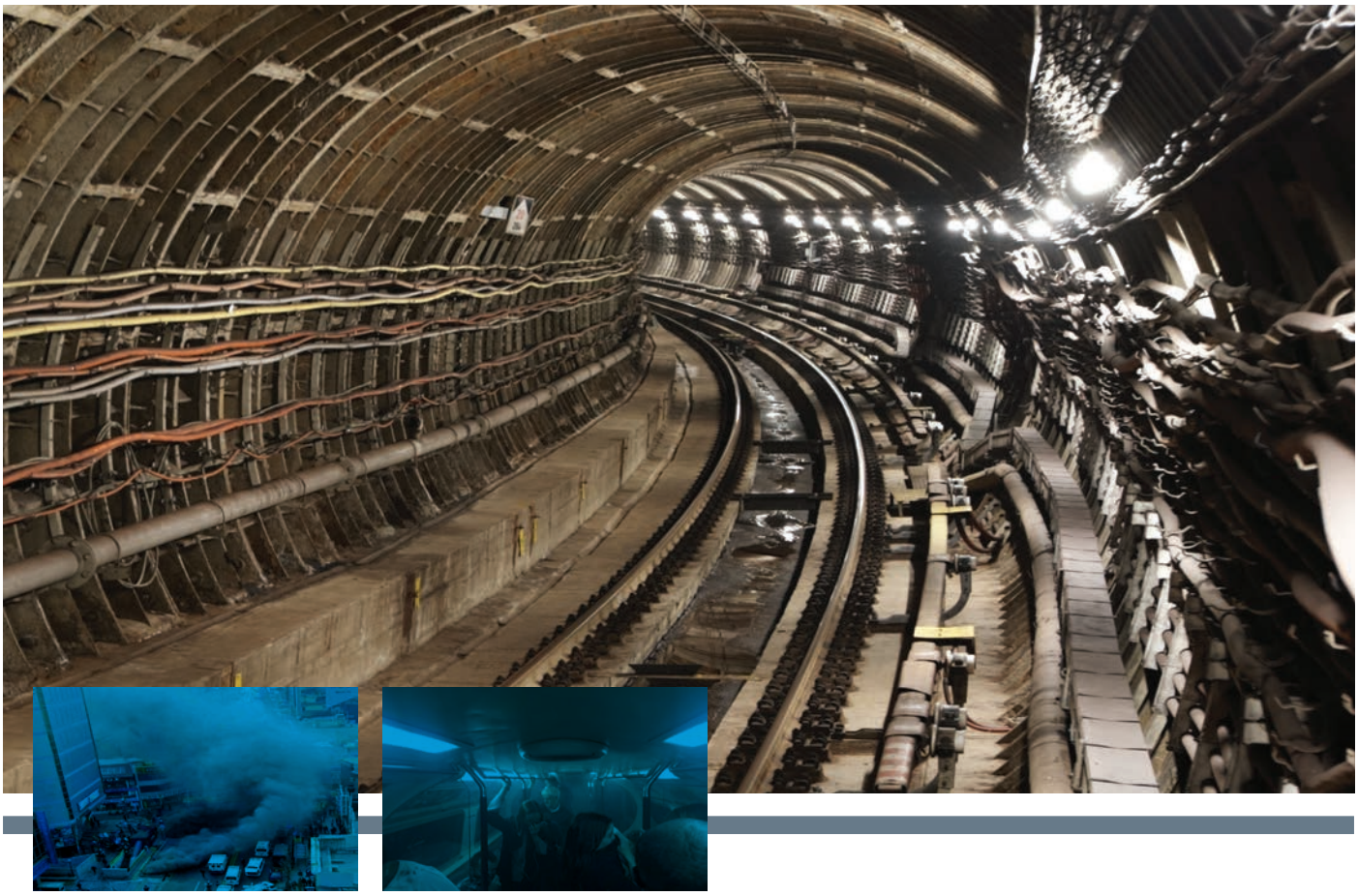
VESDA

RAIL AND METRO TUNNEL APPLICATIONS



VESDA PROVIDES DEPENDABLE SMOKE AND GAS DETECTION IN RAIL AND METRO TUNNELS

- RAIL AND METRO TUNNELS
- PLATFORMS
- AIR HANDLING SYSTEMS
- FILTERING SYSTEMS
- SERVICE TUNNELS

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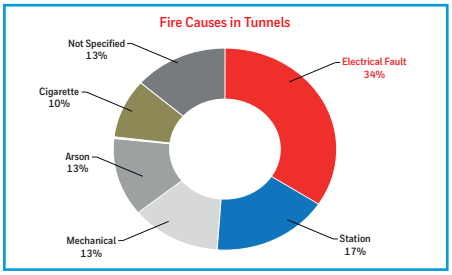
Rail and Metro tunnels are usually built with a smaller and lower overall cross-section than road tunnels, which subsequently concentrates smoke from a train fire faster and closer to escaping passengers. This has led to a very poor survival rate in historic fire situations.

This limited cross-section can also result in a more rapid escalation and spread of fire, through radiative reactions and stronger convective heating, providing less time for people to evacuate safely.

Moreover, Rail and Metro tunnels have limited escape routes with emergency exits being generally spaced at an average distance of 1,000 m (3,280 ft.) or more. Additionally, many old metro tunnels do not have any emergency exits, apart from the stations themselves, forcing passengers to walk along the rail track, which are typically ballasted or even electrified, leading to injury.

According to IFA (International Fire Academy), there is almost one fire in Rail/Metro tunnel every month



Electrical faults represent 34% of the fire causes in Rail and Metro tunnels

Underground metro tunnels are difficult to access for firefighting, so even a small fire in this environment can rapidly lead to disaster. Passengers trapped underground of course panic which adds to the complexity and significance of a fire event.

A FIRE DISASTER CAN ALWAYS OCCUR

There have been dramatic fires in Railway and Metro tunnels in the past such as the Paris Metro train fire of 1903 which killed 84 people. Perhaps the world's deadliest subway disaster remains the "Baku Metro fire" that occurred on 28th October 1995, where 289 people were killed, 270 people being injured. Even with recent advances in fire protection rail and metro tunnels are common place.

RISKS AND CHALLENGES

There are many reasons why a fire starts in a Rail or a Metro tunnel.

The most frequent cause is an electric fault in the train itself. However, fires do occur from the large amounts of equipment and cabling located along the track. Frictional heating caused by mechanical equipment failure are ignition sources that are fuelled by a build-up of oil and other contaminants on the equipment. Accumulation of flammable gases from routine operations, faulty equipment or underground gas leaks also represent a risk.

