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BEST PRACTICES FOR VIDEO SMOKE DETECTION (VSD): WHEN TO USE VSD, HOW TO USE IT, AND WHY

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BEST PRACTICES FOR **VIDEO SMOKE DETECTION** (**VSD**): WHEN TO USE VSD, HOW TO USE IT, AND WHY

PROTECTING PEOPLE, PROPERTY AND PROCESSES

With the advent of video smoke detection (VSD), the security and fire safety industry have discovered a new and efficient way to detect smoke and fire in a very early stage. VSD makes use of CCTV security cameras and smart video analytics that are able to recognize initiating smoke and fire in the video image.

Today, VSD is especially used in critical infrastructures in order to protect people, property and production processes. VSD technology can prevent serious fire incidents from happening and thus avoid high costs, more specifically:

- The cost of fire damage to infrastructure
- The cost of human lives
- The cost of production stops and evacuation during an alarm phase
- The cost of emergency services
- The cost of cleaning
- Image damage and the cost of bad reputation.

However, VSD is not for everyone. The technology is an addition to the wide range of smoke and fire detection solutions that already exist today and therefore, it should only be applied in those environments where conventional technologies fail.

In this eBook, you'll discover when you need VSD and why this technology is the best solution for a particular set of customers, applications and environments.

WHEN TRADITIONAL SMOKE DETECTION FALLS SHORT

In certain types of critical environments, like chemical plants, waste storage bunkers or production facilities, the impact and the risk of a fire can be very high. That's why companies that operate in such environments need to take the appropriate fire safety measures. However, it is exactly in those environments mentioned above that conventional smoke detection technologies, like beam or point-type detectors, will fall short.

CONVENTIONAL SMOKE DETECTION

A wide number of smoke detection technologies are available on the market. All of them have proven their value in non-critical environments.

THESE ARE SOME OF THE MOST COMMON TECHNOLOGIES:

Point-based smoke detectors are housed in plastic enclosures. When smoke reaches this enclosure, smoke can be detected optically (photoelectric), by heat or through a combination of both.

An optical beam smoke detector uses a projected beam of light to detect smoke across large area. Optical beam smoke detectors work on the principle of light obscuration, where the presence of smoke blocks the light from the beam. Once a certain percentage of the transmitted light has been blocked by the smoke, a fire is signaled.

Aspirating smoke detectors draw in air via a network of pipes to a central smoke detection unit. The air samples are captured via pipes that have multiple holes and filtered in order to remove any contaminants or dust to avoid unwanted alarms. The samples are then processed by a centralized detection unit.

Infrared (IR) flame detectors monitor the infrared spectral band for specific patterns given off by hot gases.

LIMITATIONS OF CONVENTIONAL SMOKE DETECTION

The technologies described above are cost-effective and will perform well in non-critical environments like offices or indoor commercial spaces. However, the physical environment of critical facilities often imposes serious restrictions on the performance of conventional smoke detectors. The technologies described above are inefficient in critical environments for at least two reasons:

- The detection is too slow.
- Too many unwanted alarms are generated.

Why these technologies fail, will be further explained in this eBook.
Video Smoke Detection is an addition to the current spectrum of smoke detection technologies, that is specifically useful for environments where no adequate solution is available today.

- High-impact/high-risk facilities
- Harsh environments
- Indoor spaces with high ceilings

HOW DOES VIDEO SMOKE DETECTION WORK?

THE COMPONENTS OF YOUR VIDEO SMOKE DETECTION SYSTEM

1 The camera

Today's Video Smoke Detection systems rely on the resolution and accuracy of a standard network security camera.

