insulation layer is a concealed structure, it is not possible to directly inspect its effectiveness with the naked eye. Infrared thermal imaging technology can provide a clear and intuitive view of defective areas in the insulation layer. This enables accurate evaluation and helps in assessing the insulation's performance and ensuring optimal energy efficiency.

Fire Prevention and Early Warning in Oil and Gas Storage and Transportation

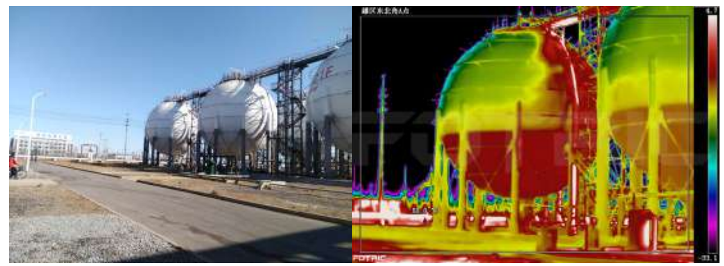
Case Description:

Oil and gas storage and transportation involve the entire process of transporting petroleum and natural gas. With the implementation of sustainable development strategies in the oil and petrochemical industry, oil and gas storage and transportation have become increasingly critical. Since the main components of oil and natural gas are hydrocarbons, which are highly flammable, explosive, prone to static electricity accumulation, and toxic, the storage and transportation of oil and gas are carried out under specific conditions. Particularly in oil pipelines, which require heating and pressurization, there is a significant fire and explosion risk. In the event of an accident, there could be substantial economic losses, casualties, and severe social consequences.

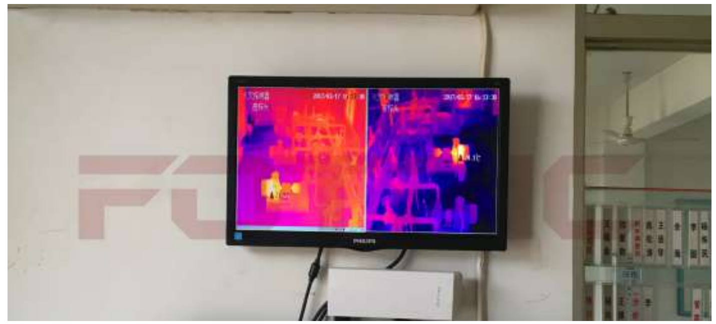
Recommended Measures:

Fire hazards in oil and gas storage and transportation arise from poor equipment design, failures, lack of explosion-proof electricals, inadequate anti-static measures, unauthorized hot work, procedural violations, and external fire sources.

The FOTRIC Smart Inspection System enables regular equipment checks, while the FOTRIC online fire prevention system provides 24/7 monitoring. Upon detecting risks like unauthorized hot work, external fire, or overheating, it triggers alarms and alerts personnel via mobile notifications for timely intervention.



Overtemperature Early Warning Monitoring in Oil Pump Rooms of Oil Storage Tank Areas



Case Description:

The oil pump station is the heart of the oil storage tank area, serving as the power source for the oil loading and unloading operations within the oil depot. It is also the most frequently used area in the depot. Issues such as oil leakage, dripping, and spillage are common occurrences. If the oil and gas concentration reaches explosive limits, encountering high-temperature sources could easily lead to flash explosions and fires, resulting in significant damage.

Currently, the monitoring methods in the oil pump station typically include two types:

- Temperature and smoke detectors installed on the roof and sides of the pump station.
- Visible light cameras installed in the pump station, enabling remote monitoring of the area.

However, neither of these methods can provide pre-emptive disaster warnings.

Recommended Measures:

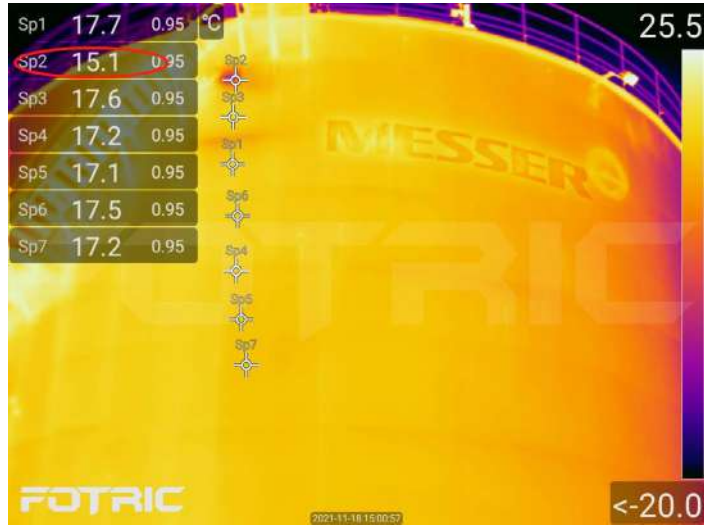
Install FOTRIC online explosion-proof thermal imaging system or use handheld thermal imagers in oil pump stations to monitor equipment temperatures in real time. Upon detecting anomalies, the system triggers instant alarms and pinpoints the issue, enabling swift on-site intervention to prevent accidents.

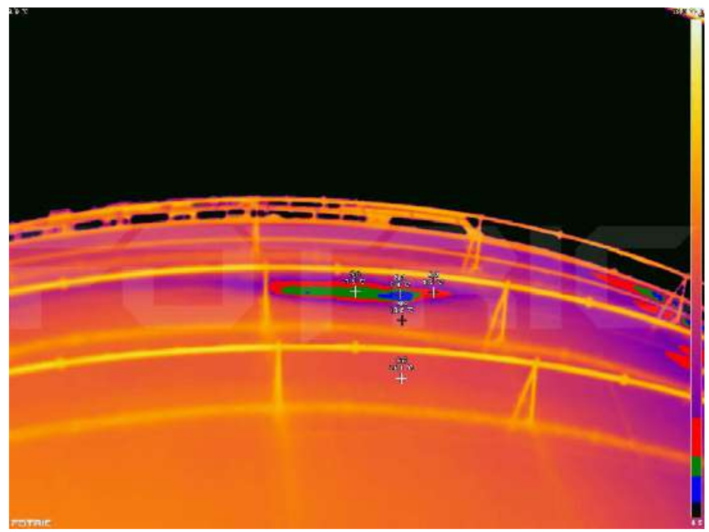
Defects and Failures in the Insulation Layer of LNG Storage Tanks

Case description

LNG storage tanks are low-temperature pressure vessels with vacuum powder insulation and a double-cylinder structure. The inner cylinder (stainless steel) and outer cylinder (pressure vessel steel) are separated by pearlite sand and a molecular sieve adsorber. A vaporizer and low-temperature liquid pump enable high-pressure gas discharge.

Vacuum powder insulation reduces heat transfer by evacuating the powder-filled space, using low-conductivity materials to minimize gas and radiant heat transfer, ensuring effective insulation.





Recommended Measures:

During the operation of the LNG storage tank, thermal expansion and contraction, construction quality issues, and other factors can cause the pearlite sand filling in the tank to settle and lead to vacuum leakage, resulting in insulation layer defects. The more severe the settling of the pearlite sand, the greater the heat transfer, and the lower the temperature of the inner steel plate and outer wall of the LNG storage tank. The areas with insulation defects in the LNG storage tank will show signs of frost, condensation, or even ice formation. Prolonged low-temperature leakage not only reduces energy efficiency but also poses a risk to the safe operation of the LNG storage tank. It is recommended to regularly use the FOTRIC Technology handheld explosion-proof thermal imager for predictive detection and maintenance of LNG storage tanks to ensure long-term operation and safety of the LNG storage tank.

Application Case Analysis

Substation Transmission and Distribution

220kV Substation Electrical Equipment Temperature Online Monitoring

Case Description:

Large integrated refineries generally have their own 220KV power system. During daily operation, the current-carrying conductors of electrical equipment generate resistance losses due to the current effect. Throughout the entire circuit for electric energy transmission, there are numerous connectors, metal joints, or contacts. Some connectors, metal joints, or contacts may have poor connections, resulting in increased contact resistance. This leads to more resistance losses and higher temperature rises in those areas, causing thermal images of localized overheating.

Recommended Measures:

The FOTRIC Online Thermal Imaging System provides 24/7 real-time monitoring of electrical equipment, detecting heating effects in transformers, circuit breakers, cables, and more. It reduces maintenance costs, enhances predictive maintenance, prevents failures, and ensures long-term equipment operation.

Temperature Monitoring of 220KV Transformers

Case Description:

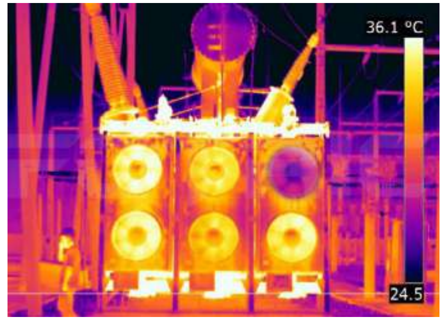
The 220KV transformer consists of components such as the iron core, coils, oil tank, insulating oil, heat dissipation fins or fans, etc. Due to its large size and the presence of insulating oil for internal circulation cooling, it is difficult to detect internal faults or defects of the transformer through infrared thermography. However, defects such as poor heat dissipation, magnetic flux leakage, poor contact, and oil deficiency can be detected in advance.

Recommended Measures:

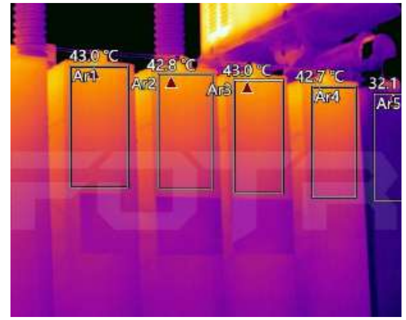
Based on the inspection results, upon planned shutdown, inspect and confirm the abnormal areas, clean and repair them, and then conduct a retest using thermography to confirm the elimination of defects.

Regular inspections using an infrared thermograph can significantly extend the normal operating cycle of electrical equipment within the fan control cabinet.

There are obvious hot spots on the bushing pillar head of the low-voltage side of the 220kV transformer, with a temperature exceeding 120°C . The upper part of the bushing's general cap is overheated. Preliminary judgment indicates that poor internal connection within the bushing leads to heat conduction to the general cap, causing an overheating phenomenon.



The temperature of the upper right cooling fan of the 220kV transformer cooler (air-cooled) is lower than expected. This may be due to abnormal circuitry or the fan itself, causing ineffective heat dissipation and lower temperature.



The local temperature of the heat dissipation fins of the 220KV main transformer is lower than expected. This may be due to a closed valve or blocked heat dissipation oil pipeline, resulting in ineffective heat dissipation by the fins.

The bolts at the bottom of the 220KV main transformer body are excessively hot, indicating eddy current losses due to magnetic flux leakage.

The oil level boundary line of the bushing rise seat of phase A of the 220KV main transformer is lower compared to those of phases B and C. Phase A's bushing is suspected of being low on oil.

220KV Isolating Switch Phase A Blade Overheating Fault

Case Description:

Phase A of a 220KV isolating switch showed abnormal heating, with the blade's crimping spring generating significant heat. According to DL/T 664-2016 standards, defects are classified as:

- General: ΔT ⩽ 15K, not meeting severe defect criteria.
- Serious: Hot spot >90°C or δ ⩾ 80%.
- Critical: Hot spot >130°C or δ ⩾ 95%.

Analysis showed a max temperature >58°C and δ ⩾ 93%, classifying this case as a general defect due to current-induced heating.

Recommended Measures:

Enhanced Monitoring and Defect Elimination Planning: Increase monitoring efforts and plan for defect elimination.

Inspection, Repair, and Re-testing: Based on the inspection results, during a planned shutdown, inspect and confirm the defective area, repair it, and then conduct a retest using thermal imaging to confirm the defect has been eliminated.

Regular Inspections with Infrared Thermography: Conducting regular inspections using an infrared thermograph can significantly enhance the normal operating cycle of the isolating switch. By monitoring potential issues early, maintenance can be performed promptly, reducing the risk of unexpected shutdowns and ensuring the reliable operation of the isolating switch.

Overheating Fault of the Blade on Phase A of a 220KV Isolating Switch

Case Description:

Phase A of a 220KV isolating switch shows abnormal heating, with significant heat at the blade's crimping spring. According to DL/T 664-2016, defects are classified as:

- General: ΔT ⩽ 15K.
- Serious: Hot spot >90°C or δ ⩾ 80%.
- Critical: Hot spot >130°C or δ ⩾ 95%.

With a max temperature >58 °C and δ ⩾ 93%, this case is classified as a general defect due to current-induced heating.

Recommended Measures:

Enhanced Monitoring and Defect Elimination Planning: Increase monitoring efforts and plan for the elimination of defects.

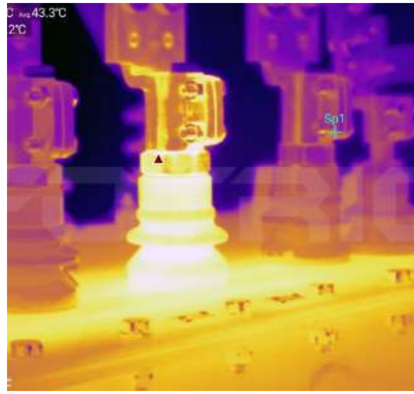
Inspection, Repair, and Re-testing Based on Inspection Results: During a planned shutdown, inspect and confirm the defective area, repair it, and then conduct a retest using thermal imaging to confirm that the defect has been eliminated.

Regular Inspections with Infrared Thermography: Conducting regular inspections using an infrared thermograph can significantly enhance the normal operation of the isolating switch. By promptly detecting and addressing potential issues, the reliability and lifespan of the isolating switch can be improved.

Transformer Bushing Overheating Fault

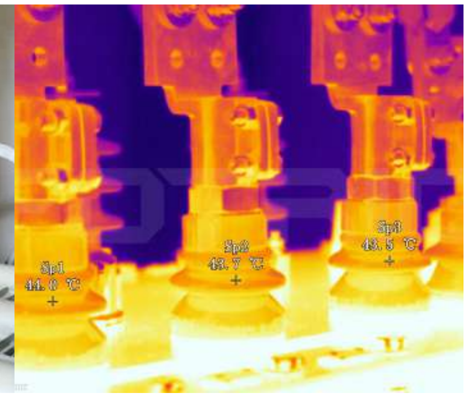
Case Description:

During an inspection, an overheating phenomenon was observed at the bushing of the B-phase pillar head on the low-voltage side of Transformer No. 1. The maximum temperature reached 71.1 °C , with an inter-phase temperature difference of 25 °C . According to the standards outlined in DL/T664-2016, "Guidance for the Application of Infrared Diagnostic Technology to Live Equipment," this constitutes a serious defect.



Recommended Measures:

- After scheduling a shutdown, the transformer was disassembled for inspection, revealing that the fixing bolts of the three-phase pillar heads on the low-voltage side had all experienced some degree of detachment, with the remaining bolts in Phase B showing significant looseness.
- After tightening the detached and loose bolts, the transformer was put back into operation, and a follow-up measurement confirmed that the temperature of the originally overheated area had dropped to 43.7 °C , within the normal range, thereby addressing the bushing defect.
- Regular inspections using an infrared thermographic camera can significantly enhance the normal operating cycle of the transformer.



