

Introduction of AIoT Management Platform in water treatment plant

Dr. Shan-Shan Chou (周珊珊), Secretary General/WAOT
Dr. Bo-Chuan Cho (卓伯全), CTO/GSD

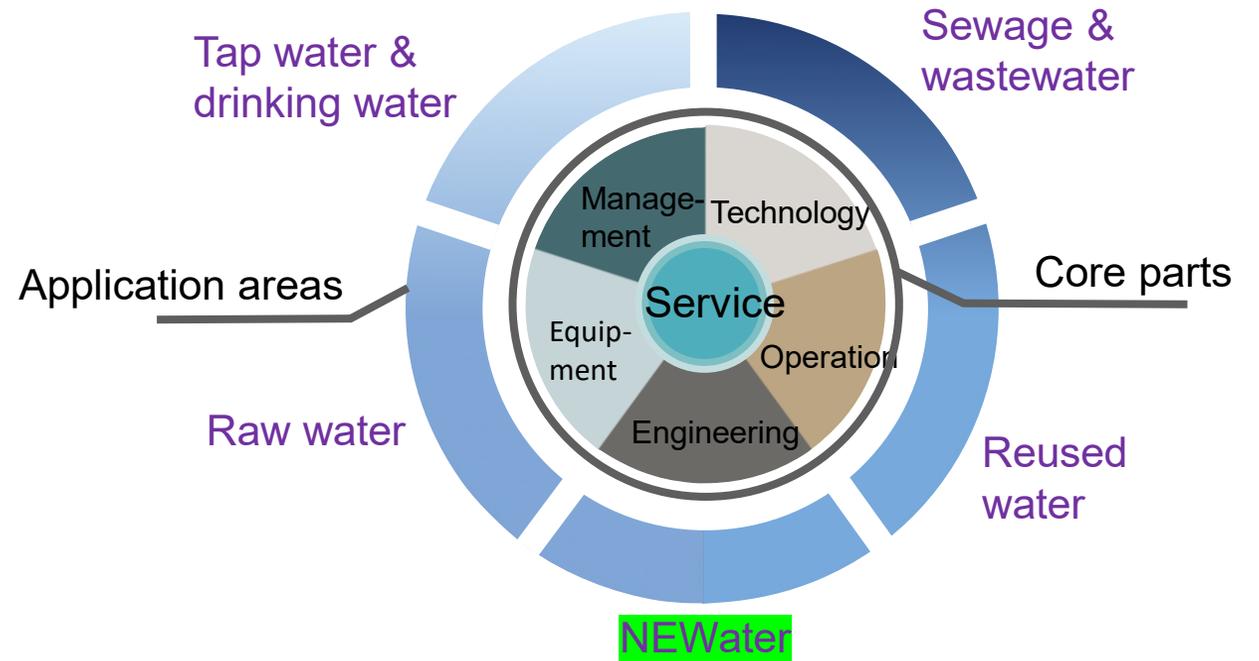


GSD Technologies Co., Ltd.
Taiwan Branch



Introduction of Water Affairs Organization (Taiwan)

- Close co-work partner with industry, government department, university, and institute to promote water industry
- Exchange platform of international and domestic water business
- Promotion of new technologies & equipments about water affairs
- Leverage bridge with supply and demand of water affairs



Information & technology exchange platform

We sincerely invite you to join the community

Logos of partner organizations and government agencies include:

- 水之源企業股份有限公司 (WaterPark Environment Corporation)
- 環興科技股份有限公司 (SNOTECH ENGINEERING SERVICES LTD.)
- 行政院環境保護署 (Environmental Protection Administration, Executive Yuan, R.O.C. (Taiwan))
- 臺北自來水事業處 (TAIPEI WATER DEPARTMENT)
- 山林水環境工程股份有限公司 (FOREST WATER ENVIRONMENTAL)
- Stantec (美商史丹明工程顧問(股)份有限公司 / Stantec Consulting Services Inc.)
- 經濟部水利署 (Water Resources Agency, MOEA, Taiwan, R.O.C.)
- 淡達科技有限公司 (LDA SCIENTIFIC LTD. COMPANY)
- 中宇環保 (CHINA ECOTEK)
- 台灣區環境保護工程專業營造業同業公會 (TAIWAN ENVIRONMENTAL ENGINEERING ASSOCIATION)
- YEEA
- 基士德科技股份有限公司 (GSD Technologies Co., Ltd.)
- 工業技術研究院 (Industrial Technology Research Institute)
- 財團法人環境與發展基金會 (Environment and Development foundation)
- 國立交通大學 (National Chiao Tung University)

Water Resources AloT Management Platform

Complete
full-cycle
management of
water treatment
system

Purpose

Programs

- ❖ Intelligent process remote control
- ❖ Equipment empowerment to improve efficiency
- ❖ Preventive maintenance & active warning
- ❖ Precisely dosing to reduce cost
- ❖ Trend analysis & full observation
- ❖ Safe water quality & stable water supply

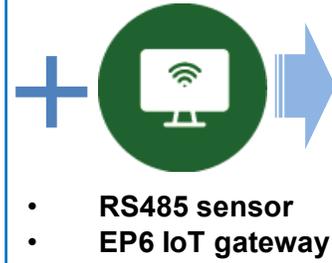
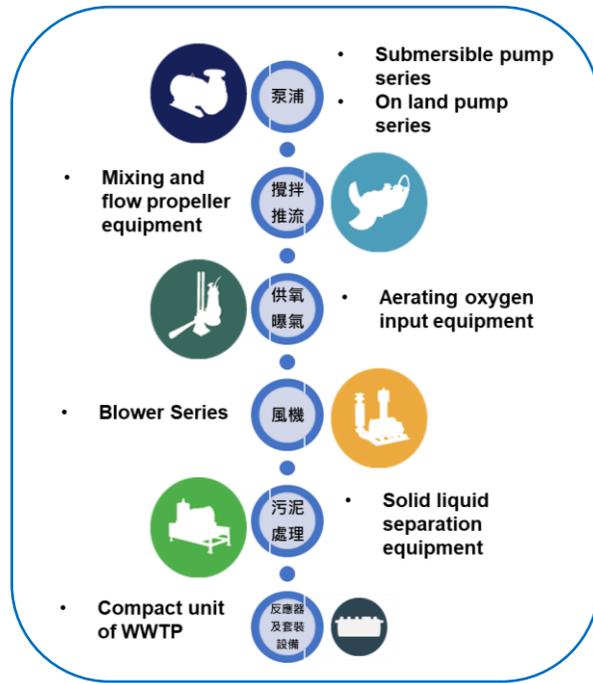
Strategies

