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IRSC 2025

Advancing Railway Safety through Innovations and Collaborations

Hong Kong, China 25th - 30th November 2025

Enhancing Rail Safety Across Hong Kong's Railway Network by Innovations

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Railways, Tram and Peak Tram Networks in Hong Kong

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Innovative Applications in Peak Tramway and Light Rail

- Hauling Rope AI Condition Monitoring System for Peak Tramway in Hong Kong
- Integrated Speed & Position Supervision System (iSPS)

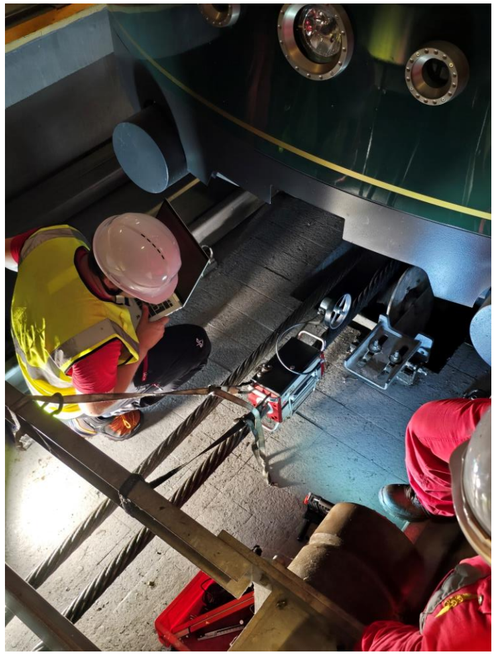
Peak Trams in Hong Kong

Light Rail in Hong Kong

Hauling Rope AI Condition Monitoring System for Peak Tramway in Hong Kong

Challenges

- Traditional inspection by visual
- Low efficiency in defect detection
- Human involvement / labour intensive
- Condition scanning led to service interruption
- Higher maintenance cost



Labour Intensive Checking

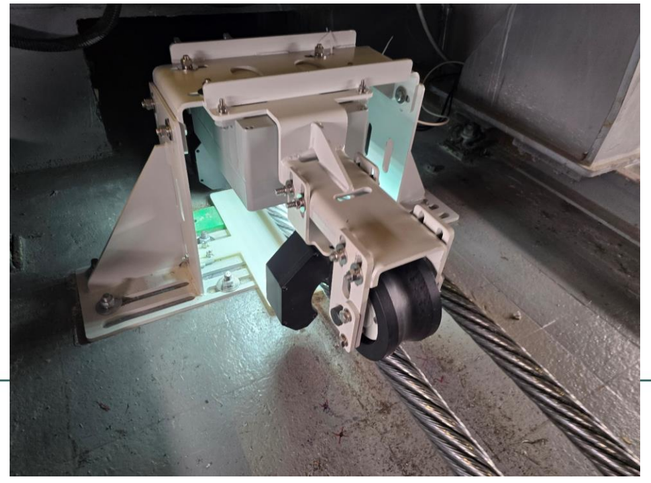
Rope Condition

Peak Trams in Hong Kong

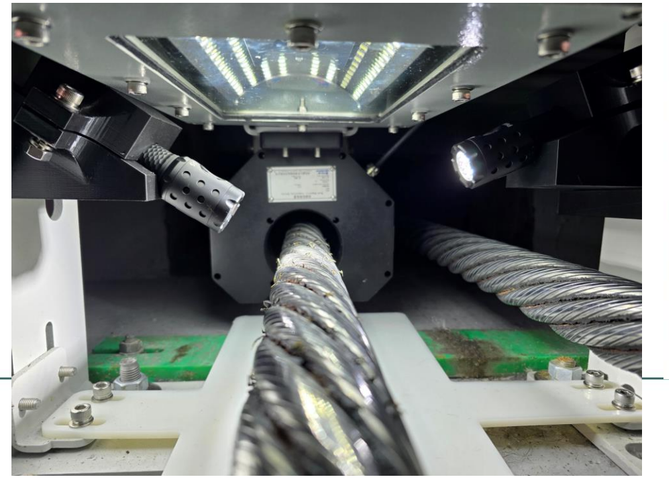
Hauling Rope AI Condition Monitoring System for Peak Tramway in Hong Kong

