

SYNECTICS

A Synectics Guide To:

Monitoring and Managing

Potentially Explosive Environments



This guide looks at a range of surveillance solutions ideally suited to monitoring and managing potentially explosive environments.

Covering everything from important camera characteristics and analytics-led early warning solutions, through to managing safety protocols and emergency response scenarios, you'll learn what's necessary, possible and practical to implement for your specific requirements.

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Explosive Environment Classifications

An explosive environment is one where the presence (or potential presence) of ignitable gases, dusts, or fibres, may cause a fire or explosion to occur.

Hazardous areas are further categorised by the frequency and duration of the explosive environment in question, with differentiations also made between gas and dust/fibre ignition risk.

	Gas	Dust	Fibre
Example risk	Carbon dioxide, methane, petroleum vapours, solvent fumes	Grain, flour, sugar – any pulverised material suspended in the atmosphere	Textiles, sawdust – any area where fibres are not suspended in air but are present
Example site/facility	Oil/gas plants, chemical processing, biomass containers, gas storage, spray finishing areas	Food processing plants/ refineries, biomass containers, grain storage containers	Sawmills, cotton mills, textile recycling facilities
Class type	I	II	III
Division 1	The hazard identified is expected to be present as part of everyday operations		
Division 2	The hazard identified is possible under abnormal conditions		

It is worth noting that categorisations can be made by Class/Division (CSA/CSAus) or Zone (IECEx, ATEX) depending on the geography and corresponding industry standard.

Division 1	The hazard identified is expected to be present as part of everyday operations.	Zone 0 (Gas) Zone 20 (Dust/Fibre)
		Zone 1 (Gas) Zone 21 (Dust/Fibre)
Division 2	The hazard identified is possible under abnormal conditions.	Zone 2 (Gas) Zone 22 (Dust/Fibre)

While differentiations are made between specific risk types, it is possible that facilities may be subject to 'risk overlap'. For instance, a container or warehouse storing biomass may release flammable gases and have dust particles that pose risk of ignition. Where there is overlap, the area would always be categorised according to the greater risk level present.

Camera Solutions

Surveillance cameras used for explosive environments, also known as hazardous area cameras, need to have been tested and certified to the hazardous area safety and performance standards specific to your geography.

Common Features

The camera specification you'll need depends on the application (and corresponding hazardous area classification) but they should be built to withstand harsh temperatures and conditions, and made from durable materials like stainless steel and tempered, pressure-resistant glass.

No Sparks

Hazardous area cameras for explosive environments aren't just built to withstand explosions, they are developed with parts that mitigate the risk of sparks from electrical components. They also feature camera housings that prevent the ingress of gas and particles that could ignite.

No/Low Light Conditions

For applications where no/low light conditions are in play, specialist explosion-proof thermal or multi-modal cameras (that can switch between colour, mono and thermal imaging) should be used.

Radiometrics

For applications where detecting thermal variation is intrinsic to process monitoring and fault detection, it is advisable to use radiometric-enabled thermal cameras as these provide an exact temperature value for every pixel in the image captured.

Temperature Thresholds

Our radiometric-enabled COEX thermal camera stations, used in conjunction with Synergy, allow operators to set areas of interest within a camera's specific field of view, assign temperature thresholds, and then 'see' heat variations that may be indicative of danger.



Early Risk Detection

Where the aim of surveillance is to help prevent safety issues from occurring, monitoring camera footage alone is often not enough.

Consider using your security and surveillance software to:

Integrate a Wider Range of Data Sources

Data from a wider range of systems and sensors is critical to gaining a clear picture of evolving conditions within an explosive area. Depending on the nature of your environment, these may include:

- Fire detection systems
- Smoke detectors
- Chemical alert systems
- Dedicated gas detection e.g. methane, CO² sensors

Leverage Specialist Analytics

Integrate specialist analytics solutions and leverage on-board analytics to rapidly analyse video content and data from third-party sources. Chemical composition analytics is a good example of a specialist solution increasingly used for monitoring explosive areas where subtle changes in atmospheric composition are highly indicative of explosive risk.

Create a Series of Fixed Event or Threshold-Based Rules and Alerts

Use your surveillance platform's integral rules engine to spot specific data combinations and threshold breaches that warrant imminent investigation. If an alert or alarm is triggered, automated workflows provide on-screen instructions to ensure the correct measures are followed based on live data received.

Preventative Monitoring Applications

Here are two applications where **Synergy** is used as a risk detection solution for explosive environments.



Safe Storage: **Biomass Sheds**



Biomass refers to renewable organic material that comes from plants and animals which is used to generate energy. Whether stored in raw state or as processed pellets, biomass materials have a propensity to self-heat and emit natural gases including CO².