- ❖ Equipment Empowerment
- ❖ AloT Process Control

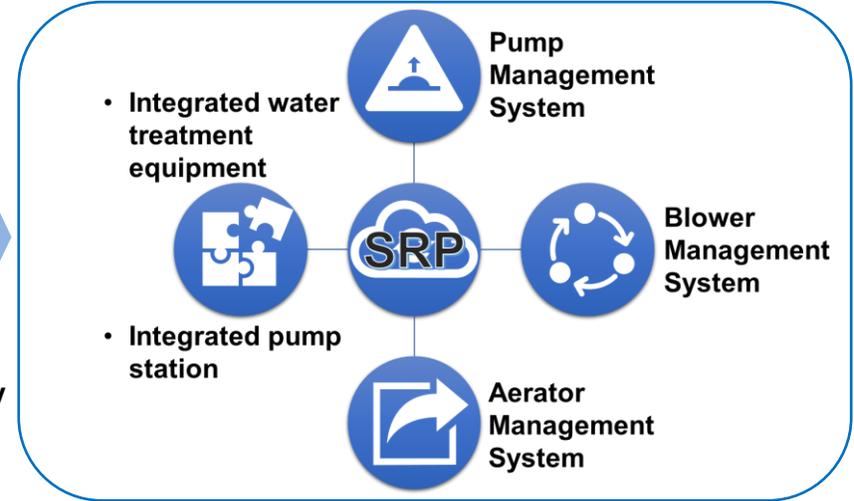
Objectives

- ❖ Equipment life extension
- ❖ Operational optimization
- ❖ Energy and cost saving
- ❖ E Inspection

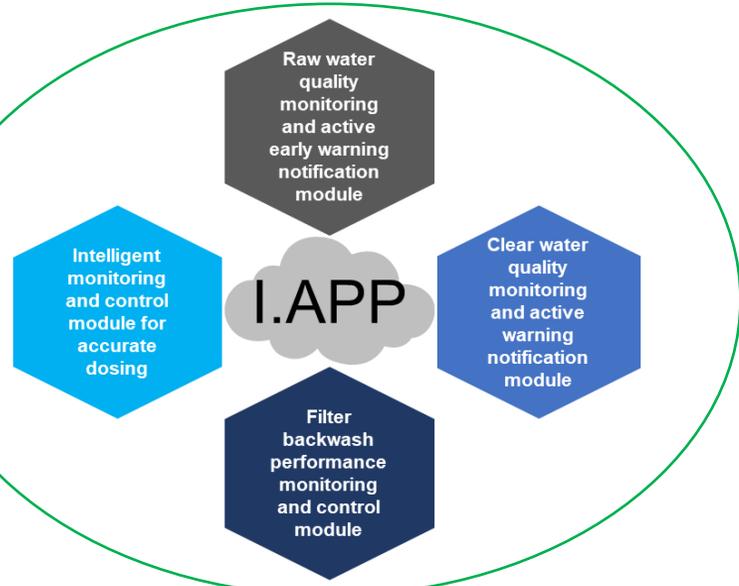
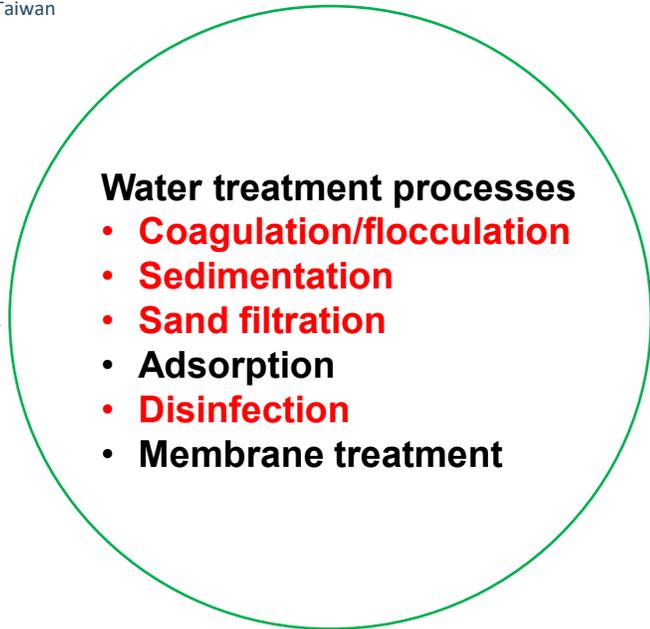
Equipment Empowerment



