Sharing Successful Implementation of SWM and Best Practices in Solid Waste Management

WARECO
Water Resources Engineering Corporation

2017. 05
Research Center
Jinwon Kim

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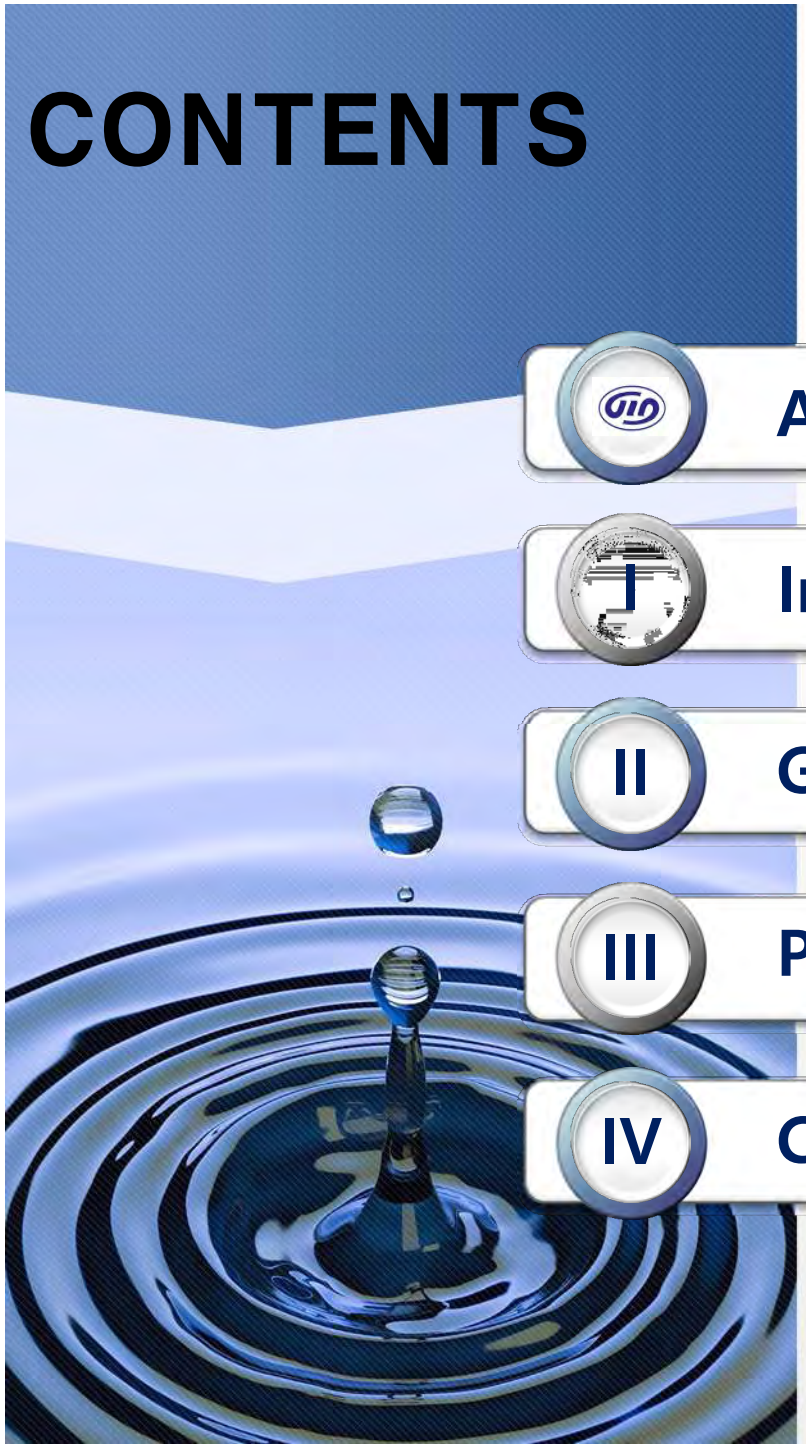

WARECO
Water Resources Engineering Corporation

About WARECO

Water Supply &
Sewage/Seawater
Desalination

Water Resource
Facility

Water Efficiency

Operation
- Tunnel
- Electric facilities
- Discharging flood gates
- Sewage systems
- Water treatment plant

