

Building Information Modelling – Asset Management - Railway Safety (BIM-AM-RS) to Enhance Railway Safety in Hong Kong

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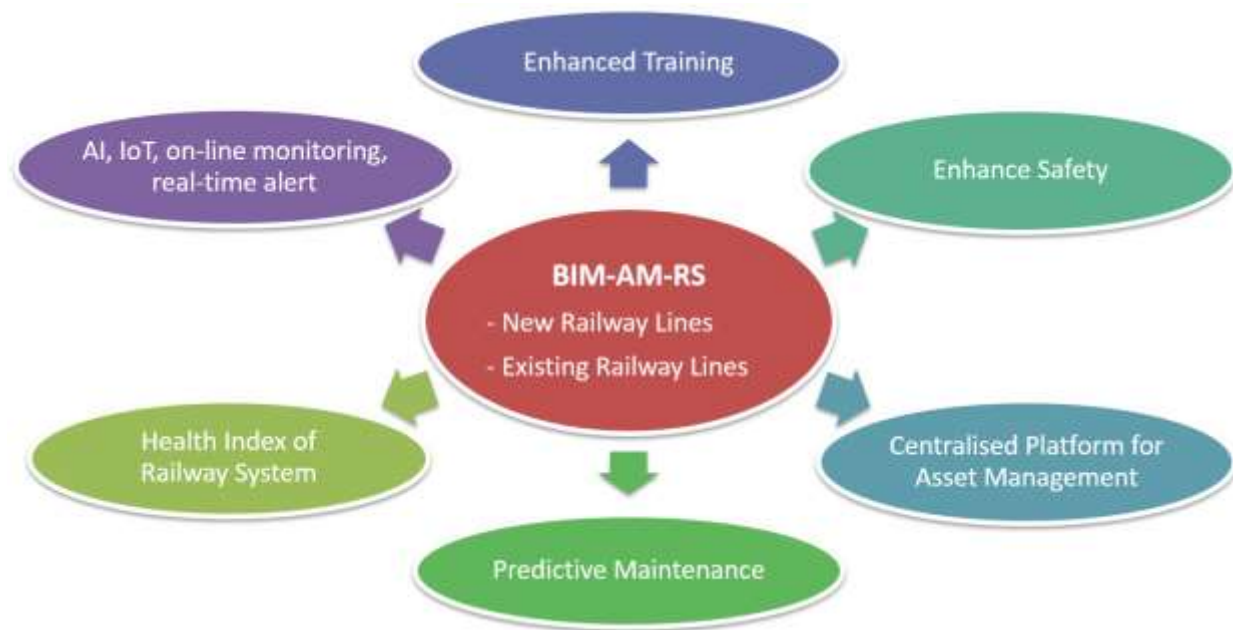
Agenda

- Objective
- BIM-AM-RS on enhanced staff training
- BIM-AM-RS on predictive maintenance
- E&M InnoPortal

Objective

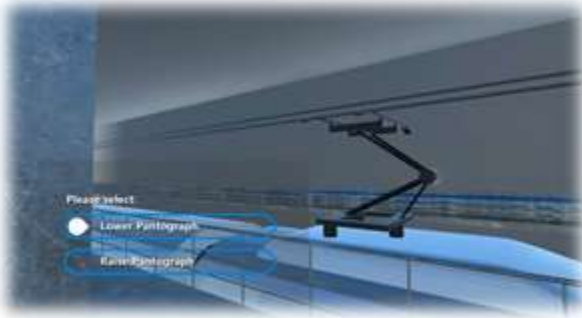
Extend the usage of BIM for asset management to enhancement of railway safety:

- improve operation safety and reliability
- enhance staff competence via 3D interactive training



Enhanced Staff Training

Simulate past railway incidents for staff training



Promote BIM-AM-RS VR training

VR Training with Haptic Suit



Enhanced Staff Training

Progress:

- EMSD provided sample training modules to MTRCL to promote BIM-AM-RS VR training
- MTRCL will develop more BIM-AM-RS VR training modules using haptic suit by end 2019