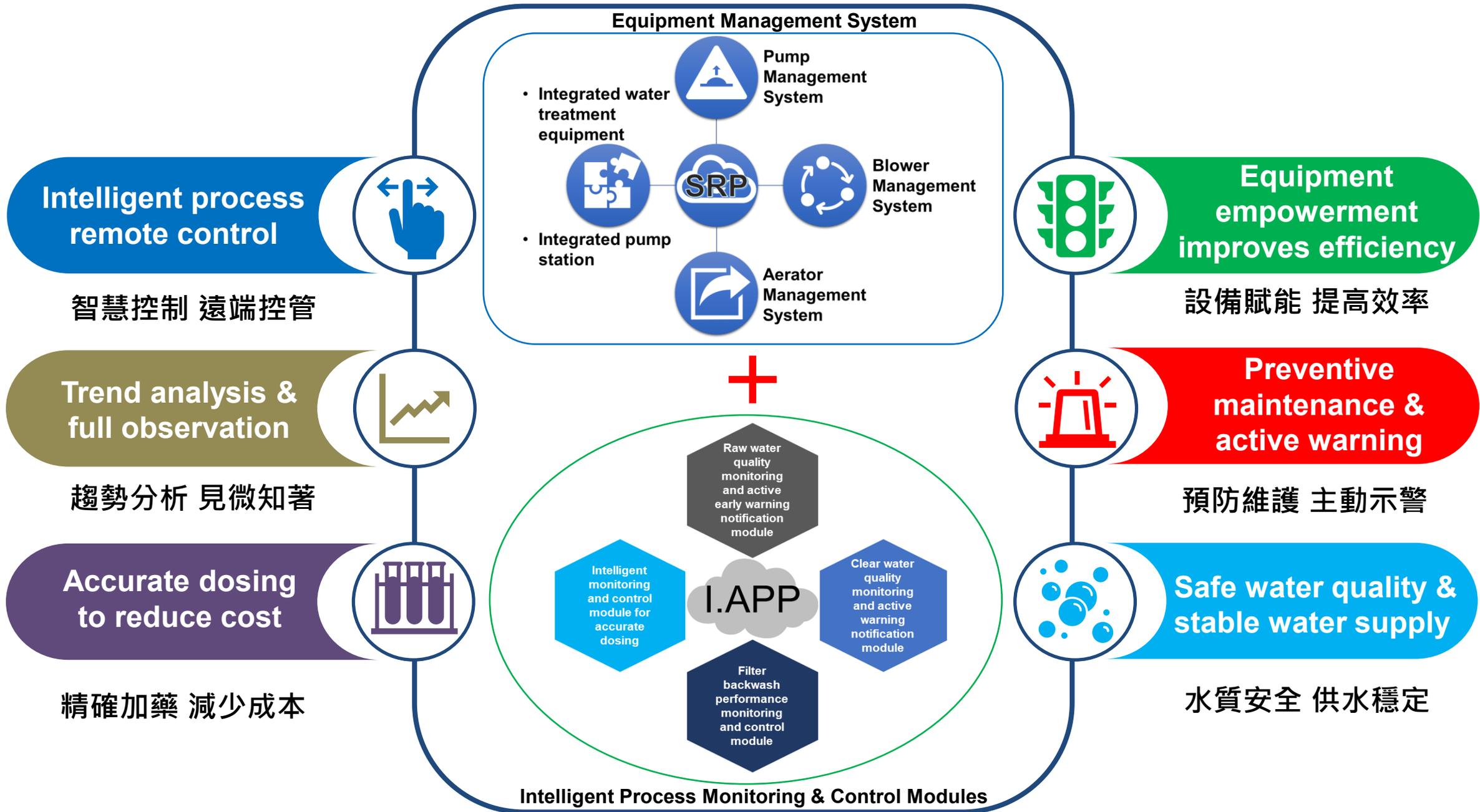
Equipment Management System

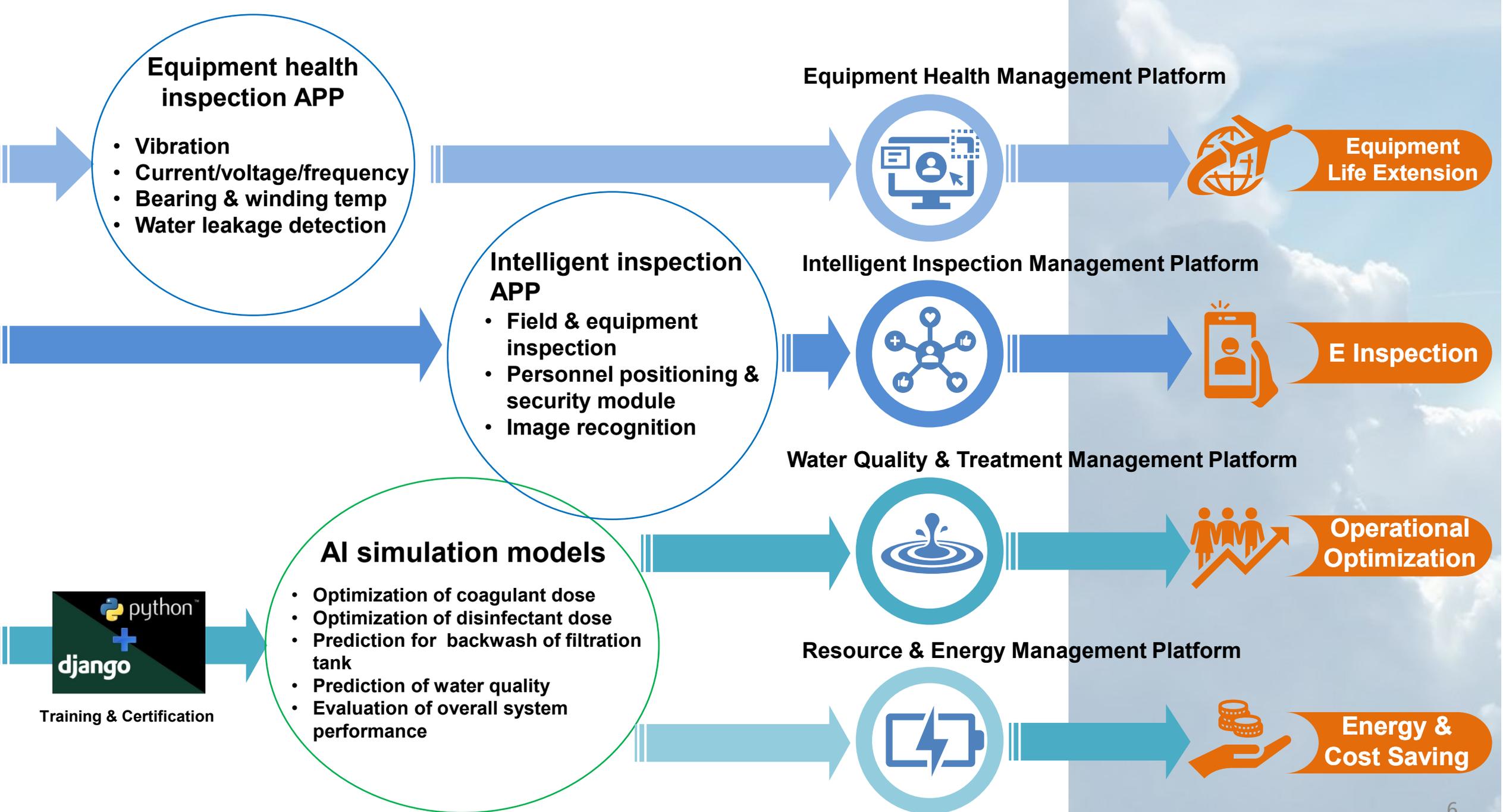


AIoT Process Control



Intelligent process monitoring & control modules





Decision-making Layer

- Water Resources AIoT Management Platform



Monitoring & Control Layer

- Central integrated management system



- Remote monitoring & control
 - Equipment management
 - Maintenance forecast
 - Performance evaluation
 - Energy optimization
 - Cost optimization
- Intelligent monitoring and control / edge computing / AI control
 - Visual monitoring control record display
 - Abnormal diagnosis / exclusion record
 - Equipment failure alarm / sign-off / maintenance record
 - Real-time/historical data query and trend chart
 - Big data archive