2 Video analytics software

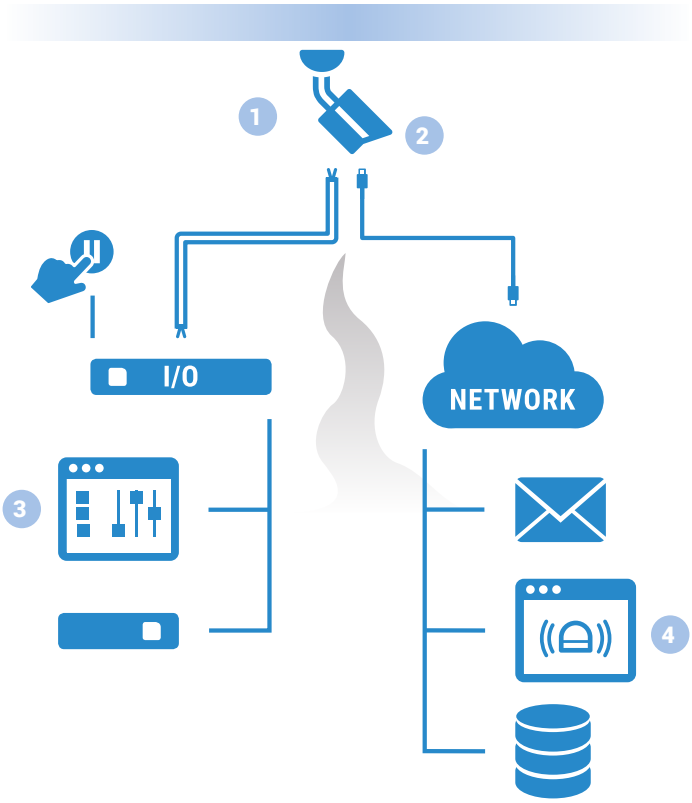
Carefully developed software algorithms installed on the camera scan the environment and continuously analyze it in real time to exactly locate the fire incident.

3 Connection to the Fire Control Panel

In case of an event, an alarm output is sent over to the fire control panel.

4 Connection to the BMS or VMS

For a smooth surveillance and monitoring experience, a video detection system can be connected to a video management system in order to provide control room operators with 24/7 situational awareness.



THE POWER OF THE IMAGE

THE BENEFITS OF VIDEO SMOKE DETECTION

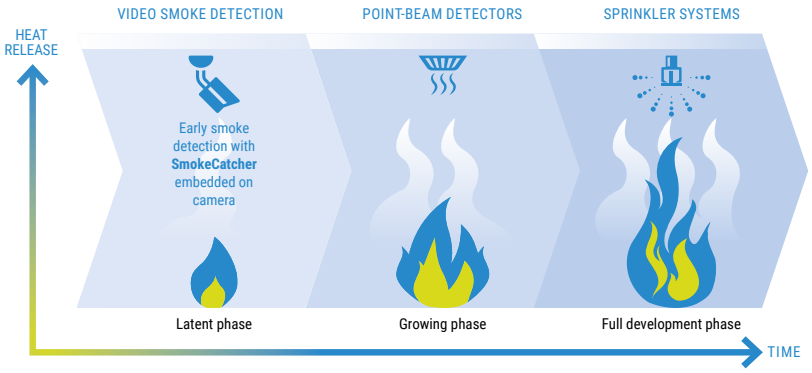
In environments where traditional detection technologies fail, Video Smoke Detection (VSD) is a **reliable, failsafe solution** to protect people, property and production process.

It's accurate

VSD is very accurate and thus the unwanted alarm rate will be extremely low. These unwanted alarms can be very costly. Just think of the time lost when a production line needs to be stopped or imagine the cost of an erroneously called emergency team. Business interruption losses are also not always covered by insurance policies.
Video Smoke Detection systems will efficiently analyze the video image to make a distinction between starting smoke and other irregularities, such as people walking in the field of view, animals, vehicles or objects.

It's fast

In fire safety, speed is crucial. Video Smoke Detection systems will spot initiating smoke much faster than conventional systems. VSD makes efficient use of CCTV, so it is able to see dangers from a very large distance. Therefore, unlike many other smoke detection technologies, video analytics do not need to make physical contact with smoke or dust. They immediately 'see' the danger at the source, when and where it originates.



