Introduction of EMTAKE
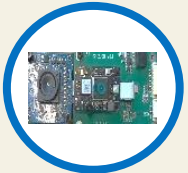
Jan / 2024

Jason Cho (CEO)

1. About EMTAKE

Core Technologies

- **Semiconductor Photo Sensor & Module**
- **Signal Synthesis, Processing & Analysis**
- **AI & Machine Learning Analysis & SDK[1]**
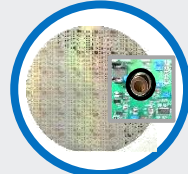- **Local/Cloud Server & Monitoring System**

Photo Sensors

On sale

IR[2] Sensor Module

Multi image sensor module

Under development
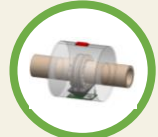
6. UV[3] Photo Sensor
- Bacteria / Virus Detection

Human Care / Safety Systems

On sale

1. Building / Ground Collapse Sign Detecting System

2. Toxic Chemical Leak signal Detecting System

3. Fire Signal Detecting Thermal Camera System

4. Human intrusion detecting system in hazardous / restricted areas

5. Baby care multi sensor bio-Camera

1) SDK : Software Development Kit, 2) IR : Infrared,   3) UV : Ultra Violet

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1. Building / Ground Collapse Sign Detecting System

● Current Situations
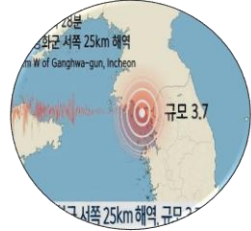
Sites under Consideration

Building construction or Demolition site, Old houses, Tunnel construction, Mine, Historic site

Inside Culvert, underground structure

Roadside with steep slope, Landslide, Falling Rocks, Old Embankment & Bridge

Earthquake causing Ground Collapse

Conventional Equipment

Inclination Measurement

Displacement Measurement

Restrictions

- Several days to analyze & report
- Retarded evacuation operation after recognizing collapse signal
- Expensive equipment with limited operations

A simple Solution provided by "EMTAKE"

- **Low-cost smart sensor** : Easily attaches to hazardous blocks with collapse possibility
- **Notifying early signs of collapse at site** : Control centers with real-time alarm to save human lives.

[Sensor (BD30)]
"KC[1]" certified

1) KC : Korea Certification

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● EMTAKE Solutions

Displacement & Movement Sensor & System

Competitiveness

- **Early warning** with real-time detection and on-site alarm
- **High accurate** measurement system
- **Inexpensive devices**, Easy to install & operation
- Real-time movement data storage and remote monitoring
- **Total Wireless : Solar Power, Wireless Communication Network**

Specification

| LED	High Brightness RED LED
Detect Resolution	Rotation Angle : < 0.01 º
Button / Port	Power (Reset), Alarm, Data, Power input
Operating Temp.	-30 ℃ ~ 80 ℃
Monitoring Range	< 100 m / Red LED On/Off flashing
Monitoring System	Movement data save & Network

- **Product 1) Stand-alone Sensor**
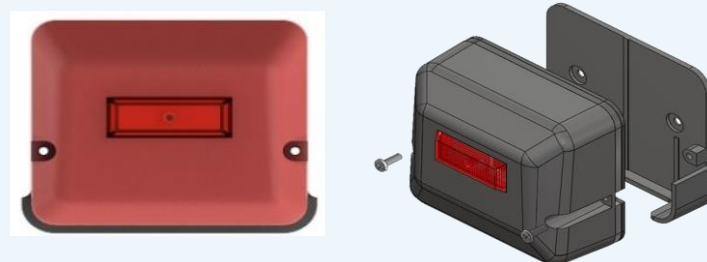
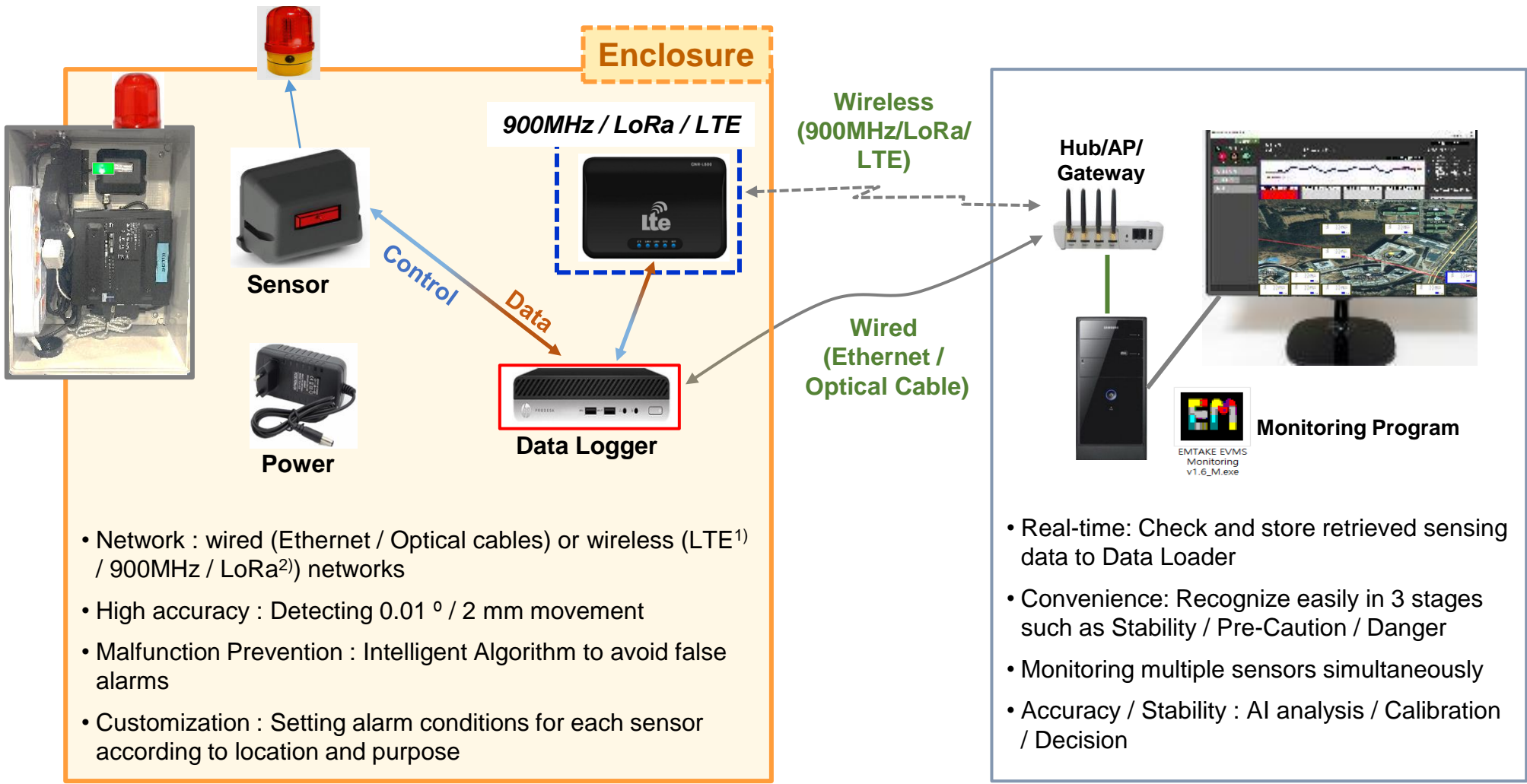- **Product 2) Network Monitoring System**

