



RM-IoT-B

Rotor Monitoring System-
Internet of Things-Battery



Wireless Rotor Health Monitoring System- Battery

- Rule-based rotor management
- Custom alarm threshold
- AI degradation inference trend
- Mobile APP remote synchronization

Pain points that RM-IoT-B solves



Machine hard to reach:

Sometimes machine location is a problem, overhead & scattered can add more difficulties to your inspection conduction.



Safety concerns:

Employees are always precious assets to the company. You would never put your workers into hazardous working environments for data collecting, eg. High temp, the potential to explode.



Spare inventory waste:

Scientific analytics assist in an appropriate spare stock management.



Alternative to pricy manpower:

Intensive inspections conducted manually can be very costly and the analytic result can vary from one to another depending on their professional knowledge. Machines never complain or are late, always accurate according to your settings.

RM-IoT-B features introduction

1

Easy operation

Within 1hr product training
averagely, users are ready to
get started.

2

No restriction

All rotors are good for
adopted and gradually
expanded.

Easy operation



No restriction



Low cost



Fast deployment

4

Low cost

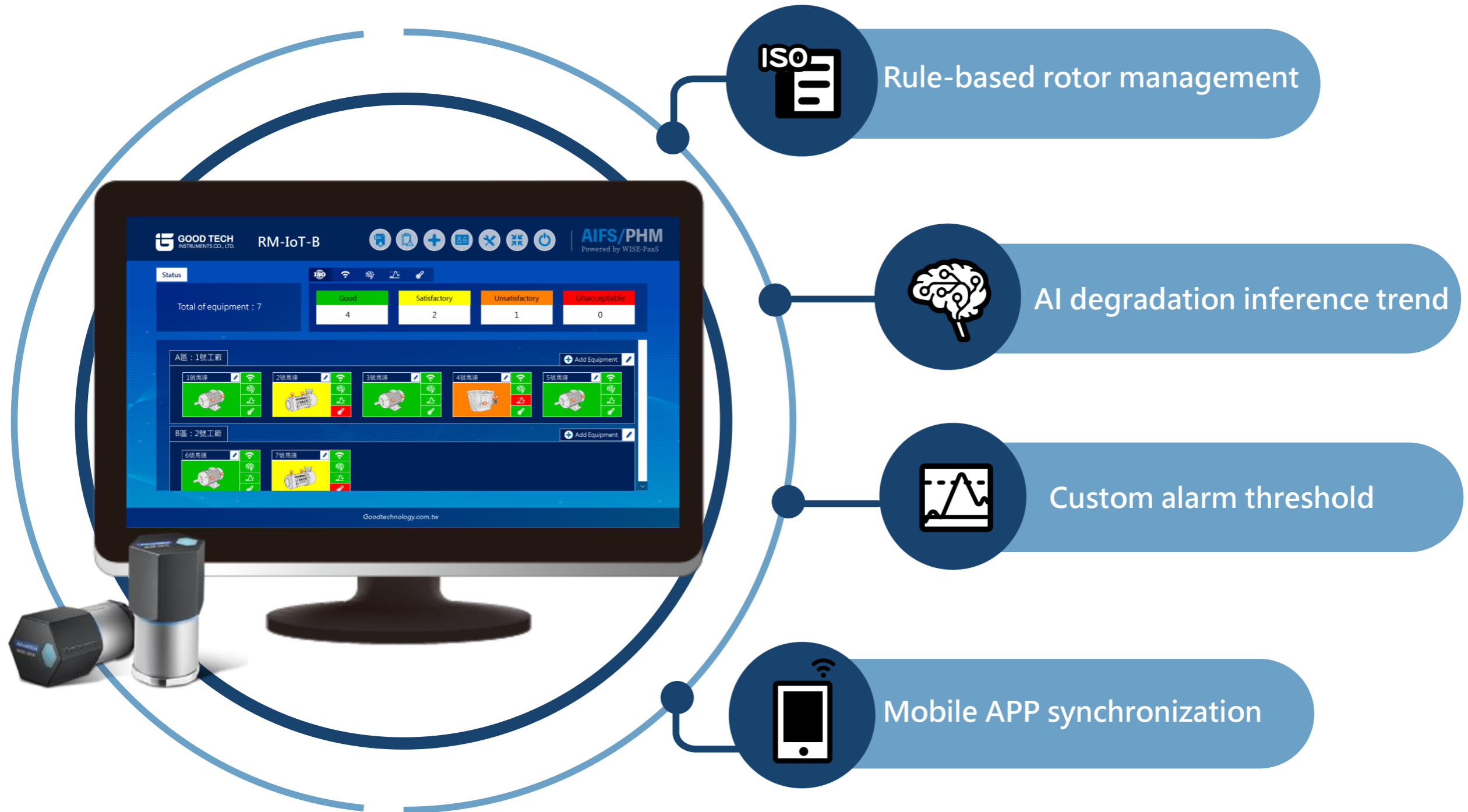
No wiring, piping
engineering cost and effort.