10KV Strain Clamp Lead Joint Overheating Fault

Case Description:

Abnormal heating was detected at the metal joint of a 10kV strain clamp, with significant heat in the thermal image. According to DL/T 664-2016:

- General: $\Delta T \leqslant 15K$.
- Serious: Hot spot >90°C or $\delta \geqslant 80\%$.
- Critical: Hot spot >130°C or $\delta \geqslant 95\%$.

Analysis shows this case is a serious defect due to current-induced heating.

Recommended Measures:

Enhanced Monitoring and Defect Elimination Planning: Increase monitoring efforts and plan for the elimination of defects.

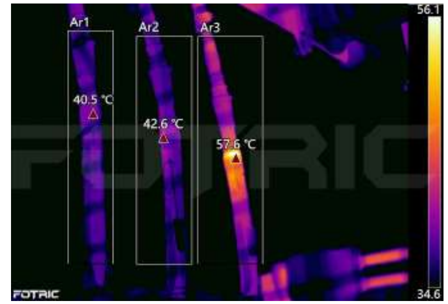
Inspection, Repair, and Re-testing Based on Inspection Results: During a planned shutdown, inspect and confirm the defective area. After repair, conduct a retest using thermal imaging to confirm that the defect has been eliminated.

Regular Inspections with Infrared Thermography: Conducting regular inspections using an infrared thermograph can significantly enhance the normal operating cycle of the strain clamp lead joints. By promptly detecting and addressing potential issues, the reliability and safety of the power transmission line can be improved, ensuring stable power supply.

Cable Trench/Cable Well/Cable Tray Cable Fire Prevention Warning

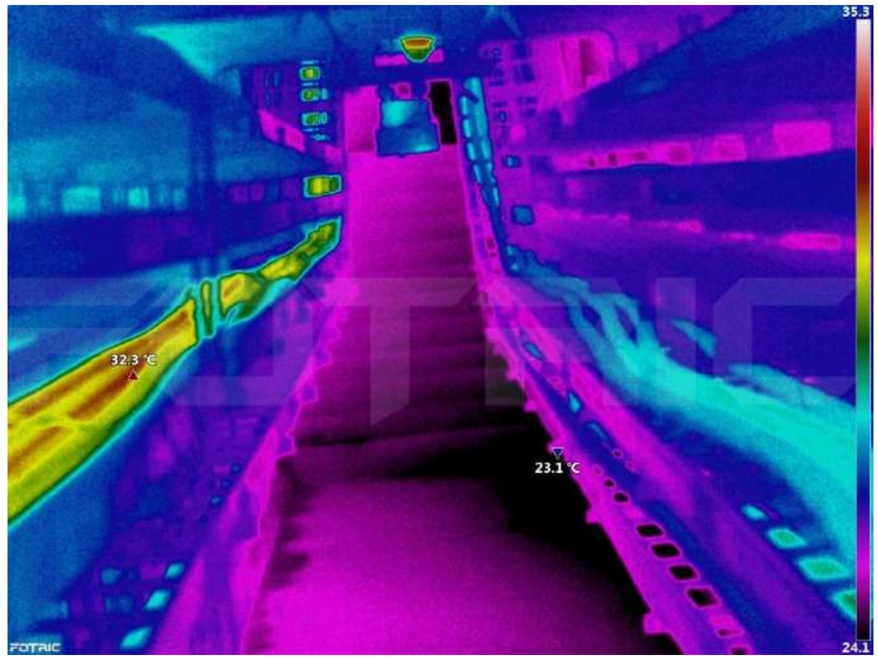
Case Description:

Cable fires in trenches, wells, and trays are caused by insulation failures or external high-temperature sources. These fires are concealed and ignite quickly, making detection difficult. Once a fire occurs, it can lead to severe consequences, including toxic smoke, environmental harm, and significant economic and personal losses.

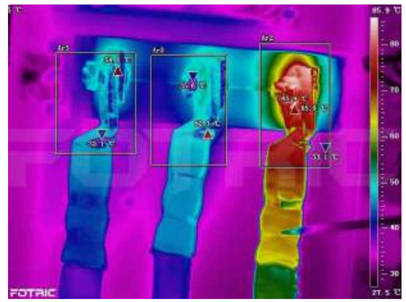


Recommended Measures:

It is recommended to conduct periodic infrared thermography surveys of cables in cable trenches, electric wells, and cable trays, or install an online thermal imaging fire prevention monitoring system like FOTRIC's. This can monitor the temperature distribution of all equipment in cable trench, cable well, and cable tray scenarios in real-time. If the temperature exceeds the preset standard, it will issue an audible and visual alarm in advance for early warning. Furthermore, the software backend can intuitively and clearly locate the position of abnormally heated cables, significantly reducing the risk of cable fire accidents.

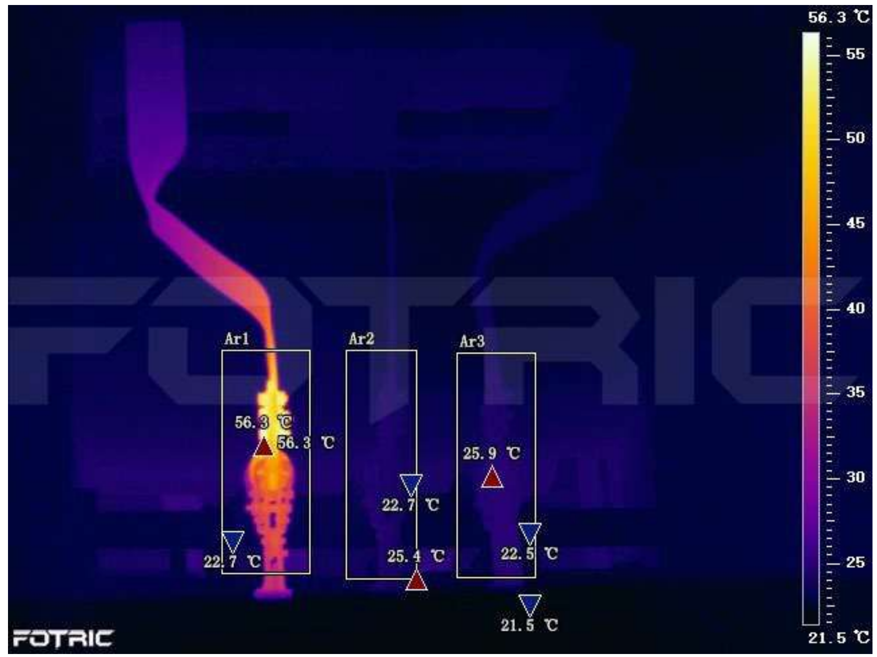


Three-Phase Copper Busbar / Cable Metal Joint Overheating Fault



Case Description:

The three-phase copper busbar / cable metal joint experiences abnormal heating, with a thermal image clearly showing significant heating centered on the copper busbar joint. According to the diagnostic criteria table for current-induced heating equipment defects in Appendix A of the Specification for Infrared Diagnosis of Live Equipment (DL/T 664-2016): general defects (temperature difference not exceeding 15K, not meeting the criteria for significant defects), serious defects (hot spot temperature >90°C or δ ⩾ 80%), and critical defects (hot spot temperature >130°C or δ ⩾ 95%). After analysis, the fault case in the following figure is classified as a serious defect of current-induced heating type.



Recommended Measures:

- Enhance monitoring and schedule defect elimination.
- Based on the detection results, during the planned shutdown, inspect and confirm the defective area, perform repairs, and then conduct a retest using thermal imaging to verify the defect elimination.
- Regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the disconnector switch.

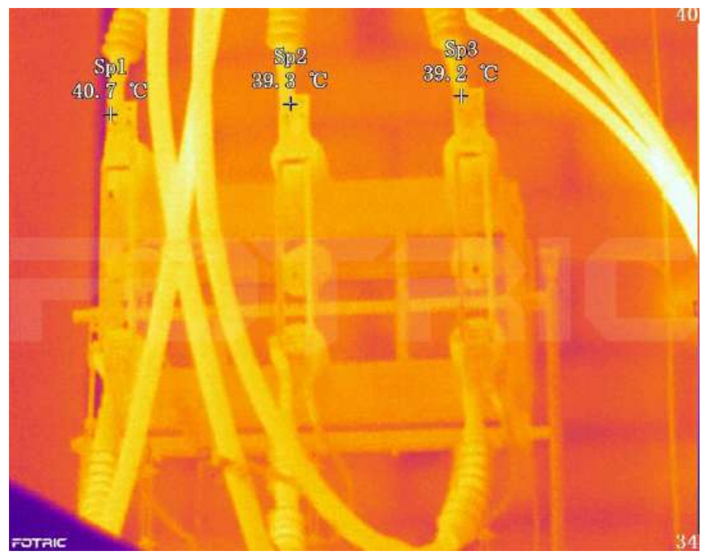
Transformer Disconnector Joint Overheating Fault

Case Description:

During an inspection, it was found that there was a significant overheating phenomenon in Phase B of the transformer disconnector, with a maximum temperature of 56°C and an inter-phase temperature difference of 11.7 °C . According to the DL/T664-2016 Guide for Infrared Diagnostic Techniques of Live Equipment, this is classified as a general overheating defect.

Recommended Measures:

- Based on the thermal imaging detection results, after shutdown, polish the contacts of the disconnector, and conduct a thermal imaging retest to confirm that the temperature has dropped to within the normal range, thereby eliminating the defect.
- Conducting regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the electrical equipment within the distribution cabinet.



Motor Control Cabinet Reactor Terminal Overheating Fault

Case Description:

During an inspection, it was found that there was a significant overheating issue at the outgoing terminal of Phase A of the reactor inside the motor control cabinet of the compressor. This was classified as a serious defect. The maximum temperature of Phase A reached 70.3 °C , with an inter-phase temperature difference of 24.8 °C . Preliminary judgment indicated that the loosening of the Phase A terminal led to an increase in contact resistance, causing the temperature of the terminal to rise.

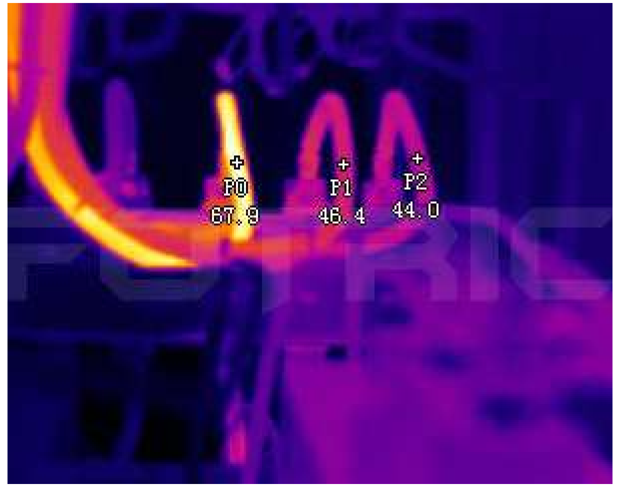
Recommended Measures:

- Based on the thermal imaging detection results, after shutting down the equipment, polish the contacts of the disconnecting switch, and conduct a thermal imaging retest to confirm that the temperature has dropped to within the normal range, thereby eliminating the defect.
- Regular inspections using an infrared thermographic camera can significantly enhance the normal operating lifespan of the electrical equipment within the distribution cabinet.

Cable Three-Phase Imbalance Fault

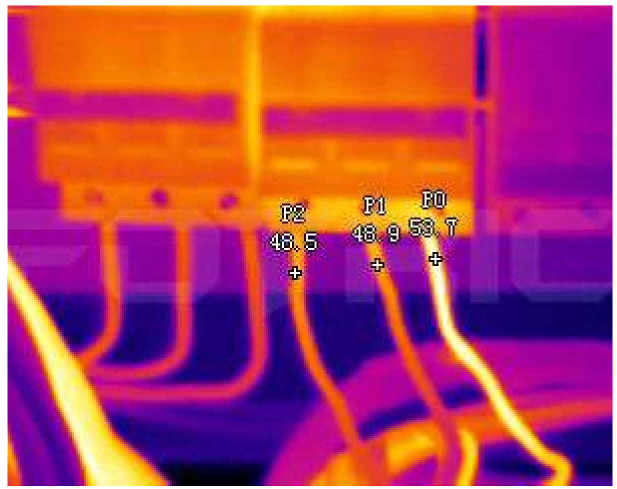
Case Description:

During an inspection, it was discovered that the C-phase cable of the 1# circuit breaker in the capacitor compensation cabinet exhibited overall overheating. The temperature at the upper end was 53.7 °C , while the lower end reached 67.9 °C , with an inter-phase temperature difference exceeding 13°C . Preliminary assessments indicated potential issues such as poor electrical contact and three-phase imbalance, with excessive loading on the C-phase causing an overall temperature increase in the C-phase cable.

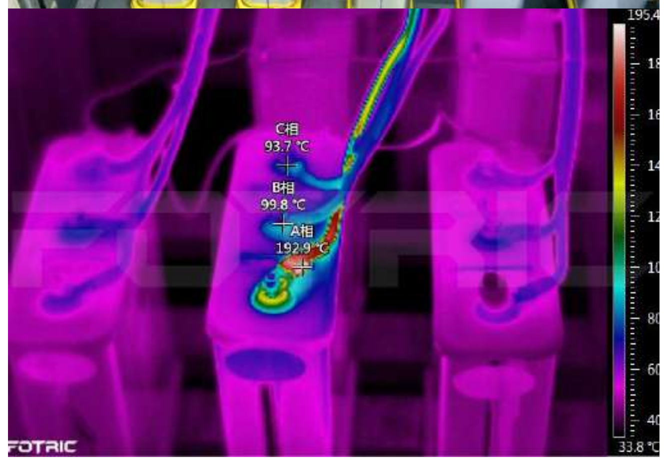


Recommended Measures:

- Based on the detection results, it is planned to tighten the C-phase connectors during a scheduled shutdown and redistribute the load at the rear end of the circuit breaker to rebalance the phases. After retesting, the temperature should drop to within the normal range, confirming the defect elimination.
- Conducting regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the electrical equipment within the capacitor compensation cabinet.



Capacitor Cabinet Electrical Connection Poor Contact Overheating Fault



Case Description:

During an inspection, it was found that the three-phase cable connectors of the 2# capacitor in the capacitor compensation cabinet were overheating. The maximum temperature of Phase A exceeded 192.9 ℃ , while Phase B was 99.8 ℃ and Phase C was 93.7 ℃ . All three-phase connectors exceeded the allowed temperature range of the equipment. Preliminary assessments indicated potential issues with poor electrical contact.

Recommended Measures:

- Based on the detection results, it is planned to inspect and tighten the three-phase connectors during a scheduled shutdown.
- After the maintenance is completed, thermal imaging must be used for retesting to confirm the defect elimination before the equipment can be put back into service.
- Conducting regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the electrical equipment within the capacitor compensation cabinet.