Applications : Building, Bridge, Construction site, Steep slope, Earthquake area, Guard post (Military) and etc.
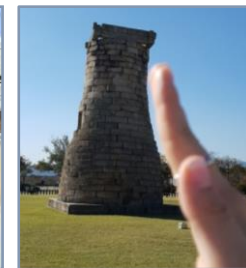
● Network Monitoring System

Sensor + Data Logger + Remote Network (Wired or Wireless) + Monitoring Program + Solar Cell


Enclosure

900MHz / LoRa / LTE

Wireless (900MHz/LoRa/LTE)

Wired (Ethernet / Optical Cable)

Sensor

Control

Data

Power

Data Logger

Hub/AP/ Gateway

Monitoring Program

EMTAKE EVMS Monitoring v1.6_M.exe

- Network : wired (Ethernet / Optical cables) or wireless (LTE[1] / 900MHz / LoRa[2]) networks

- High accuracy : Detecting 0.01 º / 2 mm movement

- Malfunction Prevention : Intelligent Algorithm to avoid false alarms

- Customization : Setting alarm conditions for each sensor according to location and purpose

- Real-time: Check and store retrieved sensing data to Data Loader

- Convenience: Recognize easily in 3 stages such as Stability / Pre-Caution / Danger

- Monitoring multiple sensors simultaneously

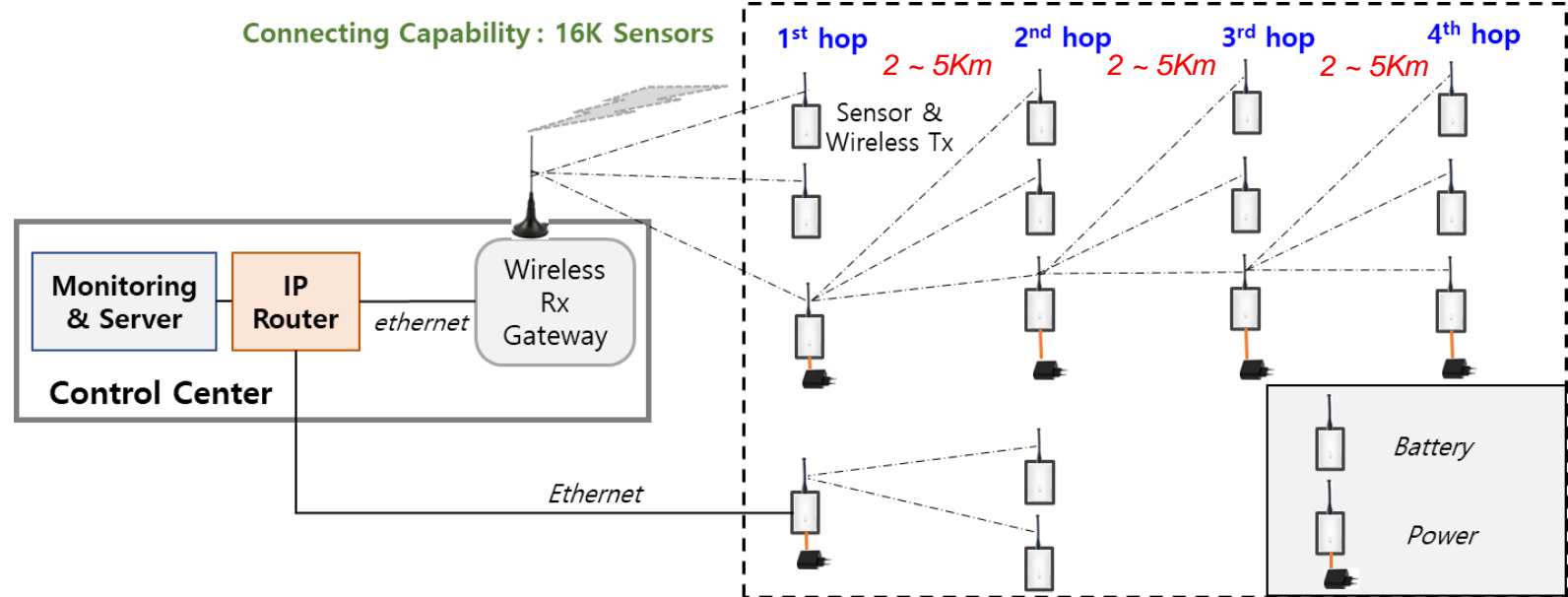- Accuracy / Stability : AI analysis / Calibration / Decision

1) **LTE : Long Term Evolution,**   2) LoRa : **Long Range**

● Wireless Solution
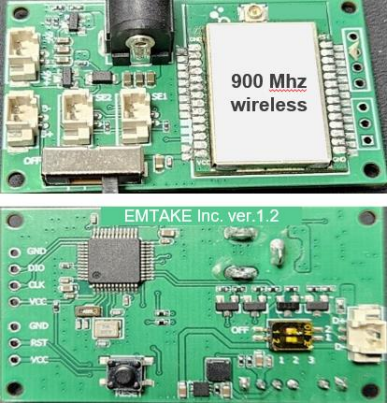
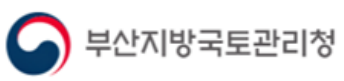## Wireless solution Spec. : EMTAKE vs. Third Party Technology

Frequency   940MHz band (USN : 940.1~944.3MHz) **: Less frequency congestion**

Transmission Power   100mW (20dBm) **: 4x higher output**

Transmission Speed   80kbps(GMSK), 50kbps(GFSK) **: Higher transmission rate compared to LoRa**

Protocol   2-Way Proprietary Protocol **: Automatic retransmission, multi-hop**

Security   AES128 : **Supporting Encryption**

I/O   2x UART, 8x GPIO, I2C, 12bit ADC, 12bit DAC **: Various I/O support**

Power Consumption   87mA(Tx@+20dBm), 8.2mA(Rx), under 1uA(Deep sleep) **: Lower power**