3

Fast deployment

Hundreds of measurement
points building up within 3
days.

RM-IoT-B functionality



Function introduction: Rule-based rotor management



GOOD TECH INSTRUMENTS CO., LTD. RM-IoT-B iMachine/PHM POWERED BY WISE-IoT

Status

Total of equipment : 7

Good	Satisfactory	Unsatisfactory	Unacceptable
4	2	1	0

A區 : 1號工廠

1號馬達 (Good) 2號馬達 (Satisfactory) 3號馬達 (Good) 4號馬達 (Unsatisfactory) 5號馬達 (Good)

B區 : 2號工廠

6號馬達 (Good) 7號馬達 (Satisfactory)

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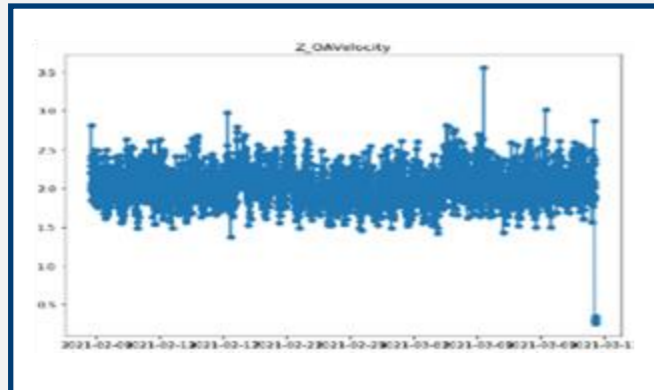


Rule-based rotor management :

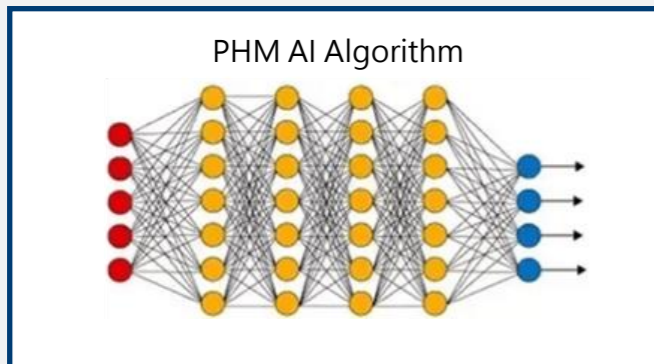
The system-integrated **ISO norms 10816/20816/2372** are applied for all rotating machinery(Motors, Compressors, Pumps) from Semiconductor to conventional manufacturing industries.

No need to memorize machines' criteria values, users can configure the respective regulation criteria according to the power consumption range. Machine health hierarchies are sharp color-coded, and users get to have a glance at the whole plant machine condition by Good, Satisfactory, Unsatisfactory, and Unacceptable levels.