Solutions

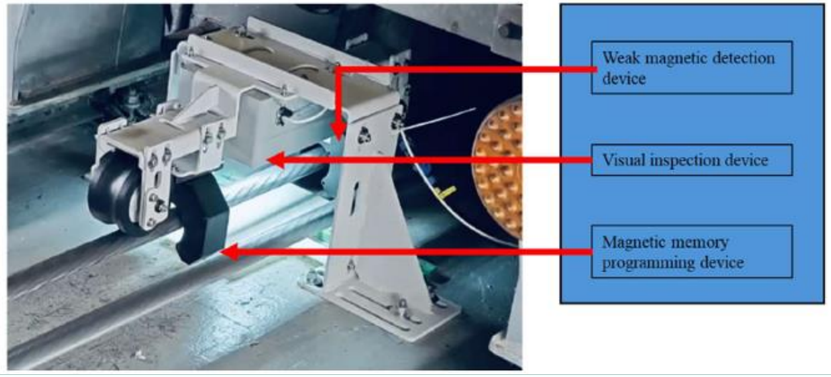
- ***Magnetic Rope Testing (MRT):*** Using magnetic sensors by analysing distortions in the magnetic fields around the rope in case of a wire break exists. Used for trend prediction and inner rope defects detection.
- ***Computer Visual Identification:*** Using high resolution cameras to inspect the rope's surface for visible anomalies like wear, cracks and corrosion. Replacing bear eyes inspection for fast scanning of outer rope surface.



Monitoring System



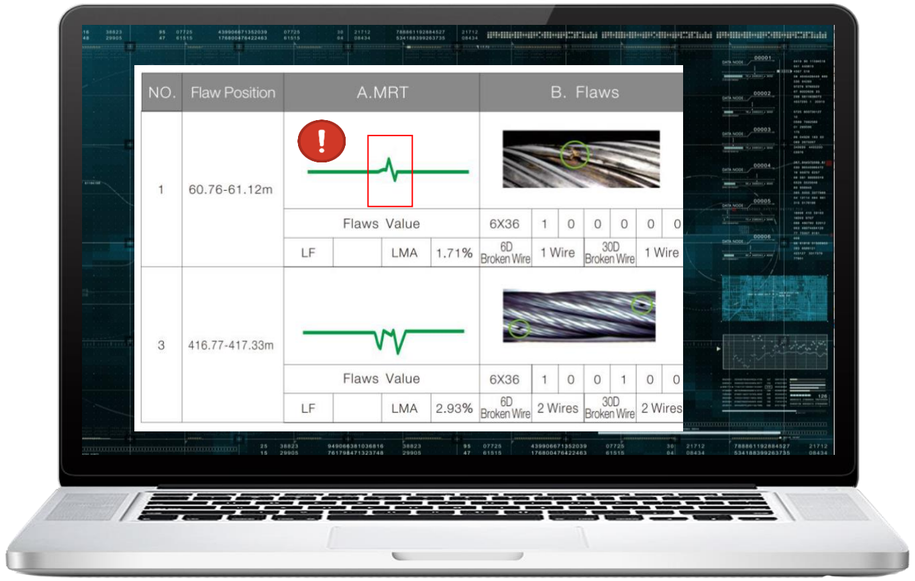
Monitoring System (Inside)



Magnetic Device / Visual Inspection Device

Hauling Rope AI Condition Monitoring System for Peak Tramway in Hong Kong

- Equipped with on-board microcomputer, all data fed into computer platform for predictive analytics
- Provide actionable insights through a dashboard



Computer Dashboards

Hauling Rope AI Condition Monitoring System for Peak Tramway in Hong Kong

Benefits

- Early detection of defect and hence enhance the safety level
- Cost savings: reduce unplanned downtime/ extend rope lifespan
- Automation leads higher operational efficiency