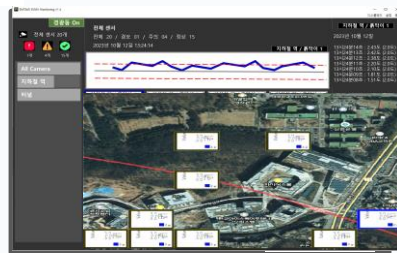Transmission Distance   5Km ~ 2Km (outdoor) **: Long-distance communication performance**

● Install References

· Product 1) : Stand-alone sensor for on-site alarm only
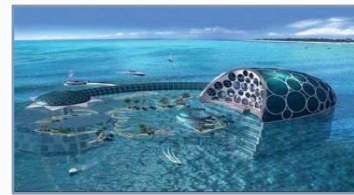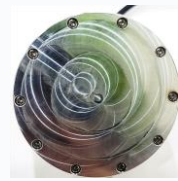
DAEWOO E&C

KUMHO ENGINEERING & CONSTRUCTION

문화재청
Cultural Heritage Administration

부산지방국토관리청

· Product 2) : (+) Movement Data Storage / Analysis
& Remote Monitoring System

Fly Incheon

LG Chem

KEPCO

HANJIN

KCC

Halla

Special Development

· Collapse signs and movement detection systems
for underwater structures (Made-to-Order)

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● Install References Detail(1/2)

EMTAKE Reference Detail (till June / 2023)

Customer	Place	Purpose	System conf	date	Site
Incheon City	Sihwa Sewage Treatment Plant	Detecting structural changes due to earthquakes	Sensor, wireless communication system, Monitoring Program	Y2022	
	Gongchon Water Purification Plant	Detecting structural changes due to earthquakes	Sensor, wireless communication system, Monitoring Program	Y2022	
Jeju Island / Cultural Heritage Administration	Manjanggul Cave	Cave (cultural property) collapse and moving detection	sensors, alarm systems	Y2023	
	Jeamcheongul Cave	Cave (cultural property) collapse and moving detection	stand alone sensor	Y2022	
Busan Land Management Office	National Highway No.7	Detect signs of collapse on steep slopes along national highways	stand alone sensor	Y2022	
	Uljin-gun District	Detecting Signs of a landslide near Bogwangsa Temple	stand alone sensor	Y2022	
Korea Electric Power Corporation	Chungju City/Yeosu City	Apartment construction and civil engineering	sensors, alarm systems	Y2022	
Kumho E&C	Cheongju City	Plant construction and civil engineering	sensors, alarm systems	Y2022	

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● Install References Detail(1/2)

Customer	Place	Purpose	System conf	date	Site
Hyundai E&C	Seoul	Collapse detection of buildings, bridges, etc.	Sensor	Y2023	
	Paju City	Freeway tunnel collapse detection	Sensor, wireless communication system, Monitoring Program	Y2023	
Daewoo E&C	Kimpo City	GTX-A (Paju-Gimpo high-speed railway) construction safety	Sensor	Y2022	
LG Chem Inc.	Yeocheon Factory	Collapse detection in high voltage landfill facilities	Sensor, wireless communication system, Monitoring Program	Y2022	
Anyang City	Anyang City, Gyeonggi Province	Detect Landslide Signs	Sensor, wireless communication system, Monitoring Program	Y2023	confirmed
Masung E&C	Kwangmyung City, Gyeonggi Province	Detect subsidence and slope of highway surface	Sensor, wireless communication system, Monitoring Program	Y2023	confirmed
Hanjin E&C	Yongin City, Gyeonggi Province	New Bundang subway extension (Gwanggyo-Homaesil) construction	Sensor, wireless communication system, Monitoring Program	Y2024	confirmed
KCC E&C	Seoul	GTX-B subway (Sangbong-Yongsan) construction safety	Sensor, wireless communication system, Monitoring Program	Y2024	confirmed

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2) Toxic Chemical Leak Detecting System

- ## Accidents

One chemical accident: 218 leaks, 80 fire/explosion accidents in 2022

- 241 injured, 13 dead   **Refer to) Korea National Fire Agency data**

Korean gas accidents: 471 cases last 5 years, explosion 27%.

Kunsan Phenol ('21.04)

Yeocheon NCC ('21.04)

Kimcheon Phenol ('20.08)

France Gas('23.06)

Yeosoo sulfuric acid ('21.05)

Indo Gas ('20.05)

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● Toxic chemicals and leak spots

More than 52% of pipe leaks occur at pipe connections.

- Various acid/alkaline/organic chemicals

□ **Piping connection type**

Flange

Welding

Lock Type

□ **Sorts of Toxic Chemicals (14 sorts)**

- Acid: Phosphoric acid, nitric acid, acetic acid, hydrochloric acid, hydrofluoric acid, sulfuric acid, BOE, semiconductor stripper
- Alkali: TMAH, NAOH
- Organic: H2O2, IPA, PGMEA, NMP

● EMTAKE Solution

☐ Configuration

1) Main components :

- Sensor, **Data Logger**, battery, antenna, gateway, server/monitoring system , leak protection cover

- Data Logger : 900Mhz Wireless Comm. Module, Sensor data processor, Detecting Algorithm, 2-way protocol Fireware

