

## Can I identify a flare with a performance issue: Alarm systems – Flare Thermocouple

Can I identify a flare with a performance issue? > Can I identify a flare with a performance issue: Alarm systems – Flare Thermocouple

### Summary

There are a range of flare monitoring systems to detect and alarm if the flare is unlit. Each technology utilises a feature of the flare such as heat or light.

A flare thermocouple uses the heat of combustion to monitor flare status. It is a simple technology, but may leave a lag time between the flare extinguishing and the thermocouple cooling before an alarm can be triggered. Thermocouples cannot differentiate flares with low levels of efficiency.

In some countries, to comply with environmental regulations it is essential to confirm that the main flare or pilot flare always remains lit.

Where a flare is unintentionally unlit the methane emissions are much higher than reported based upon flow rates.

Where cold flares are in operation (where emissions can vary between vented gas and combusted gas) the inclusion of alarm systems can help identify what operating state the system is in.

## How it Works

Flame status can be determined by several means including monitoring heat, ionized gas, light or sound. To give constant feedback of pilot status one of the following systems will need to be used:

- Heat – Thermocouples
- Ionised Gas – Flame ionisation detection
- Light – IR or UV systems
- Sound – Acoustic systems

Whilst standards such as API 537 require the use of pilots in the flare, there are a large number of older facilities that operate without pilots.

Selecting an appropriate flare alarm system requires consideration of whether it is intended to monitor the pilot flame or full flare.

Thermocouples measure the temperature. It is the flame detection system most commonly used and typically operated in association with flame front and high energy ignited pilot burners. The pilot is considered to be 'on' when the thermocouple set point has been reached. Key to reliability of this system is protection of the thermocouple mounting in the pilot burner nozzle. Sometimes two thermocouples are mounted on each pilot with separate leads running down the stack. This allows for switching of the active thermocouple by simply swapping the leads.

The prolonged exposure to extreme heat at the flare tip means thermocouples are typically viewed as a consumable item that must be regularly replaced. This may be simplified by the use of retractable thermocouples.

### Flame monitoring systems comparison:

| Technology       | Individual pilot | Ground level Maintenance | Instantaneous response |
|------------------|------------------|--------------------------|------------------------|
| Thermocouple     | X                | X                        |                        |
| Fiber Optic      | X                | X                        | X                      |
| Optical at grade |                  | X                        | X                      |
| Acoustic         | X                |                          | X                      |
| Flame ionization | X                |                          | X                      |

## Advantages



The response is slow (several minutes)



The prolonged exposure to flame at the flare tip means thermocouples are typically viewed as a consumable item that must be regularly replaced

## Go Deeper

- [Aspire Energy](#)
- [Argo flares](#)
- [Zeeco](#)

## Case study

Comparison between Fibre optic detection and Thermocouple detection highlights the longer time period for thermal systems to respond to flare outages

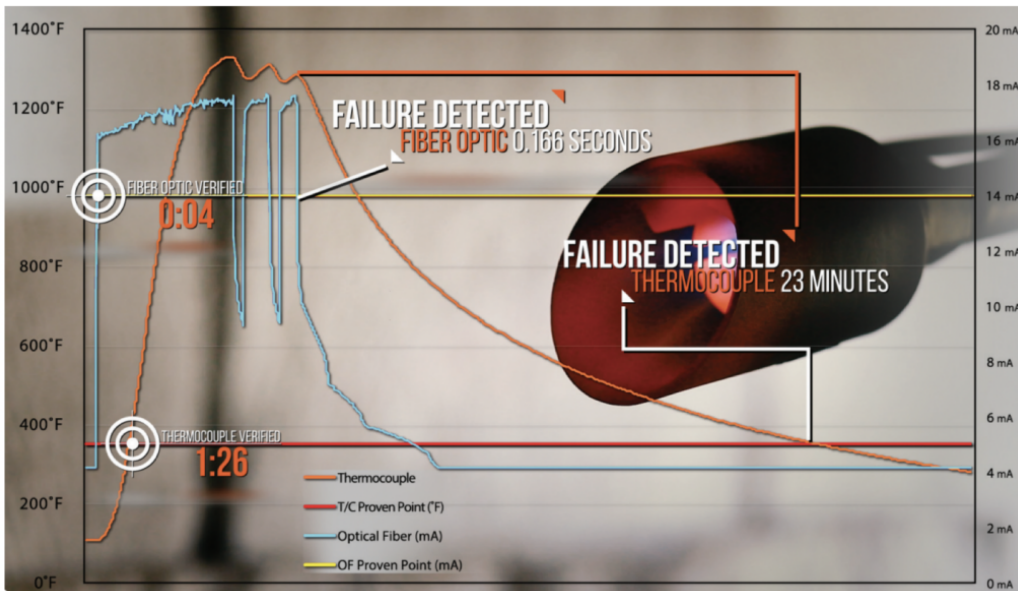


Image courtesy of [Zeeco, Inc.](https://www.zeeco.com)® – all rights reserved.

The challenge of replacing thermocouples without extinguishing the flare can be overcome through the use of purpose built pusher tools



Image courtesy of [Zeeco, Inc.](https://www.zeeco.com)® – all rights reserved.

## Can I identify a flare with a performance issue?



Can I identify a flare with a performance issue: Satellite monitoring – Wide area methane emissions monitoring



Can I identify a flare with a performance issue: Optical Gas Imaging



Can I identify a flare with a performance issue: Helicopter Optical Gas Imaging



Can I identify a flare with a performance issue: Point Sensors and Arrays



Can I identify a flare with a performance issue: Alarm systems – Image Processing