Safeguarding Rail/Metro Passengers and Infrastructure from Life Safety and Security Threats
OVERVIEW

Fires within rail/metro facilities can occur for a number of reasons, originating from high-density equipment rooms, electrical faults, hydrogen gas in battery rooms, gas leaks, arson and cigarette smoking. Conventional threat detection comes with its own challenges, including air movement from drafts, air conditioning and train motion interfering with normal smoke dispersion and smoke from small fires that lack sufficient thermal energy to reach conventional detectors located on the high ceilings of atriums and concourses.

Trying to evacuate is difficult and dangerous. The feeling of panic spreads quickly and hampers any chance of a safe and orderly evacuation. Exit from a railway station is often along the same path as smoke will travel and escalators and stairways act like chimneys for smoke.

With early warning life safety and security solutions from Xtralis, risk can be minimized, disasters avoided and service continuity maintained.

WHAT ARE THE RISKS IN RAIL FACILITIES

Fires in rail facilities result from:

• High current electrical faults
• Friction caused by mechanical faults, fueled by a build-up of oil, dirt and lint
• Arson, which commonly occurs in unsupervised areas, and may be started using discarded litter
• Unauthorized cigarette smoking

WHAT MAKES A FIRE GROW & SPREAD WITHIN RAIL FACILITIES

In rail facilities, the growth and spread of fire is fueled by:

• Dirt and lint, which builds up on the moving parts of mechanical equipment and acts like a wick
• High airflow, resulting from Heating Ventilation and Air Conditioning (HVAC) systems and the motion of trains
• Litter, in the form of newspapers and other rubbish

DETECTION CHALLENGES

• Air movement from drafts, air-conditioning and train motion interferes with the normal dispersion of smoke; often drawing it away from conventional detectors
• Smoke from small or smouldering fires lacks sufficient thermal energy to rise to conventional detectors located on the high ceilings of atriums and concourses
• Within escalators and other concealed mechanical equipment, fires tend to smoulder for a long time. This delays detection by conventional detectors
XTRALIS EARLY THREAT DETECTION SOLUTIONS

With very early warning life safety and security solutions from Xtralis, risks can be minimized and disasters avoided as well as saving lives, preserving business continuity and safeguarding assets.

For more than 30 years, Xtralis has been a pioneer in life safety and security. Our risk-informed, performance-based solutions provide unsurpassed reliability and accuracy for early threat detection, and as such, they are recognised as the “industry standard” by regulators, insurers and end users. They seamlessly integrate with other components from rail turnkey providers and contractors to significantly enhance the protection of rail/metro passengers and infrastructure.

The award-winning Xtralis Fire and Safety portfolio includes:

- VESDA high-sensitivity aspirating smoke detection
- VESDA ECO aspirating smoke detection plus gas detection and environmental monitoring
- ICAM flexible aspirating smoke detection
- ICAM ECO aspirating smoke detection plus gas detection and environmental monitoring
- ADPRO perimeter, multi-site and enterprise security
- ASIM traffic detection

THE VESDA ASPIRATING SMOKE DETECTION (ASD) SOLUTION

Since pioneering the ASD technology nearly 30 years ago, VESDA has been recognized by fire professionals as the best in the world for protecting personnel, irreplaceable assets and mission critical infrastructure in the world’s most iconic locations.

VESDA very early warning smoke detection solutions provide the earliest possible warning of an impending fire hazard. VESDA buys time to allow a controlled investigation of an alarm and initiate an appropriate response (Figure 2). And because VESDA has the industry’s widest sensitivity range and multi-level alarms, even minute levels of smoke can be detected before a fire has time to escalate enabling:

- Preventative action to stop the spread of fire and toxic smoke
- Safe and orderly evacuation
- Prevention of damage to expensive and vital equipment
- Ability to reduce service interruption / maintain business continuity

Figure 2: Fire Growth Curve: This diagram shows the progression of a fire over time. The incipient stage of a fire provides the widest window of opportunity to detect and control the spread.
Despite the harsh environmental conditions, the VESDA detectors provide reliable and enhanced smoke detection by continuously sampling air from the protected area via multiple sampling holes in a pipe network. The air sample is then transported to an externally located smoke detector for accurate analysis (Figure 3).

The detectors can be connected to a standard fire alarm panel, a management system or a software-based monitoring system.

VESDA ECO: SMOKE PLUS GAS DETECTION AND ENVIRONMENTAL MONITORING

VESDA very early warning smoke detection can be extended easily to provide reliable and cost-effective gas detection and environmental monitoring. With VESDA ECO, new or existing VESDA pipe networks can be used to actively sample air for the presence of smoke as well as hazardous/combustible gases without major construction or retrofitting.