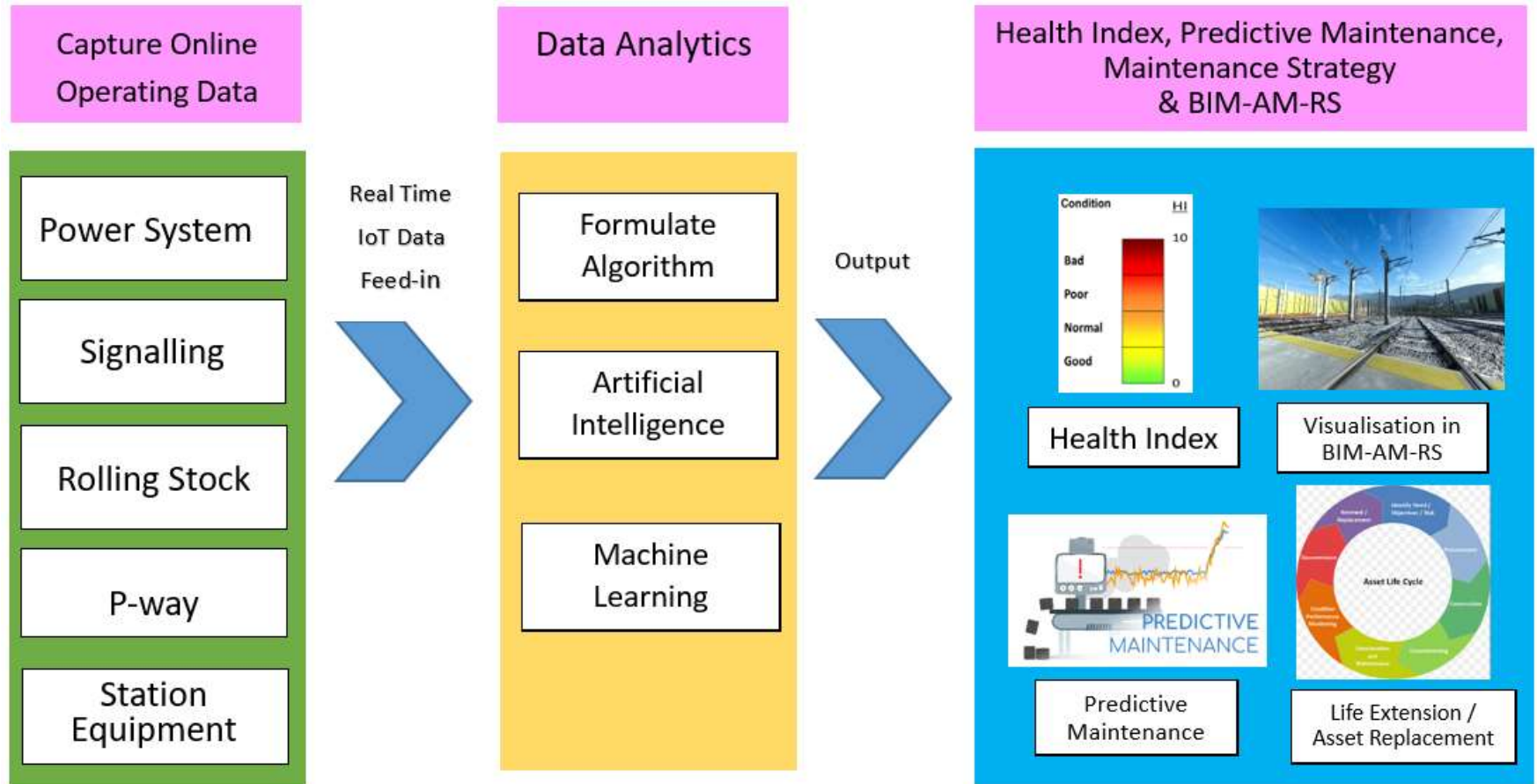


Predictive Maintenance

- IoT for major railway systems
- AI algorithm for data analytics & providing alerts before equipment failure
- Health indices to keep track of asset conditions
- Visualize system performance via 3D BIM environment



Predictive Maintenance - Implementation Framework



Real Time Monitoring of Railway Assets

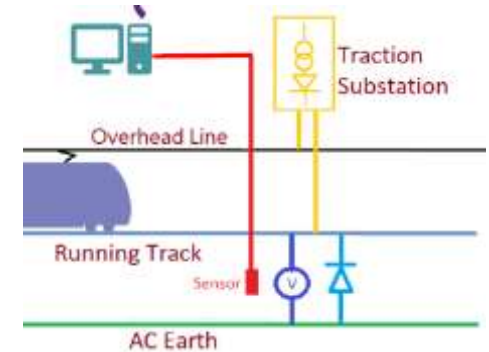


Dissolved Gas Analysis (DGA)



Partial Discharge (PD)