Transmission Layer

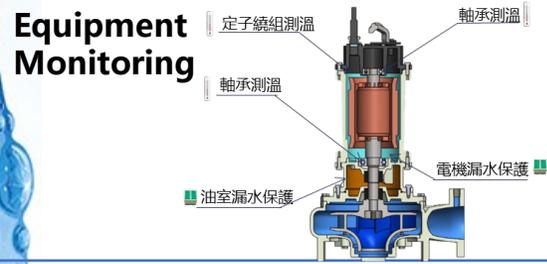
- IoT Monitoring & Control Management System



- Real-time data acquisition / storage / transmission / monitoring
- Automatic scheduling / SMS control equipment
- Get information/device status via SMS
- SMS alert notification

Perception layer

- Equipment Monitoring
- Water Quality Monitoring



Water Quality Sensors



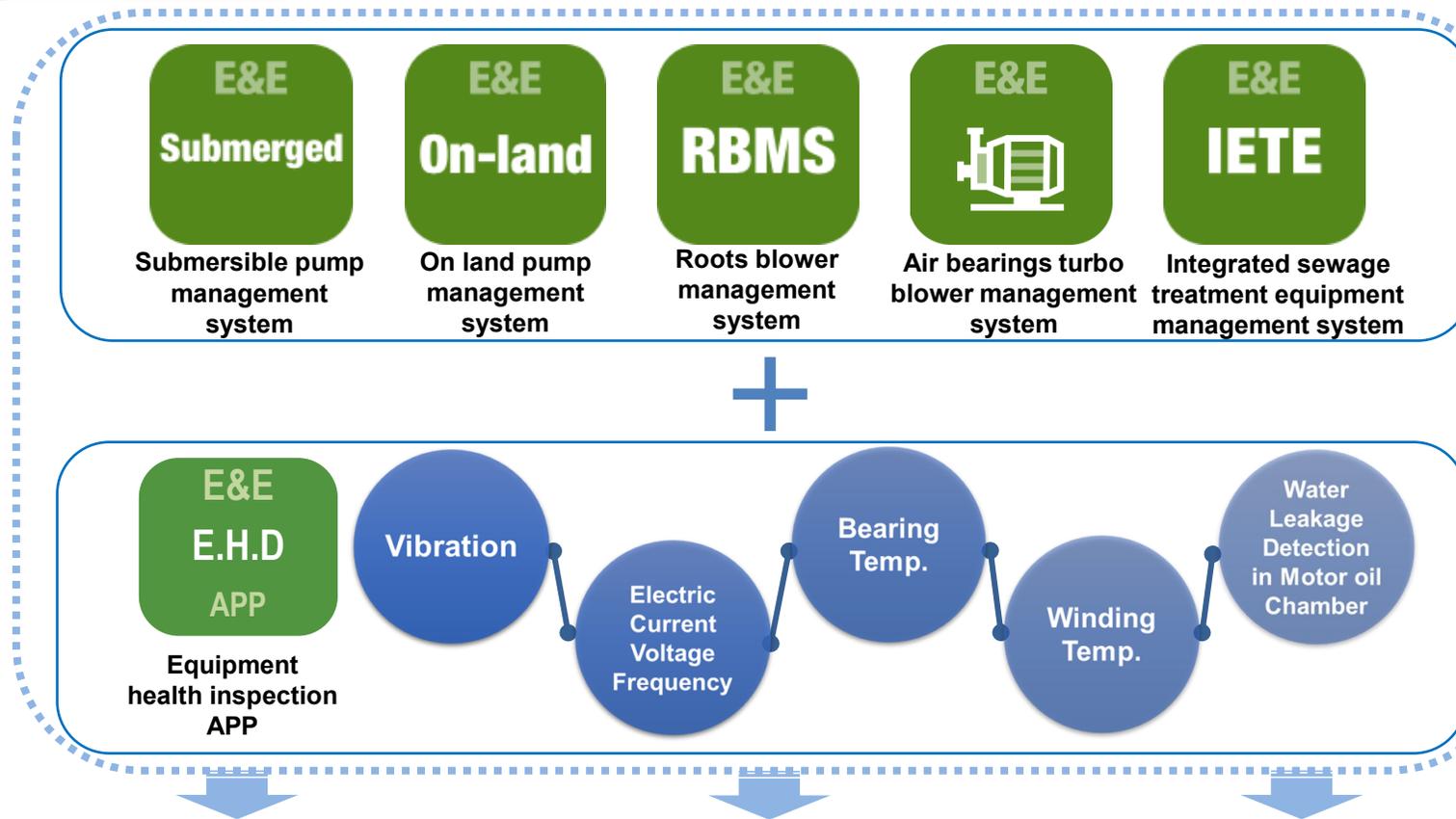
Equipment Layer

- Series of water treatment equipment





Equipment Life Extension



- Equipment operation record
- Equipment/consumable life estimation
- Regular maintenance execution
- Preventive maintenance bulletin
- Abnormal diagnosis suggestions
- Equipment energy saving optimization plan
- Equipment replacement plan

Stand-alone Equipment Management

- Real-time control of equipment status
- Before equipment failure, alarm to notify maintenance
- For professional technical service team to provide settings, maintenance, technical improvement, equipment optimization suggestions

Multi-equipment Centralized Management

- Quickly build and manage multiple smart equipment.
- It saves time and efforts as there is no need for special software.
- Connecting with the PLC system, the existing control system is upgraded, with function of alarm and remote monitoring functions in case of abnormal events.