Maintenance

National Groundwater
Monitoring Network

Engineering

Diagnosis & Inspection
- Sewage systems and pipes
- Water treatment plants and water supply pipelines

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Water Resources Engineering Corporation

Construction
- Design and build water and sewage systems
- Bury and relocate pipe lines
- General construction works

Overseas Business
- Management, operation and maintenance of water and sewage systems
- Management, operation and maintenance of hydroelectric power generation

R&D
- Development of next generation technology, Eco-Innovation Project
- Robot pilot project of a water resource facility wire rope maintenance

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About WARECO

HISTORY of WARECO

1986 ~ 2000
Water Resources Facility Repair & Maintenance Co., Ltd.

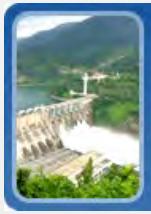
New start through privatization

2001 - Present
Water Technology Corp.

Corporate Mission

"Make the clients impressed by the top technology and the best services, and contribute to the society"

Company Motto
Technical Leap
Harmonious Unity
Accomplishment of Responsibility



Management Ideal
Build up competitiveness
make clients even more satisfied
establish sound company atmosphere

WARECO BUSINESS LOCATION IN KOREA

- Water Supply Service (16)
- Water Dam Service (8)
- 4 Great Rivers Barrage Service (5)

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I. Introduction

Smart Water Distribution Management

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I. Introduction

Total Health Care

| Optimal management technology of water distribution networks |

PIPECARE SYSTEM™

SUMIRE SYSTEMTM™ 1.0

diagnosis system for continuous water pipeline

Pipeline sample analysis

Precision diagnosis

- PIPECARE SYSTEM™ · SUMIRE SYSTEM 1.0
  - Location mapping. Leak diagnosis. Image diagnosis

Survey / Diagnosis

- Image diagnosis system for continuous water pipeline
- Pipeline sample analysis (Laser profiler)
- Image diagnosis robot

Repair / Renovation

- LINECARE SYSTEM™
  - Automatic equipment for rehabilitation of large pipe
- Small diameter rehabilitation system
  - Cleaning robot / Lining robot

Maintenance / Management

- WICS™ : Cleaning method for water pipeline
- Maintenance technology of continuous water valve
  - Replace grand packing. Remove scale. Replace valve
- Continuous water freezing cutoff method
- Maintenance business of water resources facilities

LINECARE SYSTEM ™

Small diameter rehabilitation

Wareco Ice Cleaning system™

Maintenance technology of continuous water valve

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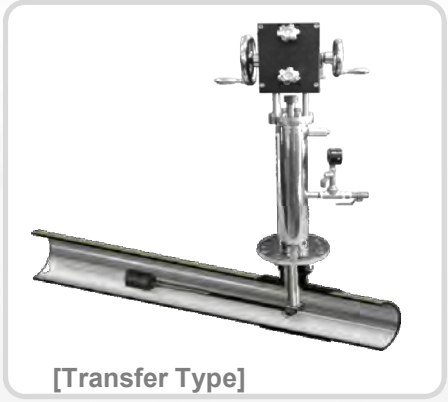
II. General Examination

Endoscope Diagnostic system Overview

Diagnosing equipment to take photos inside the pipes and analyze them by installing equipment without suspending the water supply


[Fixed Type(Small)]


[Fixed Type(Large)]


[Transfer Type]


[Fixed Type(Saddle Type)]

Division	Small diameter	Large diameter	Transfer Type	Saddle Type
Application scope	Air valve and continuous water supply bores inside water pipes			
Operation pressure	Max 18kgf/cm^2			
Applied pipe diameter	D100mm~D300mm	D350mm or greater	D100mm~D1,200mm	D300mm or greater
Installation pipe diameter	50mm	100mm	50mm	45mm
Installation height	At least 0.5m	At least 1.3m	(Movement distance) Max 50m	At least 1.0m