2) System Structure

● Differential

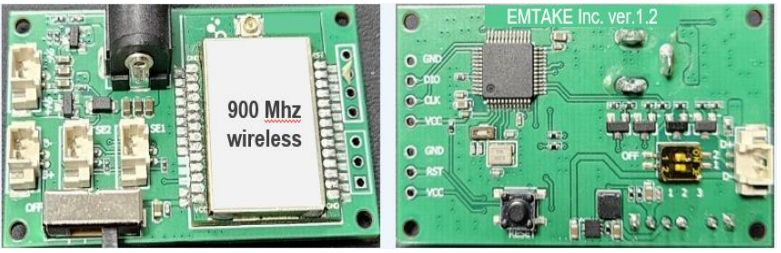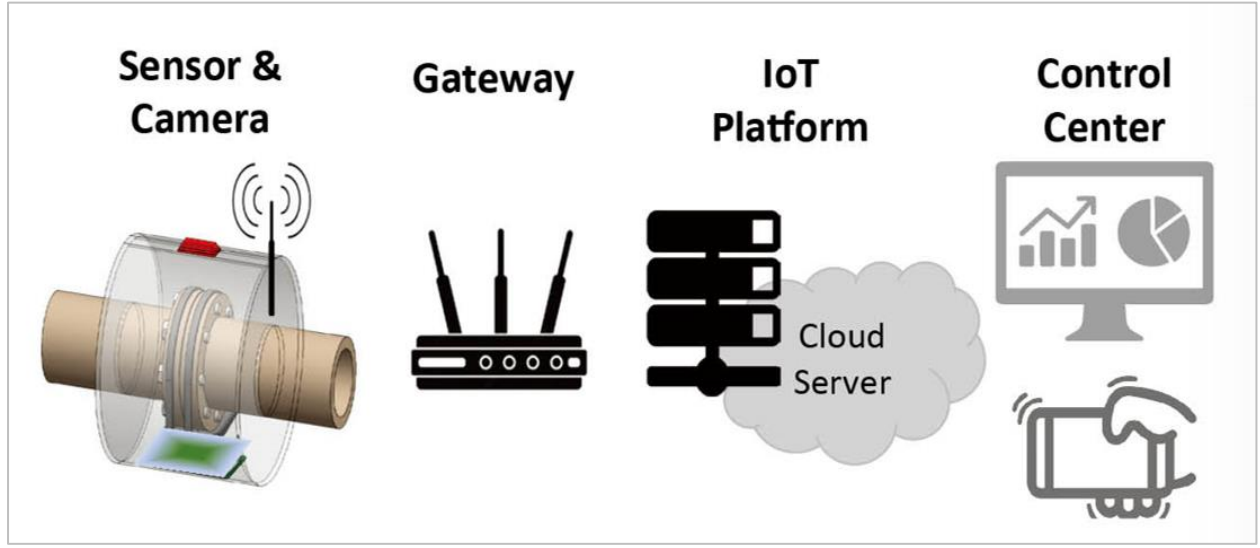1) **Detecting Performance : Detection of 12 types of various toxic chemicals**
   - Phosphoric acid, nitric acid, acetic acid, hydrochloric acid, hydrofluoric acid, sulfuric acid, BOE, Stripper, TMAH,
      NAOH, H2O2, IPA
   - Capable of responding to explosion-proof equipment (option)

2) **Accurate and reliable without malfunctions**
   - Waterproofing, prevents malfunction due to internal dew (water)
   - Periodically check remaining battery capacity and system operation status.

3) **System without any cable: Easy installation and ultra-low power system**
   - Wireless communication: 900Mhz(free frequency) long-distance/two-way wireless communication(Hopping, Mesh network)
   - Operates on batteries: DC battery powered, operates for more than 3 years after installation

4) **Remote server and intuitive monitoring system**
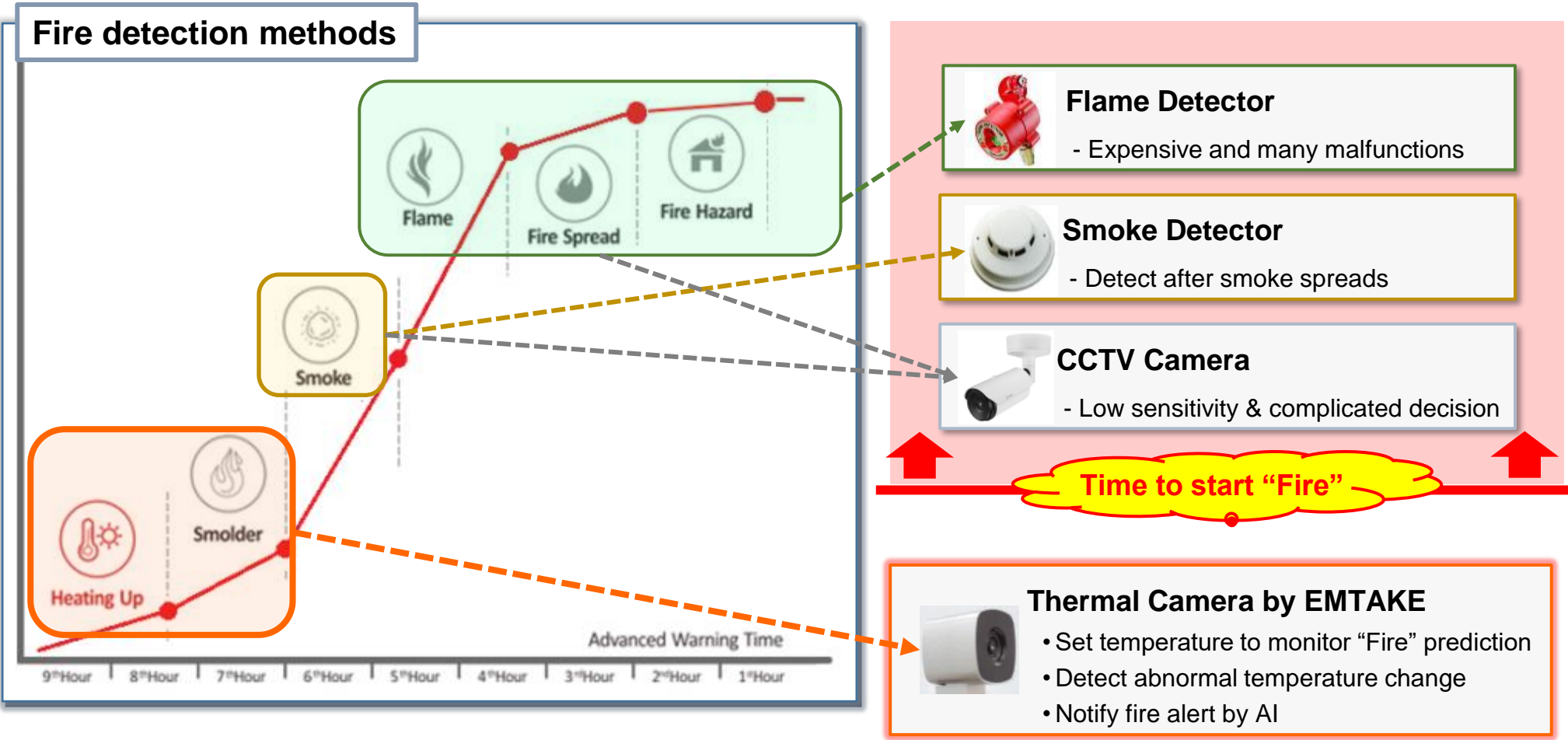   - Real-time/simultaneous monitoring of more than 4,000 leak detection sensors
   - LED at leak site indicates leak point

5) **Installed in a major global chemical company (LG Chemical)**
   - POC verification completed by LG Chemical: Nov. 2023 ~ Feb. 2024 (4-month test)
   - Installed/operating at 35 major risk points (Feb. 2024)
   - Prepare intellectual property rights globally with LG Chemical

