New Technologies for Fire Detection on Ro-ro Ships

DSM 2023
Safety Meet

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LASH FIRE

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Main challenges for traditional fire detectors on ro-ro ships

- ***False alarms***
  - *Heavy rain and sea spray*
  - *Reefer units with an idle engine*
  - *Cargo operations*
  - *Hot work*
- ***Not always responsive or fast***
- ***Lots of maintenance work***
- ***Not visual***

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LASH FIRE evaluations of alternative fire detection technologies

- ***Fire tests and operational trials on Hollandia Seaways***
  - *Linear heat detection*
  - *Video fire detection*
  - *Thermal imaging*
  - *Flame wavelength detection*

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Weather deck evaluations since Feb 2022

- *Multiband IR flame detectors → IR array and IR3 systems*
- *Thermal imaging cameras*
- *Video flame detector*
- *Hybrid (video + heat) detector*

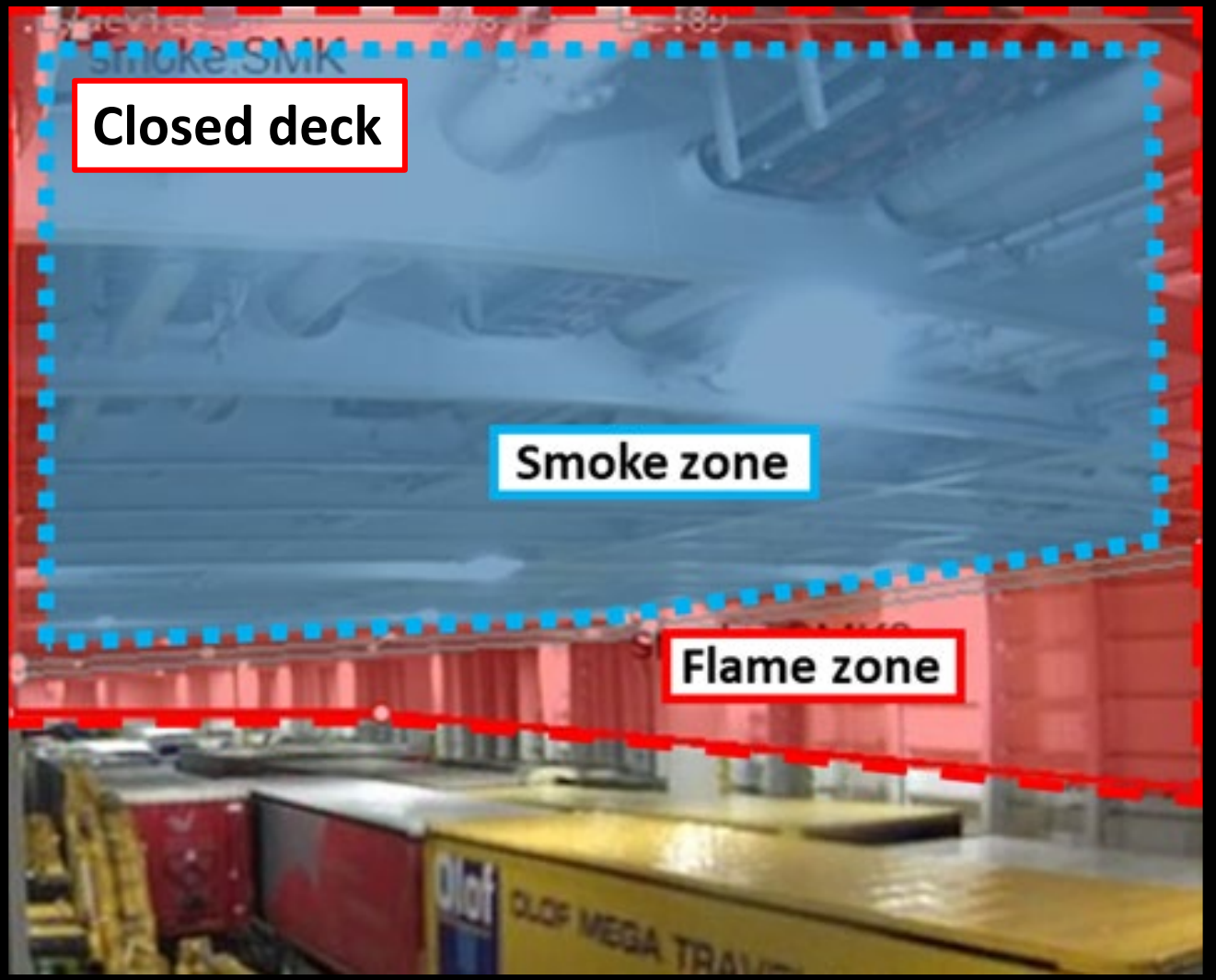
Open deck evaluations since Feb 2022

- *Multiband IR flame (IR3)*

- *Fibre-optic linear heat detection system*

Closed deck evaluations since Feb 2022

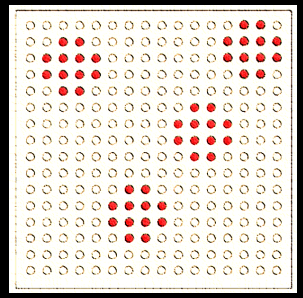
- *Video fire detection*