Control Cabinet Contactor Bolt Connection Oxidation and Overheating Fault

Case Description:

During an inspection, it was discovered that the outgoing line connector of Phase B of the contactor in the fan control cabinet exhibited an overheating phenomenon. The maximum temperature of Phase B reached 127.4 °C , with an inter-phase temperature difference of approximately 60 °C . Preliminary assessments indicated that there was oxidation and looseness in the Phase B connector, leading to an increase in contact resistance and subsequently causing an elevation in connector temperature.

Recommended Measures:

- Based on the detection results, it is planned to replace and tighten the bolt of the Phase B connector during a scheduled shutdown. After retesting with a thermal imager, the temperature should drop to within the normal range, confirming the defect elimination.
- Conducting regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the electrical equipment within the fan control cabinet.

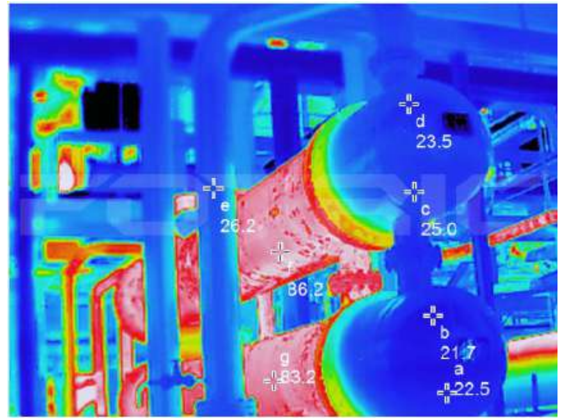
Application Case Analysis

Machinery Maintenance and Process Equipment

Clogging of Cooler Tube Bundles

Case Description:

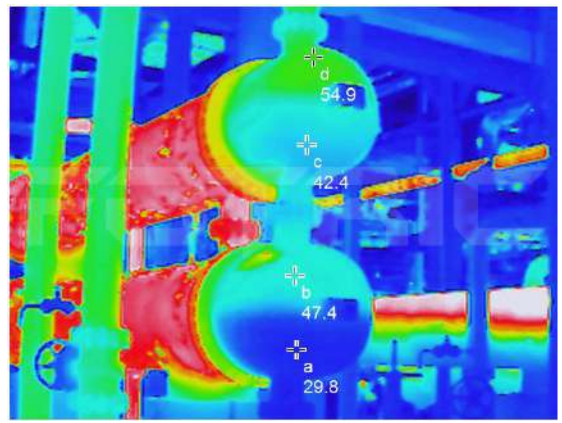
During the monthly inspection of the EC7002AB water cooler in the atmospheric and vacuum distillation unit area, it was observed that the surface temperatures of the upper and lower shell sides of the cooler were similar, and there was almost no temperature difference between the inlet and outlet water of the tube box, indicating a deterioration in the cooling effect of the tube side. The outgoing temperature of the second atmospheric distillation (diesel oil) was 54°C , exceeding the control index of 50 °C . Preliminary judgment was that fouling in the tube bundle was affecting the long-term operation of the unit.



Before Rectification

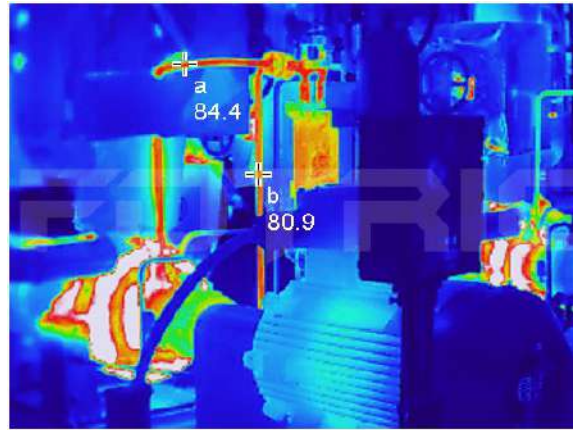
Recommended Measures:

- Perform backwashing of the cooling water circuit and blowdown of the cooling water in the tube side.
- Increase the opening of the outlet valve of the cooling water circuit to enhance the circulation volume.
- Conduct thermal imaging inspections of the water coolers within the unit on a monthly basis to collect thermal images and temperature data of the coolers to confirm their operating conditions.
- For water coolers with detected issues, promptly perform backwashing and blowdown of the tube side.



After Rectification

High-Temperature Oil Pump Mechanical Seal White Oil System Overheating



Before Rectification

After Rectification

Case Description:

In the atmospheric and vacuum distillation unit area, the mechanical seal white oil system of a high-temperature oil pump (with a medium temperature of 348 °C) was found to have a circulation temperature exceeding 84 °C . After dismantling and inspecting the white oil system and the seal oil injection system, it was initially determined that the insufficient cooling capacity of the white oil cooler led to overheating in the circulation. The white oil system could not be effectively cooled, and the abnormally high temperature severely impacted the safe operation of the mechanical seal and shortened its service life.

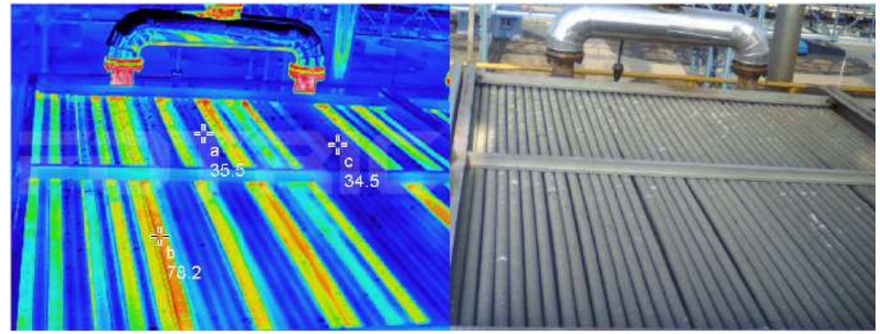
Recommended Measures:

- By installing a throttling valve at the pump base circulating water, the cooling water flow to the white oil cooler can be reasonably allocated, effectively reducing the white oil circulation temperature.
- It is recommended to use an infrared thermographic camera from a reputable brand like Fotric for regular inspections, which can signiÞcantly extend the normal operating cycle of the high-temperature oil pump mechanical seal.

The Blockage of Tube Bundles in Overhead Circulating Air Cooler

Case Description:

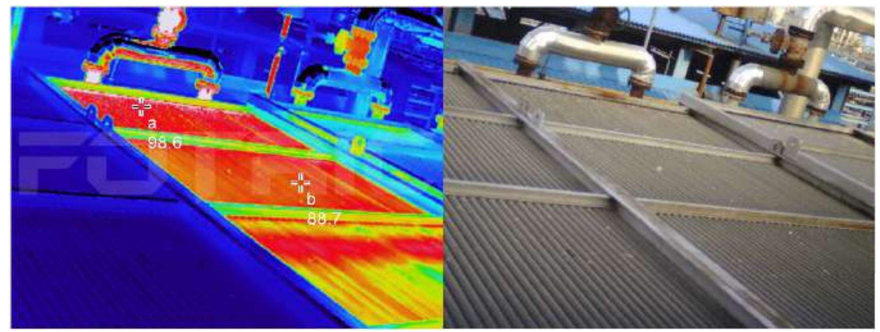
In the coking top cycle air cooler, significant temperature variations were observed on the outer surface of some tube bundles, with the highest temperature reaching 78°C and the lowest at 35°C , accompanied by clear low-temperature areas. In contrast, the outer surfaces of the unclogged tube bundles exhibited little temperature difference, with a uniform temperature distribution and notable temperature drop. Preliminary diagnosis indicates that this is due to tube bundle clogging.



Before Rectification

Recommended Measures:

- Clogging in the tube bundles leads to an elevated temperature of the cooled medium, thereby reducing the cooling efficiency of the air cooler.
- This impacts product quality control and the processing capacity of the unit.
- Cleaning should be performed either during regular maintenance or after removing the affected section.
- Utilizing infrared thermographic cameras for regular inspections can significantly extend the normal operating cycle of the top cycle air cooler tube bundles. By detecting potential issues early, timely maintenance and cleaning can be carried out to prevent further deterioration and ensure optimal performance of the air cooler.



After Rectification

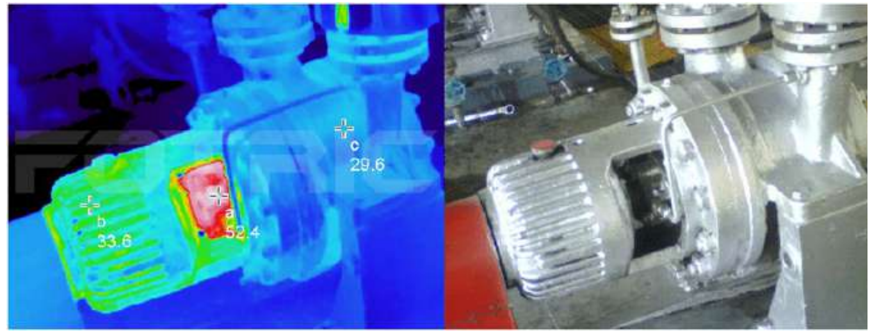
Overheating of Mechanical Seal End Cap of LPG Pump

Case Description:

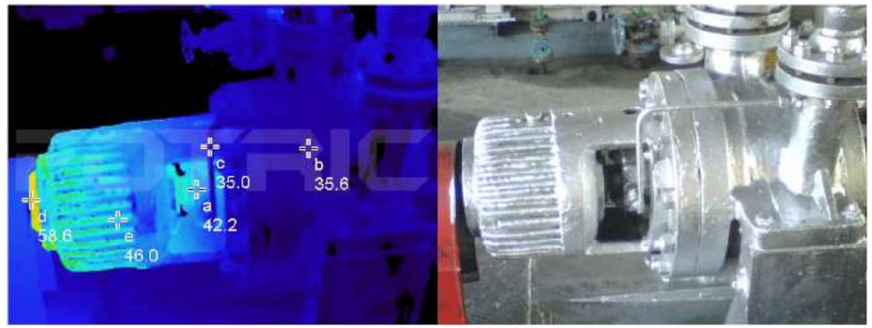
The temperature of the mechanical seal end cap of a coking liquefied petroleum gas (LPG) pump exceeded 52 °C , which is more than 10 °C above the normal temperature for mechanical seals of such pumps. Preliminary infrared thermographic detection indicated that the overheating was caused by internal clogging in the self-flushing pipeline. Operating the mechanical seal end cap at high temperatures for extended periods can lead to accelerated aging of the O-ring seals, resulting in mechanical seal failure and leakage of the transported medium. Additionally, without adequate self-flushing, the rotating and stationary seal faces of the mechanical seal are prone to depositing coke powder, which can wear down the mechanical seal and cause damage, leading to substantial leakage of the transported medium.

Recommended Measures:

- Upon dismantling and inspecting the self-flushing pipe, it was found that welding slag had clogged the pipeline, causing obstruction. After clearing the obstruction, the temperature of the mechanical seal gland approached the temperature of the medium, and the equipment returned to normal operation.
- Using an infrared thermographic camera from a reputable brand like Fotric for regular inspections can significantly extend the normal operating cycle of the LPG pump.



Before Rectification



After Rectification

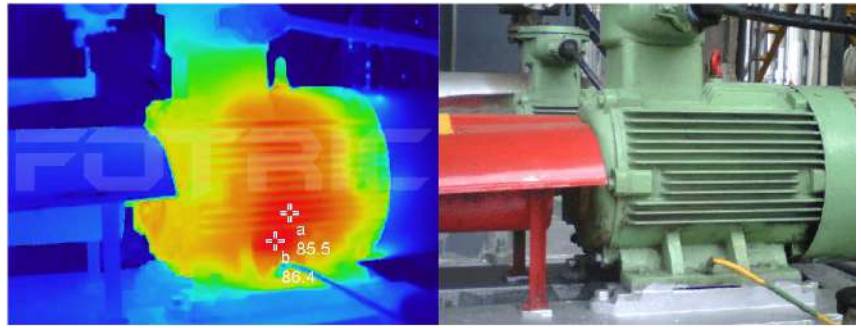
Overheating of Oil Pump Motor Stator

Case Description:

The stator temperature of the oil pump motor at a coking plant compressor station is abnormally high (85 °C vs. normal 65 °C). Infrared inspection suggests insufficient cooling air is the cause. Prolonged high temperatures may accelerate insulation aging, leading to damage, short circuits, and motor burnout.

Before Rectification:

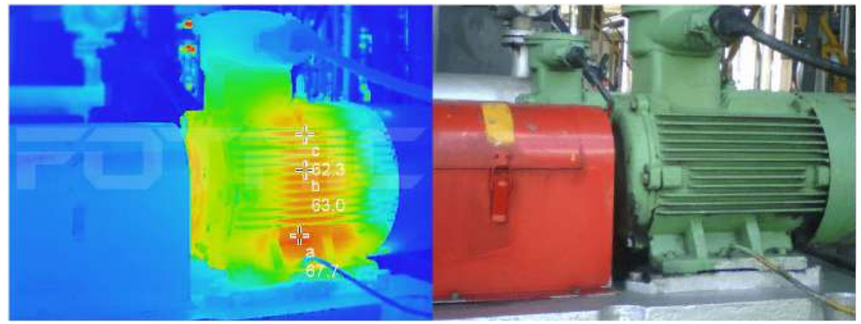
The stator temperature was excessively high.



Before Rectification

Recommended Measures:

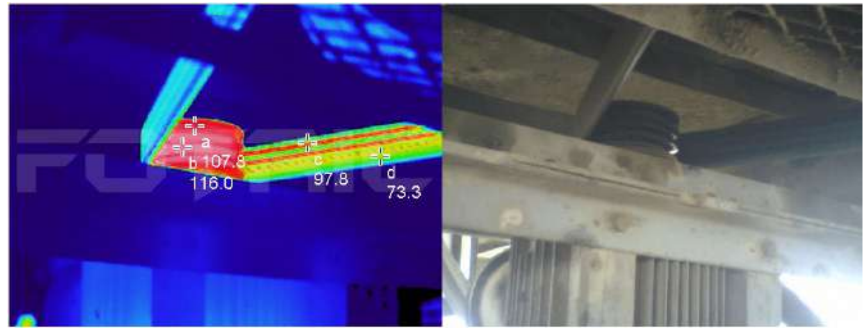
- Upon dismantling and inspecting the motor shroud, it was discovered that the blades of the cooling fan were worn, resulting in reduced cooling airflow and insufficient cooling of the motor, which led to overheating of the stator.
- After replacing the worn fan blades, the stator temperature dropped to the normal range of 65°C .
- Using an infrared thermographic camera from a reputable brand like Fotric for regular inspections can significantly extend the normal operating cycle of the motor. By detecting temperature anomalies early, timely maintenance and repairs can be carried out to prevent potential failures and ensure the continuous and reliable operation of the motor.


After Rectification

Overheating of Air-Cooled Belt

Case Description:

The air-cooled belt and pulley at the top of the coke fractionating tower's oil and gas cooling system are operating at high temperatures, resulting in a belt surface temperature exceeding 97 °C and a pulley temperature of 116 °C or higher. Preliminary diagnosis indicates that the belt's looseness is causing the overheating. Operating the belt continuously at temperatures exceeding 100°C will accelerate its aging, severely impacting its service life and exacerbating wear on the pulley.