Function introduction: AI degradation inference trend



TWF



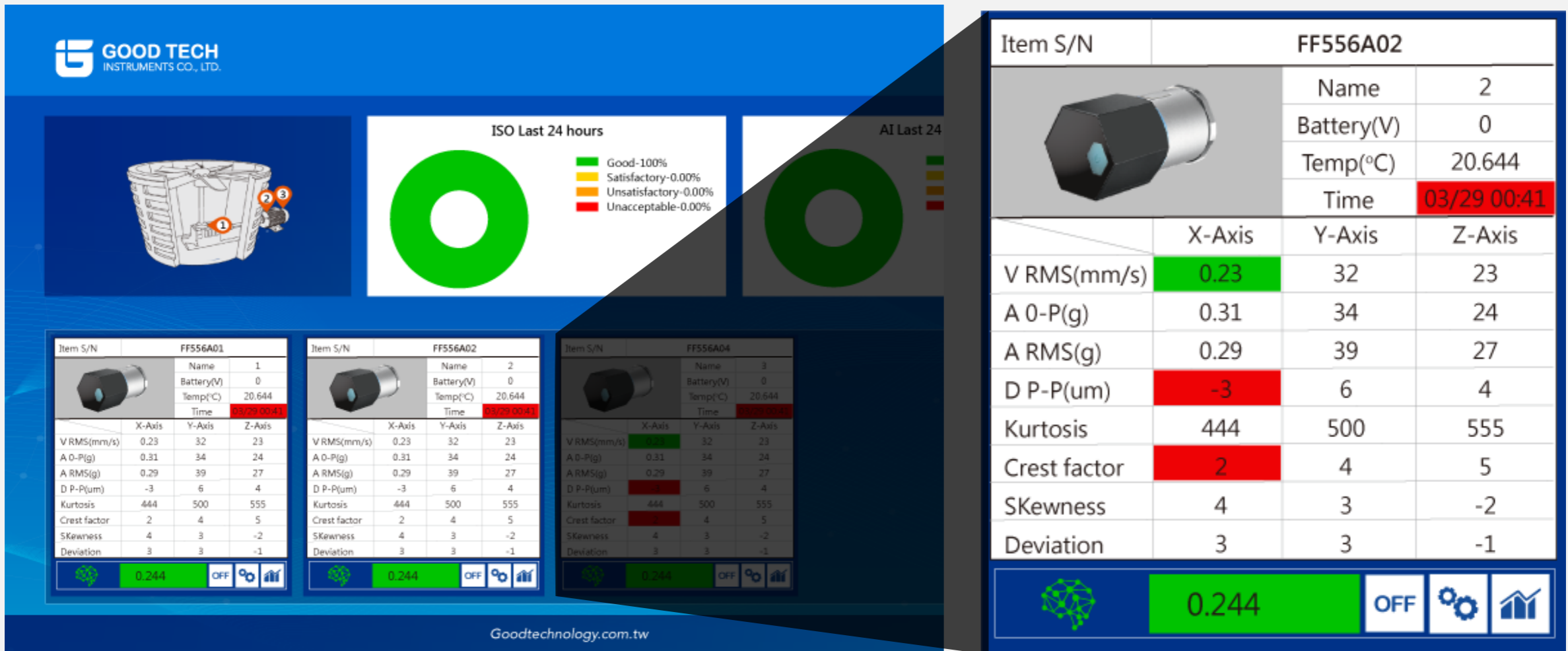
AI model analysis



AI degradation inference trend : (Optional)

Leveraging 25 parameters accumulated and through an AI cross-comparison algorithm, this function not only tells the current degradation level but also the future degradation forecast in 7 days. Intuitive colored displays level machines in Normal, Light, Moderate, and Dangerous, according to which users can schedule and plan maintenance ahead of time for the preparation of spares to avoid long delivery.

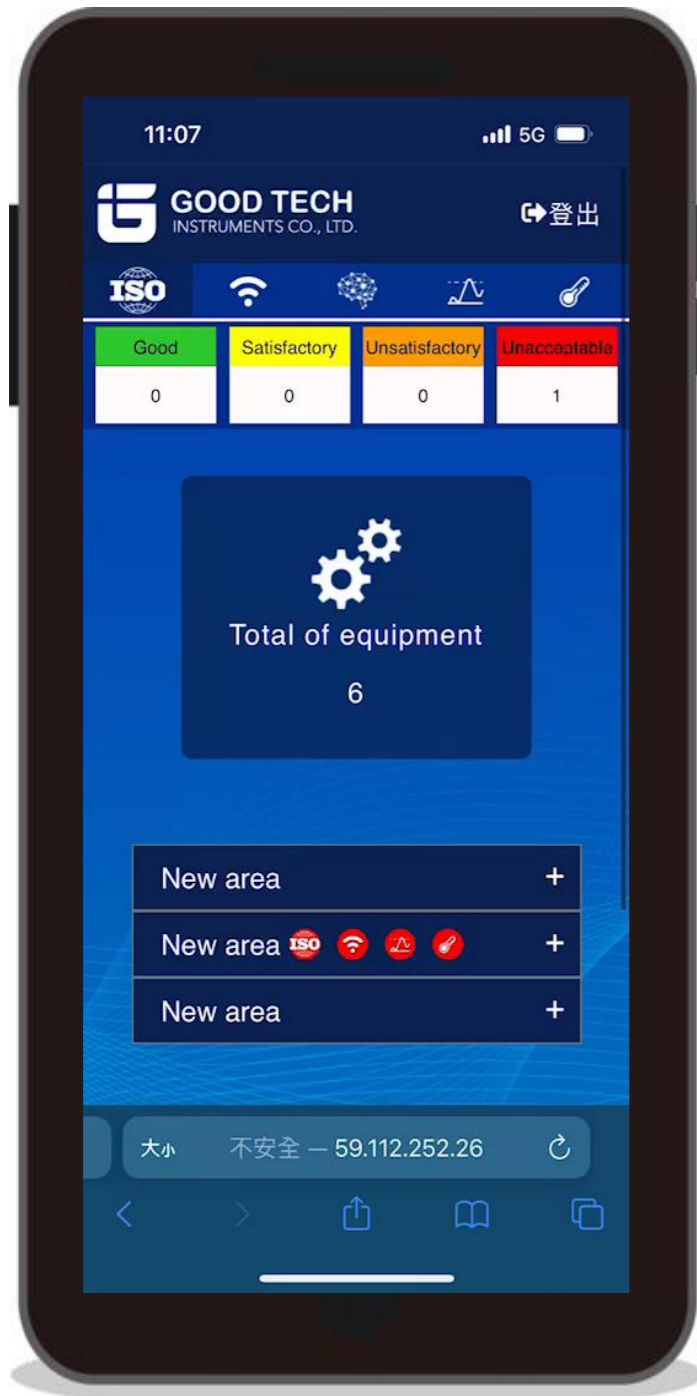
Function introduction: Custom alarm threshold