The turbulent environment and air flow velocities within a tunnel, due to the propagation of pressure waves may prevent the rapid accumulation of heat directly above a fire incident. In addition flame spread may also prevent the rapid build-up of heat directly above a fire. Both of these conditions can delay the detection of a fire. **If the smoke is not detected quickly** early intervention will not occur, smoke will be transported downstream of the fire event, resulting in detection away from the actual fire. This creates a level of ambiguity and confusion compromising a rapid response to the fire location. **In addition the tunnel turbulence and airflow** will interfere with the formation of the initial smoke plume and dilute the concentration of smoke and other products of combustion.

The reality is, traditional smoke detectors installed in tunnels suffer from **reduced sensitivity, extensive nuisance alarms and premature failure** due to pollutants such as dust, and other contaminates found in these environments, including humidity.

CONSEQUENCES OF SMOKE OR FIRE IN A RAIL /METRO TUNNEL

- Put at risk the lives of passengers and staff in the course of evacuation
- Cause severe damage to equipment due to smoke contamination within electrical equipment
- Lead to massive structure destruction making the tunnel inoperable for long periods of time
- Suspend or slow down passenger and commercial services
- Create negative publicity that can lead to reduced usage affecting sales and profits. There is also a potential litigation

WHY USE ASPIRATING SMOKE DETECTION?

The longitudinal airflow can impede and prevent smoke concentration in the tunnel if a fire occurs, diluting the smoke and delaying the detection response time of traditional detectors. Additionally, the harsh environmental conditions due to dust and dirt accumulation and other pollutants will alter the reliability and generate unwanted alarms from traditional spot type smoke detectors.

Rail and Metro Tunnels require the use of appropriate industrial detectors, such as VESDA VLI that have been specifically designed to operate and survive these and other harsh environmental conditions.