3. Fire Sign Detection System

● Advantages of Thermal Cameras

Fire detection methods

Flame Detector
- Expensive and many malfunctions

Smoke Detector
- Detect after smoke spreads

CCTV Camera
- Low sensitivity & complicated decision

Time to start "Fire"

Thermal Camera by EMTAKE
- Set temperature to monitor "Fire" prediction
- Detect abnormal temperature change
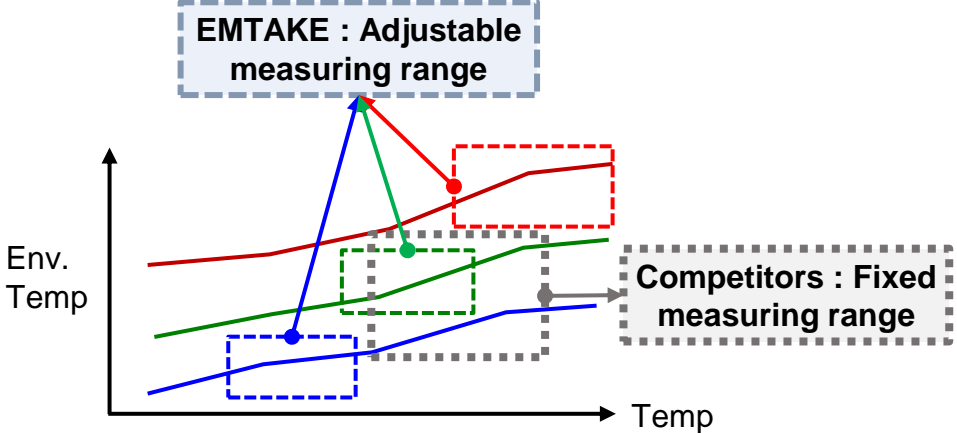- Notify fire alert by AI

Only thermal cameras can detect signs of **"Fire"** 2 ~ 3 hours in advance and prevent big fire disasters.

● Operation
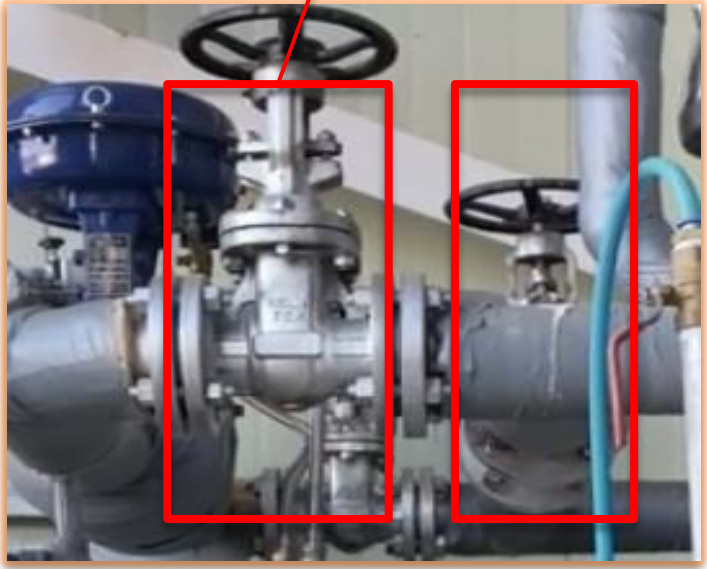
● Competences / References
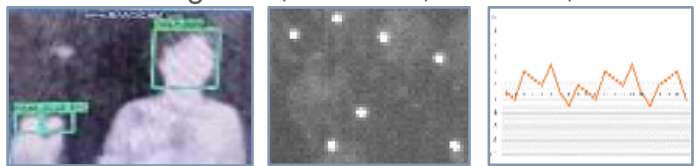
1) Customization for various environments

EMTAKE : Adjustable measuring range

Competitors : Fixed measuring range

Env. Temp

Temp

3) AI / Machine Learning

- Human Recognition, Distance, Behavior, etc.

2) Cost competitiveness

- EMTAKE developed its own affordable thermal sensor module.

4) Accuracy : Embedded Blackbody (EMTAKE solution)

- EMTAKE provides H/W & S/W blackbody solution

Thermal Camera   **Blackbody**   **Total Solution**

Install References

Shopping mall / EV charging station

Shopping mall

Factory, Switchboard

Shopping mal

Switchboard, EV charging station
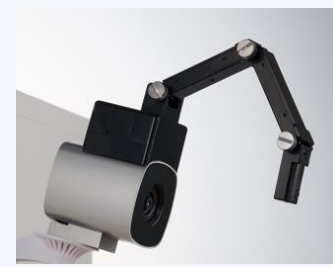

Factory, Switchboard

Factory, Switchboard

Human Care

EMTAKE Solution (1/2)

Affordable Thermal Image Camera

- Early detecting abnormal temperature change due to fire
- Network connectivity and supporting ONVIF[1] for CCTV compatibility
- Remote monitoring & control via PC, NVR[2], Smart Phones etc.
- High accurate and stable system with embedded blackbody

Model) MT-50

Applications : Smart Factory / Building / Farm, EV[3] charging station, Shopping mall, Healthcare, Military surveillance

Specification

Thermal Sensor Resolution	80 x 60 (4,800) pixels
Lens viewing Angle	90 º or 30 º / Shutterless
Video Format	H.264, MJPEG, PNG, Raw
NETD[3] / Measurement Step	< 100 mK (@ 30 ℃) / 0.1 ℃
Max. detecting Range	90 º : ~ 7 m, 30 º : ~ 10 m
Operating Temp.	- 10 ~ 50 ℃ (option : < 100 ℃)
Network	Ethernet, 62 x 53 x 65mm

Monitoring System

1) ONVIF : Open Network Video Interface Forum, 2) NVR : Network Video Recorder, 3) EV : Electric vehicle, 4) NETD : Noise Equivalent Temperature Difference

● EMTAKE Solution (2/2)

## Dual Camera with High Resolution Thermal & Real Image

- Both high resolution (256x192) thermal image and HD visual Sensor
- Various usages : Fire signal detection, Crime prevention Alert and etc.
- Network connectivity and supporting ONVIF / PoE[1] for CCTV compatibility
- Remote monitoring & control via PC, NVR, etc.
- High accurate and stable system with shuttered Lens