(i) Monitoring of Power System



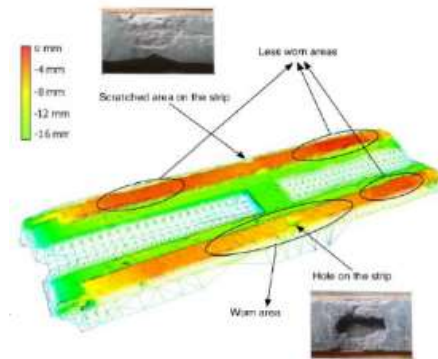
(ii) Monitoring of Stray Current



(iii) Point Switch Monitoring



(iv) Rail Crack Monitoring

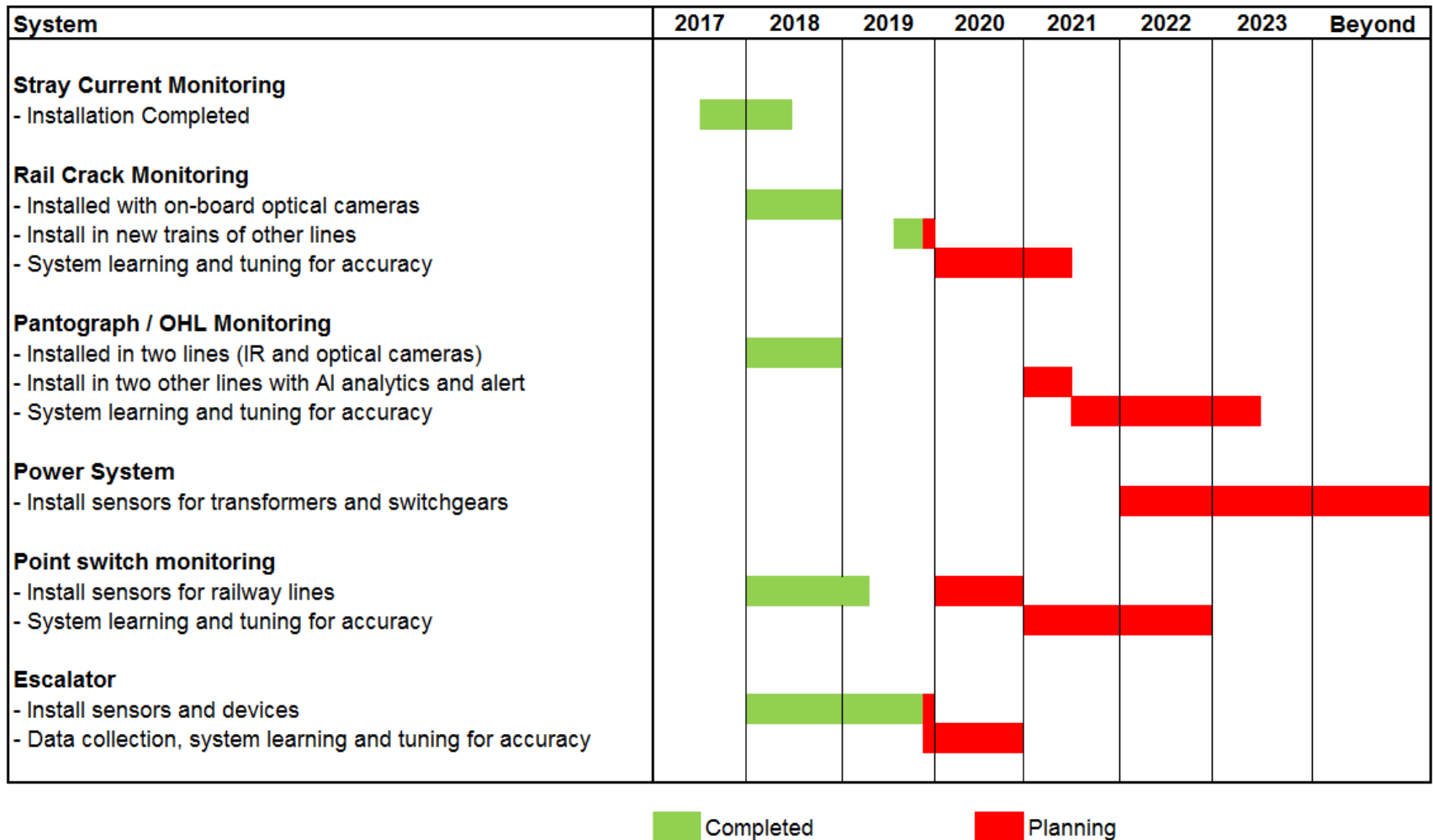


(v) Pantograph / OHL Monitoring



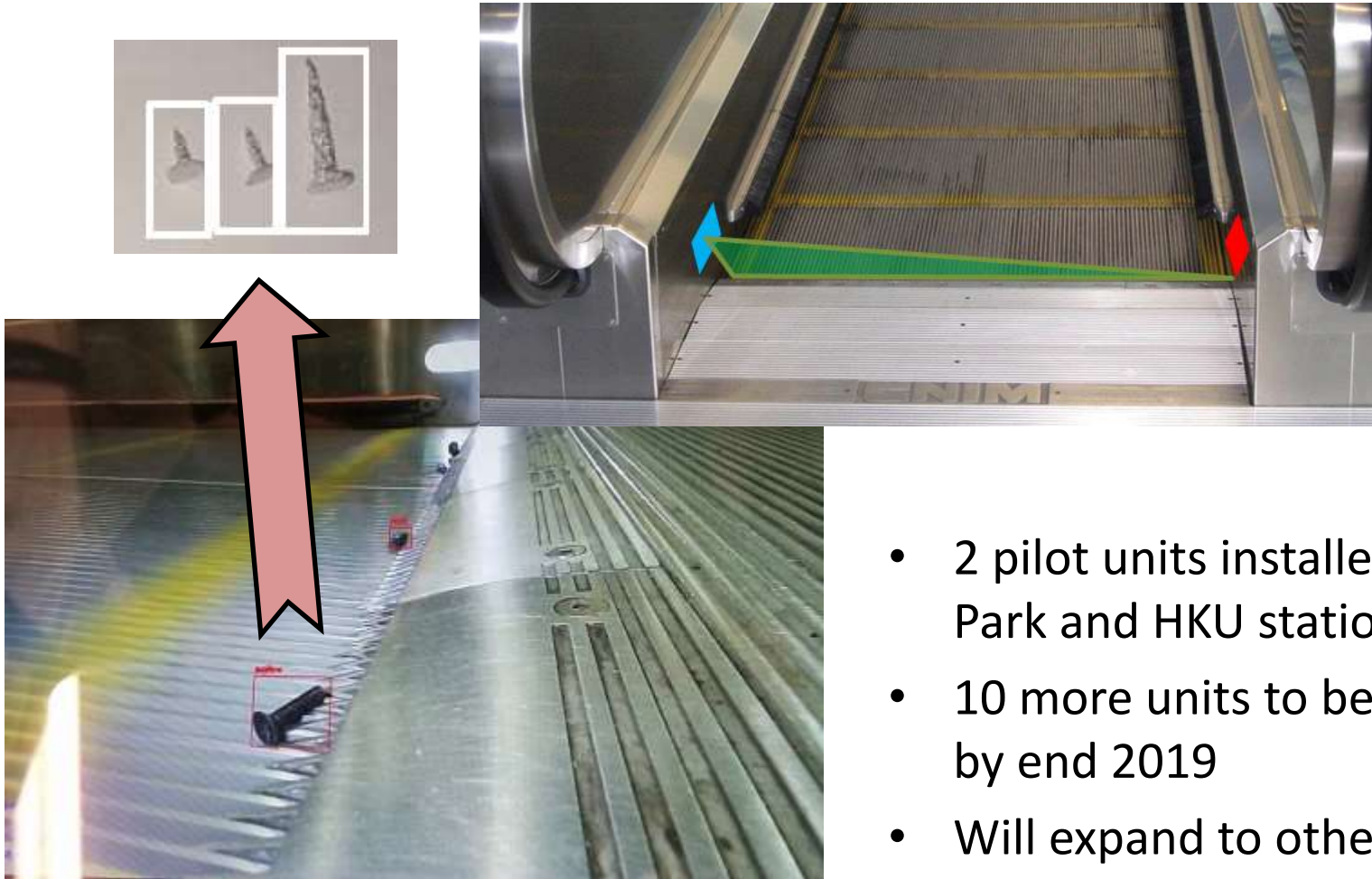
(vi) Monitoring of Escalator

Facilitate MTRCL's new technologies implementation