Award

- 50th International Exhibition of Inventions of Geneva in 2025

Show Case

DIPLÔME

inventions Geneva

SALON INTERNATIONAL DES INVENTIONS GENÈVE

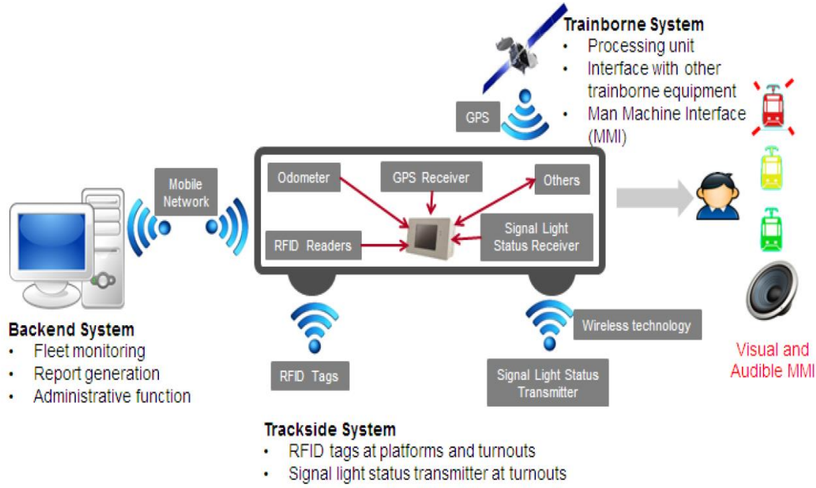
Award

Award Photo

Integrated Speed & Position Supervision System (iSPS) for MTR Light Rail

- Award-winning “Integrated Speed and Position Supervision System” (iSPS) developed by MTR engineers for Light Rail safety in Hong Kong.
- Uses a combination of Global Positioning System (GPS) and Radio Frequency Identification (RFID) technology for accurate, real-time speed and position monitoring of Light Rail Vehicles (LRVs)
- iSPS operates with in-train GPS receivers and RFID readers detecting RFID tags along the track.
- System launched on trial and progressively rolled out network-wide since Q2 2019.

Locations of Antennae



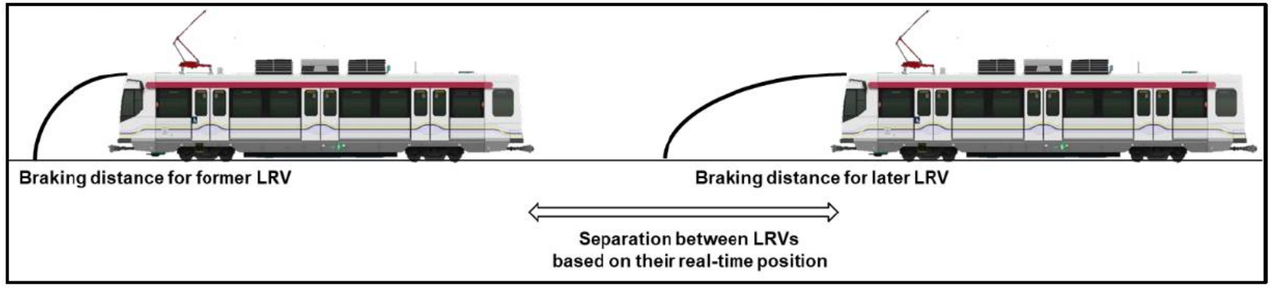
System Schematic

iSPS: Functions and Features

- ***Real-time relay of speed and position*** to Light Rail OCC via mobile communications. There are more than 500 changes in speed limits along the network.
- ***Audio reminders*** provided to train captains when approaching speed limits.
- ***Automated alerts*** for platform duty, junctions, turnouts, and train proximity. Over 60 turnouts / 160 platforms in the network.
- ***Close-up monitoring*** monitors positions and speed of trains. Calculate the required distance and remind Train Caption to maintain the distance when required.

Driving Console in Light Rail

iSPS Panel



Demonstration of Close-up Monitoring

iSPS: Achievements and Impact

- Successful rate under Shadow Run: >99.98%.
- Improved operational efficiency and train captain alertness, reducing incidents on shared tracks.
- The ***Electrical and Mechanical Services Department*** supported iSPS launch for enhanced railway safety
- ***MTR*** continues to explore public safety awareness and system upgrades for even safer operations.

Award:

- HKMA/ HKT Innovation Award – Champion of the Year 2025

HKMA/HKT Global Innovation Award

ThankYou

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