Integrated Equipment Management

- Achieving remote monitoring of processing equipment, abnormal alarms, to minimize inspection personnel or even unattendance.
- Built-in 4G module facilitates management of sewage treatment equipment in remote areas.
- Administrators can login to the web page to add new sites by themselves, with no specialist is required to modify program and proofreading.



E Inspection

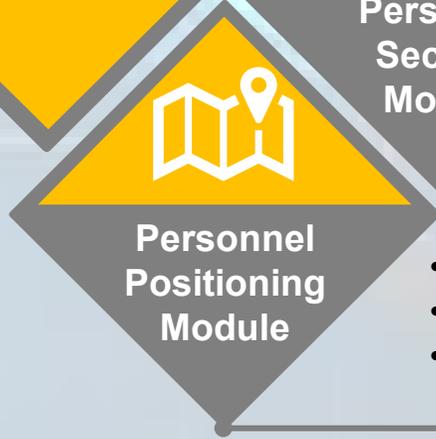
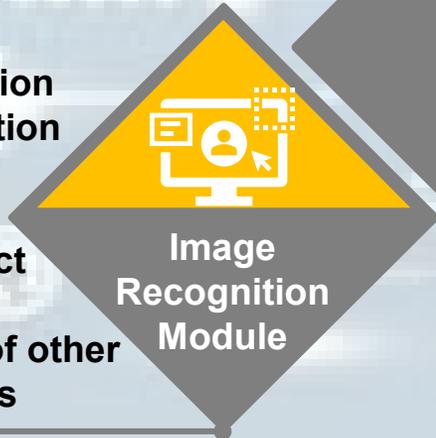
- Real-time operation information capture
- Real-time measurement, analysis and diagnosis
- Diagnostic report management



- Mobile QR code login
- Flexible checklist settings
- Real-time progress feedback

Intelligent Inspection

- Face recognition
- Safety protection equipment identification
- Hanging object identification
- Recognition of other unsafe actions



- Faint judgment
- Inactivity alert
- Fall judgment
- Fall alert
- Distress alert

- GPS satellite positioning
- iBeacon triangulation
- AI KNN nearest neighbor positioning

- ❖ Accurate detection failure factors hidden to arrange preventive maintenance in advance.
- ❖ Patrol inspection no longer just pass, but patrol according to items scanned.
- ❖ Precise positioning, toxic gas detection and safety risk control throughout full process to ensure personnel safety.
- ❖ Identification of identity/object/unsafe actions for quick detection of risk warnings.

Intelligent Inspection Management Platform



安全智能-人員安全監測系統:有限空間場所作業危害預防

全球第一套依照 ISO 標準與受限空間法令要求設計的人員安全警示系統





Operational Optimization

Intelligent process monitoring and control modules

原水水質
監測及主動預警告
知模組

Raw water
quality

精確加藥
智能化監
測控制模
組

I.APP

清水水質
監測及主動預警告
知模組

Clean water quality

濾池反洗
成效監測
控制模組

Performance of
filtration backwash

+

濾池反洗
AI推論模
型

Prediction for
backwash of
filtration tank

混凝劑加
藥量AI推
論模型

Optimization
of coagulant
dose

消毒劑加
藥量AI推
論模型

Optimization
of disinfectant
dose

AI

AI simulation
model

整體成效
評估AI模
型

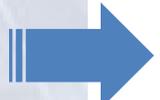
Evaluation of
overall system
performance

水質預測
AI模型

Prediction of
water quality

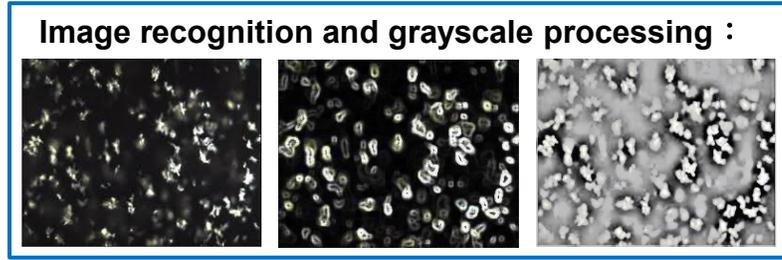
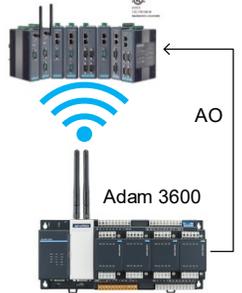