Custom alarm threshold:

Triaxial MEMS accelerometer collects 25 versatile parameters, including temp., acceleration, velocity, displacement, etc. Users can tailor-make their own threshold limits or follow machine vendors' baselines. When the thresholds get exceeded, the background color will be changed from green to red to initiate the alarm notification.

Function introduction: Mobile APP remote synchronization



Mobile APP remote synchronization: (Optional)

Responsive web programming allows all types of smartphones and tablets logging. Under the circumstances of intranet or fixed IP, you are able to sync with the plant anytime, anywhere.

RM-IOT-B deployment structure

Transmission radius 500m
(Indoors / more blocking obstacles)

LoRa

LoRaWAN

LoRa

Transmission radius 800m
(Outdoors / less blocking obstacles)



Interface to FDC, MES, PHM, SCADA platforms or
Connect with existing PLC systems
to show all parameters in the control room



RM-IOT-B system

IPC



Switch



Wired RJ45 connection



LoRaWAN Gateway

- LoRaWAN gateway supports up to 100-500 nodes
- RJ45 interface for the backhaul connection
- Din rail & wall mount supportive



Wireless sensor

- Powered by 3.6V AA lithium battery (easy to purchase)
- Customized transmit interval(Min. 10-sec to Max. 24-hour)
- Built-in 3 axes accelerometer and thermometer (include 24 characteristic vibration values)
- Wide temp. operation -20 ~ 85 °C
- IP 66 dust-tight and high pressured water jet proof
- Oil proof, anti explosion / Dust proof, anti explosion



Deployment advantage : battery power supply, no wiring quick installation



Notice :

- The inspection points should correspond with the bearing surface directly to avoid any data shielding possibility from the machine cover.
- A rigid connection is a must. Stud type and magnetic pad with adhesive epoxy glue both work.
- Ensure the XYZ is marked on the sensor to map with the direction of the test object. (X: radial; Y: axial, Z: vertical)
- For each individual test object, the sensor mounting location and direction should always be the same.
- Precision instrument inside, tensile stresses must be avoided under all conditions.