Together with the likelihood of suspended dust particles and fibres, this is a combination that can, and frequently does, lead to fires and explosions.

Synergy can pair camera and radiometric data from COEX thermal cameras with information captured from fire, smoke, and CO² sensors in biomass storage facilities. Its built-in rules engine allows risk levels (and corresponding alerts and alarms) to be associated with specific temperature and gas reading combinations.

A special air blast function is also used to prevent particles from settling on cameras in a way that could affect readings i.e., create false alerts. For biomass held in large container sheds, often located in largely un-manned areas of processing facilities, ports and depots, it becomes possible to remotely detect rising temperature/gas reading combinations that might be a precursor to fire or combustion.

Flame Composition: **Flare Stacks**



Monitoring a flare stack flame, or pilot flame, to discern burning profiles (heat levels, gas emissivity etc.) is important from a regulatory and safety standpoint.

What's more, upstream operators in oil and gas increasingly need to produce clear audit trails that demonstrate actions and operations are minimising waste gas emissions as part of environmental and sustainability performance checks.

Once again, our radiometric-enabled COEX cameras and Synergy can be used to measure the difference in 'thermal signature' between the flare and the surrounding environment.

Footage can also be overlaid with that from daylight cameras to help detect smoke or poor flame colour, indicating an un-optimised stoichiometric mixture.

Depending on the readings and risk associated, alerts can be created to automatically instigate actions ranging from deploying an un-scheduled maintenance team to check key settings, through to launching evacuation proceedings and calling specialist emergency personnel.

Keeping People Safe and Secure

While mitigating the risk of explosion is the best way to protect personnel, there are other ways to surveillance solutions can help

Remote Access: Detect Danger from a Distance

Security and surveillance solutions, such as Synergy, support remote system access capabilities which allow vital process monitoring to take place from any location, by authorised personnel using any web-enabled device. This means that environments can be continually monitored and assessed without regular physical (in-person) examination of equipment and facilities. Instead, key checks can be carried out based on live data received and on automated alerts.

Analytics: Enforcing Safety Procedures

In many cases your security and surveillance solution can support safer working conditions. For example:

Wearing Specific PPE

Using video analytics, you can detect when specific items, e.g. hard hat, masks, high visibility clothing, are being worn and when they are not. Footage captured can be used for training purposes to highlight any recurring issues.

Qualified Personnel Access

Depending on the explosive environment in question, access may be limited to personnel with specific skills or who hold a particular clearance level. Integration with HR databases, access control systems, and RFID-enabled ID badges, are all options for ensuring that only the right people can gain access to certain areas.

Limited Personnel in a Particular Area


Some explosive environments require precise temperature control or have limited manoeuvrability, meaning it is important to limit the number of people operating in that area. Conversely, it may be that checks on certain areas have to be carried out in pairs. By integrating people counting analytics, you can detect deviations to ensure worker safety.

Maintaining a Specific Distance from Equipment

Virtual perimeters can be established around specific machines, equipment and process areas. If movement is detected in safety exclusion zones, Synergy can trigger a proximity alert, prioritise on screen footage to show who or what has caused it, and if required automate audio warnings to vacate the area.

Worker Status: Detecting Emergency Scenarios

By integrating body-worn sensors and RFID technologies, Synergy can be programmed to alert teams to risk indicators e.g. a person's movement from vertical to horizontal (indicating collapse) or if a person hasn't moved in a specific length of time. As well as showing the exact coordinates of the individual on screen and prioritising the nearest available footage for situation assessment, the system can automatically alert emergency responders and push images and footage to mobile devices to ensure they are updated on any evolving scenario.



Surveillance for monitoring and managing explosive environments is a highly specialist area.

There is no 'one size fits all' answer because in each case, the nature and potential severity of explosive risk will differ. As will monitoring goals – for instance an unmanned storage location will have very different safety monitoring requirements to a processing facility frequently accessed by personnel.

This makes it vital to work with a specialist provider able to deliver equipment technically up to the task in terms of performance criteria, but also one able to tailor solutions – and develop new integration and monitoring applications where necessary – to match the specific needs and priorities for any given area.

Which is exactly what we do.

Talk to us today about your explosive environments and how we can tailor a solution to meet your organisation's unique set of requirements.





Synectics is a leader in advanced security and surveillance systems that help protect people, property, communities, and assets around the world.

We have a deep and unique understanding of our customers' issues and challenges, and we draw on this to create solutions they can rely on completely – giving them peace of mind by securing the assets, people, and livelihoods they are responsible for protecting.

We have built an enduring reputation for our problem-solving expertise, technical excellence, and total commitment to delivering for our customers.

Protecting what matters, where it matters most

SYNECTICS

Specifications subject to change. E & OE.

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