Precisely dosing
精確加藥



水質安全
Safety of
water quality

Precise dosing intelligent control module



混凝劑加藥量AI推論模型

AI module of coagulant dose

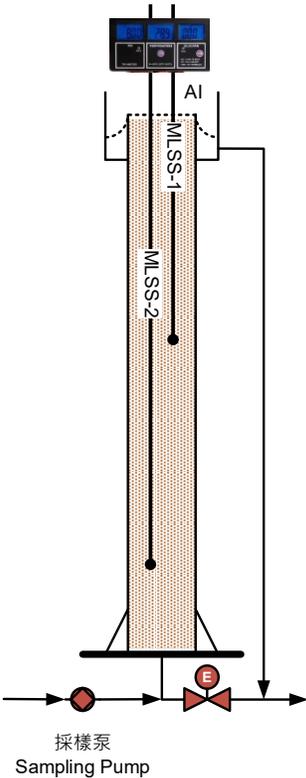
Coagulant dosage control

精確加藥
智能化監測控制模組

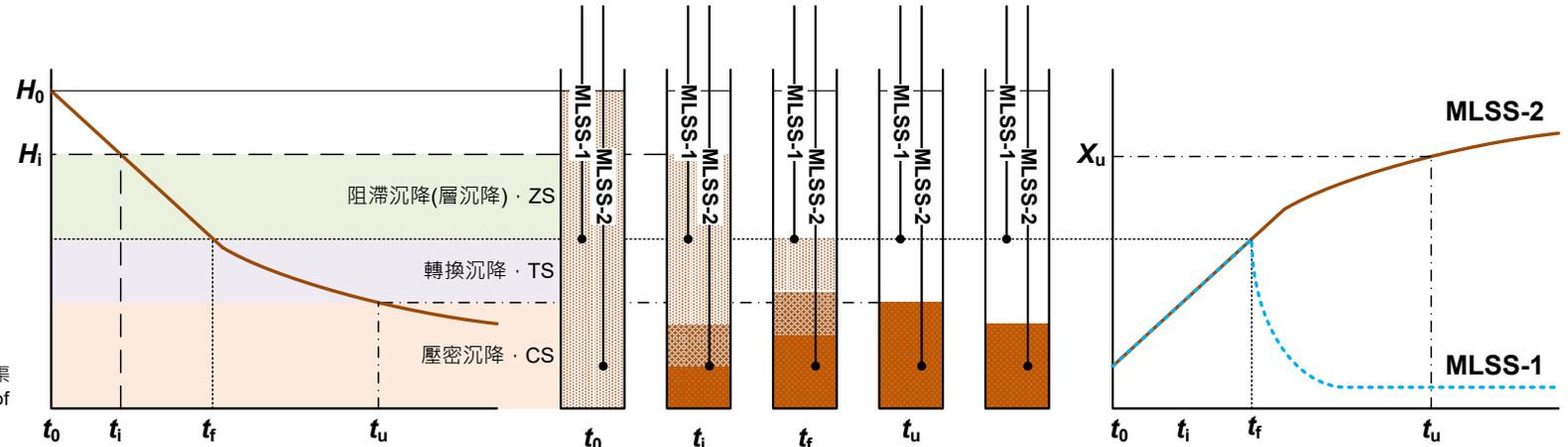
Optimization of coagulant dose

污泥沉降性監測

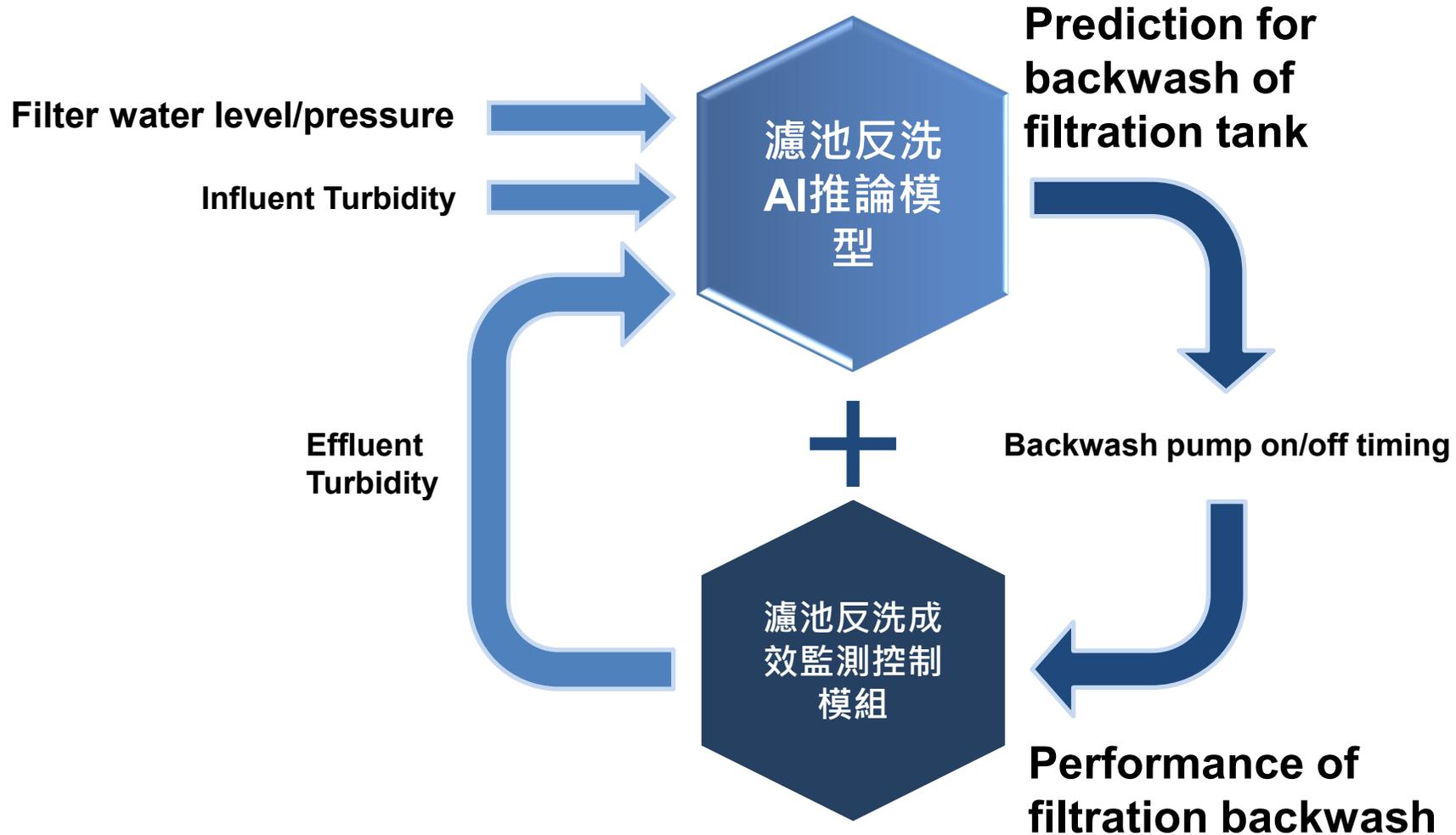
採樣自沉澱池進流水
Sampling From Sedimentation Influent



