VESDA Provides Very Early & Reliable Detection on Trains

- Passenger Compartment
- Coaches
- Passenger Open Coaches
- Railroad Locomotive
- Sleeping Car
- Dining Car
The consequence of fire on public transport is high having the potential for loss of life, large financial loss, litigation and of course public outrage fueled by widespread media coverage. Protecting human life is the key reason for selecting the best form of smoke detection on a train. However, the challenges within these environments require designers and operators to select a system that not only detects a fire incident at the very early stages, but is practical and economical to maintain over a 30+ year life span of the train.

As a result, fire protection systems for trains have become state of the art installations with stricter national and international specifications enhancing the safety of people, increasing tunnel safety and protecting the trains themselves.

Electrical and mechanical failures on trains/metros lead to more than 50% of the fires according to RSO (UK Railway Safety Organization).

More than 40% of the trains/metros fires start from seat linings according to PTC (Australian Public Transport Corporation).

A DISASTROUS FIRE IS ALWAYS A THREAT

There have been dramatic fires on Railways and Metros in the past, such as the Paris Metro fire in 1903 which killed 84 people, and the "Baku Metro fire" that occurred in October 1995, where 289 people were killed and 270 people injured.

More recently, the Kaprun funicular disaster happened in Austria on 11th November 2000. The electric fan heater in an unattended cabin at the rear end of the train caught fire. The fire melted through plastic pipes that carry flammable hydraulic fluid for the braking system. This, resulted in the loss of fluid pressure which caused the train to halt unexpectedly 600 meters into the tunnel - 155 passengers lost their lives.

CONSEQUENCES OF SMOKE OR FIRE ON A ROLLING STOCK

Maintaining high service levels and protecting passengers, staff and property in a cost-effective manner is a unique challenge.

Fires can compromise life safety, operational continuity and assets with severe and sometimes tragic consequences. It may:

- Endanger the lives of passengers and staff in the course of evacuation through mass panic
- Cause severe damage to equipment including smoke contamination of electrical equipment
- Suspend or delay passenger or commercial services
- Lead to service penalties for breaking contracted service agreements
- Create negative publicity that may affect sales and profits and lead to potential litigation
- Lead to long and costly prosecutions when it comes to passenger and staff injuries or fatalities

Very early smoke detection is a key safety component but, the type of smoke detector chosen will determine whether a fire threat can be identified in the incipient stage (earliest stage of a fire) or when flames are visible. Traditional point-type detectors (heat or smoke) are unsuitable for train environments, since significant levels of dust and lint frequently cause these detectors to false alarm, they are easily tampered with and require frequent servicing.

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Fire Causes

- Electrical fault: 34%
- Station: 10%
- Mechanical: 13%
- Arson: 13%
- Cigarette: 17%
- No Specified: 13%

Fire Origins

- Seatings: 41%
- Overheating (Traction, brakes, batteries) 14%
- External to the Coach: 14%
- Light Fittings: 11%
- Floors: 12%
- Walls: 2%
RISKS AND CHALLENGES

A typical passenger train can hold up to 2,000 passengers, many more in and around the station areas and platforms. In view of the numbers a potential fire poses a highly hazardous condition to passengers, employees and emergency rescue personnel.

Traditional point type detectors often become contaminated resulting in unwanted alarms and/or reduced sensitivity. The ability to detect incipient fires in enclosed, concealed and dusty spaces with ASD greatly reduces the risk associated with developing fires. The ability to combine multiple detection technologies such as gas and smoke in these high risk areas increases the reliability of the system and provides a high level of fire prevention. Air-conditioning and train motion can cause dilution of smoke within the area to the extent that only ASD is capable of detecting the smoke.

Friction caused by mechanical faults, can be ignition sources and are often fuelled by a build-up of oil, dirt and lint. Unauthorized smoking in unsupervised areas and unmanned operations such as driverless trains are also known risks.

WHY USE A VESDA ASPIRATING SMOKE DETECTION SYSTEM?

Since pioneering aspirating smoke detection (ASD) technology over 30 years ago, VESDA has been recognized as the best in the world by providing the earliest possible warning of a potential fire hazard. It provides flexibility regarding where you can sample for smoke, multiple configurable alarm thresholds enable staged responses as the fire escalates.

In practical terms these features allow you to define and manage the smoke event that meets your operational requirements.

Aspirating smoke detection system features provide the designer flexibility to meet their system’s design requirements of prescriptive codes as well as facilitating the use of today’s performance-based fire engineering methodologies. VESDA detectors buy ‘TIME’, time to respond to a fire threat, minimizing damage and business downtime. They provide:

- Detection of both small incipient smouldering fires and large flaming fires
- Superior performance in harsh environments and a high resistance to contamination through the use of our clean air barrier technology that protects the detection chamber
- Flexibility to design on ceiling, underfloor voids, cable ducts and across return air intakes, as well as in targeted equipment sampling such as electrical cabinets
- Sampling air within the HVAC System being the fastest method to detect smoke within the railcar
- Multiple configurable settings to provide, for example, very early warning for investigation, and subsequent warnings to initiate a fire response plan, evacuation and suppression
- Simply access to the detector and sampling pipework ensuring a quick and effective maintenance
- Integration with the Train Management Systems (TMS) enabling faster and more accurate responses to fire threats

EXISTING TECHNOLOGIES: STRENGTHS & WEAKNESSES

Historically, it has always been considered impractical to provide a reliable smoke detection system for rolling stock. In addition the high airflow in an open train compartment dilutes smoke considerably, making it difficult to detect with traditional point-type detectors.