II. General Examination

Endoscope Diagnostic system working procedures

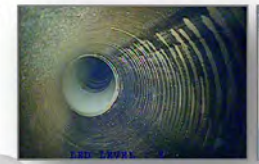
Construction process

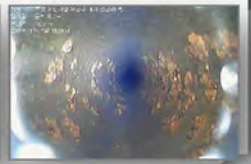
01 Pipeline excavation

02 Hot-taping

03 Installation and diagnostics

04 Result analysis





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II. General Examination

Endoscope Diagnostic system result

The resulting image

Small diameter

Large diameter

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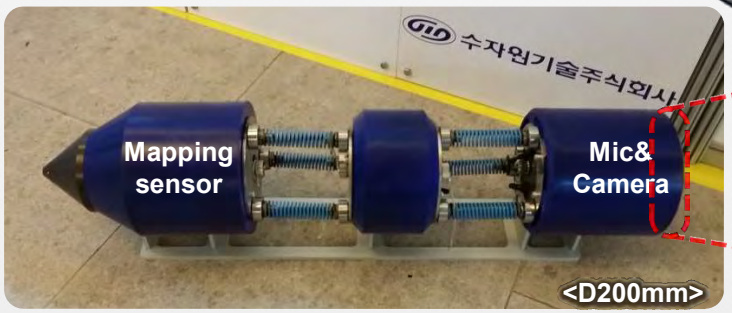
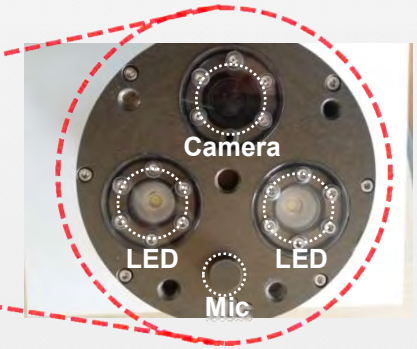
III. Precise Examination

Pipecare System ™ Overview

This system detects the accurate locations of water mains buried, and records the movement path to obtain three-dimensional location information

- ▷ **Features : Pipeline mapping, Leakage detection, Imaging diagnosis**
- ▷ **Ranges : D200~400㎜, within L=1km, All pipe types**
- ▷ **Results : map pipeline GIS, detect leak location, check the pipe condition**





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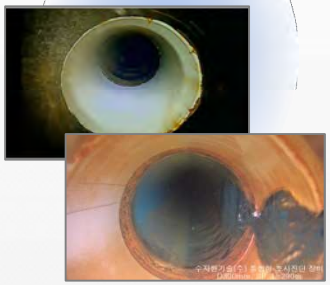
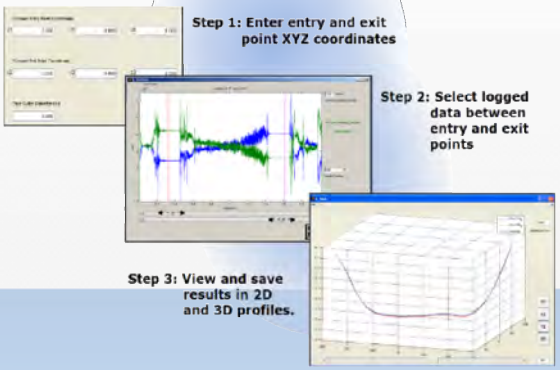
III. Precise Examination

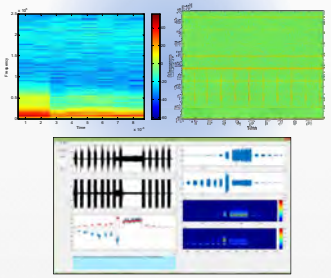
Pipeline Location and Leakage Detection System