1) PoE : Power over Ethernet

Model) MD-50

Applications : Smart Factory / Building / Farm, EV charging station, Shopping mall, Healthcare, Military Surveillance
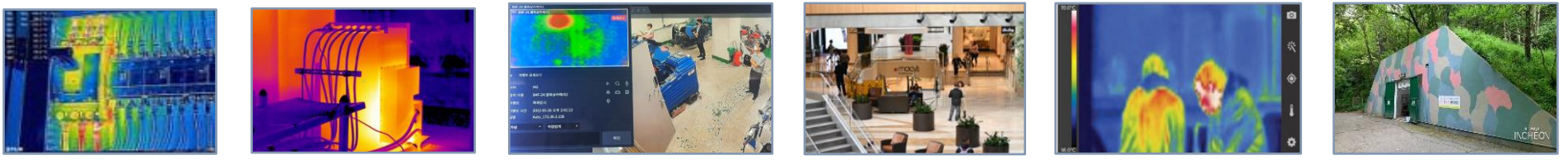
Specification

Thermal Sensor Resolution	256 x 192 / 160 x 120 / 80 x 60
Thermal Lens viewing Angle	90 º or 50 º or 30 º / Shuttered
NETD / Measurement Step	< 100 mK (@ 30 ℃) / 0.1 ℃
Real Image Sensor	HD CMOS Sensor
Video Format	H.264, MJPEG, PNG, Raw
Max. detecting Range	< 50 m (option : resolution, Lens angle)
Operating Temp.	- 10 ~ 60 ℃ (option : < 100 ℃)
Network / Power	Ethernet / DC 12V (PoE support)

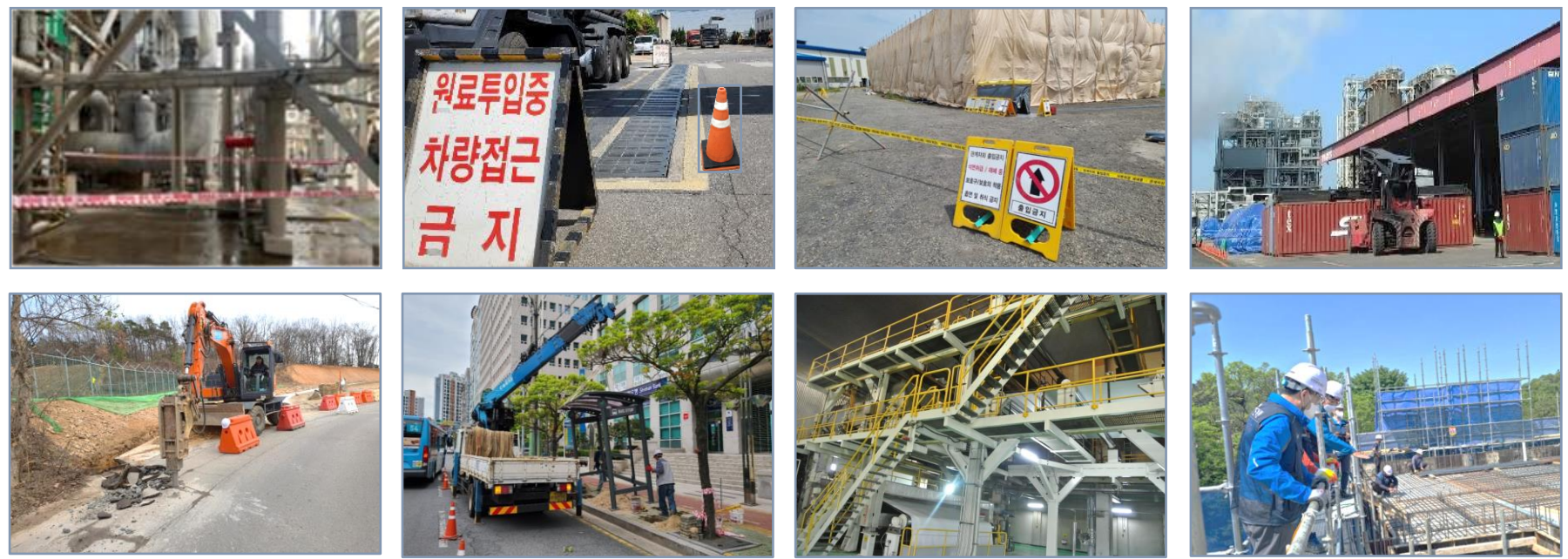### Monitoring System

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4. Intrusion Detecting System

● Issues

[Various hazardous & restricted Sites with fatal Dangers]
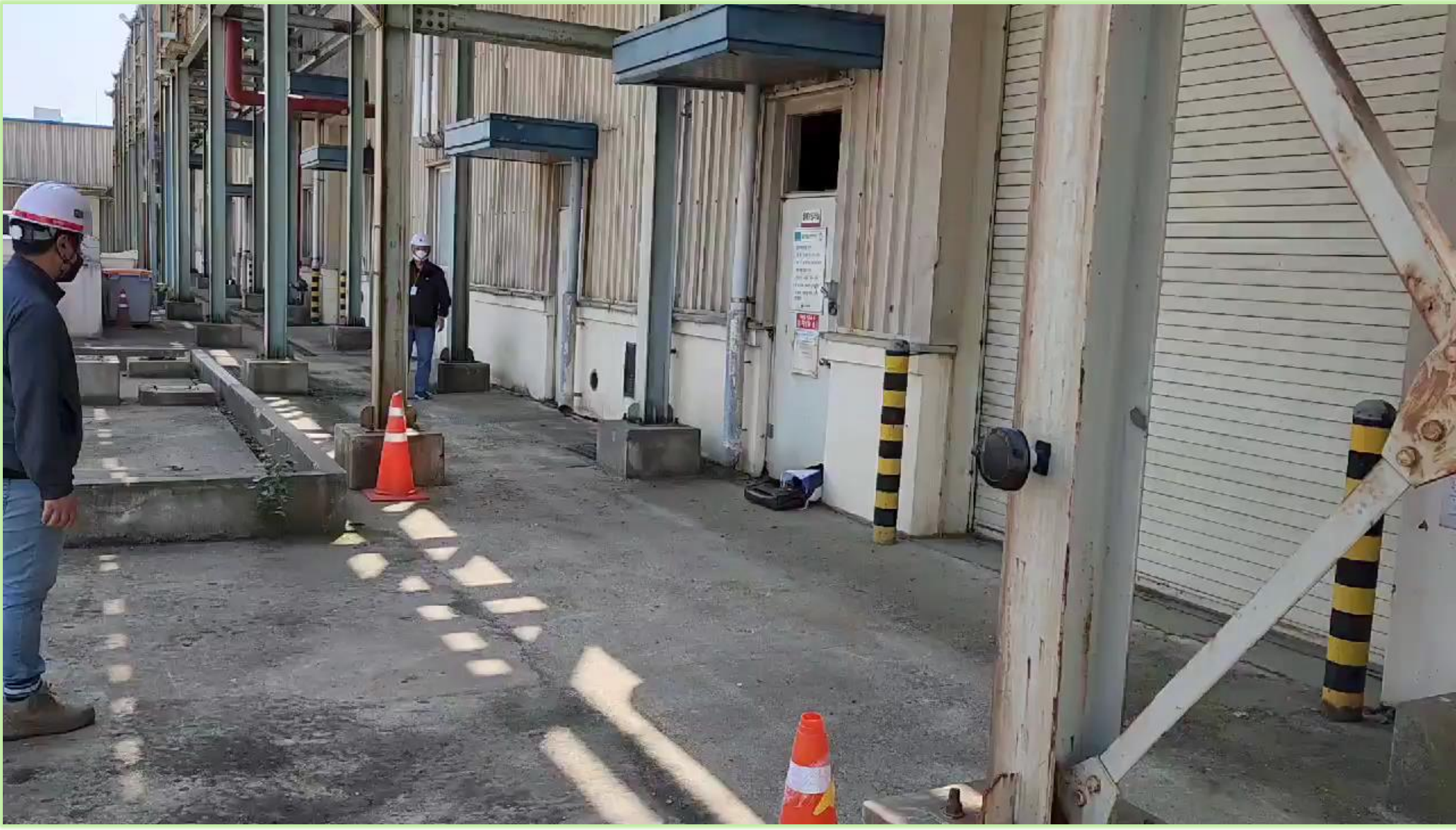