Before Rectification

After Rectification

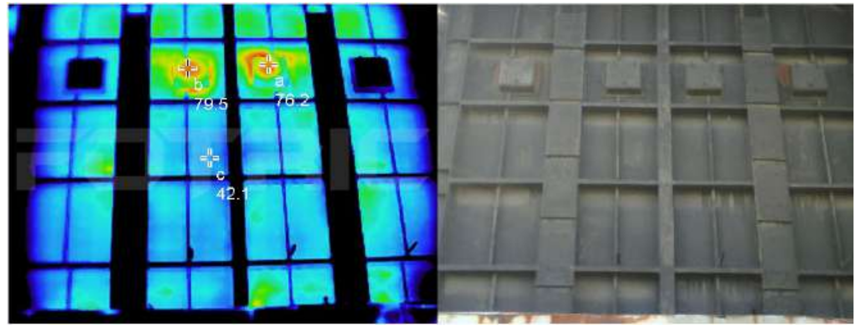
Recommended Measures:

- Adjust the tightness of the belt and inspect and align the pulleys to ensure proper centering. This adjustment reduced the operating temperature of the belt to 39°C and the temperature of the pulley to 56°C .
- Regular inspections using an infrared thermographic camera from a reputable brand Fotric can significantly extend the normal operating cycle of the air-cooled belt. By strictly adhering to this practice, the overall performance and lifespan of the equipment can be optimized.

Overheating Due to Damaged Insulation Lining of Heating Furnace

Case Description:

The surface temperature near the explosion-proof door of the radiant section of a heating furnace is nearly 80 °C . According to SH/T3036-2012 Flame Heating Furnaces for General Refinery Units, the outer wall temperature of the heating furnace should not exceed 80°C on the outer surface in calm conditions at 27°C. Preliminary diagnosis through infrared thermographic inspection indicates that the elevated temperature is caused by damage to the insulation lining of the explosion-proof door. An outer surface temperature exceeding the recommended value not only increases heat loss but also results in fuel wastage, energy conservation and consumption reduction. Prolonged exposure to excessively high temperature flue gas can corrode the furnace lining, damaging the heating furnace wall.



Before Rectification

After Rectification

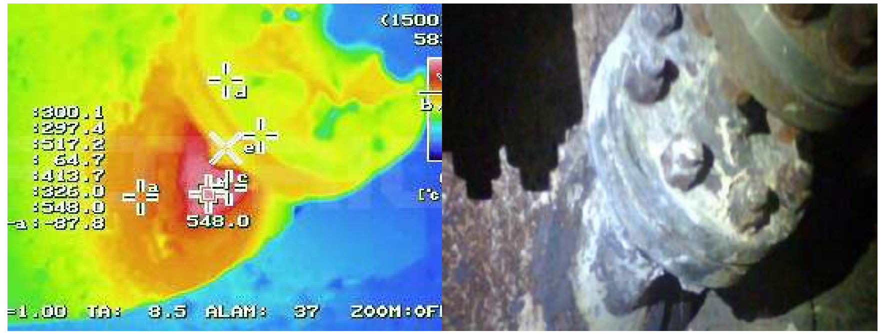
Recommended Measures:

- During shutdown and maintenance periods, repair the insulation lining at the explosion-proof door. After the repair, the temperature dropped to 14°C .
- Regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the heating furnace. By strictly adhering to this practice, the overall performance and lifespan of the equipment can be optimized.

Thermocouple Flange Short Joint Lining Shedding at Riser Nozzle

Case Description:

The surface temperature at the thermocouple flange short joint of the catalytic cracking riser nozzle is nearly 548 °C . Preliminary diagnosis through infrared thermographic inspection indicates that the shedding of the refractory lining at this location is causing the temperature increase. The temperature of the outer surface of the riser exceeding the recommended value not only increases heat loss but also exposes the riser shell to prolonged exposure to excessively high-temperature flue gas, which can easily lead to corrosion. In severe cases, it may even burn through the riser.



Before Rectification

After Rectification

Recommended Measures

- During shutdown and maintenance periods, repair the refractory lining at the thermocouple flange short joint of the riser nozzle. After the repair, the temperature dropped to 201°C .
- Regular inspections using an infrared thermographic camera can significantly extend the normal operating cycle of the refractory lining of the riser.

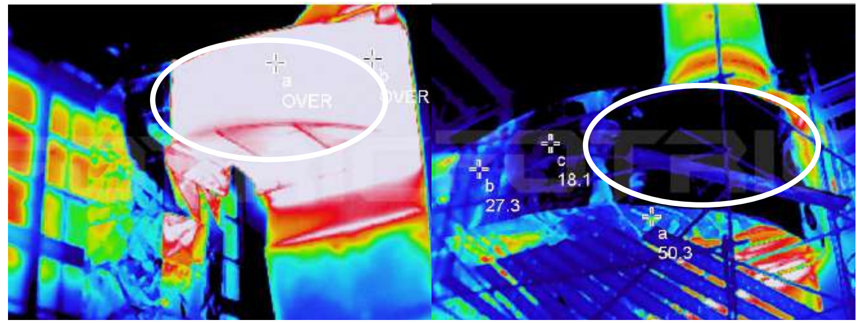
Evaluation of Energy-Saving Effectiveness and Construction Quality of Insulation Layers for Heating Furnaces and Reactors

Case Description:

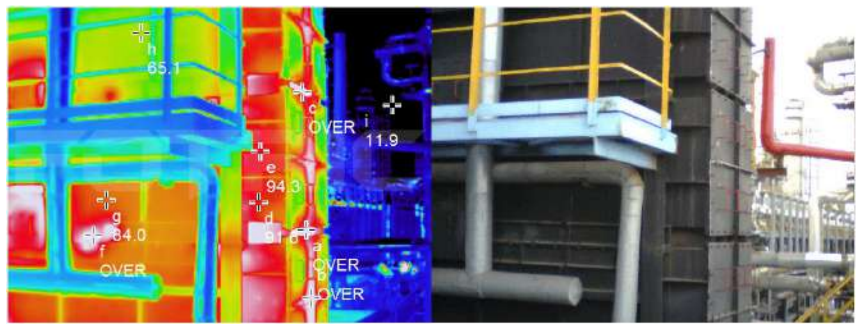
Petroleum refining and processing facilities contain numerous high-temperature equipment such as heating furnaces, reactors, boilers, and steam pipes. To conserve energy, reduce costs, and enhance efficiency, insulation measures are typically implemented on the outer shells of these high-temperature devices. Normally, the outer surface temperature of a well-insulated layer is close to the ambient temperature, indicating effective insulation and significant energy-saving and temperature-retention benefits. However, the construction of insulation layers is a concealed project, and the insulation effectiveness cannot be directly observed by the human eye.

Recommended Measures:

It is recommended to utilize infrared thermographic technology to clearly and intuitively identify defects in the insulation layers of high-temperature equipment shells. This technology is invaluable for assessing the energy-saving effectiveness and construction quality of insulation layers.

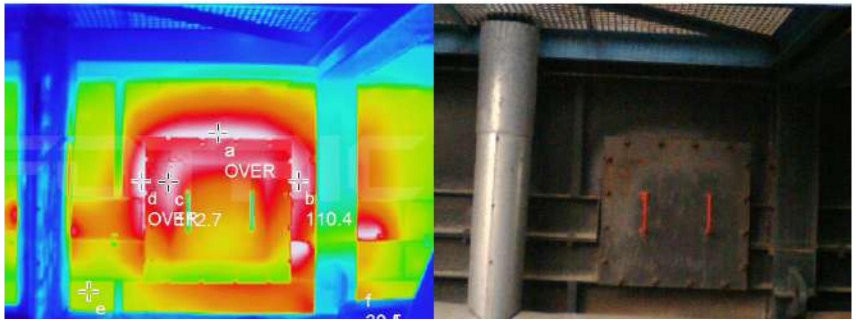


Before energy-saving retrofits were implemented on the air preheater ducts of the waste heat recovery system of a heating furnace, the outer wall heat loss was substantial, with the highest temperature exceeding 120 ℃ . After the energy-saving retrofits, the outer shell temperature dropped to the ambient temperature of 20 ℃ , resulting in a temperature difference of approximately 100 ℃ before and after the retrofits, which helped the user achieve significant cost savings.

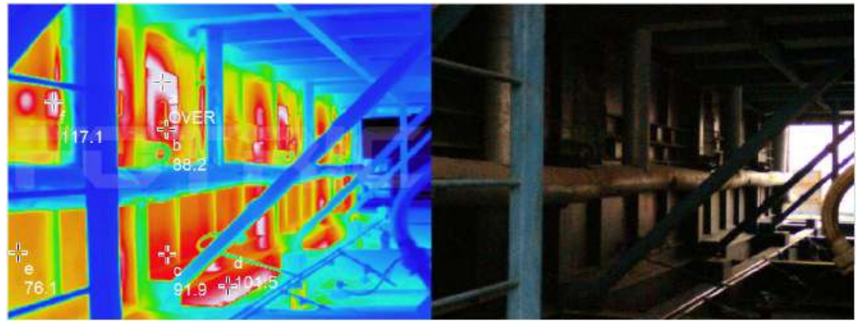


Additionally, there is a potential risk of flue gas leakage in the elbow box of the heating furnace. Long-term leakage of high-temperature sulfur-containing flue gas can erode the outer shell, leading to corrosion and perforation, which can affect the normal operation of the equipment.

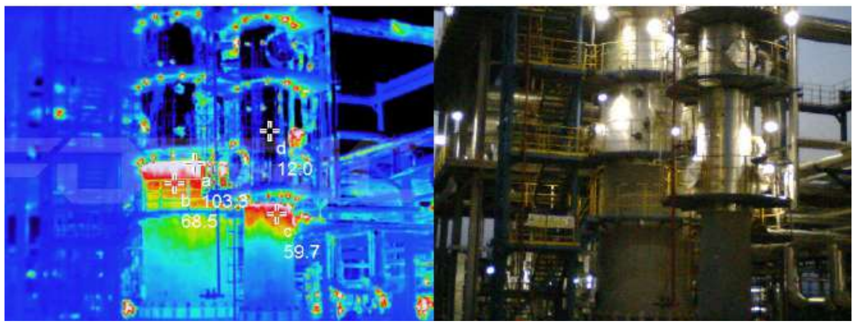
Evaluation of Insulation Quality and Energy Saving Effect for Heating Furnaces and Reactors



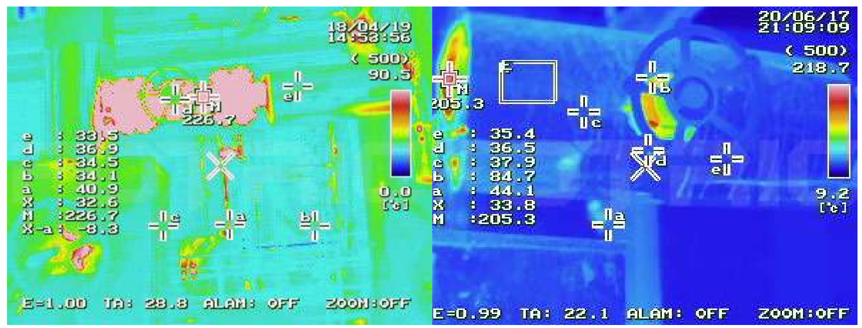
The convection chamber manhole area of the heating furnace has an outer shell that is overheated, with the maximum temperature exceeding 120°C . This leads to significant heat loss, which is detrimental to energy savings, cost reduction, and efficiency improvements for the user.



The outer shell of the convection chamber manhole area of the heating furnace is overheated, with the maximum temperature exceeding 120 °C . The heat loss is large, which negatively affects the user’ s energy conservation, cost reduction, and efficiency improvements.



The insulation quality of the reactor's outer shell is poor, with insulation layer detachment, causing substantial heat loss. This is unfavorable for the user's cost reduction and efficiency enhancement.



The valve connection points of the medium-pressure steam pipeline have not been insulated, with the surface temperature exceeding 220 °C . This results in significant heat loss from the medium-pressure steam, which is not conducive to the system's energy saving and subsequent process control.

After insulation was applied to the valve connection points of the medium-pressure steam pipeline, the surface temperature of the pipe dropped to around 35 °C . The heat loss from the medium-pressure steam was significantly reduced, showing a marked energy saving effect.

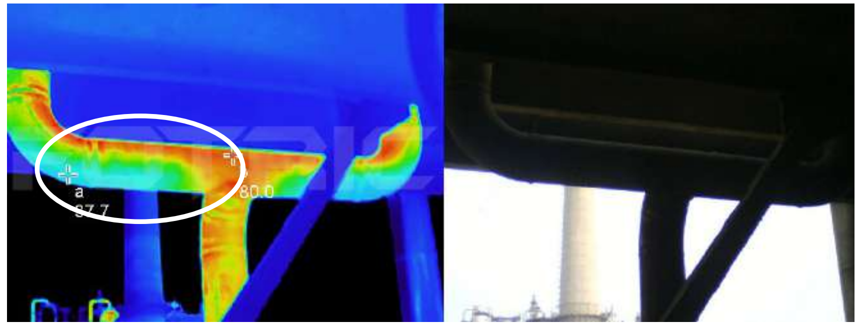
Poor Salt Deposition Flow in the Outlet Pipeline of the Top-Circulating Air Cooler

Case Description:

The temperature distribution in the top-circulating air cooler outlet pipeline is uneven, with a cold spot at the lower end of the bend (37.7°C vs. normal 80 °C). This 42.3 °C temperature difference indicates salt deposition and low injection water flow, causing uneven flow in the pipeline.

Recommended Measures:

- Salt Deposition Issue: The blockage due to salt deposition results in a higher temperature of the cooled medium, reducing the cooling efficiency of the air cooler and negatively affecting product quality control and processing capacity.
- Maintenance and Cleaning: During scheduled maintenance, the system should be cleaned or removed for inspection. After cleaning the pipeline, a thermal imaging test should be conducted to ensure that the issue is resolved and confirm the corrective action.
- Regular Inspection with Infrared Thermography: Implement regular infrared thermography inspections to significantly improve the operational lifespan of the electrical equipment in the fan control cabinets, ensuring stable and efficient operation



结盐的顶循管道

正常的顶循管道

The External Cooling and Flushing of the Overhead Reflux Pump of the Solvent Dehydration Tower is not Functioning Properly.

Case Description:

The solvent dehydration tower top reflux pump (P1408A, single seal) in the refining unit has a Plan 21 external cooling flushing system that is clogged. The temperature difference at both ends of the flushing pipe exceeds 40 ℃ , causing the heat generated by the mechanical seal friction pair to be unable to dissipate properly. This results in deteriorated operating conditions for the mechanical seal, shortening the equipment’s lifespan.

Recommended Measures:

Switch the pump and clear the flushing pipe.Inspect and clean the heat exchanger; Regularly use an infrared thermal imager for routine inspections, which can significantly improve the equipment’s normal operating cycle.