It's visual

Control room operators can monitor the CCTV video images in real time. This allows them to assess the nature and severity of the fire as well as the stage it is in. Based on pre-incident recording, they can see whether people are present at the place of the incident and they can better assess the overall situation. This way, they can also make better use of their emergency resources. After the incident, the video footage can be used for risk analysis and prevention of future incidents.

WHEN TO USE VIDEO SMOKE DETECTION

#1: HIGH-IMPACT ENVIRONMENTS

When detection speed and visual feedback is crucial

In some environments, such as chemical plants, even a small fire can cause huge consequential damage. In these high-impact and high-risk environments, conventional smoke detectors would be useless, because these might only get activated when the damage is already done.

Video smoke detection has a number of significant benefits that make it the ideal detection technology for high-impact and high-risk environments:.

- The high detection speed of Video Smoke Detection will dramatically reduce the impact and the risk of a fire outbreak.
- The accuracy of detection will bring down the false alarm rate to an extremely low level.
- The visual nature of VSD will allow control room operators to monitor any irregularity very meticulously. VSD almost rules out any uncertainty and enables operators to immediately see any irregularity and as a result, they can make well-founded decisions in case of real and unwanted alarms.

#2 HARSH ENVIRONMENTS

Where conventional smoke detectors generate too many unwanted alarms

Smoke detection systems that generate too many unwanted alarms are not only very annoying, they are also quite costly. In production facilities, alarms will require the production lines to be stopped. Unwanted alarms also lead to the unavailability of emergency teams in case of real fires. In some cases, users of these detection systems might decide to deactivate the detectors altogether, just to avoid the above-mentioned problems.

In harsh environments, where chemicals, dust or vapor are present every day, conventional smoke detectors will generate a lot of unwanted alarms.

- **Humidity:** A high degree of humidity in the air can activate a conventional point or beam-type smoke detector. Humidity can be created by processes where steam is involved, but detectors can also be activated by very humid weather.
- **Chemicals:** Smoke detectors can be set off by strong chemicals like ammonia, paint fumes or volatile sprays.
- **Dust:** A conventional smoke detector will handle dust in the same way as smoke particles, which can set off the alarm. Dust is also one of the reasons why a conventional smoke detector will degrade very fast.

Because of its visual nature, Video Smoke Detection will be able to analyze the above-mentioned phenomena in a more intelligent way through the use of smart video analytics. This will heavily reduce the number of unwanted alarms. That is why video-based smoke detection is an ideal technology for use in harsh environments, such as chemical plants, waste recycling plants, wood processing companies or in the oil and gas industry.

#3 GREAT HEIGHTS

Where conventional technologies will not detect or will detect too late

Video smoke detection is ideal for use in tall buildings or large indoor spaces. In these environments, smoke might never reach a traditional smoke detector, because of a process called stratification, which stops the upward movement of smoke.

The smoke stratification phenomenon

High or voluminous buildings of 10m+ have issues with the stratification of smoke, whereby smoke will not rise high enough or quickly enough to reach ceiling mounted point or beam detectors. This is the case for example in aircraft hangars, airport passenger terminals, factory production halls, retail areas, museums and many historical buildings.

In atrium halls or in large spaces where the roof heated by the sun is poorly insulated, a layer of **hot air** will form under the ceiling. On the other hand, the more smoke rises, the more its temperature will decrease. So, when the smoke plume's average temperature is less than the upper hot air layer, this layer will prevent the smoke from actually reaching the ceiling.

Conventional point-type and beam-type detectors are not sensitive enough to provide early warning of smoke in large open spaces or tall buildings, because stratification will prevent the smoke to make physical contact with the detector in time. By the time smoke is detected by such systems, a fire would have to be very large, creating sufficient heat and smoke to rise up to the ceiling.