[Issues]

- Low awareness of safety guides : Sometimes ignoring Safety Tape / Fence / Railing etc.

- Risk of mortality accidents : multiple safety levels are required with flashlight & audio alarm.

- A number of hazardous indoor / outdoor sites nearby

**"Smart safety sensor"**

Operation

● Feature & deferential

Affordable Intrusion Detector
in hazardous / restricted areas

- Real-time accurate alert and notification with LED and alarm
- Low operating cost due to unmanned detection
- Adjustable detecting range (5 ~ 10 m, line type detection)
- Synthesizable warning alarm sounds
- Waterproof device for outdoor environment
- Various installation tools : L-Shaped, I-shaped, Magnet, Velcro, etc.

Detecting Range

Beam   Beam

1 ~ 10 m   1 ~ 10 m
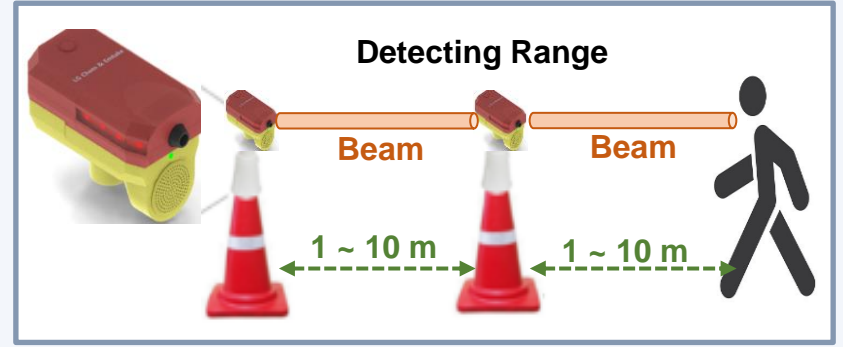
Applications : Loading & unloading zone, Construction site, Temporary fence, Safety Guard, Museum, Art gallery, Performance Hall

Specification

Sensor Type	Thermal sensing & Movement sensing
Detecting Angle	3 ~ 30 º (Factory preset available by customer request)
Detecting Range	< 10 m (Adjustable)
Alarm LED	High brightness LED
Alarm Sound	5 W / Voice or Alarm sound (Customizable)
Button / Size	Power, Mode, Volume / 78 x 145 x 90 mm
Power / Waterproof	DC 5 V or Battery (9 V) / IP 64

Various installation tools
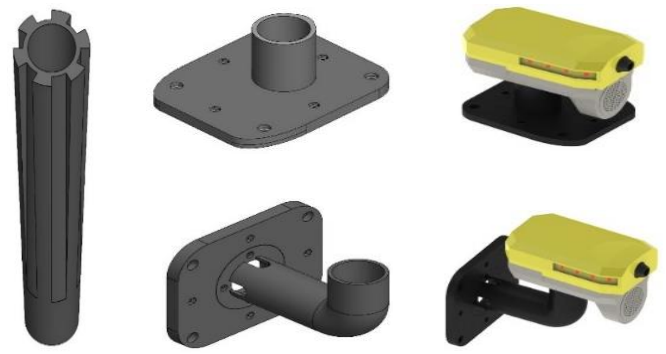
5. Baby care multi sensor bio-Camera

● Concept

1) needs

- ● Preventing sudden death in infants: High fever, breathing, and sleep environment monitoring required
- ● Requires multi-sensors : Real image, IR thermal image, radar, sound, and humidity

2) Concept

- ● Real-time observation and alarm notification of baby health, sleep status, environment, etc. within 2.0m
- ● Real-time detection of abnormal conditions in infants such as high fever, apnea, waking up, and crying during sleep.
- ● Check sleep environment by measuring sleep routine, appropriate sleep temperature, humidity, and brightness.
- ● Motion and audio detection/AI analysis (Option: applied when linked to Cloud)
- ● Real-time monitoring on smartphone App.
- ● Easy installation and UX/UI, design that goes well with a baby's bed
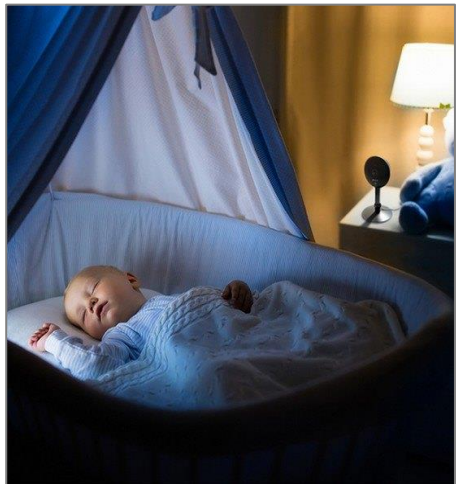
● Target customer

1) Major customer

● B2C

- Home : Baby gifts: parents, grand parents, friands, etc.