Multiband flame detectors based on infrared radiant energy

IR3 detectors have 3 sensors that can monitor 3 infrared radiation ranges and their ratios for the detection of flames

IR array detectors have an array of infrared sensors and can locate the flame within their view in terms of X&Y coordinates for one or multiple flames.



Fibre-optic linear heat detection

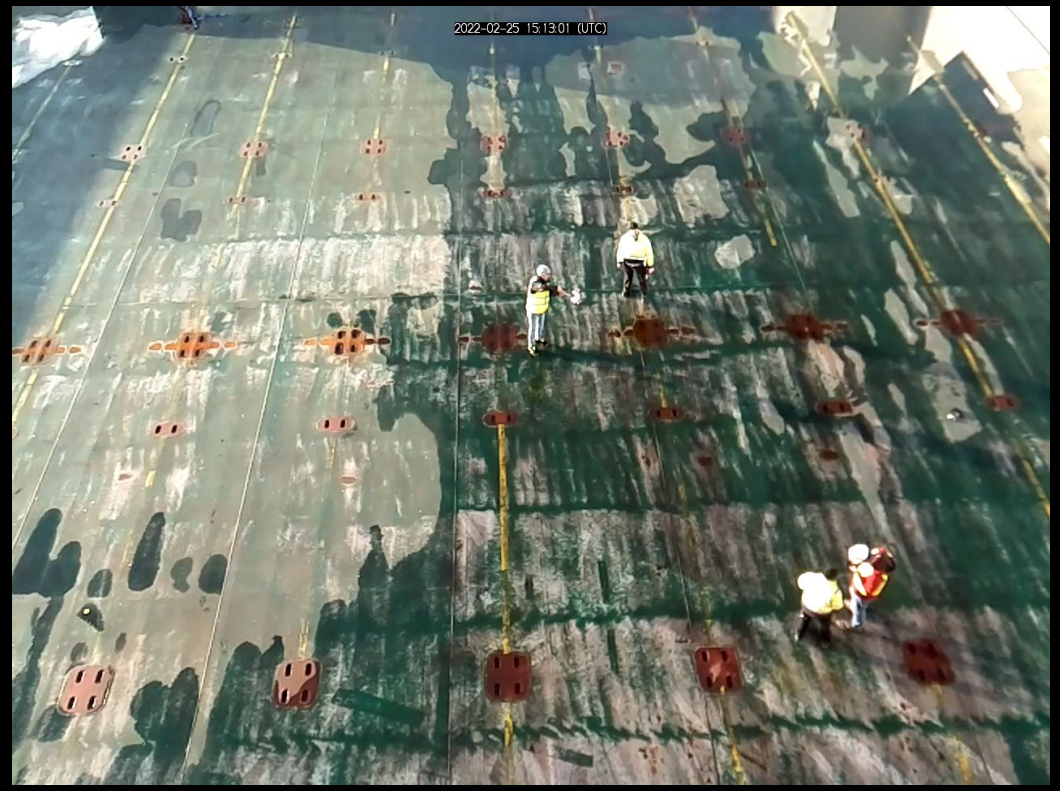
A single fibre-optic cable can be used to monitor temperatures along the deckhead up to a distance of 16 km.

Thermal imaging cameras

Thermal imaging cameras measure the infrared radiation emitted from objects and can be used to estimate the temperature of objects.

Flame detection tests on board

A test in March 2022 where a flame detector detects a small flame while it is difficult to see with the naked eye.



March 2022

A test in March 2023 where a flame detector detects a gas fire equivalent to a 1 ft square heptane pool fire.

March 2023

Experiments with autonomous fire monitors guided by 2 IR array detectors

Real-scale experiments at RISE Fire Research in Norway

Experiments with concealed fires at RISE Fire Research in Norway

A fire inside a container is detected using a thermal imaging detection system before any open flame or smoke is visible to the naked eye.