In contrast, video smoke detection does not need to make physical contact with the smoke. The initiating smoke can be seen from a large distance, right at the source, making early detection possible.

PRACTICAL REQUIREMENTS FOR YOUR VIDEO SMOKE DETECTION INSTALLATION

A Video Smoke Detection system will not operate flawlessly under just any condition. For the best video smoke detection performance, a number of practical requirements need to be taken into account.

1. Indoor or roofed areas

In order to minimize the effect of various types of weather conditions, Video Smoke Detection systems will perform best in indoor or roofed areas.

A video smoke detection camera installed indoors will not be affected by direct sunlight shining into the lens or by reflections of the sun. Most video detection systems will also find it difficult to cope with various types of precipitation, including rain, snow or mist.

2. Sufficient light

For most Video Smoke Detection systems to work properly, a minimum of 15 lux of light should be present. As VSD is only 100% efficient indoors, this should be provided by artificial light on a 24/7 basis.

3. A clear field of view

A Video Smoke Detection system can only provide good detection results for areas that can be seen by the camera. Obstacles in the field of view will limit the performance. Therefore, effective camera positioning is of utmost importance.

USE CASE #1: CHEMICAL PLANTS

Fire safety in chemical plants is a major issue. In these environments, working with highly flammable chemical contaminants puts extra pressure on fire safety professionals and high requirements on fire safety technology. Smoke detectors need to be very reliable and accurate and they often need to be able to cope with the presence of dust, vapor or chemicals.

WHY VIDEO SMOKE DETECTION IS IDEAL FOR CHEMICAL PLANTS:

Low false alarm rate

Beam and point detectors usually have a lot of difficulty coping with dust and chemicals. These types of detectors will treat such anomalies just like smoke, which will result in a lot of unwanted alarms. Video Smoke Detection on the other hand can analyze these phenomena in a much more intelligent way and will be able to make a distinction between a smoke plume on the one hand and chemicals or vapor on the other hand.

Detection speed is crucial

Even the smallest fires can have big consequences in chemical plants. Usually, the first five minutes are crucial in a developing fire. After 7-10 minutes, the fire is already so wide spread and temperatures so high that the risk of personal incidents and damaged infrastructure is very high. But in chemical plants, there might not even be that much time.

Depending on the environment, Video Smoke Detection will react within 10 to 60 seconds of smoke appearing in the detection field of view. This enables fast reaction and fast interventions in the first minutes when the fire is still in a controllable stage.

100% visual control

The consequential damage and cost of downtime in a chemical production plant can be very high. To avoid unnecessary interruptions, the number of unwanted alarms needs to be reduced to a minimum, so that the flow is not interrupted unnecessarily. But even in cases where a real incident is detected and an alarm is set off, it is sometimes deemed more efficient not to interrupt the production flow and just isolate and control the incident while production line is running.

In order to make proactive, well-founded decisions, operators need to have full control and an efficient overview. Because video detection uses the company's CCTV system, operators can always visually verify an incident immediately and then decide on the measures they need to take.

USE CASE #2: WASTE PLANTS

Fires in waste storage bunkers are a frequent and well-known problem. These fires can be caused by spontaneous combustion, in which a hidden source of heat resulting from biological decomposition or the chemical oxidation processes generates a rise in temperature. If the waste mass cannot dissipate the heat faster than it is generated, then spontaneous combustion can occur.

WHY VIDEO SMOKE DETECTION IS IDEAL FOR WASTE PLANTS:

Harsh environments

Damp from spontaneous combustion, dust or waste flying around caused by loaders moving the waste heaps: a waste plant is the casebook example of a harsh environment. To make an accurate distinction between these phenomena and an actual smoke fume and initiating fire, there is a need for intelligent detection technology. Because of its visual nature and pattern-based analytics, Video Smoke Detection can accurately detect starting fires without generating unwanted alarms.