(i) Monitoring of Escalator

Small objects detection: issue real time alert to station staff



- 2 pilot units installed at Ocean Park and HKU stations
- 10 more units to be completed by end 2019
- Will expand to other MTR stations

(i) Monitoring of Escalator

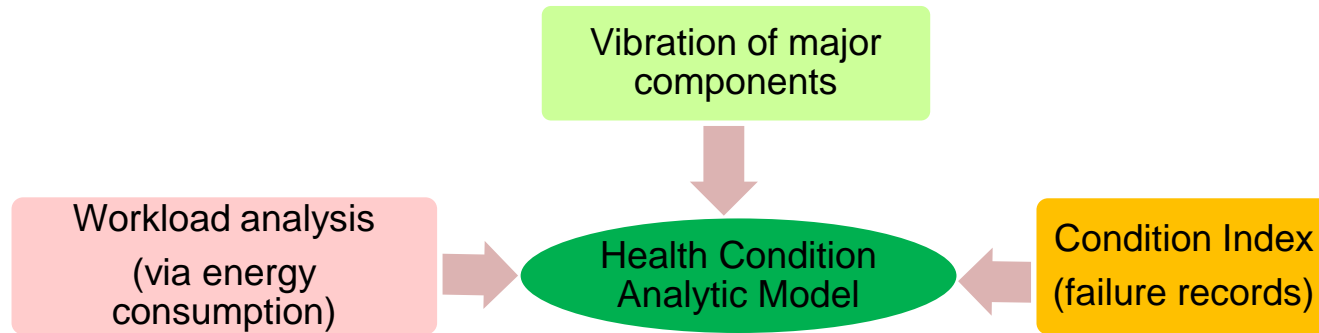
Bulky objects detection: issue warning messages to passengers and alerts to station staff