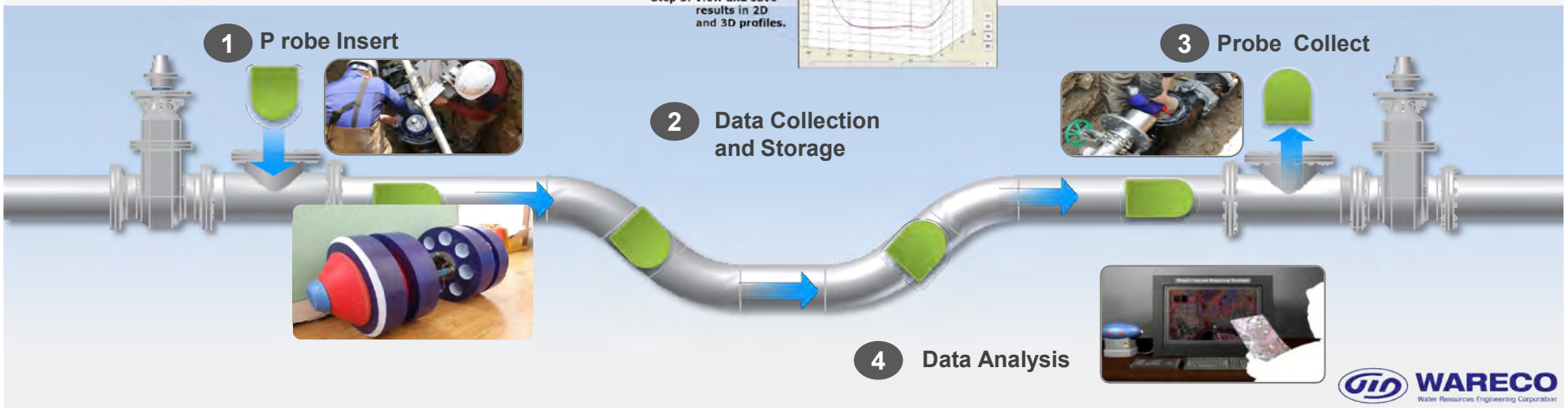
Multi-purpose pipeline diagnosis and mapping system including 3D Location and leak detection

Imaging Diagnosis + Pipeline 3D Mapping + Leakage detection









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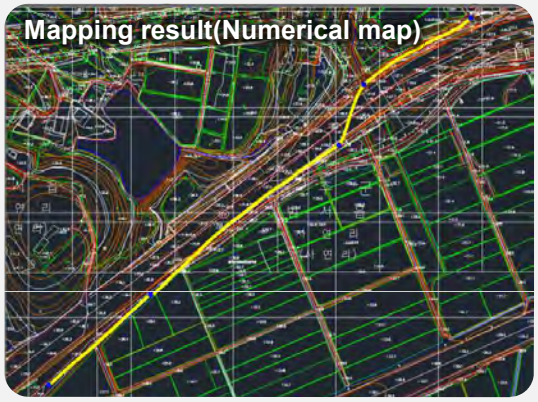
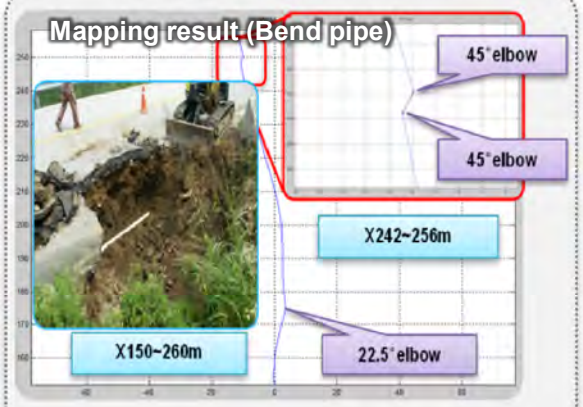
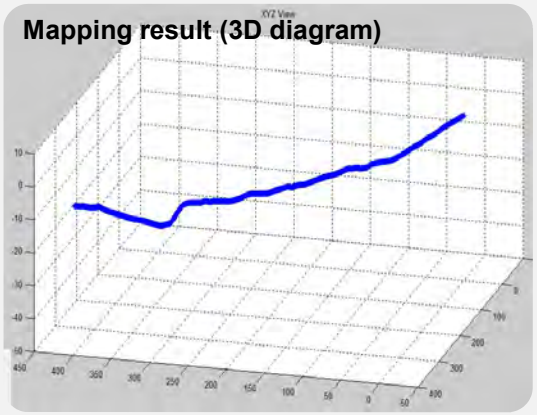
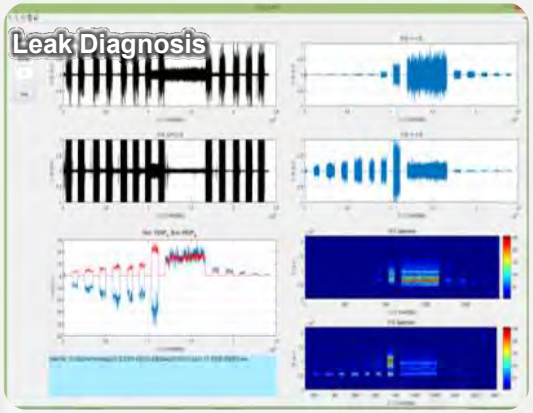
III. Precise Examination