In addition to providing superior smoke detection, the VESDA Sensepoint XCL gas detector provides an environmental solution that provides the ability to detect both smoke and gas throughout the tunnel.
Point-type gas detectors traditionally used in tunnels are plagued by the same airflow and turbulence challenges which affect traditional smoke detection and are not monitored for the presence of contamination that could prevent the detection of gas. CO, NOx and other gases may not be uniformly distributed throughout the space making detection with standard detectors problematic.

By leveraging the air sampling pipe network used for smoke detection together with VESDA Sensepoint XCL gas detection, standalone gas detectors are then not required. Maintenance is centralized rather than being distributed throughout the tunnel, reducing cost and increasing safety and a more timely response.

Aspirating Smoke Detectors buy "TIME", time to respond to a fire threat, minimizing loss of life, damage and business disruption. They provide:

- Detection of both **small incipient smouldering fires** and **large flaming fires**
- Detection of both smoke and gas throughout the tunnel
- **Very early warning** that gives time to undertake safe evacuation
- Superior **performance in harsh environments** and a **high resistance to contamination**
- **Flexibility in design** - for on ceiling, underfloor voids, cable ducts and across return air intakes, as well as in targeted situations such as sampling in electrical equipment cabinets
- **Multiple configurable sensitivity threshold settings**, providing for example, initial very early warning for investigation. Subsequent additional warnings to advise of fire escalation which can initiate a fire response plan, evacuation or suppression

APPLICATIONS THAT OFFER A PARTICULAR STRONG SOLUTION-FIT

Rail and Metro tunnel applications are wide and varied and present various challenges to effective and reliable smoke detection and on-going maintenance.

Applications	Causes	Consequences	Detection Challenges
Rail & Metro tunnels	High voltage arcs, remote electrical circuit malfunctions, equipment cabling faults, lighting short-circuits	Critical impact on operational function, loss of high value assets, and extensive downtimes	Incipient slow-growth fires, low smoke levels, dilution due to air velocity, accumulation of dusts and pollutants
Platforms	Electrical malfunction, fire loads due to material storages, smoking in banned areas, terrorism	Injury and loss of life from smoke exposure and panic	Large volume areas and air movement causing dilution of smoke
Air handling and Filtering systems	Filter fires, general area fires	Injury and loss of life from smoke exposure and panic	High airflow causing dilution of smoke and high maintenance

ASPIRATING SMOKE DETECTORS SUITABLE FOR RAIL/METRO TUNNELS APPLICATIONS

Xtralis protects Rail and Metro tunnels around the world providing actively monitored air sampling systems. High detector performance, reliability and consistent sensitivity over time provides a proven alternative to other ineffective detection alternatives.

Equally, the high IP rating of both VESDA VLI and VESDA Sensepoint XCL detectors makes their use suitable for harsh conditions where dust and moisture are prevalent.

VESDA VLI	VESDA Sensepoint XCL
	
• Maximum area coverage of 2,000 m^2 (21,520 sq. ft.) • Up to 4 inlet pipes • Total pipe length 360 m (1,181 ft.) • Maximum single pipe length 120 m (394 ft.) • Absolute smoke detection • Clean air barrier for optics protection • Patented fail safe intelligent filter • Air flow continuous monitoring • Patented In-field Clean Air Zero • Auto learn smoke levels and thresholds • IP66 ABS enclosure • Conformal coating for improved corrosion resistance • NEC 500 Class I Division II - Class A, B, and C fires • SIL 2 rated according to IEC 61508	• Multi-point gas sampling for better area coverage • Use of the existing VESDA ASD pipework • Catalytic beads (flammable gas or vapour). Electrochemical cells (toxic gas and oxygen) • Non Dispersive Infrared (Carbon dioxide) • Direct interface to FACP, HVAC and BMS using relays, 4-20 mA or Modbus outputs • PC (Polycarbonate) / IP65 enclosure

ABOUT XTRALIS

Xtralis is a leading global provider of powerful solutions for very early & reliable detection of smoke, fire, and gas threats. Our technologies prevent disasters by giving users time to respond before life, critical infrastructure or business continuity is compromised.

We protect highly valuable and irreplaceable assets and infrastructure belonging to the world's top governments and businesses.

To learn more, please visit us at www.xtralis.com

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