

# Refinery Improves Fire Detection and Suppression for Continuous Catalytic Reformer

## RESULTS

- False alarms triggered by steam releases are avoided, supporting uninterrupted production
- Operators released from manual monitoring can perform higher value tasks
- Reformer unit can operate with automated alarming rather than manual gas release and fire detection

## APPLICATION

Rosemount™ 975HR Multi-Spectrum Infrared (IR) Hydrogen Flame Detector used in a continuous catalytic reformer (CCR) unit to detect developing hydrogen flames.

## CUSTOMER

Large refinery located in Asia

## CHALLENGE

Oil refineries are among the largest producers and consumers of hydrogen. Hydrogen is a product in catalytic reforming and an important feedstock for hydrocracking and other processes. Not surprisingly, refineries have learned over the years to manipulate hydrogen and make provisions for reducing the consequences of accidental releases of the gas. Hydrogen is a combustible gas that is difficult to detect and easily ignitable on contact with open flames, electrical sparks, and static discharge. It is lighter than air and consequently challenging to detect in open, well ventilated areas. Moreover, hydrogen produces fires that radiate primarily in the ultraviolet spectrum, rendering them almost visually imperceptible in artificial or natural light.

Aware of the dangers associated with hydrogen leaks, an oil refinery in Asia sought to install hydrogen flame detectors at select locations in the reactor of a continuous catalytic reformer. Nonetheless, company management expressed concern over the interference that steam could cause on flame detectors. Steam, used in the reactor to regulate reaction temperature, had proven a troublesome source of false alarms for several flame detectors the company had tried. Steam is continuously present in certain zones and dissipates irregularly from the reactor.

To compensate for the presence of steam, operators had reconfigured the devices to a lower sensitivity setting and applied voting schemes, but the measures proved impractical. Many more detectors would be required to provide adequate detection coverage and voting schemes



*Tests [of Rosemount 975HR flame detector] with steam releases and controlled hydrogen flames resulted in 100 percent correct responses from both sources.*



*Rosemount 975HR Multi-Spectrum IR Hydrogen Flame Detector*

## REFINING

would have to be refined through trial and error. Meanwhile, the catalytic reformer remained at risk of fires and explosions.

In one situation, plant maintenance technicians using portable gas detectors found a hydrogen release. Understanding the potential for fire, the technicians informed the control room and operators increased the steam flow to raise the reactor temperature to reduce hydrogen output while technicians hunted for the source. The leak was identified and patched pending the next scheduled outage, but the incident called attention to the risk of hydrogen fires.

## SOLUTION

On review of the situation, Emerson's representatives recommended the Rosemount 975HR flame detector to improve flame detection monitoring. Because of its patented spectral analysis of bands for hot water emissions and non-flame sources, the Rosemount 975HR is highly resilient to steam and suffers little loss of detection coverage in the presence of the false alarm source. A demonstration unit was set at medium sensitivity, allowing for ample detection coverage per device. While evaluating the detector for a week, the refinery engineering team gained greater confidence on the Rosemount 975HR's capacity to discriminate between the radiant energy generated by steam and that of hydrogen flames, a critical differentiation because the heating coils that produce the steam operate continuously. Tests with steam releases and controlled hydrogen flames resulted in 100 percent correct responses from both sources.

A review of the site and the areas of potential releases resulted in a system using eight Rosemount 975HR units positioned to provide a full view of affected areas with redundant coverage of most critical spots. Data from the detectors are now used to trigger alarms and fire suppression systems. The continuous catalytic reformer can now operate without concern for incipient hydrogen fire quickly escalating into a major safety and environmental incident.

## RESOURCES

[Rosemount 975 Flame Detectors](#)

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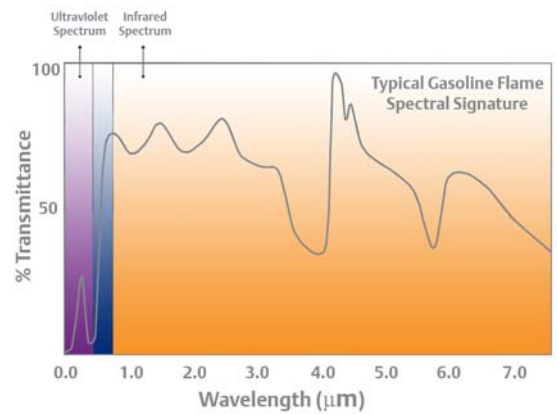
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The Rosemount 975HR Multi-Spectrum IR Hydrogen Flame Detector is able to read radiation in the 2.7 µm wavelength band created by water vapor resulting from hydrogen combustion, while also capturing higher wavelengths common to hydrocarbons, including reformate.