Pipecare System ™ Application Results









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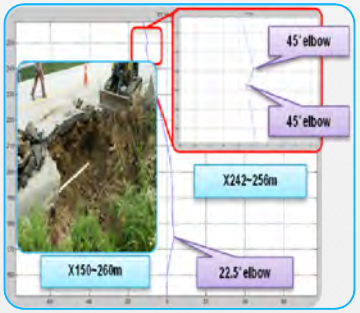
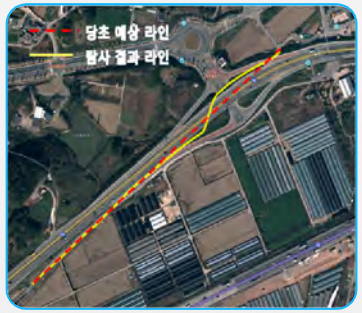
III. Precise Examination

Pipecare System ™ Seven Field Application

City	diameter (mm)	Pipe Material	Distance(m)	Note
J-City	200	HI-3P	668	Result verifier [within range]
U-City	300	DCIP	540	Pipe mapping due to road construction
N-City	300	DCIP	1,393	Application of 1,000m water pipe
P-City	350	DCIP	137	Application of river cross section
S-City	200	DCIP	274	Comparative analysis with existing pipe GIS
N-City	400	DCIP	743	Application of diameter 400mm water pipe
G-City	300	SP	950*2	PFP steel tube imaging diagnosis



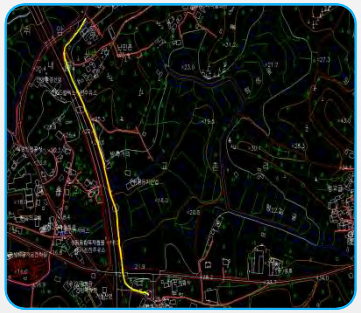
J-City



U-City

N-City

P-City


N-City

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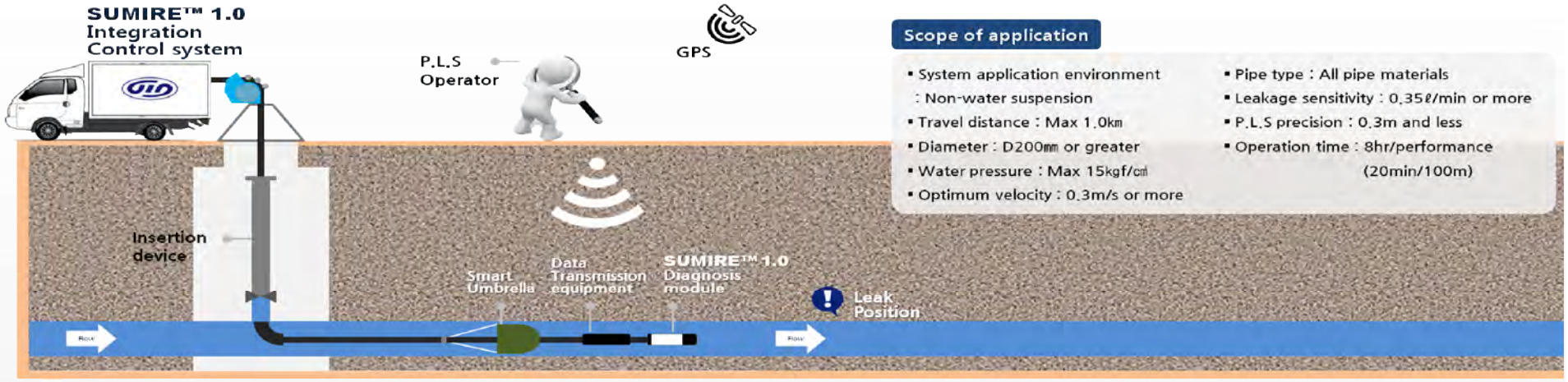
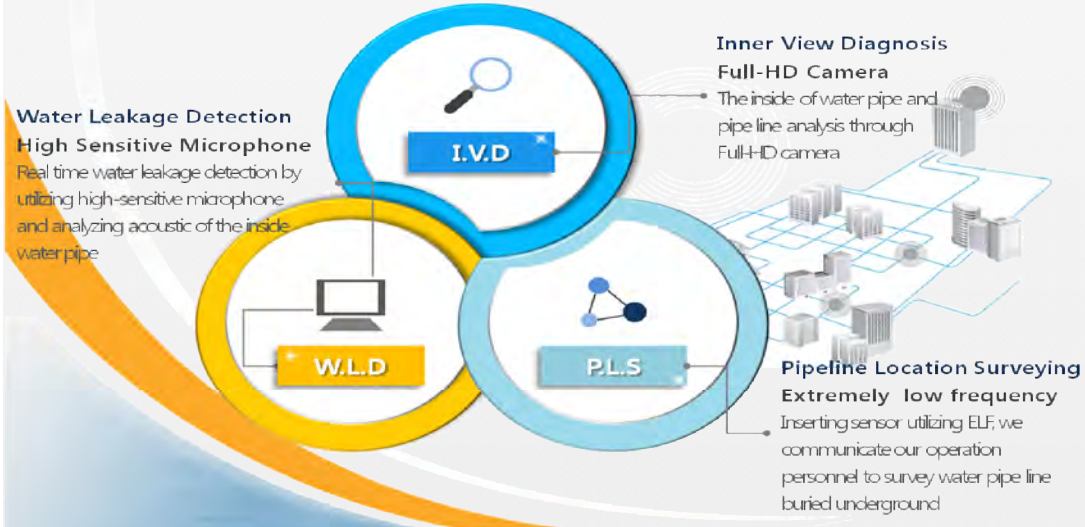
III. Precise Examination