● B2B

- Baby care center, obstetrics and gynecology hospital, postpartum care center, pediatric hospital

2) Expanding customer

● Elderly care:

- House : Parental care, care for the elderly living alone, care for the sick, etc.
- Care Center : Nursing home / Nursing hospital

● Pet health care

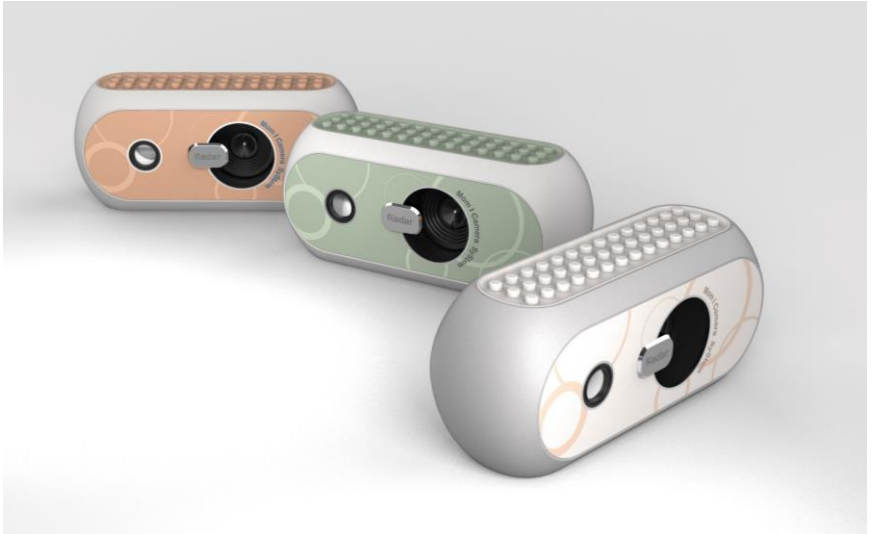- Home, animal hospital / animal storage / animal cafe

● Design differentiation

1) Design Concept

Minimal   **Less but Better**

- **Innovative.**

- **Make it useful.**

- **beautiful.**

- **Make it understandable.**

- **There are details.**

- **It is a minimal design.**

- **Distributor differentiation, customer expansion**

2) Design

● Competitiveness

1) Function

			Competitiveness	Detecting Sensors			
		CCD Sensor	IR Image sensor	Radar sensor	Mic.	Humid	Sound
Activity	Realtime image	HD image	Thermal Image				
		Image recording					
		vertical image					
	Video Recording	Check the reason for the alarm					
Choke	Breath			Measurement			
Disease	Fever		Body Temp.	Distance			
	Crying sound				Crying detecting		
Danger	Big Noise				Noise detecting		
	Fire signal		Fire Sign detecting				
sleep environment	Wake up				Crying detecting		
	sleeping conditions				Noise detecting	Humid measure	Well sleeping sound

2) Simple but very useful Smartphone App.

- **Simple Android/IOS App. UX/UI**
  - Image/icon type design for intuitive recognition
- **Check and alarm various health abnormalities**
  - Apnea, high fever, fire sign, crying, abnormal sleeping environment
- **Providing care/information services to babies/mothers**
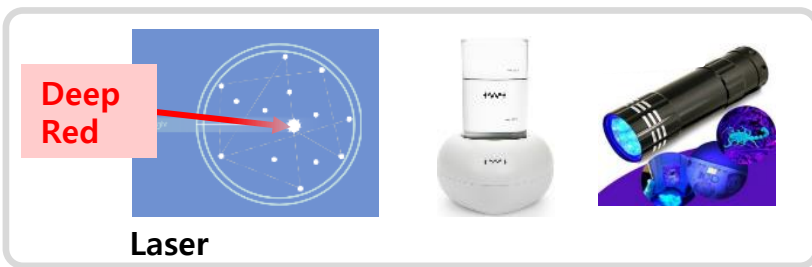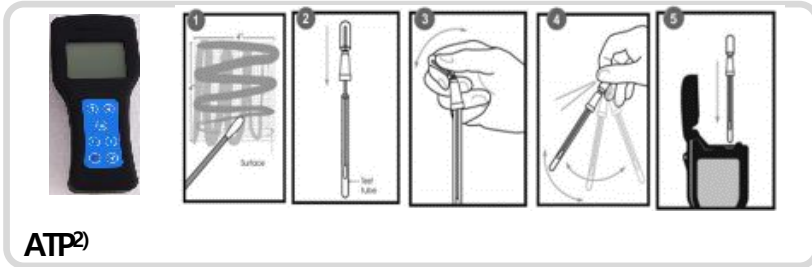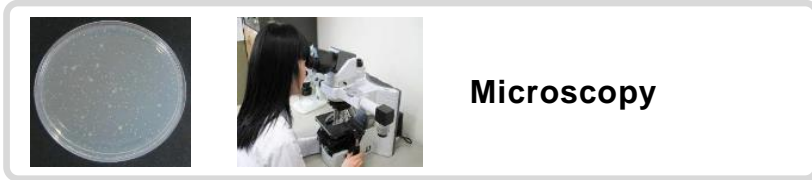 - Providing customized information according to age

6. Bacteria Detecting Semiconductor Photo sensor (under development)

# ● Bacteria Detecting Semiconductor photo Sensor

AS_IS Solution

- Difficult to measure specific bacteria in real time and without touch.
- Difficult to apply to portable or consumer products, because of a high voltage, expensive and big size.

Microscopy

PMT[1]

ATP[2]

Deep Red

Laser

1) PMT : Photo Multiplier Tube, 2)ATP : Adenosine Tri Phosphate

VS

EMTAKE's Sensor

Focusing on Human care Bio UV Photo sensor & Module Prototyping for non-touch based real-time detection of food poisoning bacteria.

Sensor	System	Certification	Patent
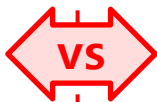
Real Bacteria Test

Sensor Module application for home appliance
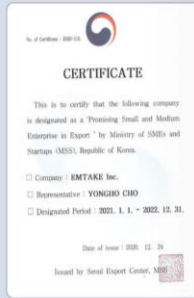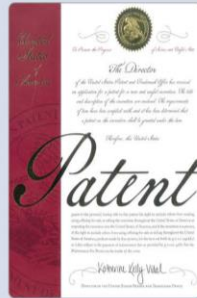
Company Ability

IP
Registered patent : 8 (Korea 6, US 2)
Applied patent : 4 (Korea 3 ,US 1)

Export Performance

US, China, Thailand, Vietnam etc.

References

HYUNDAI ENGINEERING & CONSTRUCTION | HANJIN | DL E&C | S-1 CORPORATION | SHINSEGAE

LG Chem | Hanwha Systems | all ways INCHEON | KOREA NATIONAL PARK SERVICE

Contact

👤	**Name**	Jason Cho
✉️	**E-mail**	email@emtake.com
🌐	**Homepage**	www.emtake.com
🏠	**Address**	289, Pangyo, Sungnam City, R.O. Korea

Homepage   **LinkedIn**

The product functions, performance, and design specified
in this brochure may differ from the actual products.

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Thank you