USE CASE SCENARIO

FLARE STACK MONITORING

Flare systems are essential in oil and gas operations but are challenging to monitor reliably. Because they detect heat instead of visible light, thermal imaging cameras offer an effective, non-contact solution that allows operators to identify abnormal flame behavior, optimize combustion, improve safety, and reduce operating costs.

Flare systems play a critical role in oil and gas operations. Often serving as the last line of defense, they safely burn off excess hydrocarbons to prevent dangerous pollutants from being released into the atmosphere. Ensuring that flares operate correctly is essential—not only for environmental compliance, but also for safety, efficiency, and cost control.

Monitoring flare performance, however, presents ongoing challenges. Traditional flare monitoring technologies are often limited in effectiveness, particularly in harsh operating conditions where smoke, heat, and distance interfere with reliable detection. Automated thermal imaging offers a proven, non-contact way to improve flare visibility and ensure proper combustion at all times.

The Challenge of Reliable Flare Monitoring

Various technologies have been used to monitor flare stacks, but many fall short when it comes to assessing burn efficiency. Smoke generation is a key indicator of incomplete combustion, yet many conventional sensors struggle to perform reliably when looking through smoke. Other technologies must be installed directly in contact with the process, causing them to degrade or be “consumed” over time and requiring frequent replacement.

A flare stack with a small flame coming out on a cloudy day

A thermal image of a flare stack with a bright flame

Ultraviolet flame detectors, while useful in some applications, can also be affected by smoke and atmospheric conditions. These limitations increase the risk of undetected flame loss—particularly pilot flame failure. Flaring without an active pilot flame allows unburned gas to escape into the air, raising the risk of explosions and increasing environmental impact.

Even during normal operation, maintaining a stable, efficient flame is essential. Poor combustion can drive up operating costs, increase emissions, and create upset conditions that require immediate corrective action.

A Thermal Imaging-Based Solution

Thermal imaging technology provides a reliable way to distinguish the heat signature of a flare stack flame from the surrounding background, which is typically sky or cloud cover. By visualizing heat rather than visible light, infrared cameras can detect flames even in smoky or low-visibility conditions.

For continuous monitoring, fixed-mount thermal cameras such as the Flir Axxx-Series and Flir A500f/700f offer a more automated approach. Permanently installed and positioned to view the flare and igniter flame, these cameras provide around-the-clock temperature information that supports consistent, repeatable monitoring without manual intervention.

From Detection to Actionable Insight

Fixed thermal imaging systems enable automated flare monitoring by continuously collecting temperature data and identifying abnormal conditions. Alarms can be configured to alert operators when flame behavior changes or when critical thresholds are exceeded. This allows corrective action to be taken quickly, before minor issues escalate into safety or environmental incidents.

Thermal imaging also supports improved combustion control. By verifying that the assist gas-to-waste ratio is properly adjusted, operators can minimize smoking events and reduce upset conditions that require immediate changes to air or steam volume. Over time, collected thermal data can be analyzed to better understand flare performance and optimize the combustion process.

An added benefit of automation is improved resource efficiency. Automated assist gas injection control helps prevent excessive steam consumption, reducing operating costs while maintaining effective combustion.

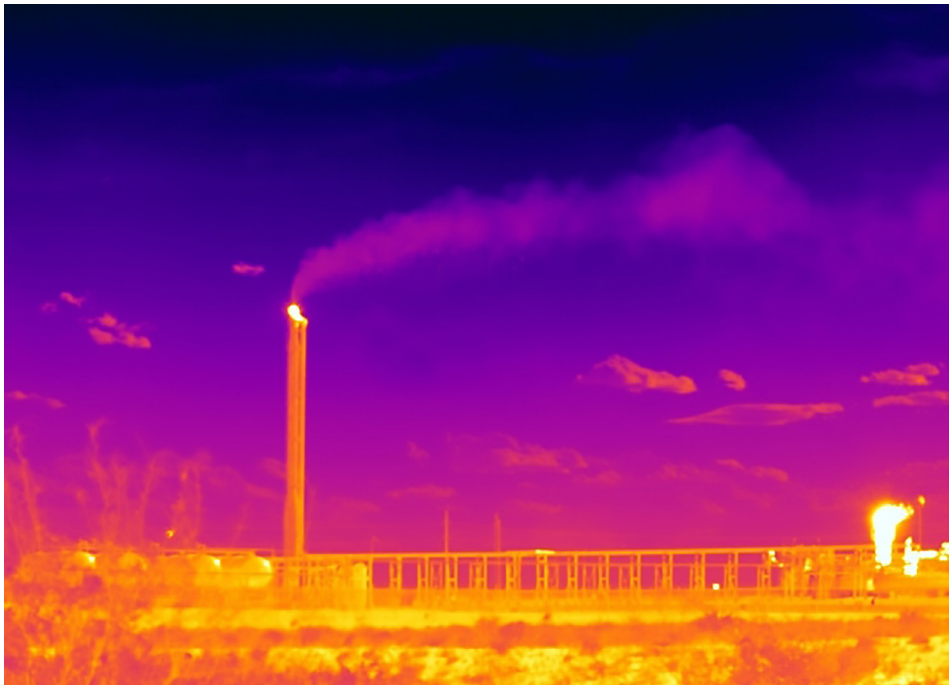
Safer Operations, Lower Costs

Whether used for quick inspections or continuous monitoring, thermal imaging gives oil and gas

operators greater visibility into flare performance. The ability to see through smoke, confirm pilot flame presence, and monitor combustion trends helps reduce environmental impact, improve safety, and avoid unnecessary operating expenses.

By replacing contact-based and smoke-sensitive technologies with non-contact infrared cameras, companies gain a more durable, reliable solution—one that delivers actionable insight while standing up to harsh industrial environments.

To install solutions like these at your own business, learn more or contact an expert from our partner Hi-Tech.
To install solutions like these at your own business, learn more or contact an expert from our partner Hi-Tech.



Axxx-Series Image Streaming Fixed-Mount Thermal Camera

A500f/A700f Advanced Smart Sensor Fixed-Mount Thermal Imaging Camera for Condition Monitoring and Early Fire Detection

To learn more about solutions for flare stack monitoring, please visit.

Specifications are subject to change without notice.

©Copyright 2026, Teledyne FLIR, LLC.

All other brand and product names are trademarks of their respective owners. The images displayed may not be representative of the actual resolution of the camera shown. Images for illustrative purposes only.

Revised: 6/5/2026, 5 x Automation application notes_flare stack monitoring 26-0374-INS

1.888.610.7664 www.calcert.com sales@calcert.com