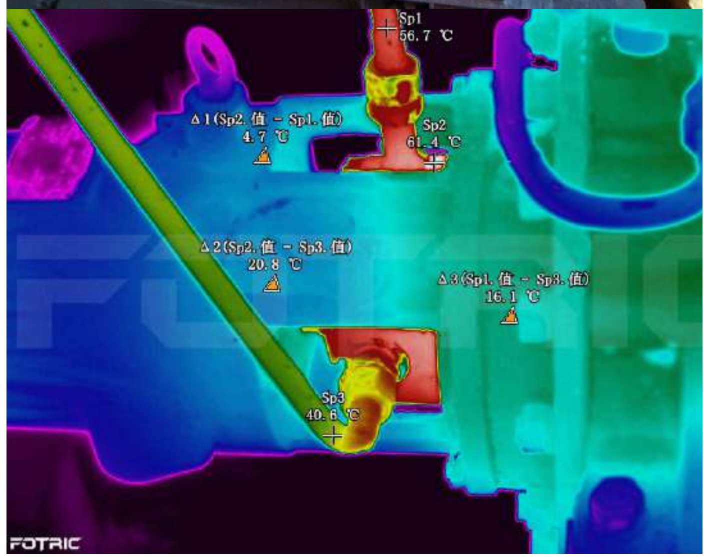
Butadiene Recovery Tower Bottom Pump White Oil Tank Temperature High

Case Description:

The butadiene recovery tower bottom pump (P1402A, double seal) in the refining unit has a Plan 52 white oil tank with an abnormally high temperature. The cooling water coil of the white oil tank has not been activated, and the white oil circulation temperature exceeds 50 °C . This prevents the heat generated by the mechanical seal friction pair from being cooled effectively, resulting in deteriorated operating conditions for the mechanical seal and a shortened equipment lifespan.

Recommended Measures:

- Activate the cooling water coil for the white oil tank and monitor the white oil circulation temperature.
- Regularly use an infrared thermal imager for routine inspections, which can significantly improve the equipment' s normal operating cycle.



Vibrating Conveyor Drive Mechanism Operating Temperature High

Case Description:

The drive mechanism of the vibrating conveyor in the post-treatment unit is operating at a high temperature. The normal operating temperature is around 28°C , but some areas exceed 50°C , which is detrimental to long-term operation and shortens the equipment’ s lifespan.

Recommended Measures:

- When the production line is shut down, it is recommended to disassemble, inspect, and clean the drive mechanism, check the eccentric wheel, and replace the lubricating grease.
- Regularly use a Fotric IR thermal imager for routine inspections, which can significantly improve the conveyor equipment’ s normal operating cycle.

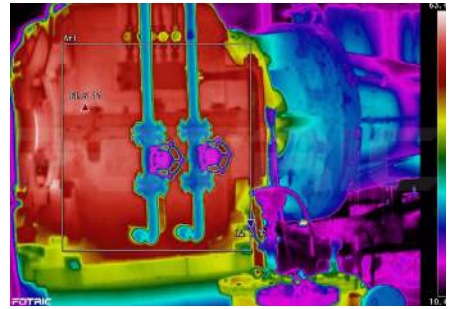
Extruder and Dryer Lubricating Oil Station Cooler Cooling Effect Inspection

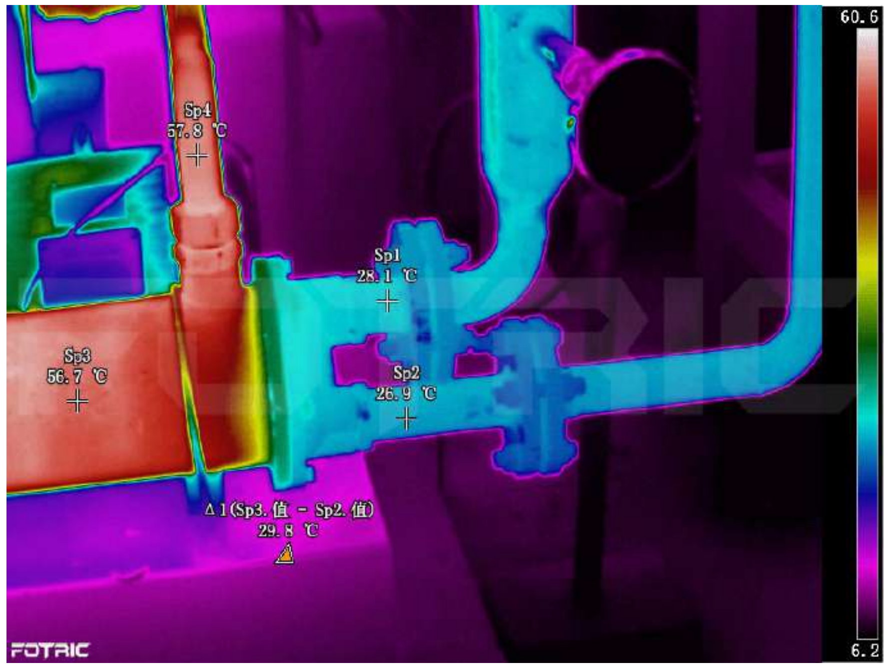
Case Description:

The cooling effect of the lubricating oil station cooler for the extruder and dryer in the post-treatment unit is poor, and the lubricating oil is unable to dissipate heat effectively. The surface operating temperature of the gearbox exceeds 60 °C , which is too high and detrimental to long-term operation, shortening the equipment's lifespan.

Recommended Measures:

- When the equipment is shut down, it is recommended to clean and inspect the cooler to improve its cooling effect.
- Regularly use an infrared thermal imager for routine inspections, which can significantly improve the equipment's normal operating cycle.





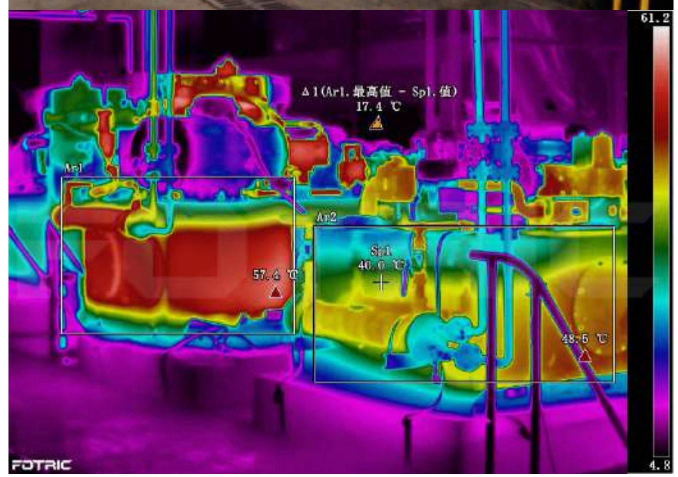
Briquetting Machine Oil Station Temperature Inspection

Case Description:

The oil station temperature of the briquetting machine in the post-treatment unit is too high, with the maximum temperature exceeding 57°C , while the normal operating temperature is around 40°C .

Recommended Measures:

- It is recommended to investigate the cause and, when the equipment is shut down, perform an inspection to identify the reason for the temperature exceedance.
- Regularly use a Fotric IR thermal imager for routine inspections, which can significantly improve the briquetting machine's normal operating cycle.



Gearbox Spindle Mechanical Seal Overtemperature Inspection

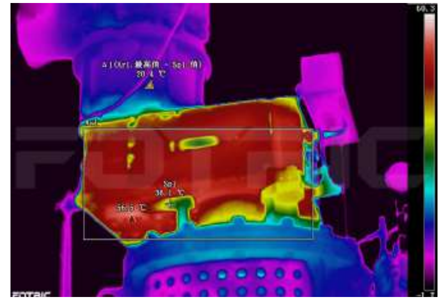
Case Description:

The temperature at the gearbox spindle mechanical seal of the screw extrusion dehydration machine is too high, with the temperature at the seal exceeding 93 °C . Prolonged high-temperature operation can affect lubrication and shorten the bearing's lifespan.

Recommended Measures:

- After planned shutdown, inspect the mechanical seal to check if it is installed too tightly, verify if there is a lack of lubricating oil, or if the lubricating oil has been overfilled.
- Regularly use a Flying IR thermal imager for routine inspections, which can significantly improve the gearbox's normal operating cycle in the screw extrusion dehydration machine.

Poor Cooling Effect of Stirring Motor Gearbox

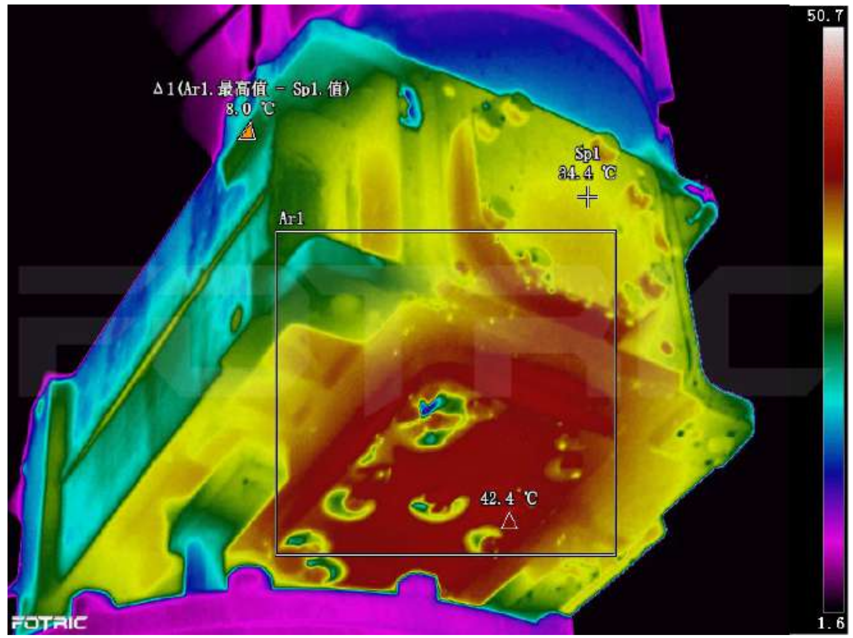


Case Description:

Wth an abnormal surface temperature exceeding 56.5 °C . The normal operating gearbox outer shell temperature is around 35 °C . The temperature is approximately 20 °C higher than the normal operating temperature, which initially indicates that the cooling and flushing effect of the gearbox is insufficient.

Recommended Measures:

- After a planned shutdown, inspect and clean the cooling and flushing pipes of the gearbox, and then observe the cooling effect.
- Regularly use an infrared thermal imager for routine inspections, which can significantly improve the gearbox's normal operating cycle.



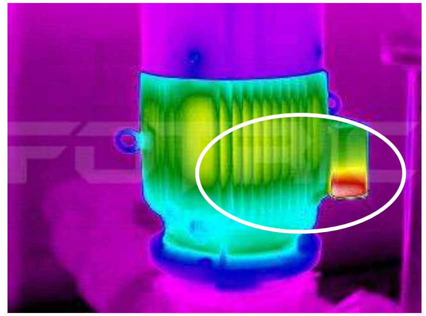
Motor Junction Box Overtemperature Inspection

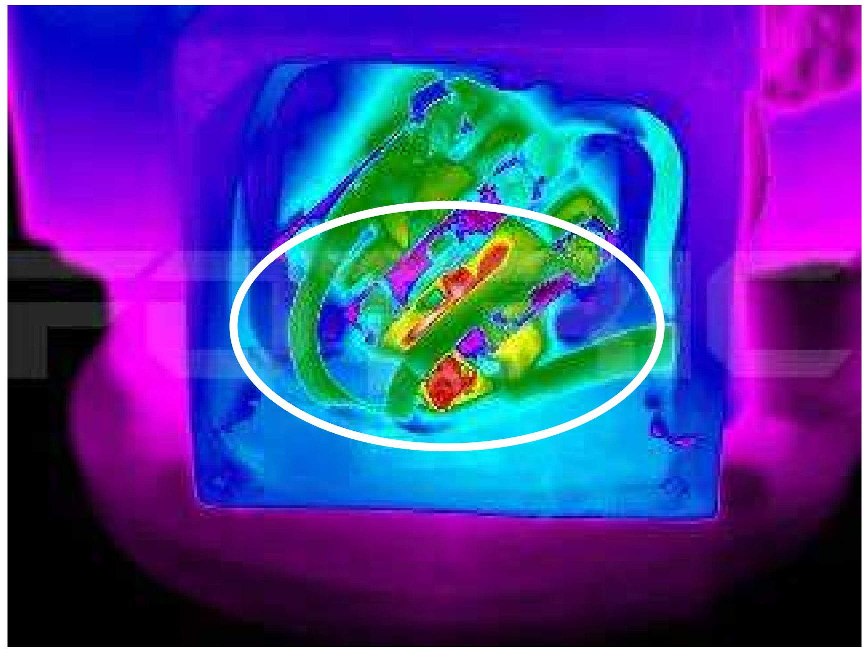
Case Description:

The junction box of the cooling water pump motor has a localized temperature exceedance. Initial judgment indicates poor contact inside the junction box. After opening the cover, it was found that cooling water had entered the junction box, causing corrosion of the A-phase electrical connection and resulting in abnormally high temperatures at the terminal connections. The high internal temperature of the junction box radiated to the outside, causing localized overheating of the junction box shell.

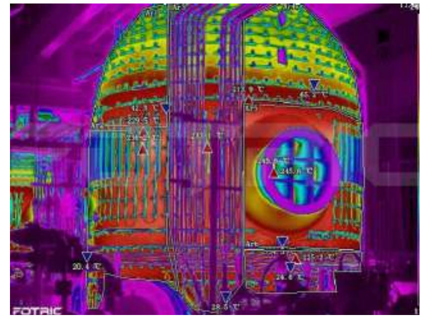
Recommended Measures:

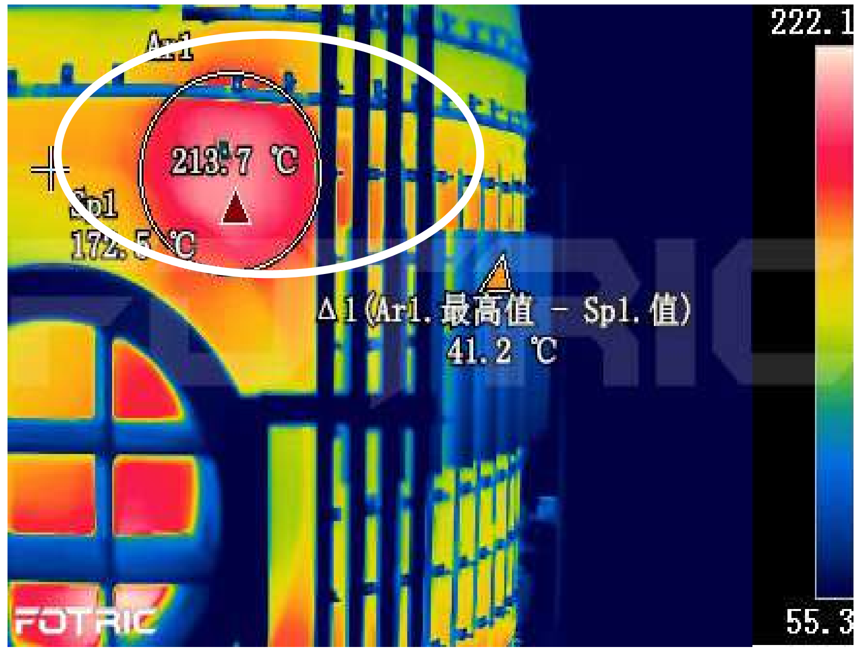
- After shutdown, remove corrosion from the internal connections of the junction box, re-crimp and secure the three-phase electrical connections, and clean any accumulated water inside the junction box to prevent motor short circuits and potential motor damage.
- Regularly use an infrared thermal imager for routine inspections, which can significantly improve the cooling water pump motor’s normal operating cycl.