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<tr>
<th>Technology</th>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Point-type Smoke detectors</td>
<td>Inexpensive</td>
<td>Sensitivity drift over the time. Service time increases due to dirty and dusty environments.</td>
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<tr>
<td>Point-type Heat detectors</td>
<td>Inexpensive</td>
<td>Under minimum airflow conditions, the detector has troubles to detect small and incipient fires. Service time increases due to dirty and dusty environments.</td>
</tr>
<tr>
<td>Linear Heat detectors</td>
<td>Good response to the fire scenarios that cause temperature rise.</td>
<td>Field of application limited to railcar’s underneath as well as locomotives.</td>
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APPLICATIONS THAT OFFER PARTICULAR STRONG SOLUTION–FIT

Rolling Stock applications are wide and varied and present various challenges to effective and reliable smoke detection and on-going maintenance.

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<th>Applications</th>
<th>Causes</th>
<th>Consequences</th>
<th>Detection Challenges</th>
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<tbody>
<tr>
<td>Passenger compartments</td>
<td>Electrical short circuits, lightning cabling failures, fire loads (luggage, clothing items), discarded rubbish such as newspapers and food wrappers</td>
<td>Injury and loss of life from smoke exposure and panic</td>
<td>Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems</td>
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<tr>
<td>Toilet</td>
<td>Unauthorized smoking, threats of vandalism and terrorism</td>
<td>Fire spreads to passenger areas, injury and loss of life from smoke exposure and panic</td>
<td>Unsupervised areas nearby passenger areas, and luggage racks</td>
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<td>Saloons, bars, dining rooms</td>
<td>Electrical wiring, discarded rubbish such as newspapers and food wrappers and potentially high and fast growth-rate fire loads</td>
<td>Injury and loss of life from panic, loss of high value assets, long time to replacement</td>
<td>Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems, open fires</td>
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<td>Sleeping cars</td>
<td>Numerous, smoking, electrical faults, arson, etc</td>
<td>Injury and loss of life from smoke exposure and panic</td>
<td>Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems</td>
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<td>Driver cabs</td>
<td>Large amount of equipment and cabling installed in very compact spaces and concealed areas</td>
<td>Injury, loss of propulsion, impact on operational function, missed schedules</td>
<td>Highly condensing environment, harsh temperature for electronics</td>
</tr>
<tr>
<td>Traction compartments</td>
<td>High-current electrical equipment and faults, arsons, frictions due to mechanical failures</td>
<td>Injury, loss of propulsion, impact on operational function, missed schedules</td>
<td>High level background fumes and vapours, humidity and high airflows, reliability, high maintenance</td>
</tr>
<tr>
<td>Air handling &amp; Filtering systems</td>
<td>Filter fires, general area fires</td>
<td>Injury and loss of life from smoke exposure and panic</td>
<td>High airflow causing dilution and high maintenance</td>
</tr>
</tbody>
</table>

VESDA DETECTORS APPROVED FOR ROLLING STOCK APPLICATIONS

VESDA VLF

- Maximum area coverage of 250 m² (2,690 sq. ft.) for VLF-250
- Maximum pipe length 1 x 25 m (80 ft.) or 2 x 15 m (50 ft.)
- Maximum area coverage of 500 m² (5,380 sq. ft.) for VLF-500
- Maximum pipe length 1 x 50 m (150 ft.) or 2 x 30 m (80 ft.)
- Absolute smoke detection
- Clan air barrier for optics protection
- Airflow monitoring
- Auto learn smoke levels & thresholds
- IP30 ABS enclosure (IP66 optional enclosure available)
- EN 54-20 Class A, B and C
- EN 50155 (T3 Class of Temperature)
- NF F16-101
- SIL 2 rated according to IEC 61508
- NEC 500 Class I Division II
- Class A, B, & C fires

VESDA protects Rolling Stock around the world by offering an actively monitored sampling system, offering superior detection performance and reliability, sensitivity consistency over time and efficient response compared to other ineffective detection solutions. Our VESDA VLF detector is approved to EN 50155 (Railway applications – Electronic Equipment used on Rolling Stock) which defines the Environmental and EMC requirements. Depending the country, the fire behaviour of components is covered by DIN 5510-2 for Germany, NF F16-101 for France, and BS 6853 for United Kingdom. All of these are well and widely accepted in the rest of the world. Last but not least, VESDA VLF detector is SIL 2 rated according to IEC 61508 providing a high level of reliability.

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

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