# ENGINEERED SOLUTIONS

## CASE STUDY

**Enhancing Flame Detection Robustness in the Face of Chemical Releases:**
A Case Study of a Chemical Plant's Process Heater

relevant.

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# BACKGROUND

The client sought out the expertise of Relevant Industrial to collaboratively develop a solution that would integrate a code compliant Burner Management System (BMS) incorporating advanced flame detection technology.

A prominent chemical manufacturing company faced two significant challenges after one of their process heaters experienced a devastating fire due to the absence of flame detection capabilities. The incident led to severe damage, garnering public attention and highlighting the urgent need for improved safety measures. Prior to the incident, the plant relied on monitoring gas pressures as a means of flame detection.

After modern flame detection systems were installed, the system proactively shut down operations for an unknown reason. That unknown reason turned out to be a significant release of EB (Ethylene glycolmonobutylether ) which introduced an unforeseen variable that activated the flame detection system.

This case study highlights the collaboration between a premier global engineering, procurement, and construction company and Relevant Industrial's Engineered Solutions team to retune the flame detection on the process heater so it would reliably stay in operation during any future EB release, as well as protect the units and their surroundings after the discovery of the EB release.

The Engineering, Procurement, and Construction (EPC) partner and was tasked with rebuilding and recontroling the process heater. Recognizing the criticality of the situation, sought out the expertise of Relevant Industrial to collaboratively develop a solution that would integrate a code compliant Burner Management System (BMS) incorporating advanced flame detection technology.

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# CHALLENGES & OBJECTIVES

1. Lack of flame detection
2. EB release impact
3. Ensuring process stability

There were two phases of challenges: First, ensuring the safety of the plant after recovering from the catastrophic fire in the process heater resulted in severe damages, prompting the need for a comprehensive solution to rebuild and recontrol the system.

The second challenge came six months later following the unexpected EB release resulting in the shut down of the process to ensure the safety of the plant. This was to address the lack of flame detection, which had led to the devastating fire incident at the chemical plant's heater.

The objective was to design and implement a reliable flame detection solution that would ensure the safety and operational efficiency of the 14 burner heater. Additionally, the system needed to overcome the vulnerability posed by potential interference from the chemical EB (Ethylene glycolmonobutylether ) and maintain consistent flame detection performance even during unexpected process changes.

### 01 LACK OF FLAME DETECTION

The absence of a reliable flame detection mechanism in the process heater made it vulnerable to potential incidents.

### 02 EB RELEASE IMPACT

The release of EB, a chemical with high vapor density, compromised the UV signal produced by the combustion process, leading to a malfunction of the flame detection system and subsequent tripping of the process heater.

### 03 ENSURING PROCESS STABILITY

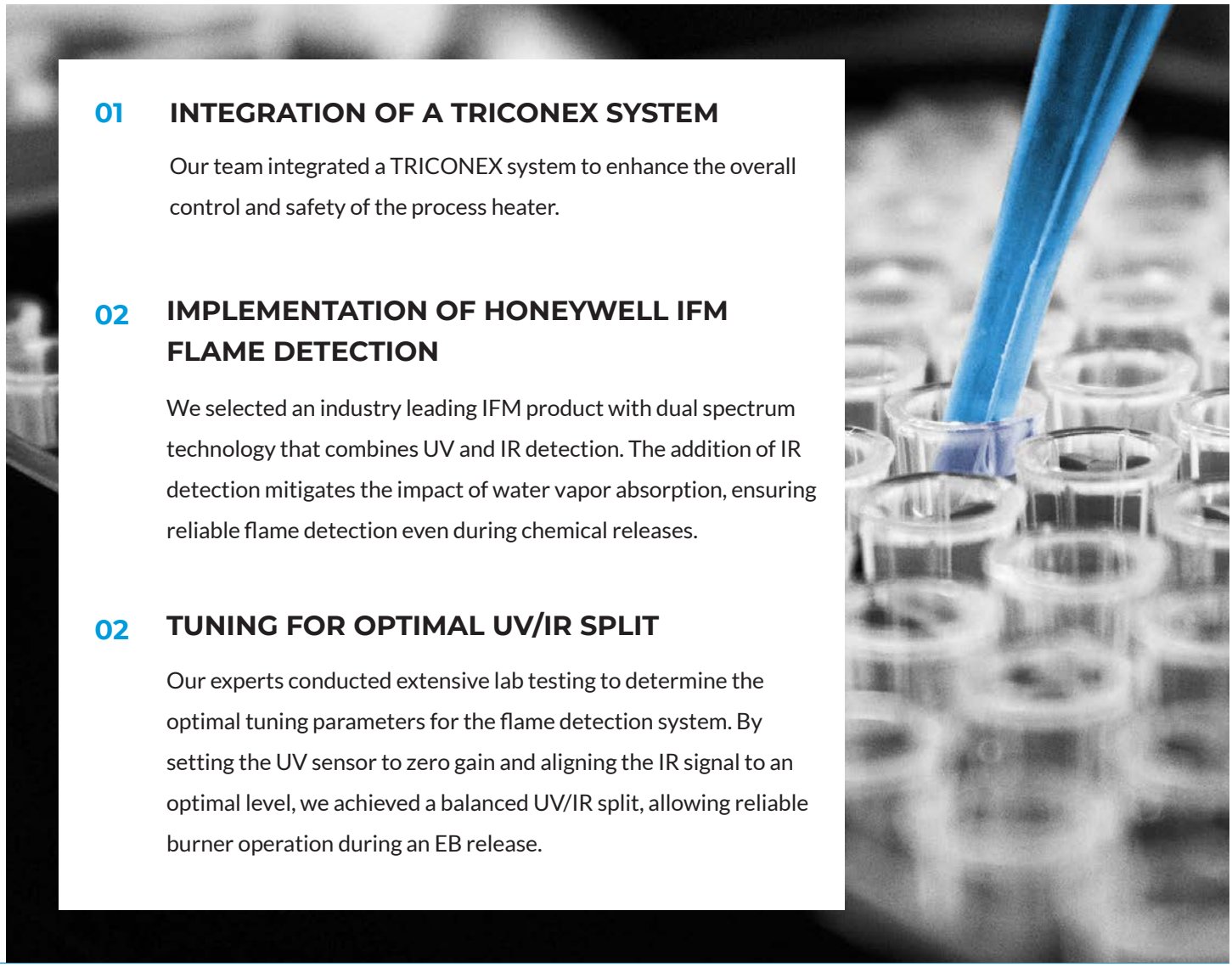
It was crucial to ensure that the newly implemented flame detection system could withstand future chemical releases and maintain reliable burner operation to prevent process disruptions.