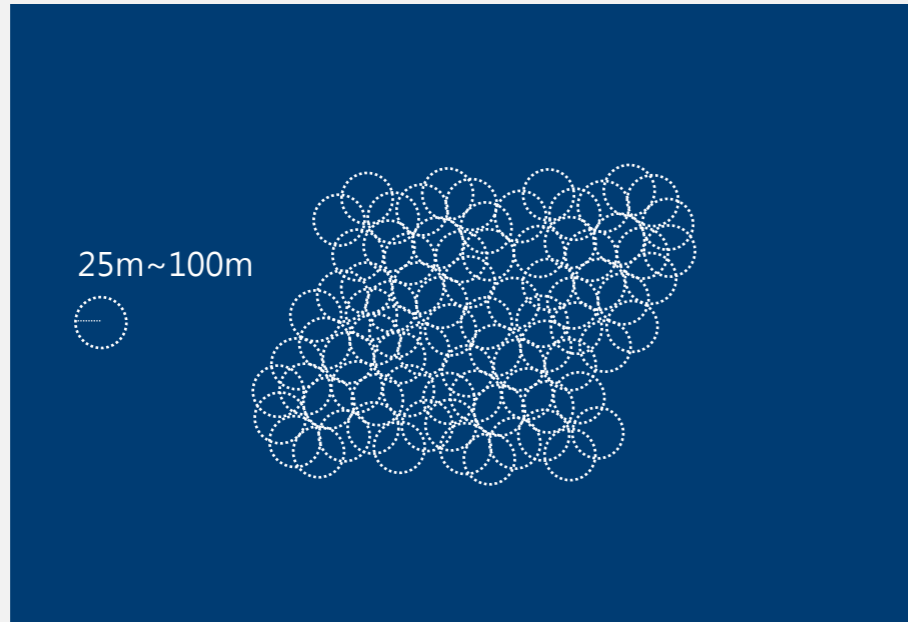
1. Direction

2. Affix

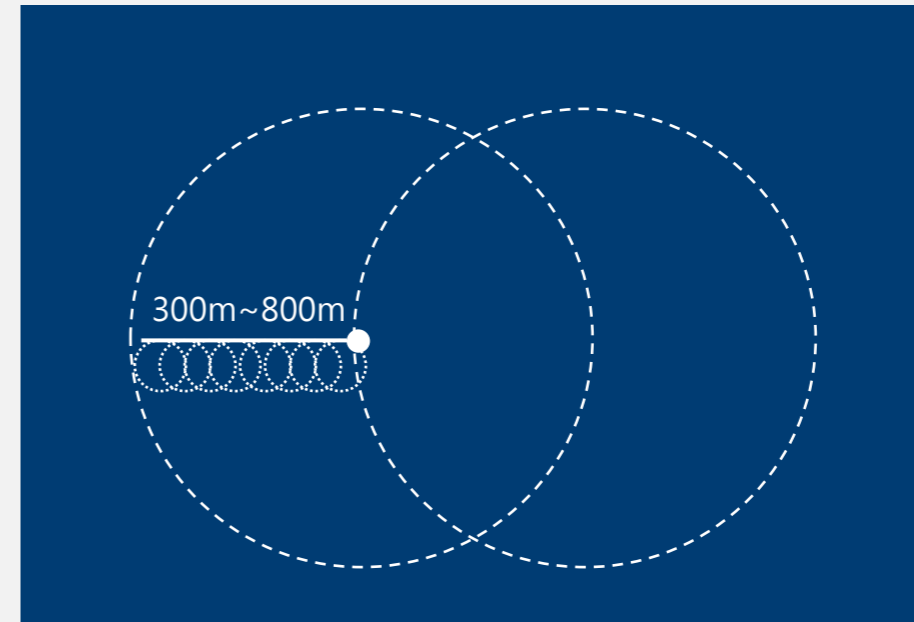
3. Power on

Transmission advantage : LoRa low power wide area network

Wi-Fi/Bluetooth



LoRa



Wi-Fi /Bluetooth transmission distance: 25~100 meter, signal coverage per node is 30 square meter.

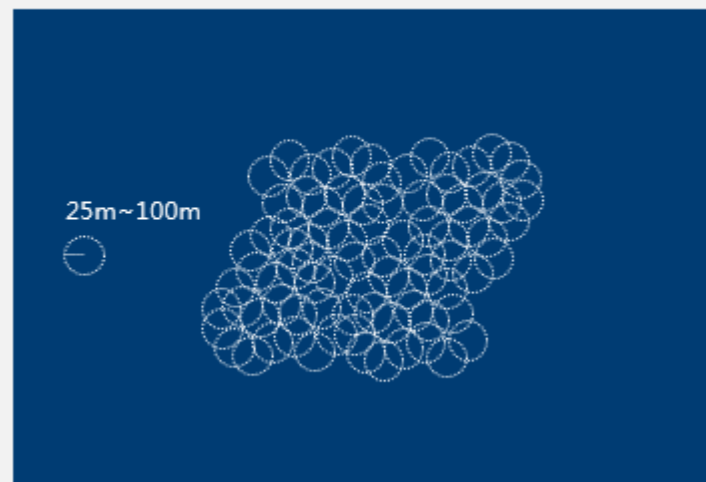
LoRa transmission distance: 300~800 meter, signal coverage per node is 242 square meter.

LoRa outperforms Wi-Fi & Bluetooth “8 times better”.

