Innovation Partner for Impact

TECH OFFER

Predictive Maintenance Technology for Critical Facilities & Infrastructures

KEY INFORMATION

TECHNOLOGY CATEGORY:
Infocomm - Internet of Things
Infocomm - Artificial Intelligence
Infocomm - Smart Cities

TECHNOLOGY READINESS LEVEL (TRL): TRL9
COUNTRY: HONG KONG
ID NUMBER: TO175442

OVERVIEW

Critical facilities and infrastructures face growing risks from equipment failures, costly downtime, and safety hazards, while traditional inspections often lack the speed and accuracy required to address these challenges. This innovation combines physical non-destructive testing (NDT) with AIoT-driven predictive analytics to deliver continuous, real-time monitoring that enhances safety, efficiency, and resilience. As an advanced IoT predictive maintenance technology, the platform enables faster fault identification and proactive intervention in mission-critical environments.

Engineered with business continuity and rapid incident response at its core, the system detects early anomalies, prioritizes risks, and enables proactive maintenance to reduce disruptions and ensure compliance. Its key advantage lies in a proprietary dataset of over 10 million hours of real-world operational data from HVAC, motor, and pump systems in metropolitan environments, enriched with expert domain labelling. This unique resource powers machine learning models with superior accuracy, outperforming conventional predictive tools that lack real-world grounding.

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The platform is also the first industrial transformer-based multimodal AI system, integrating diverse sensing modalities with unmatched precision. Its scalable, modular design supports multi-sensing, multi-modal applications across diverse sectors. By shifting from reactive or scheduled maintenance to predictive, condition-based asset management, the solution bridges gaps left by inspections and supervisory control and data acquisition (SCADA) systems, resulting in safer operations, optimized resource use, and measurable ROI.

The technology owner is seeking collaboration with industrial partners, including property owners, operators of power plants and utilities, transportation providers, government agencies, and industrial facility managers, who aim to minimize downtime, extend asset lifecycles, and strengthen resilience against failures.

TECHNOLOGY FEATURES & SPECIFICATIONS

Physical Sensors & NDT Hardware

- Vibration, current, RPM, thermal, acoustic, and analogue data converter
- IoT-enabled data acquisition units for real-time streaming
- Edge/cloud computing station for on-site signal pre-processing

AIoT Platform & Software

- Industrial transformer-based multimodal AI engine
- Machine learning models trained with >10M hours of real-world operation data
- Multi-sensing and multi-model analytics integrating video, audio, and environmental signals
- Cloud-native dashboard with predictive analytics and risk prioritization
- Integration API with BACNET, Modbus connection

Continuity & Response Layer

- Automated anomaly detection & early-warning alerts
- Seamless integration of Incident response with existing SCADA or BMS systems
- Actionable recommendations for optimize maintenance scheduling and resource allocation

Scalability & Integration

- Modular design for HVAC, moto-and-pump, power systems, and critical infrastructure
- API/SDK for seamless integration with enterprise asset management software
- Cybersecurity-ready architecture for mission-critical operations

POTENTIAL APPLICATIONS

This technology delivers ready-to-adopt modular solutions, including AIoT predictive maintenance platforms, smart NDT-enabled sensors, multi-modal industrial monitoring systems, and cloud-based asset health dashboards. Potential applications include:

- **Energy & Utilities:** Predictive monitoring of transformers, turbines, and pumps to prevent unplanned outages and extend asset lifecycles
- **Transportation Infrastructure:** Monitoring of rail, metro, and airport motor-driven systems to enhance safety, reliability, and service continuity

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- **Commercial Properties & Data Centres:** Protection of HVAC, motor, pump, and IT infrastructure to maintain occupant comfort and ensure IT uptime
- **Industrial Facilities:** Continuous monitoring of motors and machinery to minimise costly breakdowns and unplanned downtime
- **Disaster Resilience & Recovery:** Rapid condition assessment after earthquakes, floods, or accidents to confirm system integrity, identify urgent repairs, and support faster recovery and continuity of essential services
- **Future Expansion:** Scalable multi-sensing analytics for smart cities, water treatment plants, and public safety infrastructure

UNIQUE VALUE PROPOSITION

- **Superior Accuracy:** Validated by hospitals and power plants in Hong Kong, the multi-modal, transformer-based AI generates a machine health index, predicting potential failures up to 6 months in advance
- **Proprietary Dataset:** Trained on over 10 million hours of real-world machine data, enriched with domain expert labelling, delivering a competitive advantage with every new deployment
- **Plug-and-Play Simplicity:** Designed for fast implementation with integrated sensing intelligence, eliminating reliance on costly expert interpretation
- **Proven ROI & ESG Impact:** Achieved 2–10x ROI, extended asset lifecycles by more than 25%, and reduced energy consumption by over 18%, turning costly maintenance into a strategic advantage

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