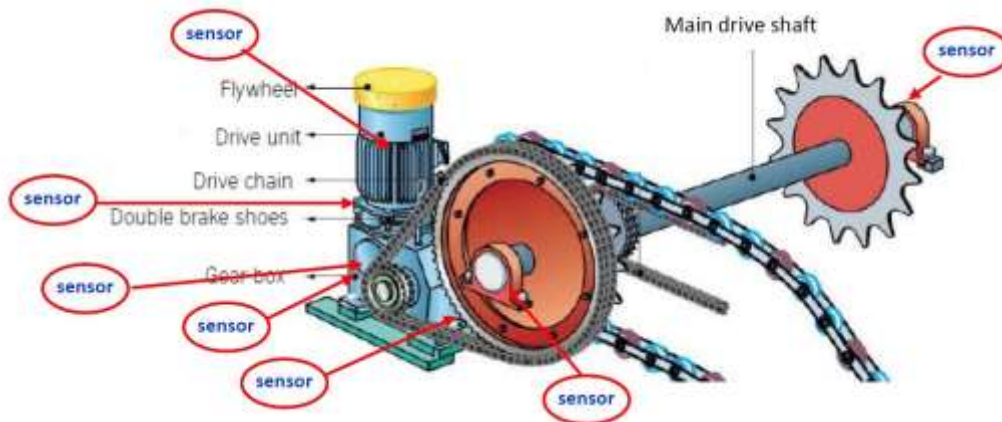
(i) Monitoring of Escalator

Condition Monitoring

- Phase 1 Determine Health Condition of Escalators (Q1-Q4 2019)



- Phase 2 Predictive Maintenance and Real Time Alert (mid 2019 to Q4 2020)
 - To formulate the data modelling and AI analysis for abnormalities

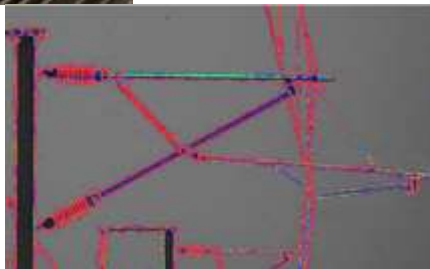


(ii) Pantograph / Overhead Line Monitoring

- Phase 1: Train borne pantograph and OHL monitoring system installed
 - IR camera for arcing and high temperature monitoring
 - Optical cameras for monitoring of pantograph and OHL structural movement
 - Maintenance staff to review records



Installation



Cantilever monitoring



Arcing and High Temperature Detection
at Section Insulator



(ii) Pantograph / Overhead Line Monitoring

Phase 2: Optical & infrared cameras with AI engine providing real time alert

- Two sets to be installed
- Will expand to other train lines on Q1 2021 to mid-2023