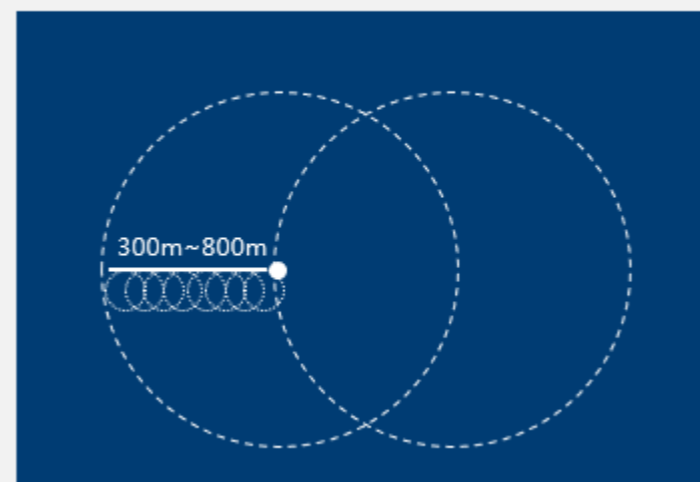
Wireless comparison chart

	Wi-Fi PTP(Point to point)	Bluetooth BLE 5.0	LoRa LPWAN(Low Power Wide Area Network)
Transmission radius	Max 25 meters	Max 100 meters	Max 800 meters
Power consumption	High power consumption speeds up battery change rate	Medium	Low power consumption extends battery life
Conclusion	<p>High-frequency signals can be easily blocked by metal material, causing the sending error.</p> <p>Moreover, due to the bundle with the existing IT network, network vulnerability is a major concern.</p> <p>Only be applicable for small-range data transmission. For future expansion, user needs to purchase the signal expander which will overly increase the cost.</p>		<p>Best receiver sensitivity (-148dbm) , strongest anti-interference ability, and farthest transmission coverage are the major advantages that reduce the required sensor amount also simplify the installation process and time, very suitable for the wide range and low-cost demand</p> <p>*Speaking of wireless transmission, the higher the sensitivity, the wider the transmission distance.</p>

Wi-Fi/Bluetooth



LoRa LPWAN



Under the same square feet, if LoRa tech requires 2 gateways, WiFi & BLE at least requires 16 gateways to fulfill the same signal coverage, which ramps up the infra cost.

Solution advantage



Scenario :

Machine location : 5F

Measurement point : 8 units of cooling tower, 32 points in total

Main system location : 3F

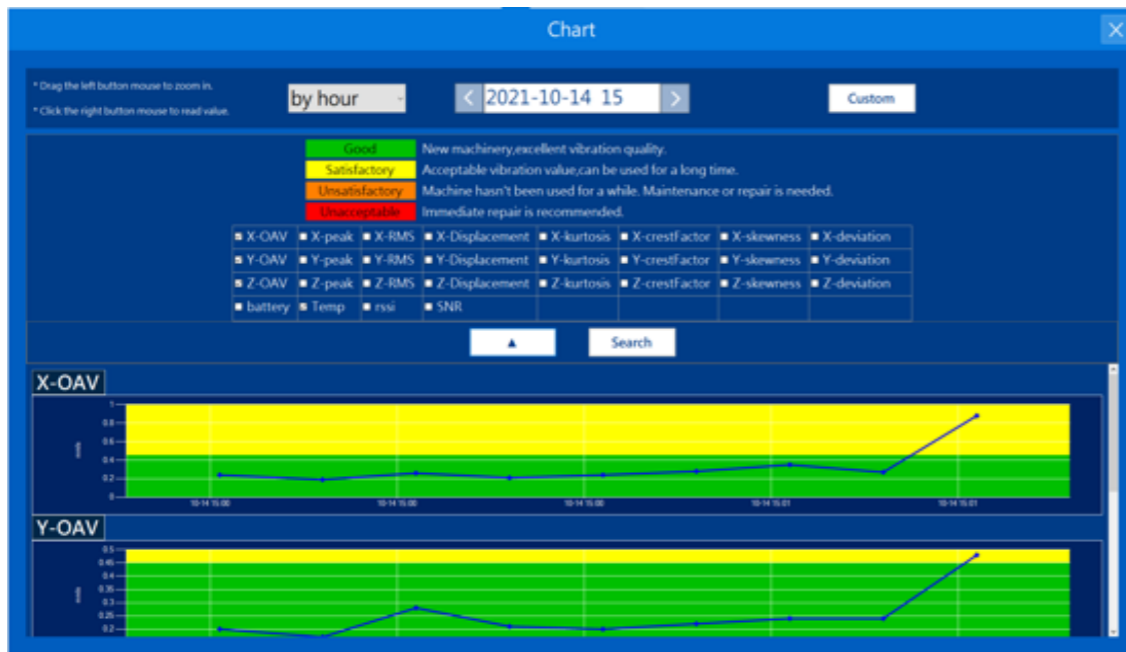
Transmission distance : 400m

Online monitoring methods	BT/Wifi transmission	Wired transmission	RM-IOT-B (LoRa LPWAN)
Sensor price	\$	\$	\$
Gateway	At least 2 units	1 ~ 2 units according to max. channel supported	1 unit
Nodes supported per gateway	Max. 30 nodes	1~32 channels	100 / 500 nodes
Signal coverage	50-100 meters	100 meters	800 meters
Signal extending	Signal extender to solve the metal interference & weak signal issue	NA	NA
Deployment	<ul style="list-style-type: none"> · Signal strength testing to allocate gateway base · Sensor affixing 	<ul style="list-style-type: none"> · Wiring, piping and other relevant engineering efforts · Sensor affixing 	<ul style="list-style-type: none"> · Signal strength testing to allocate gateway base · Sensor affixing
Future expansion	Easily, but highly require additional gateways	<ul style="list-style-type: none"> · Complex and costly · Must require another piping, wiring engineering 	Easily
Infra cost	Middle	High	Lowest