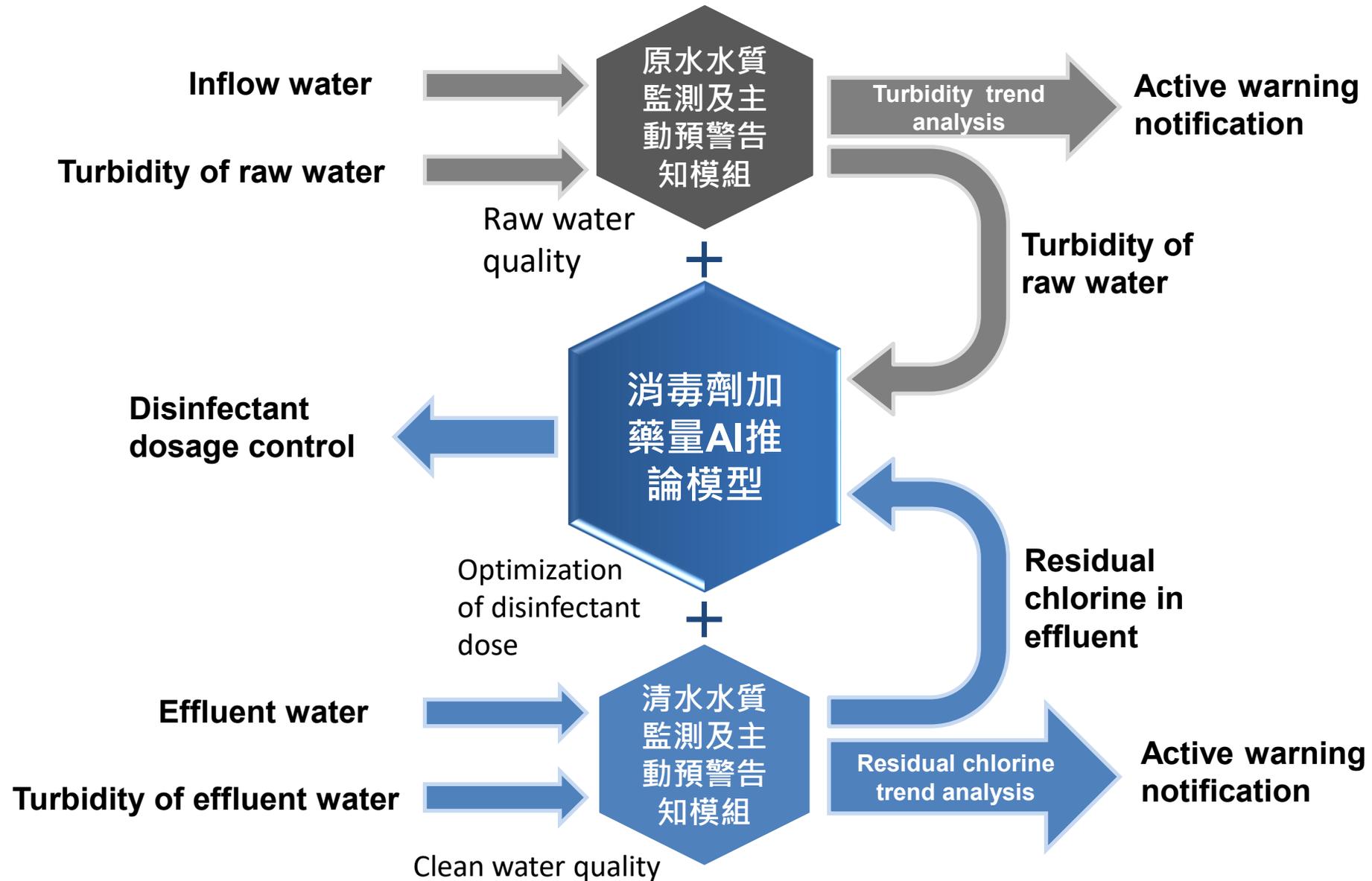
排放至沉澱池進流渠
Discharge to Inlet of Sedimentation



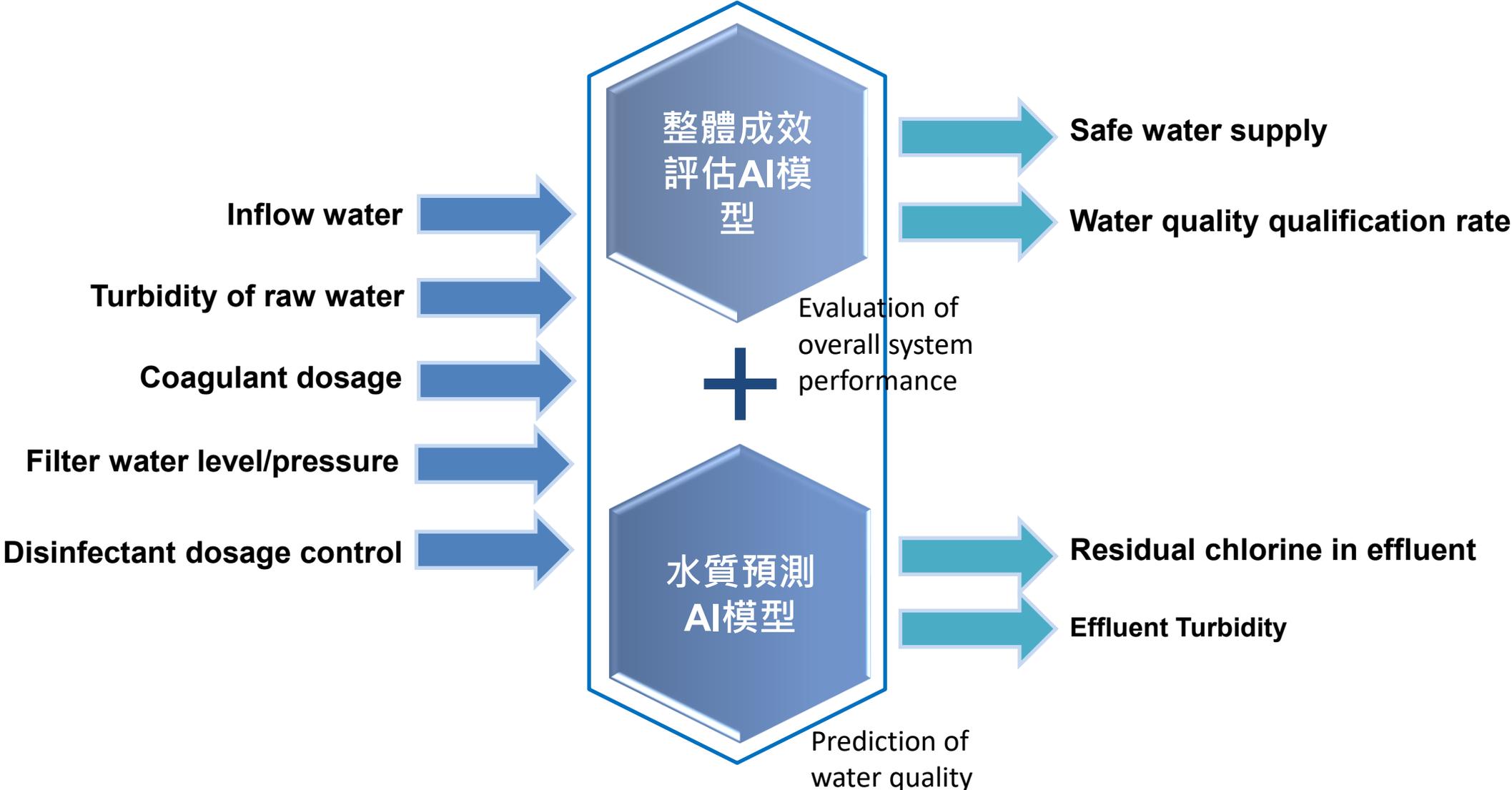
Filter backwash intelligent monitoring and control module