Gasifier Refractory Material Defect Failure





Case Description:

The gasifier converts coal to syngas (H_2, CO, CO_2, H_2O) using water coal slurry and oxygen via four horizontal burners. Operating at ~8 MPa and 1300 °C, it has refractory bricks to protect the furnace wall. Over time, these bricks degrade, and if they thin or fall off, the wall may burn through, causing severe safety risks.

Recommended Measures:

- During the process of refractory brick degradation, the surface temperature of the furnace wall will change based on the wear of the bricks. As the bricks wear down and become thinner, the surface temperature of the gasifier will gradually increase.
- It is recommended to regularly use a Fotric IR handheld explosion-proof thermal imager or install a Fotric IR online thermal monitoring system to monitor the furnace wall temperature in real-time or periodically. Through infrared thermal imaging technology, the surface temperature distribution of the gasifier can be comprehensively imaged and detected, allowing precise localization of refractory defects in the gasifier.

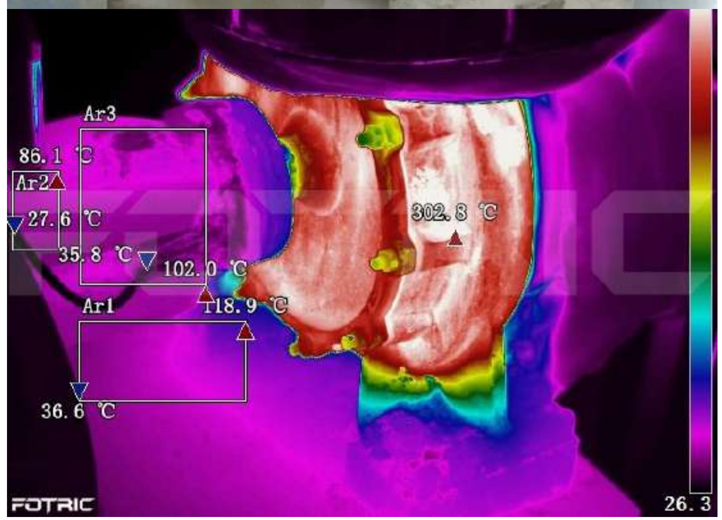
Biphenyl - Biphenyl Ether Heat Transfer Medium Circulation Pump Leakage Overtemperature Alarm

Case Description:

In the PA66 production process, biphenyl-biphenyl ether is commonly used as the heat transfer medium. The biphenyl pump station, which is responsible for circulating the biphenyl-biphenyl ether heat transfer medium, is an important piece of equipment that requires regular inspection.

Recommended Measures:

By regularly conducting infrared thermal imaging inspections of the heat transfer medium circulation pump, potential leakage risks at the mechanical seal can be detected in advance. Alternatively, continuous 7d×24h temperature monitoring of the biphenyl pump station via a thermal monitoring system can provide early warning when the temperature exceeds the standard control temperature, effectively preventing fire accidents caused by heat transfer medium (thermal oil) leakage.



Coal Bunker Fire Prevention Warning

Case Description:

The coal bunker is a critical area for storing coal. If the coal is accumulated for a long time and is in contact with oxygen, without timely heat dissipation, it can undergo a self-accelerating oxidation exothermic reaction. This heat builds up inside the accumulated coal and can eventually lead to spontaneous combustion. The higher the calorific value of the coal, the more prone it is to spontaneous combustion. Coal temperatures exceeding 350°C in a state of spontaneous combustion can easily cause the entire coal bunker to ignite. More seriously, if the high-temperature coal is not detected in time and is transported on a conveyor belt, it could ignite the belt, leading to the destruction of the entire coal conveying system and causing direct economic losses of millions. The unplanned shutdowns during the repair of the coal storage and transportation system would result in even greater economic losses. Coal self-ignition poses a serious safety threat to the user's operation.

Recommended Measures:

It is recommended to use the Flying IR infrared thermal imaging fire warning system to monitor the entire coal bunker 24/7. The critical temperature for coal self-ignition generally ranges between 60 °C and 80 °C . The minimum temperature value of 60 °C can be used as the first-level alarm threshold. When the thermal imaging system detects an unusually high-temperature source, it can issue an audible and visual alarm in milliseconds, alerting management to intervene and handle the situation in time, significantly reducing the risk of fire accidents in the coal bunker.

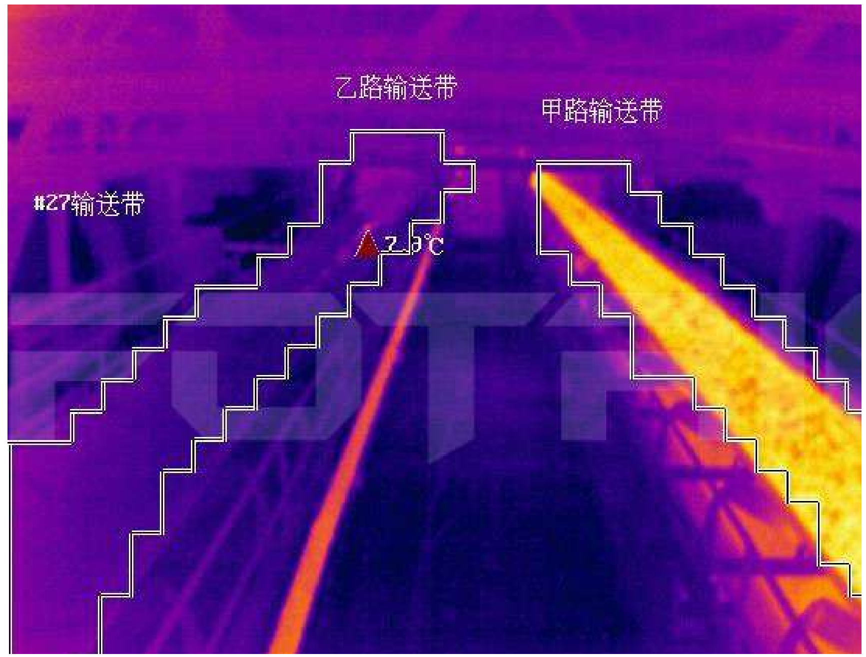
Coal Conveyor Belt Fire Prevention Warning

Case Description:

The coal conveyor belt is vital for transporting coal, but over time, fine coal dust accumulates. Overheating bearings or friction between rollers and the belt can ignite this dust, leading to a fire. Such fires can cause significant economic losses and unplanned downtime, especially with higher-calorific coal being more prone to self-ignition.

Recommended Measures:

It is recommended to use the Fotric IR infrared thermal imaging fire warning system to conduct 24/7 real-time monitoring of the entire coal conveyor system. The critical temperature for coal self-ignition generally ranges between 60°C and 80°C . The minimum temperature value of 60°C can be set as the first-level alarm threshold. When the system detects an unusually high-temperature source in the coal conveyor belt area, it can issue an audible and visual alarm within milliseconds, alerting management to intervene and handle the situation promptly, significantly reducing the risk of fire accidents in the coal conveying system.



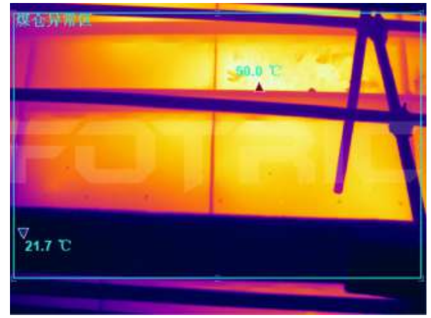
Coal Hopper Fire Prevention Warning

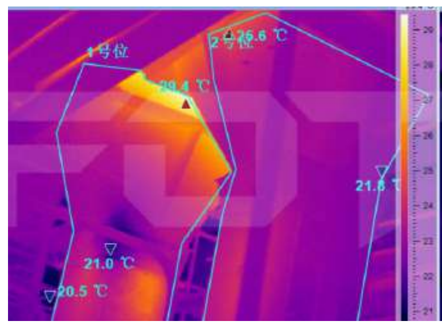
Case Description:

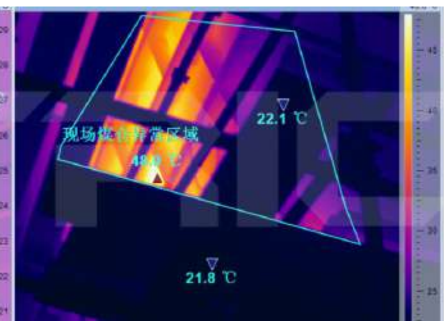
During coal loading and storage in the coal hopper, coal may easily accumulate on the walls and in the corners, forming a buildup of coal dust. When coal dust accumulates in the corners of the hopper for an extended period and comes into contact with oxygen, it can easily lead to smoldering within the hopper. These abnormal high temperatures inside the hopper cannot be directly observed by the human eye. If these high temperatures are not detected and addressed promptly, it may cause the coal in the hopper to ignite and fall onto the coal conveyor belt, potentially resulting in a fire in the conveyor system. This not only endangers the safety of personnel but also causes significant economic losses for users. The customer in this case has experienced a fire accident in the coal hopper.

Recommended Measures:

It is recommended to use the Fotric Infrared Thermal Image Fire Prevention Warning System for 7d×24h continuous real-time monitoring of the temperature variations on the surface of the coal hopper. If localized abnormal high temperatures are detected inside the coal hopper, the fire prevention warning system will issue an audible, visual, and image alarm within milliseconds. Additionally, the system will immediately push the related image and location information to the relevant personnel, enabling them to take appropriate emergency actions and ensuring the safe operation of the coal transportation equipment.







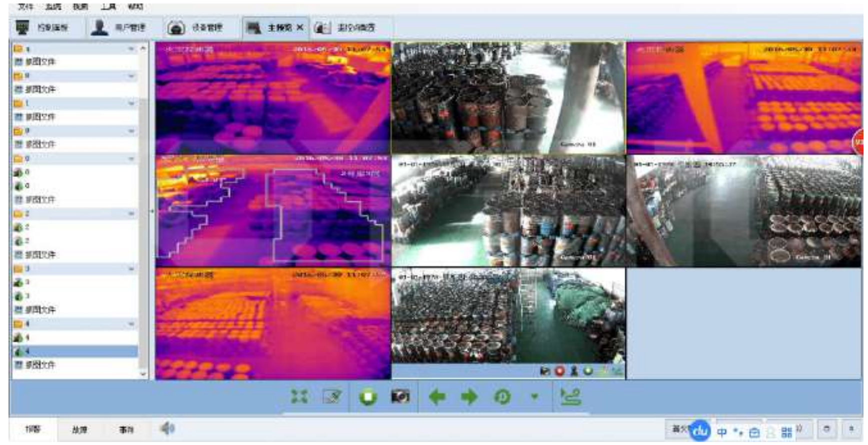
Fire Prevention Early Warning for Hazardous Materials Storage Warehouses

Case Description:

A large or ultra-large integrated warehousing enterprise, especially when it comes to the storage of hazardous materials, often needs to handle different storage specifications and requirements. If different types of hazardous materials are stored in the warehousing system, there may be risks of abnormal material temperatures due to management issues, environmental factors, or even unknown and complex causes, leading to the risk of fire. In severe cases, this may even trigger explosions and chain reactions, posing a serious threat to the lives and property safety of users.

Recommended Measures:

It is recommended to adopt the Fotric Online Thermal Imaging Fire Prevention Early Warning System. This system provides 7x24-hour real-time monitoring of the temperature changes of all materials inside hazardous materials warehouses. Based on industry or enterprise requirements for fire prevention and control, high-temperature warning thresholds can be preset. When the material temperature inside the warehouse exceeds the warning threshold, the warning system will issue audible and visual alarm signals along with image alerts within tens of milliseconds. At the same time, it can be linked with the fire protection system, allowing operators to promptly take corresponding emergency measures to ensure the safety of the hazardous waste pit.



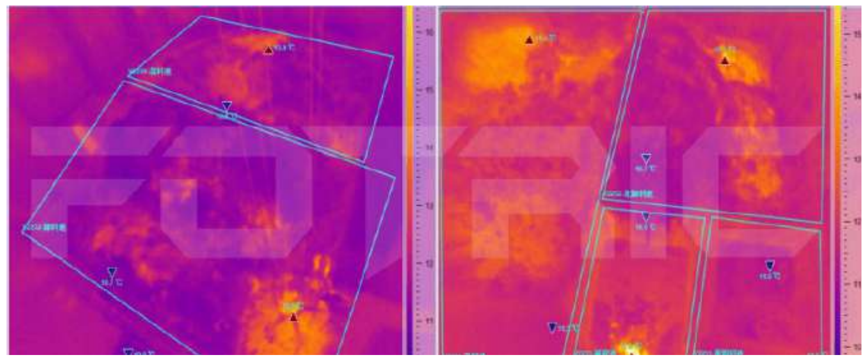
Fire Prevention Early Warning for Hazardous Waste Pit

Case Description:

The hazardous waste pit is an area where hazardous waste is temporarily stored before being incinerated in the furnace. Due to the complex nature of hazardous waste, which contains many unknown flammable chemicals and exothermic chemical reactions, there are hidden safety hazards of spontaneous combustion. Many users have experienced fire incidents in their hazardous waste pits. If not handled promptly, these incidents can pose significant property damage and personal safety risks to users.

Recommended Measures:

It is recommended to adopt the FOTRIC Online Thermal Imaging Fire Prevention Early Warning System. This system provides 7-day-a-week, 24-hour real-time monitoring of the temperature changes of all waste materials inside the hazardous waste pit. Based on industry or enterprise requirements for fire prevention and control, high-temperature warning thresholds can be preset. When the temperature inside the hazardous waste pit exceeds the warning threshold, the system will issue audible and visual alarm signals along with image alerts. At the same time, it can be integrated with the fire protection system, allowing operators to promptly take corresponding emergency measures to ensure the safety of the hazardous waste pit.



Early Warning of Refractory Lining Defects in Rotary Kilns

Case Description:

A rotary kiln is used in chemical and environmental protection industries to incinerate hazardous waste, reducing waste volume, toxicity, and conserving energy. The kiln operates at over 1200°C , with a 220mm thick refractory lining. Over time, the refractory material erodes, exposing the steel plate to high temperatures, which can cause it to soften or melt. This presents safety risks and, in the case of unplanned shutdowns, could halt production at the factory.

Recommended Measures:

During the process of refractory bricks in the rotary kiln wearing down and thinning, the outer surface temperature of the kiln shell gradually increases as the refractory bricks wear and thin. FOTRIC recommends regularly using Fotric handheld explosion-proof thermal imagers or installing Fotric online thermal imaging monitoring systems to monitor the shell temperature of the rotary kiln in real-time or on a regular basis. Through Fotric infrared thermal imaging technology, comprehensive imaging and detection of the temperature distribution on the surface of the rotary kiln can be conducted to accurately locate defects in the refractory lining of the rotary kiln.