# SOLUTION IMPLEMENTATION

1. Integration of a TRICONEX system
2. Implementation of Honeywell IFM flame detection
3. Tuning for optimal UV/IR split

To address the challenges faced by the chemical plant, in collaboration with the EPC, Relevant introduced an integrated solution that combined a TRICONEX, a Schneider Electric Safety Shutdown System for burner management, coupled with an industry leading IFM (Industrial Flame Monitoring) product from Honeywell for flame detection. Notably, the flame detection technology employed dual spectrum capabilities, incorporating both ultraviolet (UV) and infrared (IR) detection. This enhanced system design aimed to mitigate the impact of EB release by leveraging the unaffected IR signal, thus ensuring uninterrupted flame detection.

The Relevant Industrial Engineering Solutions team worked across the multiple companies to execute a comprehensive solution using the best knowledge and experience from all the parties. The key components of the solution included:



### 01 INTEGRATION OF A TRICONEX SYSTEM

Our team integrated a TRICONEX system to enhance the overall control and safety of the process heater.

### 02 IMPLEMENTATION OF HONEYWELL IFM FLAME DETECTION

We selected an industry leading IFM product with dual spectrum technology that combines UV and IR detection. The addition of IR detection mitigates the impact of water vapor absorption, ensuring reliable flame detection even during chemical releases.

### 02 TUNING FOR OPTIMAL UV/IR SPLIT

Our experts conducted extensive lab testing to determine the optimal tuning parameters for the flame detection system. By setting the UV sensor to zero gain and aligning the IR signal to an optimal level, we achieved a balanced UV/IR split, allowing reliable burner operation during an EB release.

# RESULTS

1. Enhanced Robustness
2. Improved Detection Reliability
3. Prevention of Process Disruptions

Following the implementation of the enhanced flame detection system, the chemical plant experienced significant improvements in process safety and operational reliability. During an EB release incident, which had previously caused the process heater to trip due to compromised UV flame detection signals, the new system successfully detected and maintained flame integrity using IR detection. By retuning all 14 loops of the flame detection system, the UV sensors were temporarily disabled while optimizing the IR signals, effectively countering the interference caused by EB. As a result, the process heater remained operational, preventing costly downtime and process disruptions.

## CONCLUSION

The collaboration between Relevant Industrial, the EPC, and the chemical company resulted in a successful outcome showcasing the importance of domain expertise, world class problem solving skills, and robust flame detection technology. By integrating one of the industry leading IFM products with dual spectrum technology and implementing a comprehensive tuning approach, we were able to address the challenges posed by the EB release and ensure the reliable operation of the process heater. The enhanced flame detection system not only mitigated the risks associated with chemical releases but also showcased its capability to adapt to abnormal process conditions.

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