Disinfectant dosing intelligent control module



Comprehensive performance evaluation and water quality prediction AI model



Energy & Cost Saving

Electric energy monitoring data for main energy-consuming power equipment

Operation optimization program power equipment power monitoring data

Management data for material, chemical, consumables and PSI (purchase, sales and inventory)

Registration information for operation record and working hours



- ❖ Energy overview
- ❖ Energy performance index
- ❖ Energy KPI Management Plan
- ❖ Energy demand forecast
- ❖ Real-time power consumption information
- ❖ Power consumption statistics for the first 6 months
- ❖ Electricity statistics
- ❖ Energy consumption trend analysis
- ❖ Historical data query

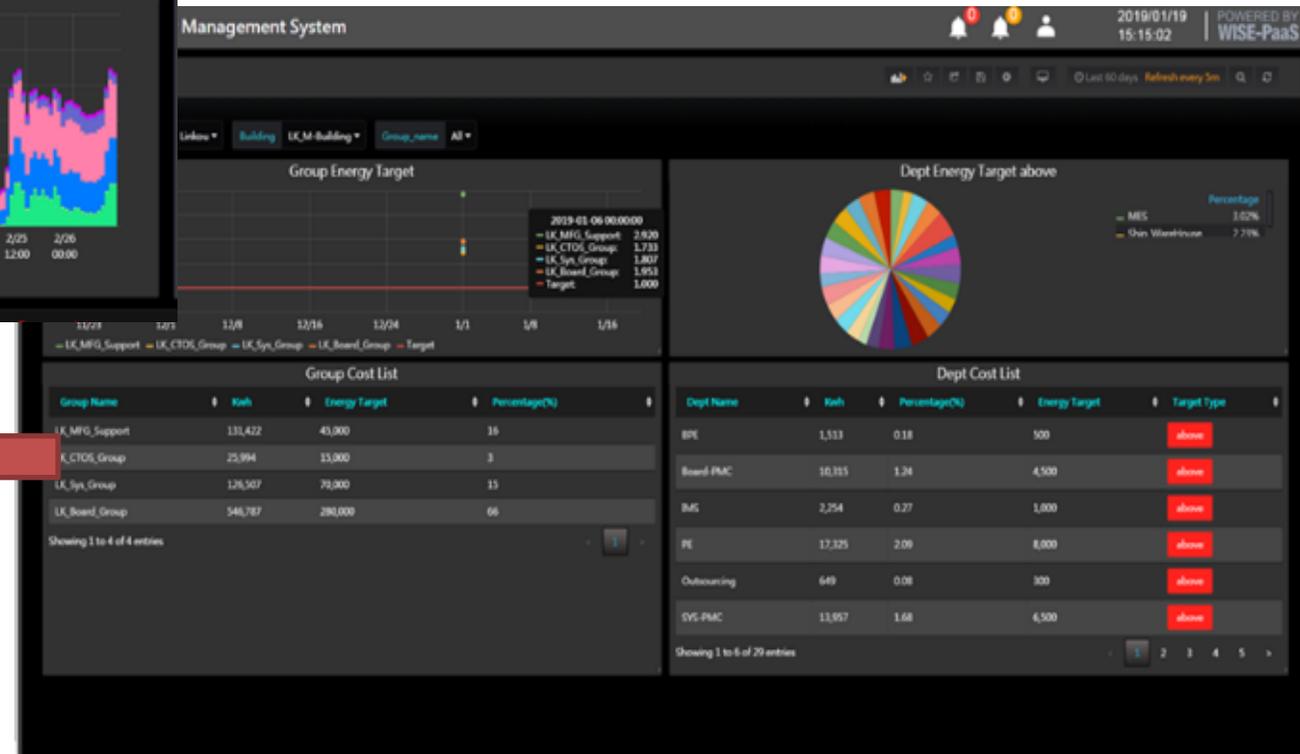
- ❖ Material consumption cost analysis
- ❖ Chemical consumption cost analysis
- ❖ Cost analysis of equipment maintenance loss
- ❖ Operation and maintenance labor cost analysis
 - ❖ Patrol site manpower
 - ❖ Inspection manpower
 - ❖ Operation manpower
 - ❖ Maintenance manpower
 - ❖ Abnormal accident handling manpower

Energy Management Platform



For example, through the "Energy Consumption Overview", you can monitor the accumulative power consumption of each district, and know which unit, equipment or area the power consumption comes from, and find out the unreasonable energy consumption after comparing the differences between the districts; For high power consumption equipment (such as blowers), the power consumption profile can be monitored.

Through the "Energy KPI Management", the total power consumption can be allocated to each unit, so as to formulate energy-saving KPIs, and review the rationality of power consumption with the energy-consumption responsibility system. Consolidation and analysis of energy-related data, so as to know processing efficiency from changes in energy consumption.



Thanks for Your Listening!