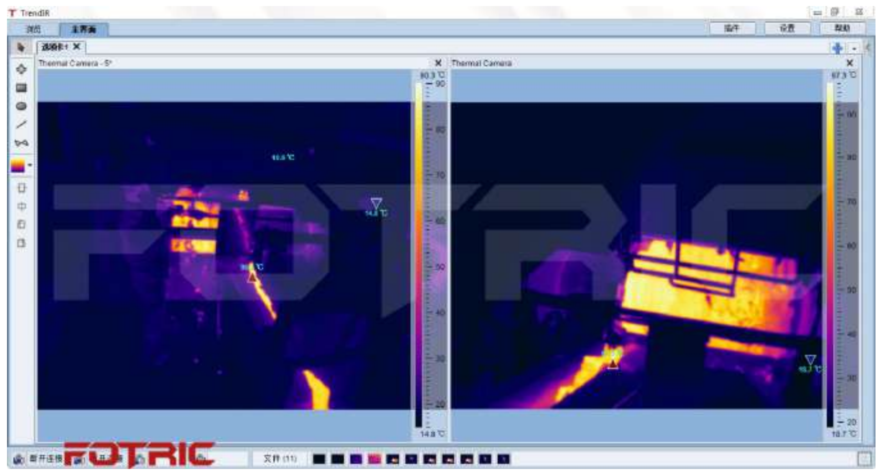
Temperature Monitoring of PM Phenolic Molding Compound

Case Description:

PM Phenolic Molding Compound is a granular plastic made from phenolic resin, bakelite powder, and additives. The production temperature is typically between 90°C and 100°C , and exceeding 120°C can degrade the compound's quality. High-temperature sparks in the materials can cause ignition if undetected, potentially leading to unplanned shutdowns and significant economic losses.

Recommended Measures:

It is recommended to adopt the FOTRIC Online Thermal Imaging Fire Prevention Early Warning System. This system provides 7-day-a-week, 24-hour real-time monitoring and automatically, non-contactly collects the temperature values of all materials during the production process of PM Phenolic Molding Compound. It visually presents the temperature distribution in the form of videos and images. When the material temperature exceeds 120 °C , the system can output abnormal information as an alarm signal within tens of milliseconds, immediately notifying the responsible personnel on site to handle the situation and control the production line to stop operating. This significantly reduces the risk of fire during the production process and enhances the product quality of PM Phenolic Molding Compound.



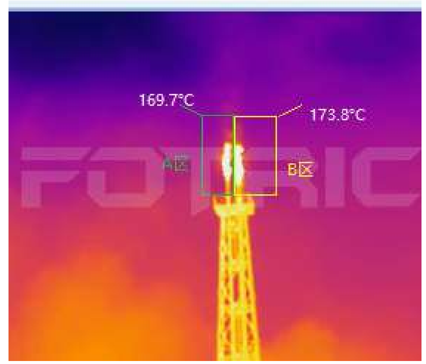
Torch Flame Condition Monitoring and Early Warning

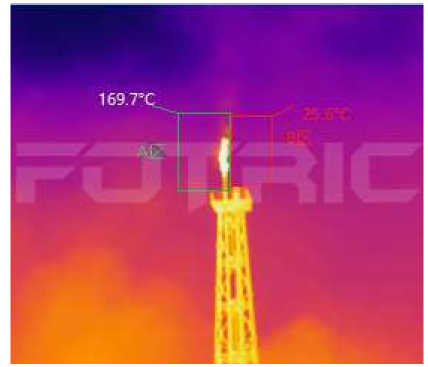
Case Description:

The torch and pressure relief system are critical safety and environmental protection equipment in petrochemical facilities. They burn off flammable gases during startup, shutdown, or emergencies, preventing overpressure accidents. The torch also ensures complete combustion of gases, converting them into water vapor and carbon dioxide to prevent pollution. Failure to burn these gases can lead to personal injuries and significant environmental harm.

Recommended Measures:

It is recommended to adopt the FOTRIC Torch Condition Monitoring and Early Warning System to achieve 7x24-hour real-time monitoring of the torch flame combustion state. The combustion state of multiple torches can be monitored and alarmed in different zones. The temperature data of the flame in different zones can be connected to the DCS system to realize configuration monitoring of torch flame combustion data and real-time screen projection monitoring of torch combustion temperature. Effective monitoring of the true state of flame combustion can still be carried out under adverse weather conditions such as haze or fog. By selecting suitable telephoto lenses, real-time monitoring of the torch flame combustion state in explosion-proof areas can be conducted from a distance of over 300m.





Fire Prevention Early Warning for Hydrogen Peroxide Production Plants

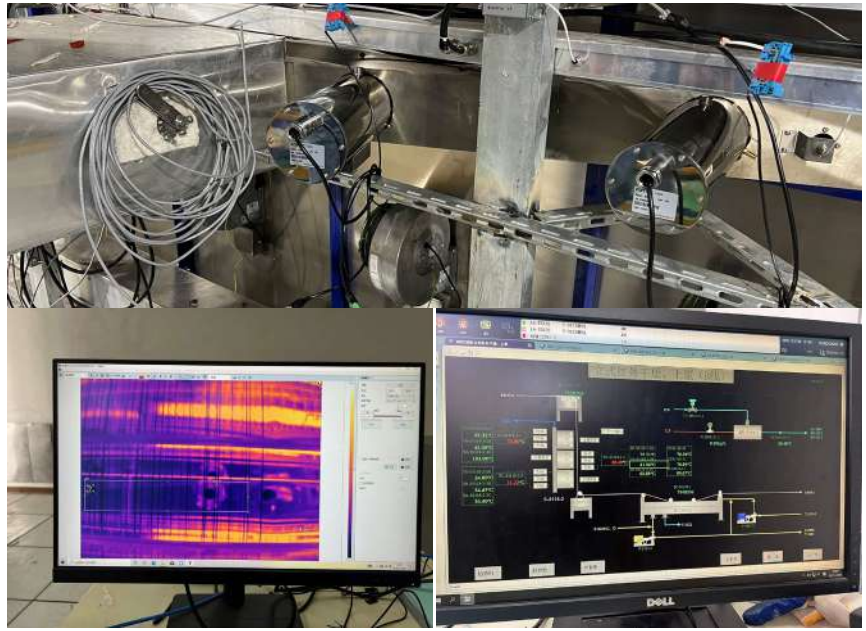
Case Description:

Hydrogen peroxide is considered one of the "cleanest" chemicals, but its production is hazardous. Hydrogen peroxide production facilities are classified as major hazard sources, with a complex process involving dangerous substances. Recent incidents, including explosions and combustion in reactors, highlight the risks. In this case, the user's hydrogenation tower experienced a high-temperature thermal runaway, destroying the production facility and causing significant property damage and reputational harm.

Recommended Measures:

It is recommended to adopt the FOTRIC Online Thermal Imaging Fire Prevention Early Warning System, which can provide 7x24-hour real-time monitoring of the temperature changes on the surfaces of all equipment within the entire hydrogen peroxide production plant scene. It can capture the highest temperature values on key equipment such as hydrogenation towers, oxidation towers, extraction towers, and purification towers in real-time. When abnormal surface temperatures are detected on the equipment, the system can push abnormal warning information to the centralized control center and the relevant personnel in charge of the equipment within tens of milliseconds, helping users intervene and handle the situation in a timely manner and significantly improving the safety of hydrogen peroxide production facilities.

Real-Time Monitoring of Carbon Fiber Drying Temperature



Case Description:

Carbon fiber raw materials are heat-treated to form heat-resistant structures and then carbonized at over 1000 ℃. During the drying process, infrared drying equipment is used to remove moisture from the filaments, preparing them for resin absorption. Real-time monitoring of the filament surface temperature is crucial—too low a temperature leaves moisture, while too high a temperature risks energy inefficiency and potential combustion or fire.

Recommended Measures:

It is recommended to install a Fotric 600W high-temperature-resistant dustproof thermal imager on the exhaust box of the infrared dryer, transmitting temperature data to the monitoring center via network cables and optical fibers. The system enables 24/7 real-time monitoring of carbon fiber drying temperatures and can send data to the DCS system for temperature control. This solution reduces fire risks and improves efficiency and quality in the drying process.

Customer List

BASF
DuPont Shanghai
INEOS Ningbo
Covestro Shanghai R&D centre
Covestro Shanghai
China Petrochemical
Shanghai Petrochemical
PipeChina
Cabot Tianjin, Xuzhou

FOTRIC Product Selection

FOTRIC PMix

Acoutherm Camera

Top-tier Temperature Measurement and Imaging

- 640*480 Pixel Detector
- Various Selections of Lens Configurations
- IREdge® Image Detail Enhancement
- TurboFocus® Intelligent Autofocus System

AI-Powered Sound-Image Mode

- 162 MEMS Digital Microphones
- Partial Discharge (PD) Diagnosis
- 13 Megapixel Visible Light Camera
- Sound and Image Focusing, Filtering Out Unrelated Noise

AnalyzIR Professional Analysis Software

- Histogram, 3D Plot, and Line Temperature Distribution Display
- Add, Delete, Rename, and Move Measurement Tools on the Thermal Image
- Supports Regional Emissivity Settings
- Real-Time Display, Transmission, Recording, and Analysis of Full Radiation Thermal Image Video Streams

Specifications

Model	P7-MiX	P5-MiX
Unique Features		
Mix Mode	Display thermal imaging and acoustic signals on the same interface, enabling cross verification.	
NaviPdM®	Support, AI inspection assistant	
IRExplorer ™	Support, cross-platform remote control and data transfer	
T-DEF®	Support, thermal and visible light image blend, transparency 0% ~100%	
T-TWB®	Support, tempetrature visual representation normalization	
IREdge	Support, contour detail enhancement	
MagicThermal®	AI-based auto-recognition and feature contour mark up.	
Hardware		
Thermal Imaging Parameters		
Infrared Resolution	640 x 480	384 x 288
Super Resolution	1280 x 960	768 x 576
Detector Type	Uncooled infrared focal plane detector	
Thermal Sensitivity (NETD)	<30mK@30°C (86 °F)	<40mK@30°C (86 °F)
Detector Pitch	17μm	
Spectral Range	8~14μm	
Frame Rate	30Hz	
Field of View (FOV)	25° x 19°	
Spatial Resolution (IFOV)	0.68 mrad	1.14 mrad
Minimum Focus Distance	0.25m(0.82ft)	0.1m(0.33ft)
Focal Length	25mm(0.98'')	15mm(0.59'')
Focus Mode	TurboFocus® system (thermal contrast AF, laser-assisted AF, continuous AF, touch AF); Manual	
Acoustic Imaging Parameters		
Microphone Channels	162 MEMS digital microphone	140 MEMS digital microphone
Acoustic Image FOV	66° x 52°	

Specifications

Acoustic Sampling Rate	200kHz	
Acoustic Refresh Rate	25Hz	
Working Distance	0.3~100m(1~328ft)	
Analysis Parameters		
Temperature Analysis		
Temperature Range	-20~120°C (-4~248 °F), 0~650°C (32~1202 °F), Intelligent range	
Measurement Accuracy	± 1°C (1.8 °F) or ± 1 %, whichever is greater (ambient temp at 25°C /77 °F , temperature range 0° C-100° C/32 °F ~212 °F), ± 2°C /3.6 °F or ± 2 % for other temperature range	± 2°C /3.6 °F or ± 2 %, whichever is greater (ambient temp at 25°C /77 °F)
Line Temperature Distribution	Support checking line temperature distribution	
Measurement Parameters	Emissivity, Reflected temperature, Ambient temperature, Humidity, Distance and IR window compensation.	
Local Emissivity	Support changing emissivity for individual measurement tool.	
Area Alarm	Area alarm; High temperature alarm and low temperature alarm.	
Delta T/Temperature Rise	Support	
PC Software	AnalyzIR® NaviPdM®	
Acoustic Measurement Analysis		
Frequency Range	2~100kHz	2~100kHz
Frequency Range Selection	Support preset frequency range for different scenarios for later selection; Support manual adjustment for frequency range.	Support preset frequency range for different scenarios for later selection; Support manual adjustment for frequency range.
Detection Mode	LQ Mode: Displays the leakage level; PD Mode: Displays a PRPD diagram, adapted to different AC frequencies (50/60Hz).	
Leak Evaluation	Automatic identification of leakage points, automatic evaluation of leakage and annual energy costs.	
Partial Discharge Diagnostics	Automatic diagnosis of discharge types such as surface, floating and tip (corona) discharges.	

FOTRIC VMix

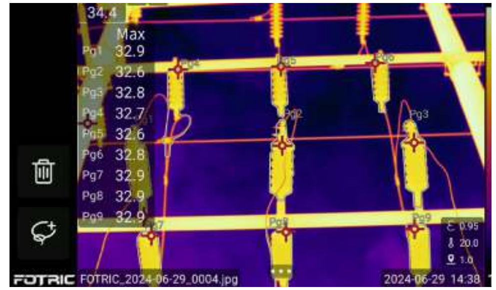
Acoutherm Camera

MiX Mode for Multidimensional Analysis

In MiX mode, the thermal distribution and acoustic signature information of the tested equipment appear simultaneously, allowing fault characteristics of the equipment to be obtained from multiple dimensions. This enables comprehensive and accurate hazard analysis of the equipment, improving the efficiency and quality of inspections.

Magicthermal®

Artificial intelligence (AI) to automatically recognize feature targets and quickly add irregular measurement tools that match the target shapes.



Thermal and Leak Detection Dual-Function Infrared Lens

- Response Band: 10μm to 10.8μm
- Detectable gases: sulfur hexafluoride (SF6), ammonia (NH3)

Specifications

Model	V7MiX	V5MiX
Acoutherm Specification		
Unique Features		
Mix Mode	Display thermal imaging and acoustic signals on the same interface	
NaviPdM®	Support, AI inspection assistant	
IRExplorer ™	Support, cross-platform remote control and data transfer	
T-DEF®	Support, thermal and visible light image blend, transparency 0% ~100%	
T-TWB®	Support, tempetrature visual representation normalization	
IREdge	Support, contour detail enhancement	
MagicThermal®	AI-based auto-recognition and feature contour mark up.	
Thermal Imaging Parameters		
Infrared Resolution	640*480	384*288
Thermal Sensitivity (NETD)	<30mK@30°C (86 °F)	<40mK@30°C (86 °F)
Detectable Gas	(Equipped with HR lens) sulfur hexafluoride, ammonia, ethylene, vinyl chloride, methyl vinyl ketone, acrylonitrile	Not supported
Frame Rate	30Hz	30Hz
Field of View (FOV)	25° *19°	25° *19°
Spatial Resolution (IFOV)	0.68 mrad	1.14 mrad
Minimum Focus Distance	0.25m	0.1m
Focal Length	25mm	15mm
Focus Mode	TurboFocus® system (thermal contrast AF, laser-assisted AF, continuous AF, touch AF); Manual	
Acoustic Imaging Parameters		
Microphone Channels	162 MEMS digital microphone	140 MEMS digital microphone
Acoustic Image FOV	66° *52°	66° *52°
Acoustic Sampling Rate	200kHz	
Acoustic Refresh Rate	25Hz	
Working Distance	0.3~100m	

Specifications

Thermal Specification		
Temperature Analysis		
Temperature Range	-20~120°C (-4~248 °F)，0~650°C (32~1202 °F)，Intelligent range	
Measurement Accuracy	± 2°C (3.6 °F)or ± 2 %, whichever is greater.	
Local Emissivity	Support changing emissivity for individual measurement tool.	
Delta T/Temperature Rise	Support	
Thermal Imaging Display		
Image Mode	Thermal\Digital\PIP\T-DEF® blend\High sensitivity	
High Sensitivity	Only available when the lens registers as HR gas detection lens.	
Color Alarm	High temperature, low temperature, and interval isotherms.	
Image Overlay	Display global max, min, avg and measurement parameters.	
High/Low Temperature Tracking	Yes, for both global and regional.	
Digital Zoom	1~12x, continuous	1~8x, continuous
Acoustic Specification		
Acoustic Measurement Analysis		
Frequency Range	2~100kHz	
Frequency Range Selection	Support preset frequency range for different scenarios for later selection; Support manual adjustment for frequency range.	
Detection Mode	LQ Mode: Displays the leakage level; PD Mode: Displays a PRPD diagram, adapted to different AC frequencies (50/60Hz).	
Acoustic Image Focus	Masks the surrounding area and focuses only on a selected part of the acoustic image.	
Leak Evaluation	Automatic identification of leakage points, automatic evaluation of leakage and annual energy costs.	
Partial Discharge Diagnostics	Automatic diagnosis of discharge types such as surface, floating and tip (corona) discharges.	
Gray-scale Background	Displayed as a digital image in black and white grey scale	
Sound Pressure Tracking	Special marker tracking the maximum sound pressure spot.	
T-FFTD®	Capture instantaneous sound signals and make it stay longer in real-time audio and video images.	