SUMIRE System ™ Overview



Scope of application

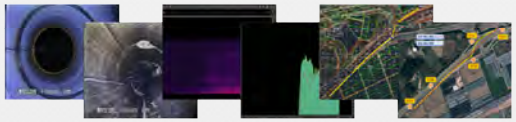
- System application environment : Non-water suspension
- Travel distance : Max 1.0㎞
- Diameter : D200㎜ or greater
- Water pressure : Max 15㎏f/㎠
- Optimum velocity : 0.3m/s or more
- Pipe type : All pipe materials
- Leakage sensitivity : 0.35ℓ/min or more
- P.L.S precision : 0.3m and less
- Operation time : 8hr/performance (20min/100m)



Water Leakage Detection
High Sensitive Microphone
Real time water leakage detection by utilizing high-sensitive microphone and analyzing acoustic of the inside water pipe

Inner View Diagnosis
Full-HD Camera
The inside of water pipe and pipe line analysis through Full-HD camera

Pipeline Location Surveying
Extremely low frequency
Inserting sensor utilizing ELF, we communicate our operation personnel to survey water pipe line buried underground



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III. Precise Examination

SUMIRE System ™ Seven Field Application

City	Diameter(mm)	Pipe Material	Distance(m)
B-City	250	DCIP, HI-3P	530
Y-City	150~400	DCIP, PE	1,700
G-City	150	CIP, DCIP	1,200
S-City	400	SP	500
J-City	300	DCIP	600
N-City	150~200	DCIP	810
Saudi Arabia	400	Asbestos	1,200