Detect repeated arcing alarms

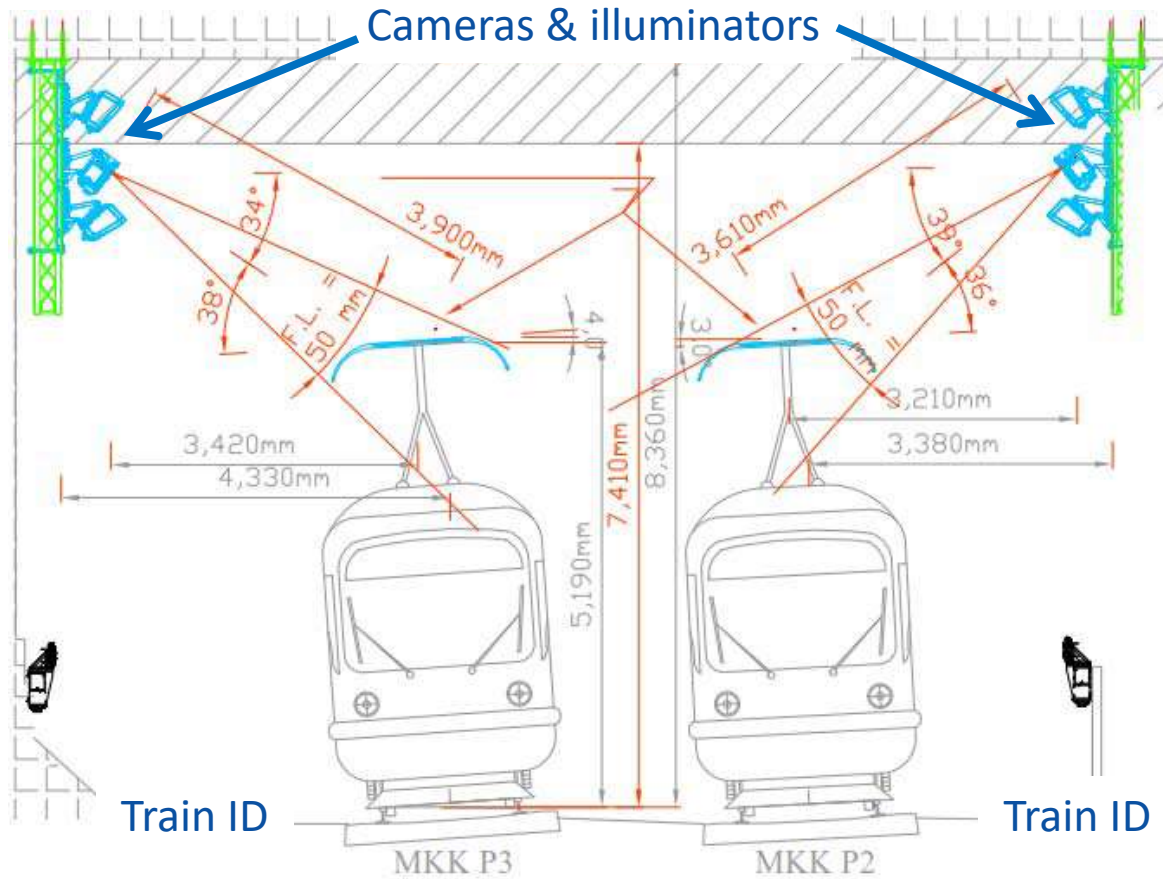


Detect signs of arcing and high temperature on section insulator



(ii) Pantograph / Overhead Line Monitoring

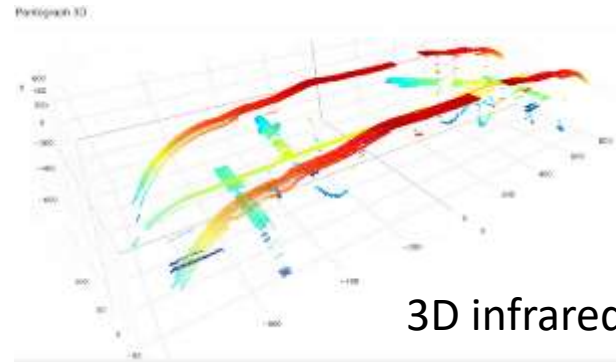
- Trackside 3D cameras installed in Jul 2019



