PATENT APPLICATION

10-2023-0192290 Filed

AI-based structural monitoring system utilizing flexible elastic wave sensors to predict and detect errors

10-2024-0012586 Filed

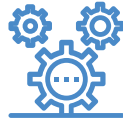AI-based structural monitoring system that predicts potential errors in structures using acoustic emission sensors

10-2024-0061148 Filed

AI-based structural monitoring system utilizing wireless elastic wave sensors

APPLICATION CASE

Plant Site Installation

LOTTE CHEMICAL

Establish and operate a real-time monitoring system for plant exhaust leakage management points.

Fracture Detection Installation

HD HYUNDAI OILBANK

Management points for facility breakage Established real-time monitoring system

PARTNER ORGANIZATION

bluepoint

One Electronics Co., Ltd.

CISTEP 천안과학산업진흥원

BIT

HD HYUNDAI OILBANK

LOTTE CHEMICAL

가스안전 국민행복 한국가스안전공사 KOREA GAS SAFETY CORPORATION

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RINA SOLUTION

APPLICATION OF FLEXIBLE ELASTIC WAVE DETECTION SENSOR
REAL-TIME INDUSTRIAL SAFETY MONITORING SOLUTION

EARLY DETECTION
24/7 INSPECTION
PREDICTIVE MAINTENANCE

RINA SOLUTION

MISSION

Rina Solution Co., Ltd. provides real-time monitoring solutions for industrial equipment and structures, incorporating flexible elastic wave detection sensor technology for regular inspection.

- **Early Detection**
- **24/7 Inspection**
- **Predictive Maintenance**

Real-time Industrial Safety Monitoring Solution Using Flexible Elastic Wave Detection Sensors

CORPORATE HISTORY

2022

MAY — Established Rina Solution

AUG

SEPT — Shinhan Square Bridge Daejeon Accelerating Program 1st Cohort / Partnered with 500 Global

OCT

DEC

Selected for Preliminary Startup Package / Best Award from Ministry of SMEs and Startups

Attracted angel investment

Seed funding received from Bluepoint Partners

Selected for Realization Technology Development Support Project / Supported by Cheonan Science and Industry Promotion Agency

JUN — Selected for TIPS program / received 2-year funding

MAY — Listed as a collaborator with Lotte Chemical / Industry-academia-research institute Collaboration R&D / Supported by the Ministry of SMEs and Startups

MAR — Selected for Startup Success Package Support Project / Supported by the Ministry of SMEs and Startups

JAN — **2023** — Established Corporate Research Center / Certified as a Venture Company

JUL

NOV — Awarded Minister of SMEs and Startups Award / Received at Stage Cheonan 2023 Startup IR Competition

2024

MAR — Selected as one of 7 Promising Startups in Cheonan / Chosen for the C-STAR 1st Cohort

SEPT — Listed as a collaborator with Hyundai Oilbank

EXISTING PROBLEMS & SOLUTION

Existing Method
Personnel-Centered/Manual/ Periodic Inspection
- Inability to detect early on, periodic inspection
- Inspection speed varies based on worker capability
- Potential safety risks due to worker involvement
- Limited data density with manual inspections

Solution & Approach
Unmanned/Smart/ Regular Inspection
- 24/7 inspection, early detection
- High-reliability smart inspection
- Eliminates safety risks for workers
- Big data analysis and predictive maintenance can be applied

FLEXMATE & FLEXREAL
PRODUCT

Smart sensor hardware and web-based software integrated solutions, providing precise early detection and predictive maintenance, enabling user-friendly smart safety management.

FLEXMATE — Signal Detection
FlexMate is **AE** sensor with flexible tranceducer

FLEXREAL — Data Processing & Visualization Software
FlexReal is data processing and visualizing software

FLEXMATE
Uses piezoelectric fiber composites to maximize flexibility, making it easy to attach to curved surfaces like piping and detects elastic waves to capture abnormal signals from equipment

FLEXREAL
Processes and visualizes data collected by FlexMate, enabling real-time data analysis to ensure constant monitoring of industrial facility safety

Acoustic Emission Technology
By using Acoustic Emission technology, and captures sounds beyond human hearing, the system can monitor, analyze, and evaluate structural integrity in real time, ensuring comprehensive surveillance of potential risks

SOLUTION

Load / Acoustic emission wave : invisible / sensor / very fine crack : invisible

AE system Components : pre-amplifier main amlifier DAQ, etc

PC with software : Detection Mesurement Interpretation Evaluation, etc

Application Areas

Leak Detection
Used for plants to monitor leaks in pipes, connections, etc., and provides real-time monitoring for leak detection

Fracture Detection
Applicable to detect extreme fractures or cracks in high-temperature, high-pressure environments, providing real-time monitoring

Factory Monitoring
Applied to production plant facilities to monitor vibration characteristics and provide predictive maintenance for equipment

Expected Benefits

Accident Prevention
Real-time detection of abnormal signals in industrial facilities allows for the prevention of accidents before they occur

Maintenance Cost Reduction
Enables continuous monitoring of facility safety without the need for regular manpower, thus reducing ongoing maintenance costs

Case Studies

Lotte Chemical
Real-time monitoring system for safety installed to monitor pipeline leaks and other issues. [Since October 2023]

Hyundai Oil Bank
Installation of a safety monitoring system for detecting fractures in Hyundai Oilbank's facilities. [Expected from March 2025]