Highlights of infrared flame detectors

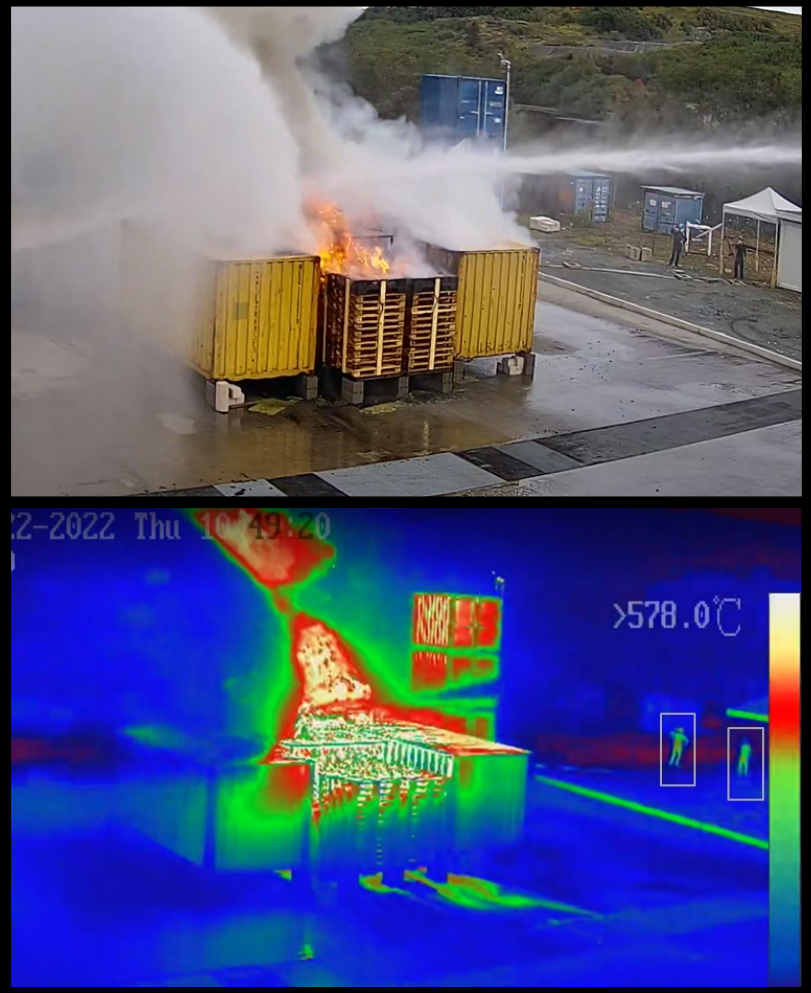
Positives

- Detection of infrared wavelength radiation from flames over a large area
- Fire location data for automatic fire suppression systems in certain configurations
- Can detect even small flames that may be missed during manual observations
- Can be combined with a video camera to provide live images
- The most suitable option for weather decks with minimal false alarms

Negatives

- Only open flames and their reflections are detected (no detection of smoke, heated surfaces, or concealed fires)

Highlights of thermal imaging detection systems



Positives

- Detection of hot surfaces using an infrared camera over a large area
- Live heat images for surveillance
- Fire location data for automatic fire suppression
- Can be combined with ordinary cameras and video detection

Negatives

- Prone to false alarms because they can detect heat sources unrelated to fire (e.g., exhaust pipes of vehicles, reflection of light over shiny surfaces, etc.)
- More expensive than other systems

Highlights of video fire detection systems

Positives

- Highly suitable for closed environments with fixed light levels
- Very economic
- Easy to understand the footage

Negatives

- Flames or their reflections must be visible and have contrast from the background
- More frequent false alarms in open environments with changing light conditions
- No relevant European standards for testing, only American (FM3232)

Highlights of hybrid (heat + video) detection systems

Positives

- More immune to false alarms than either technology alone
- Cheaper than thermal imaging cameras

Negatives

- Flame or its reflection must be visible and have contrast from the background
- More frequent false alarms in open environments with changing light conditions
- No relevant European standards for testing, only American (FM3232)

Highlights of Linear Heat Detection

Positives

- Less affected by wind compared to point detectors
- Temperature information along a cable at every 1 m
- Can use the rate of temperature rise for alarm triggering
- Provides fire location data and a heat map of the covered area
- Heavy-duty cable which is reliable in harsh environments

Negatives

- Relies on the transport of hot gases towards the sensor cable
- Slower detection in some cases compared to optical detectors

The main takeaways

- *Linear systems can significantly improve detection in open decks where wind may compromise point detectors.*
- *Multiband infrared flame detectors are the best candidates for weather deck fire detection.*
- *Video fire detection is more useful for closed decks.*
- *IR array flame detectors can localise the fire and provide X&Y coordinates to autonomous fire suppression systems.*
- *Thermal cameras are excellent for surveillance of hot spots and developing fires, but they are prone to raising false alarms if connected to the fire alarm system.*

Thank you for your attention.

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