Height

Waste storage bunkers usually have tall ceilings. Therefore, conventional point or beam type detectors would be very inefficient. Video Smoke Detection cameras on the other hand can be installed high up attached to the bunker walls to ensure a good overview of the entire bunker. The distance between the camera and the waste pile is no problem, since the video image can be accurately analyzed from practically any distance.

High-risk

Due to the phenomenon of spontaneous combustion, there is always a high, actual risk of fire. The damage caused by fire can result in various financial losses, including loss of energy resources, loss in productivity, possible collateral damage, as well as the costs for fire extinguishing measures and cleanup - not to mention the risk of injury or even loss of life. In these cases, accurate, fast detection with a visual reference for the operator is of crucial importance.

USE CASE #3:
CRITICAL COMPANY HOTSPOTS

The application of Video Smoke Detection technology is not merely restricted to large companies. Practically any production or engineering company has one or more company hotspots or specific places that are critical to the company's daily operations. Installations like battery charging stations, incinerators or boiler rooms need to be in good shape 24/7. But at the same time, these installations can cause great damage in case of a fire and therefore, they need extra monitoring for fire safety.

WHY VIDEO SMOKE DETECTION IS IDEAL FOR CRITICAL COMPANY HOTSPOTS:

Risk reduction

Company owners want to reduce the risk of a fire as much as possible. Whenever smoke starts to develop, it is essential for them to react fast and reduce the impact of the fire as much as possible. A minimal investment for one or two video detection cameras directed at the hotspot installation can already give company owners full visual control and a way to make fast and well-founded decisions.

Low false alarm rate

Video Smoke Detection will be able to make an accurate distinction between actual smoke fume and other irregularities in the video image, like vapor or even people walking in the camera's field of view. As a result, the number of unwanted alarms will be extremely low.

VIDEO SMOKE DETECTION FOR CRITICAL ENVIRONMENTS

CONCLUSION

Critical environments where the impact and the risk of a fire can be very high, need to take the appropriate fire safety measures. But it's exactly in environments like these that conventional smoke detection technologies, like beam or point-type detectors, will be ineffective.

Managing fire safety and smoke detection more specifically means striking a difficult balance between detecting every irregularity there is in time and avoiding too many costly unwanted alarms. Video smoke detection is probably the only detection technology out there today that strikes that balance extremely well.

DETECTION AT THE SOURCE

Video smoke detection has a number of benefits that conventional technologies lack: detection speed, accuracy, robustness and visual operator feedback. This makes it the ultimate detection technology for critical environments that want to reduce the risk and impact of a fire 24/7.

Because of its visual nature, VSD can spot initiating fires directly at the source, practically from any distance. This is a huge speed advantage compared to smoke detection technologies that need to make physical contact with the smoke. With VSD, there is no need to wait until the smoke has reached the ceiling. This is time gained for anyone who needs to make tough decisions about the required actions that need to be taken to avoid further fire and smoke damage.
A detection system that generates too many unwanted alarms will become useless and ignored in the long run. Video Smoke Detection technology on the other hand can effectively filter out unwanted events that are so typical of critical environments.

ENABLING BETTER DECISIONS

Unwanted alarm or not, probably the biggest advantage of Video Smoke Detection technology is that it gives the operator time for more interpretation. Since it is so fast and since it allows for visual verification, VSD provides the operator with valuable time to make a well-founded decision.

That decision could be calling the emergency services and avoid further damage or human suffering. But bearing in mind the cost of an alarm, it could also be ignoring the alarm and if possible isolating and controlling the fire event in order to prevent the entire operation from closing down and running into costs.