As with fire detection, proactive gas detection enables countermeasures to be taken to protect rail/metro personnel and property from unseen gas hazards in a wide array of applications including:

- Battery and UPS rooms to detect hydrogen to prevent explosions
- Underground utility tunnels to detect leakage from utility gas lines (methane), natural seepage (methane or hydrogen sulfide), and oxygen deficiency to ensure personnel safety
- Underground car parks to detect carbon monoxide and nitrogen dioxide from car exhaust to ensure healthy air quality

WHY VESDA

- When business continuity is critical
- In high airflow environments where smoke is diluted
- When smoke is difficult to detect in high ceiling applications
- In hazardous technical rooms, service ducts and equipment tunnels where access is difficult
- When the earliest possible warning is needed to facilitate appropriate emergency response and orderly evacuation
- When environmental conditions are difficult due to air pollution
- When suppression systems are required

In 2003, over 100 people were killed by a fire that started in an underground station in South Korea

Figure 3: Aggregate Air Sampling

Figure 4: Fire modeling software is used to show the development of a smoke plume.
The most important objective for rail/metro operators is providing safe passage for millions of people and tons of high-value cargo. Operators also are concerned with efficiency and service continuity – getting people and goods where they need to go without service disruptions. With solutions at more than 40,000 customer sites and 400 central monitoring stations worldwide, ADPRO is the most reliable choice for protecting rail/metro facilities from any security threat.

- Full range of intrusion detection, video transmission/recording solutions for early threat detection and a complete security picture
- Award-winning video motion detection designed for automated outdoor surveillance that dramatically reduces the costs of security guards
- Protection of critical infrastructure and high-value assets by enabling trained operators to manage security breaches
- Cost-effective access control to multiple remote locations, allowing operators to visually identify and enable entry to staff and contractors
- Occupational health and safety compliance by actively monitoring lone workers and providing assistance when required
Atriums and concourses
Smoke dilutes and stratifies below high ceilings, never reaching the conventional detectors above. VESDA sampling pipes can be installed where smoke is likely to spread, ensuring early detection.

Elevators
Debris build-up and rubbish in elevator shafts is a fire risk. A VESDA sampling pipe can be installed in the shaft and within the motor room. In addition, elevators can be used as part of the evacuation procedure where VESDA plus VESDA ECO are deployed to monitor for tenable conditions, including CO detection.

Escalators
Burning lint and paper and oil build-up on the moving parts of escalators generates lots of smoke. A VESDA sampling pipe can be installed underneath the escalator, near the moving parts.

Data centres
Positioning a VESDA sampling pipe across the return air vent of an air-conditioning unit detects smoke as it is carried by the airflow. Sampling on the ceiling can be used for actuation of suppression systems.

Service ducts and tunnels
Dusty service ducts and tunnels can be protected with VESDA detectors without false alarms or excessive maintenance costs. VESDA ECO provides active detection of methane and monitors for oxygen deficiency to protect personnel.

In 1987, 31 people died in the tragic escalator fire at Kings Cross Station, London when the presence of smoke caused panic.
Substations
High-voltage cables, switch gear and batteries with uninterrupted power supplies are a fire risk. A VESDA solution provides targeted equipment protection, allowing early warning of a fire and time to act appropriately.

Trains
High-voltage electrical systems and the fuel loads brought aboard (e.g., newspapers) increase the risk of fire. High airflow within and around the train makes the detection of smoke difficult. VESDA can detect invisible, incipient smoke. Onboard, stand-alone Xtralis Central Control and Display (CCD) provides a simple yet cost-effective solution for monitoring VESDA ASDs throughout the train. This simple yet reliable connectivity ensures onboard safety system monitoring and management.

Battery-charging rooms
VESDA ECO can be used to reliably monitor hydrogen gas in a battery-charging or UPS room. VESDA ECO also can be used in battery rooms to reduce energy costs by using demand-controlled ventilation, ventilating only when required and not continuously.

Emergency control rooms
By installing VESDA sampling pipes inside equipment cabinets and in the sub-floor space, any smoke is quickly drawn to a VESDA detector. In the control room, operators use ADPRO remote monitoring and management software for:
- Remote alarm verification
- Passenger emergency intercoms with two-way audio
- Post-incident video analysis

Air-handling and exhaust systems
Air-handling systems can purge smoke and buy time for evacuation. A VESDA sampling pipe can be positioned across the exhaust fan vent. VESDA ECO gas detectors also can be used to manage air quality and reduce energy consumption by up to 50 percent through demand-controlled ventilation to operate fans only when gases are present and not continuously.

Service cupboards
High-current electrical equipment and densely-packed cables are a fire hazard. VESDA sampling pipes can be installed in cable trays and within equipment cabinets.
ABOUT XTRALIS

Xtralis® is the leading global provider of converged solutions for the early detection and remote visual verification of fire, gas and perimeter threats.

Our technologies prevent disasters by giving users time to respond before life, critical infrastructure or business continuity is compromised. We protect high-value and irreplaceable assets belonging to the world’s top governments and businesses. Our brands include the VESDA-E – the next generation of aspirating smoke detection technology; VESDA® – the world’s leading very early warning aspirating smoke detection (ASD) systems; ICAM™ for flexible ASD; ECO™ – Gas detection & environmental monitoring modules for VESDA & ICAM systems; and OSID™ – easy to use smoke detection for open areas.

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