Over 30% of saving minimum

Item	ABB	Goodtech
Sensor price	\$\$\$\$	\$\$
Gateway price	\$\$\$\$\$\$	\$\$\$
Wireless tech	BT	LoRa
Transmission coverage supported	25m~50m	300m-800m
Supported nodes under 1 gateway	20 nodes max.	100-500 nodes
Data transmission frequency & Battery life	30 min is unchangeable setting for data transmission. The cloud server can only update the data every per hour.	Custom transmission setting supported(Min. 10-sec to Max. 24-hour) Depending on different transmission interval setting, the battery life cycle can be varied.
Battery	Unchangeable battery design(Directly replace with a new sensor)	Changeable for any industrial 3.6V AA lithium battery
WAN structure	Extranet(250MB for one gateway per month)	Intranet
System program	Cloud server	Local server
Pay architecture	Subscription	Perpetual license

Situation Room, at a glance!



Time trend of different parameters.

The 'LOG 輸出' window displays a table of alarm events. The table has the following columns: 時間 (Time), 區域 (Area), 設備 (Equipment), 感測器 (Sensor), 超標類型 (Alarm Type), and Data. The data rows are as follows:

時間	區域	設備	感測器	超標類型	Data
2022-09-29 16:57:01	A區	10	1	溫度	24.812
2022-09-29 16:57:01	A區	22	1	ISO	警告
2022-09-29 16:57:01	A區	03	1	溫度	24.822
2022-09-29 16:57:02	B區	05	1	AI	22.5
2022-09-29 16:57:02	A區	04	1	AI	233.5
2022-09-29 16:57:03	A區	03	1	自訂值	123.12
2022-09-29 16:57:04	A區	02	1	溫度	22.12
2022-09-29 16:57:05	C區	03	2	ISO	警告
2022-09-29 16:57:06	C區	01	1	ISO	危險

Log file output for all alarms.

The '設定' (Settings) window is divided into two main sections: LINE and E-Mail. The LINE section includes an AccessToken field, a recipient name field, a recipient password field, and a '發送測試訊息' (Send Test Message) button. The E-Mail section includes a recipient name field, a recipient password field, and a '發送測試信件' (Send Test Email) button. Below these sections are input fields for '無訊號警報(min) 30' and '發送後等待(min) 30', and a '儲存' (Save) button. On the right side of the screen, a 'LINE Notify' chat window is open, showing several messages from 'Wise Alarm' with status updates like 'Alarm test', 'No signal', and 'warning'.

Mail alarm notifications (Line APP supported too).

The '報表輸出' (Report Output) window displays a table of equipment data. The table has the following columns: 區域 (Area), 設備 (Equipment), ISO 狀態 (ISO Status), 傳輸狀態 (Connection Status), AI 狀態 (AI Status), 自訂值 (Self-set Value), and 溫度 (Temperature). The data rows are as follows:

區域	設備	ISO 狀態	傳輸狀態	AI 狀態	自訂值	溫度
A區	10	危險	連線	異常	異常	危險
A區	22	警告	連線	中度異常	正常	危險
A區	03	危險	連線	中度異常	危險	危險
B區	05	正常	連線	輕度異常	正常	正常
A區	04	優良	連線	正常	正常	正常
A區	03	警告	連線	輕度異常	正常	正常
A區	02	警告	連線	輕度異常	正常	正常
C區	03	警告	連線	中度異常	正常	正常
C區	01	危險	連線	中度異常	危險	危險