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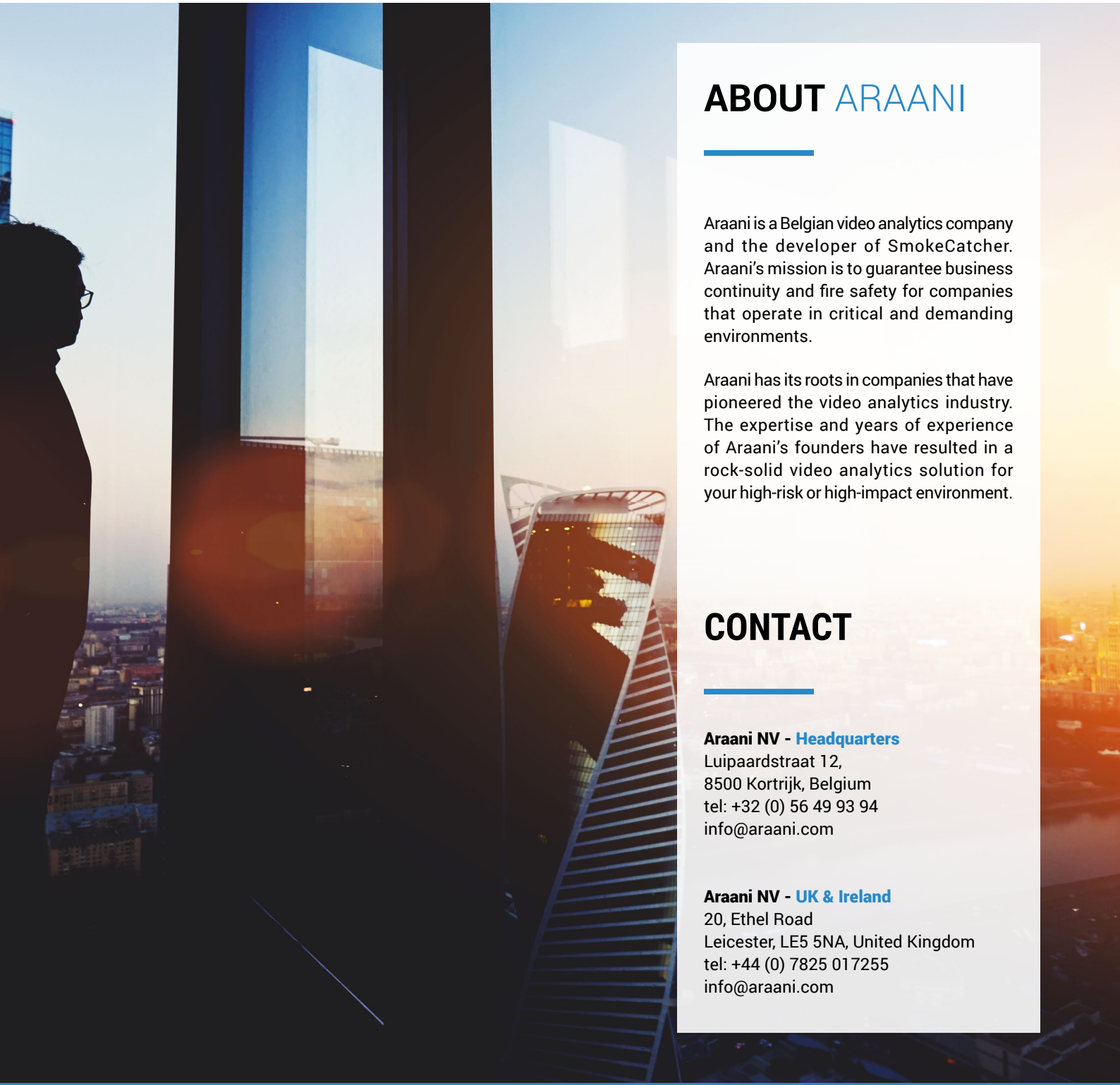

ABOUT ARAANI

Araani is a Belgian video analytics company and the developer of SmokeCatcher. Araani's mission is to guarantee business continuity and fire safety for companies that operate in critical and demanding environments.

Araani has its roots in companies that have pioneered the video analytics industry. The expertise and years of experience of Araani's founders have resulted in a rock-solid video analytics solution for your high-risk or high-impact environment.

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