Mongkok East Station

(ii) Pantograph / Overhead Line Monitoring

Visit overseas countries to appreciate the use of new technologies

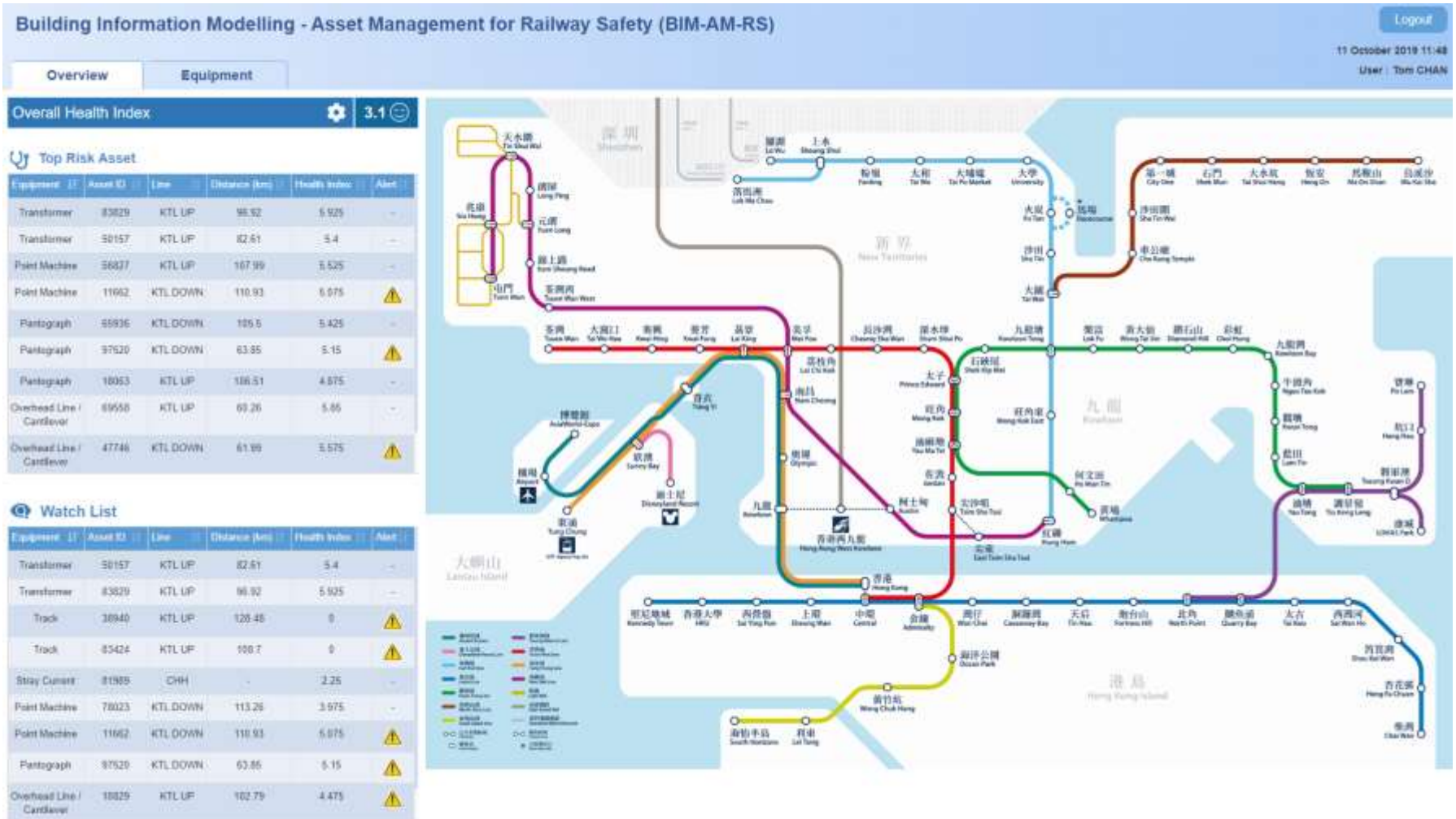


3D infrared images of pantograph



Real time detection of
pantograph defects

BIM-AM-RS Platform



BIM-AM-RS Platform

Building Information Modelling - Asset Management for Railway Safety (BIM-AM-RS)

Logout

11 October 2019 11:32

User: Tom CHAN

Overview

Equipment

Q Search Box

Input Asset ID

Chainage

Station: YMT

Line: All

From: km To: km

System / Equipment Type

☐ Power System
☐ P-Way
☐ Signaling
☐ Rolling Stock
☐ Station Equipment

GO

Equipment Type	Asset ID	Make	Model	Year of Service	Serial No.	Line	Distance (km)
Transformer	26460	Siemens	SR16	6	DC21816232075	KTL UP	100.64
Transformer	92250	Hyundai	SD84	1	LC6883863313	KTL DOWN	100.34
Track	83424	Trackwork	KQ12	11	-	KTL UP	108.7
Track	89310	Trackwork	NT75	3	-	KTL DOWN	112.62
Switchgear	58309	ABB	XP7	9	EH25957062735	KTL DOWN	101.12
Switchgear	81783	Siemens	MM6	1	BQ11645199960	KTL UP	107.36
Stray Current	49754	-	-	-	-	YMT	-
Power Cable	22441	AFL Global	ZA97	8	-	KTL DOWN	104.2
Point Switch	78023	Thales	EV3	11	GF59327188873	KTL DOWN	113.26
Point Switch	56827	Thales	PB99	10	EC95180000913	KTL UP	107.96
Point Switch	51486	Thales	TX30	12	IL93114215436	KTL UP	109.53
Point Switch	11602	Thales	DY78	9	ZT84851658253	KTL DOWN	118.93
Pantograph	18063	CRRC	FV26	12	F58734959069	KTL UP	106.51
Pantograph	65936	CRRC	YM65	7	FU79193639611	KTL DOWN	105.5
Overhead Line / Cantilever	10829	TE Connectivity	BU68	6	FQ21688435843	KTL UP	102.79
Escalator	27033	Kone	GK67	4	MT38413696201	YMT	-

BIM-AM-RS Platform

Building Information Modelling - Asset Management for Railway Safety (BIM-AM-RS)

Logout

11 October 2019 10:42
User: Tom CHAN

Overview Equipment

Search Box
Input Asset ID

Damage

Station: All

Line: All

From: km To: km

System / Equipment Type

- ☐ Power System
- ☐ P-Way
- ☐ Signaling
- ☐ Rolling Stock
- ☐ Station Equipment

GO

Real Time Monitoring

Asset ID: 11662

Point Machine

Health Index: 5.075

Location: KTL DOWN 110.93km

Make: Thales

Model: DYT8

Year of Service: 9

Serial No.: ZTS4501658253

Incident History

Maintenance History

Documents

Building Information Model



The 3D visualization shows a railway track with a white rectangular structure, possibly a platform or a building, and yellow equipment, likely a train or a vehicle, on the tracks. The structure is outlined in green, and the equipment is also outlined in green. The background is a light brown color.