FOTRIC P series

Premium Thermal Camera

Powerful Hardware Performance

- 1280×1024 infrared resolution
- Microsecond-level response time
- Dual FOV Lens

Powerful on-site Analysis Capabilities

- Real-time analysis of thermal images
- Automatic capture of high and low temperatures
- 25 points, 25 areas, 25 lines

Self-developed Imaging Technology

- TWB (thermal white balance) Feature
- IREdge Imaging Algorithm

Full-radiometric Thermal Video Streaming

Real-time transmission of raw temperature data for each pixel in every frame. Video recording saves the temperature data of each pixel in every frame, enabling temperature trend analysis of the target.

Specifications

Model	P9	P7	P5
Thermal Imaging Parameters			
Infrared Resolution	1280x1024	640x480	384x288
Super Resolution (SR)	2560x2048	1280x960	768x576
Detector Type	Uncooled infrared focal plane detector		
Detector Pitch	12μm	17μm	17μm
Thermal Sensitivity（NETD)	＜ 0.03°C (30mk)@30°C (86 °F)		＜ 0.04°C (40mk)@30°C (86 °F)
Spectral Range	8 ~ 14μm		
Image Frame Rate	30Hz		
Field of View （FOV)	25° x 20°	25° x 19°	25° x 19°
Spatial Resolution (IFOV)	0.34 mrad	0.68 mrad	1.14 mrad
Minimum Imaging Distance	0.4m	0.25 m	0.1 m
Focal Lengths	f35	f24.8	f15
Focus Mode	TurboFocus® system (thermal contrast AF, laser-assisted AF, continuous AF); Touch AF; Manual		
Lens Recognition	Auto		
Optional Lens	Refer to "Lens" Sheet		
Digital Zoom	1-32x	1-16x	1-12x
Unique Features			
NaviPdM®	Support, AI inspection assistan		
T-DEF®	Support, thermal and visible light image blend, transparency 0% ~100%		
IREdge®	Support, contour detail enhancement		
T-TWB®	Support, temperature visual representation normalization		

Specifications

Temp Analysis			
Complete Temperature Range	-20 °C ~ 2000 °C (-4 °F to 3632 °F)		-20 ° C ~ 1550 ° C (-4 °F to 2822 °F)
Temperature Range	-20°C ~ 120°C (-4 °F to 248 °F), 0°C ~ 700°C (32 °F to 1292 °F), 300°C ~ 2000°C (572 °F to 3632 °F) (Depending on the mounted lens)		-20°C ~ 120°C (-4 °F to 248 °F), 0°C ~ 700°C (32 °F to 1292 °F), 300°C ~ 1550°C (572 °F to 2822 °F) (Depending on the mounted lens)
Temperature Range Extension	support extension: lowest to -40°C (-40 °F) Does not guarantee measurement accuracy between -40°C ~-20°C (-40 °F ~-4 °F)		
Intelligent Range	Support		
Accuracy	± 1°C (1.8 °F) or ± 1 %, whichever is greater (ambient temp at 25°C (77 °F) , temperature range 0°C -100°C (32 °F ~212 °F)), ± 2°C or ± 2 % for other temperature range		±2°C or 2% , whichever is greater (at 25°C ambient temperature)
Uniformity	±2 °C or 2%		
ROI Spot	30 spot markers	25 spot markers	20 spot markers
ROI Area	30 (rectangle or circle)	25 (rectangle or circle)	20 (rectangle or circle)
ROI Line	30 measurement lines	25 measurement lines	20 measurement lines
User-definable ROI on PC software	Unlimited		
Measurement Parameters	Emissivity, Partially emissivity, Reflected temperaure, Ambient temperature, Humidity, Distance and IR window compensation.		
Temperature Rise Feature	Support		
Area Alarms	Area alarm; High temperature alarm and low temperature alarm		
Color Alarm	High temperature, low temperature, and interval isotherms		
PC Software	AnalyzIR®,NaviPdM®		

FOTRIC V series
Advanced Handheld Thermal Imager

Magicthermal®

Artificial intelligence (AI) to automatically recognize feature targets and quickly add irregular measurement tools that match the target shapes.

TurboFocus Intelligent Focusing System

The TurboFocus intelligent focusing system developed by FOTRIC fully integrates the advantages of automatic image focusing and laser autofocus. By using intelligent continuous autofocus, it ensures clear imaging and prevents temperature measurement errors caused by inaccurate focusing.

Expert-level Onboard Analysis Functionality

- Infrared thermal imaging for distance, area, and length measurements
- Full-screen temperature rise display and inter-zone temperature difference calculation
- Easily filterable saved annotations
- Onboard full-radiation thermal video recording
- Onboard real-time thermal image analysis and emissivity zone settings

Specifications

Model	V7	V5
Thermal Imaging Parameters		
Infrared Resolution	640 x 480	384 x 288
Super Resolution	1280 x 960	768 x 576
Thermal Sensitivity (NETD)	＜0.03°C (30mk)@30°C (86 °F)	＜0.04°C (40mk)@30°C (86 °F)
Spectral Range	8-14μm	
Image Frame Rate	30Hz	
IR Detector Type	Uncooled infrared focal plane detector	
Detector Pitch	17μm	
Field of View (FOV)	25° x 19°	
Spatial Resolution (IFOV)	0.68 mrad	1.14 mrad
Focal Length (mm)	24.8	13.7
Minimum Imaging Distance	0.25 m	0.1 m
Interchangeable Lenses	Refer to lens data sheet	
Focus Mode	TurboFocus® system for continuous, laser-assisted, thermal contrast AF, touch AF; Manual focus	
Digital Zoom	1-10x, continuous	
Unique Features		
NaviPdM®	Support, AI inspection assistant	
IRExplorer ™	Support, cross-platform remote control and data transfer	
T-DEF®	Support, thermal and visible light image blend, transparency 0% ~100%	
IREdge	Support, contour detail enhancement	
T-TWB®	Support, tempetrature visual representation normalization	
Temperature Analysis		
Temperature Range	-20°C ~ 120°C (-4 °F to 248 °F), 0°C ~ 700°C (32 °F to 1292 °F), 300°C ~ 1550°C (572 °F to 2822 °F)	
Intelligent Range	Support	
ROI Spot	16 spot markers	
ROI Area	12 (rectangle or circle)	

Specifications

ROI Line	8 measurement lines
Accuracy	± 2°C (3.6 °F) or ± 2 %, whichever is greater, (ambient temp at 77 °F)
Measurement Parameters	Emissivity, Partial emissivity, Reflected temperaure, Ambient temperature, Humidity, Distance and IR window compensation.
Temperature Rise Feature	Support
ROI Emissivity	Support
Area Alarms	Support
Color Alarms (temperature alarms)	High temperature, low temperature, and interval isotherms
PC Software	AnalyzIR®

FOTRIC *H series*

Advanced Handheld Thermal Imager

Digital Microphone・Large Array Layout

- Up to 162 MEMS digital microphones
- Spiral array

Durability and Advanced Protection

- 2-meter drop resistance
- IP54 rating

High-definition wide-angle view for more efficient detection

- Acoustic image field of view (FOV): 66° x 52°
- Industrial digital camera: 13 megapixels

Partial Discharge Diagnostics

Leak Evaluation

Specifications

Model	H6	H4
Acoustic Imaging Parameters		
Microphone Channels	162 MEMS digital microphone	112 MEMS digital microphone
Acoustic Image FOV	66° × 52°	
Acoustic Sampling Rate	200kHz	
Acoustic Refresh Rate	25Hz	
Working Distance	0.3~200m(1~626ft)	
Acoustic Measurement Analysis		
Frequency Range	2~100kHz	
Frequency Range Selection	Support preset frequency range for different scenarios for later selection; Support manual adjustment for frequency range.	
Measurement Spot	2	
Measurement Area	2	
Detection Mode	LQ Mode: Displays the leakage level; PD Mode: Displays a PRPD diagram, adapted to different AC frequencies (50/60Hz).	
Default AC Frequency	60Hz	
Acoustic Image Focus	Masks the surrounding area and focuses only on a selected part of the acoustic image.	
On-device Analysis	The device can directly analyse acoustic images.	
Analysis Software	AnalyzIR professional thermal and acoustic image analysis software.	
Leak Evaluation	Automatic identification of leakage points, automatic evaluation of leakage and annual energy costs.	
Partial Discharge Diagnostics	Automatic diagnosis of discharge types such as surface, floating and tip (corona) discharges.	

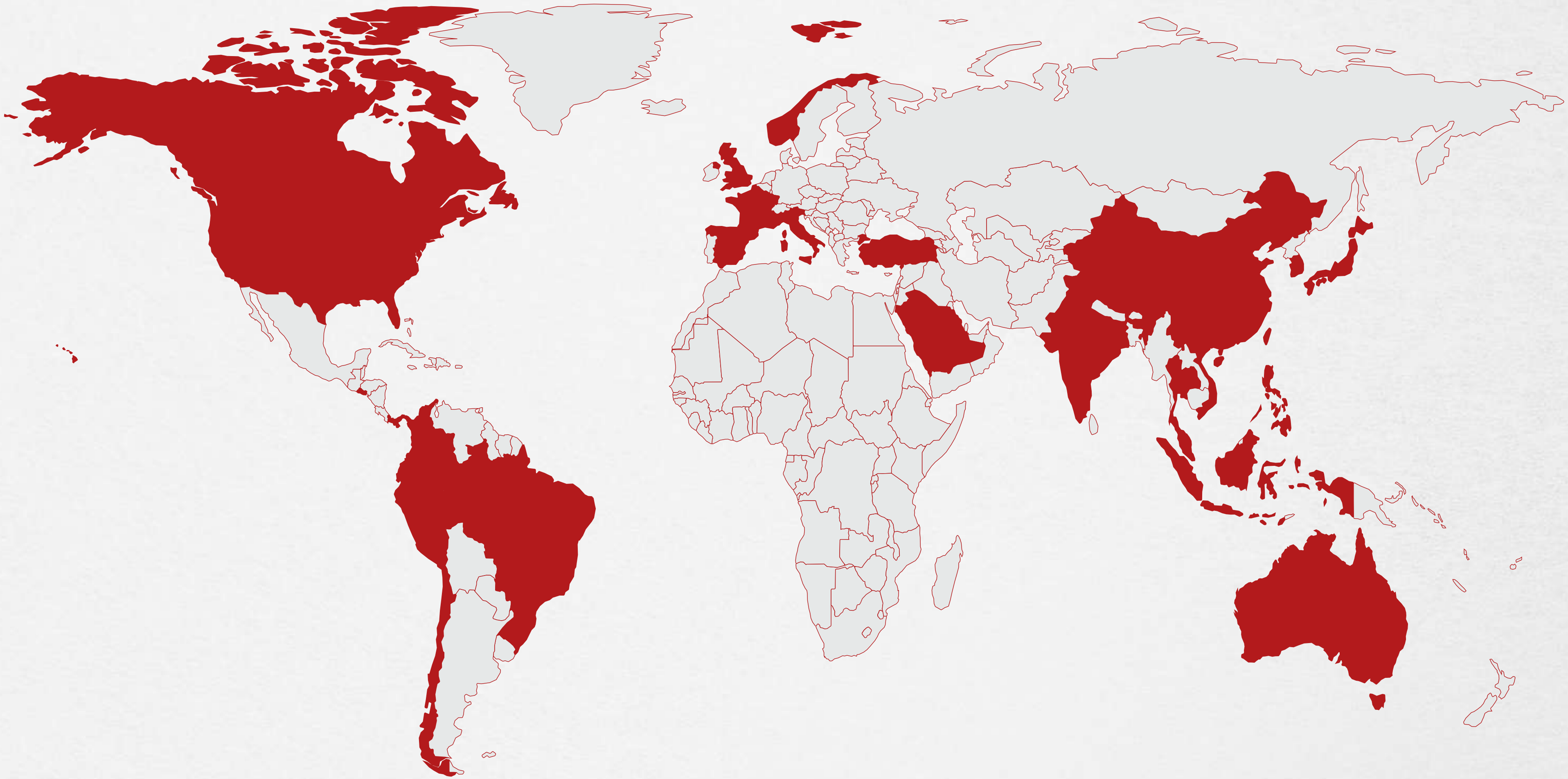
Company Introduction

FOTRIC Inc. is specializing in innovative thermal and acoustic sensing solutions for a wide range of industrial safety applications. Serving over 50 countries, our expertise extends to defect detection, condition monitoring, and safety assurance in sectors like manufacturing, chemical processing, metallurgy, electric utilities, oil & gas, and building infrastructure.

From our inception, precision in measurement and superior imaging technology have been our hallmarks. As a certified high-tech enterprise, FOTRIC adheres to stringent quality standards, evidenced by our ISO: 9001, FCC, CE, and KC certifications. Our leadership in the industrial safety equipment sector is marked by a commitment to continuous innovation, integrating advanced technologies for comprehensive safety solutions.

Underpinning our global presence is a robust distributor network across North America, Europe, Latin America, Southeast Asia, and other regions. This network ensures not only reliable sales channels but also sound technical support for our worldwide customers.

Embracing the motto 'Connecting the Digital Future', FOTRIC envisions a world where industrial safety is enhanced by smart, interconnected technologies. Our goal is to evolve continually, offering precise, data-driven tools that empower professionals to make informed decisions for safeguarding lives and livelihoods in the digital era.



Global Sales Network

40+

In over 40 countries and regions, including North America, Europe, South Korea, Singapore, Australia, and Wuhan, the company has established partnerships with international distributors, providing services to global users.