II. General Examination

Precise Examination result

The resulting image

Pipecare System ™

SUMIRE System ™

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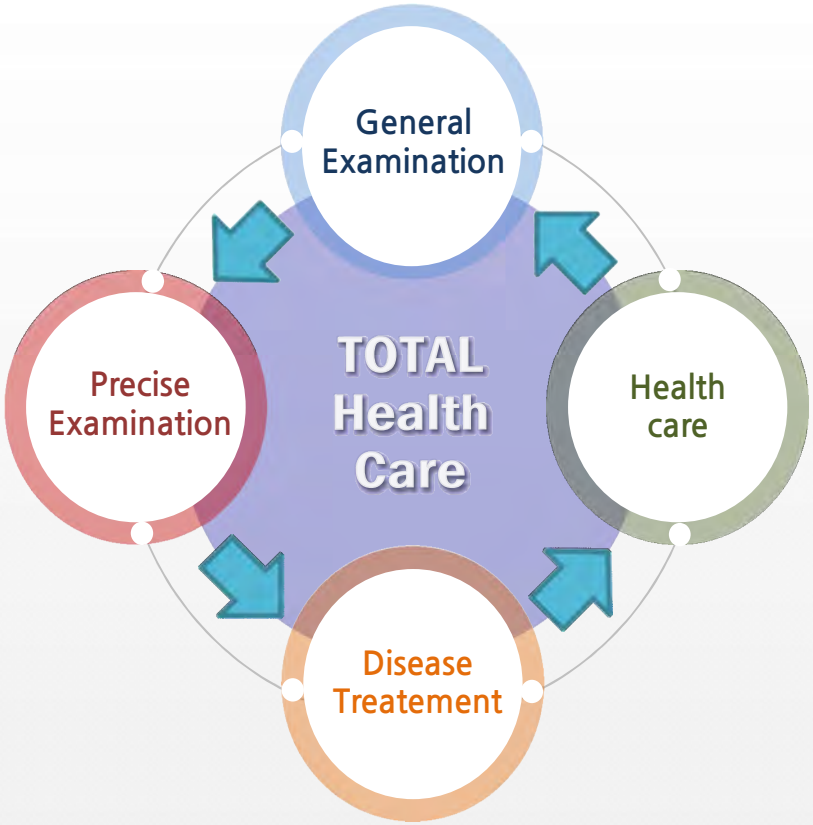
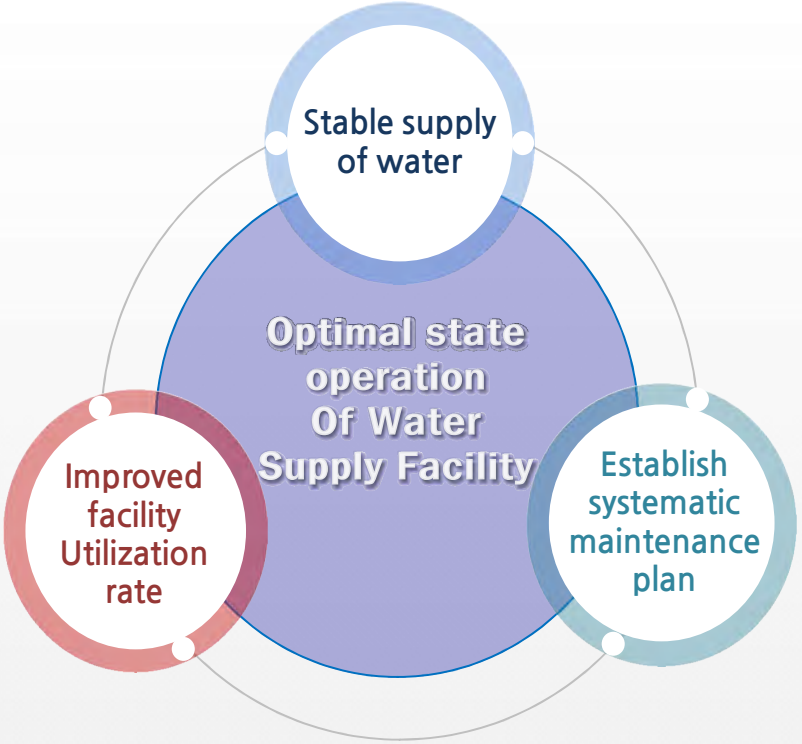
IV. Conclusions

Expected effects





1. Cost reduction and technology accumulation
2. Prevention and recovery of incidents
3. Reduce water leakage and improve water quality
4. Improving water facility safety

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IV. Conclusions

- WARECO developed pipe location system for mapping system using gyro and acceleration sensor.
- The new system was successfully applied to pipeline with big diameter, pipeline crossing highway and a river.
- Duplicate test showed high accuracy and precision.
- The new system also has pipe inspection capability using CCD camera and hydrophone.
- Leak detection and locating is possible using leak sound analysis.
- This project was part of Gbest project

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감사합니다.

THANKS VERY MUCH.

WARECO
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