BIM-AM-RS Platform

Building Information Modelling - Asset Management for Railway Safety (BIM-AM-RS)

11 October 2019 11:47
User: Tom CHAN

Overview Equipment

Search Box
Input Asset ID

Chainage
Station: All
Line: All
From: km To: km

System / Equipment Type
☐ Power System
☐ P-Way
☐ Signaling
☐ Rolling Stock
☒ Station Equipment
☒ Escalator

GO


Building Information Model

Asset ID: 27033

Escalator	
Health Index	0
Location	YMT -4m
Make	KONE
Model	GHST
Year of Service	4
Serial No.	MT38413698201

Real Time Monitoring

Incident History
Maintenance History
Documents



The image shows a close-up view of a metal escalator track. A red bounding box highlights a specific component, likely a screw or bolt, which is the subject of the maintenance history or incident report shown in the interface. The track is made of parallel metal bars, and the background is slightly blurred, showing the interior of the escalator shaft.

BIM-AM-RS Platform

Building Information Modelling - Asset Management for Railway Safety (BIM-AM-RS)

Logout

11 October 2019 11:44

User: Toon CHAN

Overview

Equipment

Q Search Box

Input Asset ID

Chamagne

Station: All

Line: All

From: km To: km

System / Equipment Type

- ☐ Power System
- ☐ P-Way
- ☐ Signaling
- ☒ Rolling Stock
- ☒ Pantograph
- ☐ Station Equipment

GO

Building Information Model

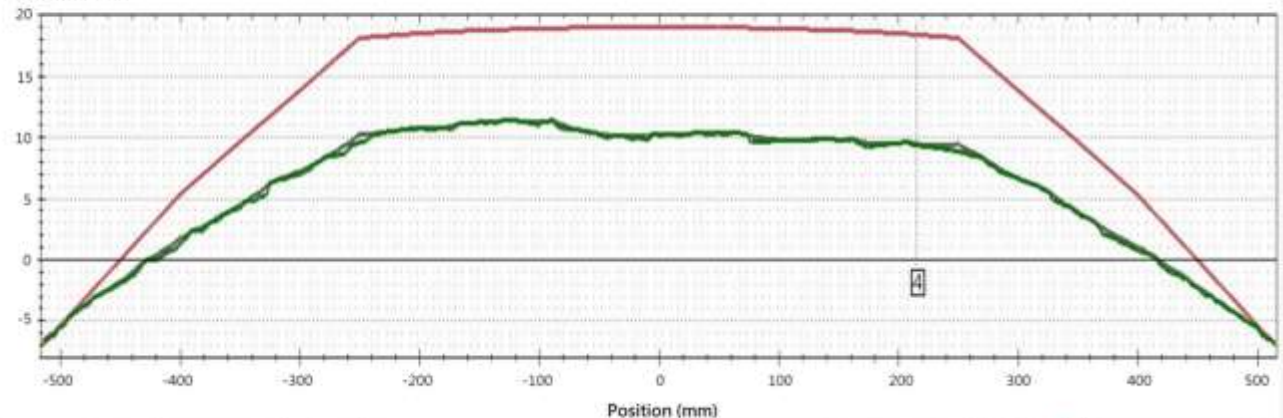


Asset ID	101863
Pantograph	-
Health index	4.875
Location	KTL-UP 106.61km
Make	CRRC
Model	PV28
Year of Service	t2
Serial No.	P58734959069

- ☐ Incident History
- ☒ Maintenance History
- ☐ Documents

Real Time Monitoring

Thickness (mm)



Kooldikte grafiek Carbon profile 3D View

Carbon position: - Laser position - Image position: - 2°

Analyse details

Pantograaf 1, Koolstrip 2°

Label	Measurement	Value	Status	Alarm Rule	Alarm Limits
1	Gier hoek (Yaw)	0,3°	Ok	-	-
2	Rollhoek (Roll)	0,1°	Ok	-	-
3	Stamphoek (Pitch)	-0,7°	Ok	-	-
4	Dikte koolstrip	9 mm	Ok	-	-
5	Opdruk	4 mm	Ok	-	-
6	Opdruk kracht	104 N	Ok	-	-



E&M InnoPortal

<https://inno.emsd.gov.hk/en/it-wish-list/index.html>

E&M InnoPortal

Home

I&T Solutions

I&T Wish List

Success Cases

Highlights

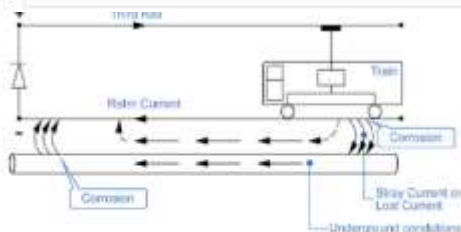
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SMART DC STRAY CURRENT
MONITORING AND REDUCTION IN
RAILWAY SYSTEM



TO ENHANCE ESCALATOR SAFETY



AUTOMATIC DETECTION OF RAIL
CRACK TO ENSURE PASSENGER
SAFETY



ENERGY DATABASE MANAGEMENT
SYSTEM (MATCHED WITH I&T
SOLUTION S-0049) **MATCHED**

E&M InnoPortal

- Cooperation agreement signed on 11 June 2019 with 12 academic and research institutions to promote I&T in government



Thank You