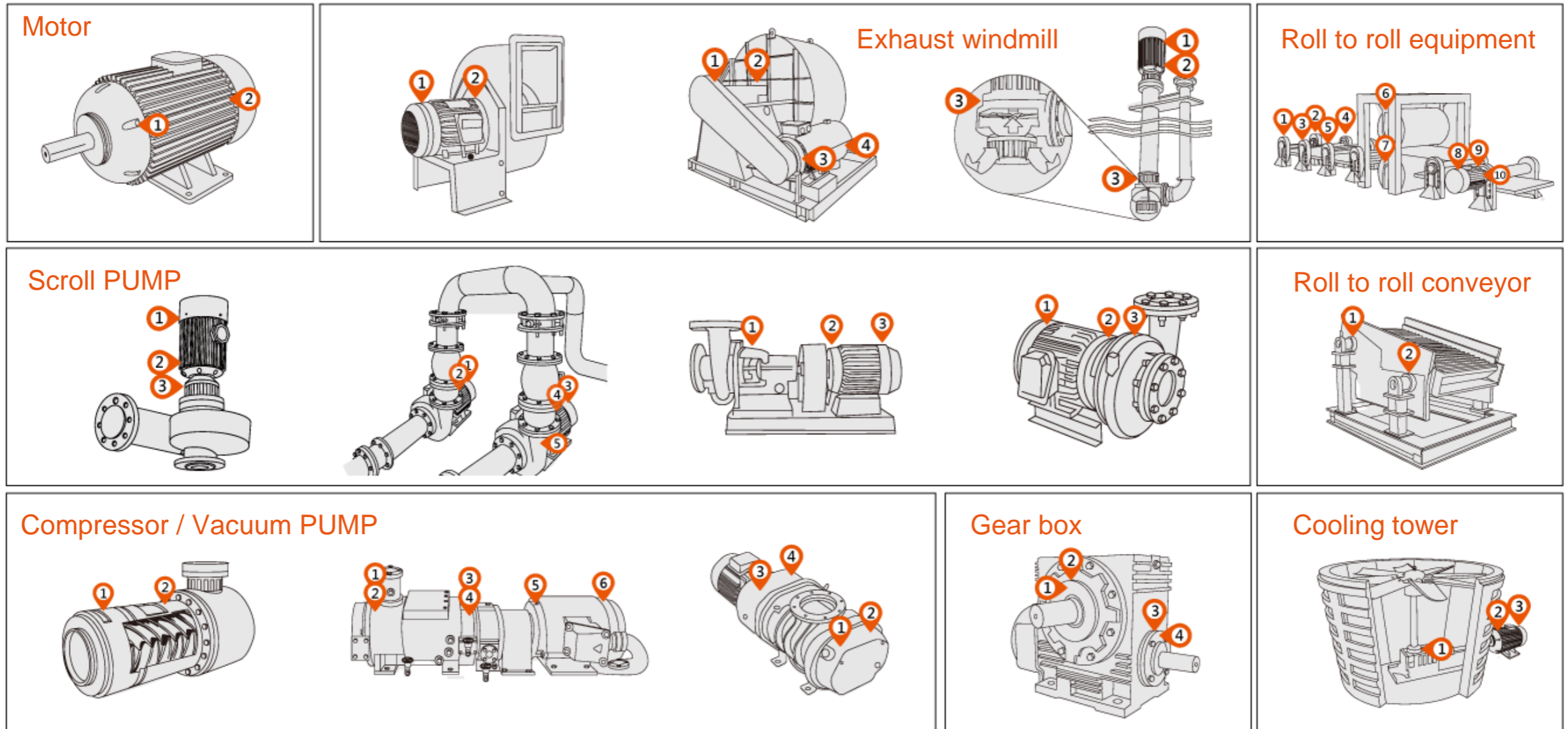
Data exportation.

Quick sorting function

The dashboard displays the following information:

- Header:** GOOD TECH INSTRUMENTS CO., LTD. RM-IoT-B | iMachine/PHM POWERED BY WISE-IoT
- Status:** Total of equipment : 10
- Summary:** Pass: 0, Fail: 0
- Equipment List:**
 - Row A:** 01 (Yellow), 02 (Green), 03 (Yellow), 04 (Yellow), 05 (Red)
 - Row B:** 06 (Yellow), 07 (Green), 08 (Green), 09 (Green), 10 (Green)
- Footer:** Goodtechnology.com.tw

Built-in measurement points on common machinery



Built-in a dozen of common rotating machines along with point orange pins. Even no professional background users can start measurement immediately.

Field & Target machine



Field :

Semiconductor Industry, Petrochemical Plant, Food Factory, Pharmaceutical Plant, Paper Mill, Panel Factory, Led Factory, Power Plant, Pumping Station, Sewage Treatment Plant, Processing and Manufacturing, Equipment Manufacturers, Maintenance Service Providers, etc.

Target machine:

Pump: vacuum pump, oil pump, sewage pump, etc.

Production equipment: machine tool spindle, cutting machine, etc.

Air compressors: screw, centrifugal, reciprocating air compressors, etc.

Others: cooling towers, exhaust windmills, HVAC, etc.

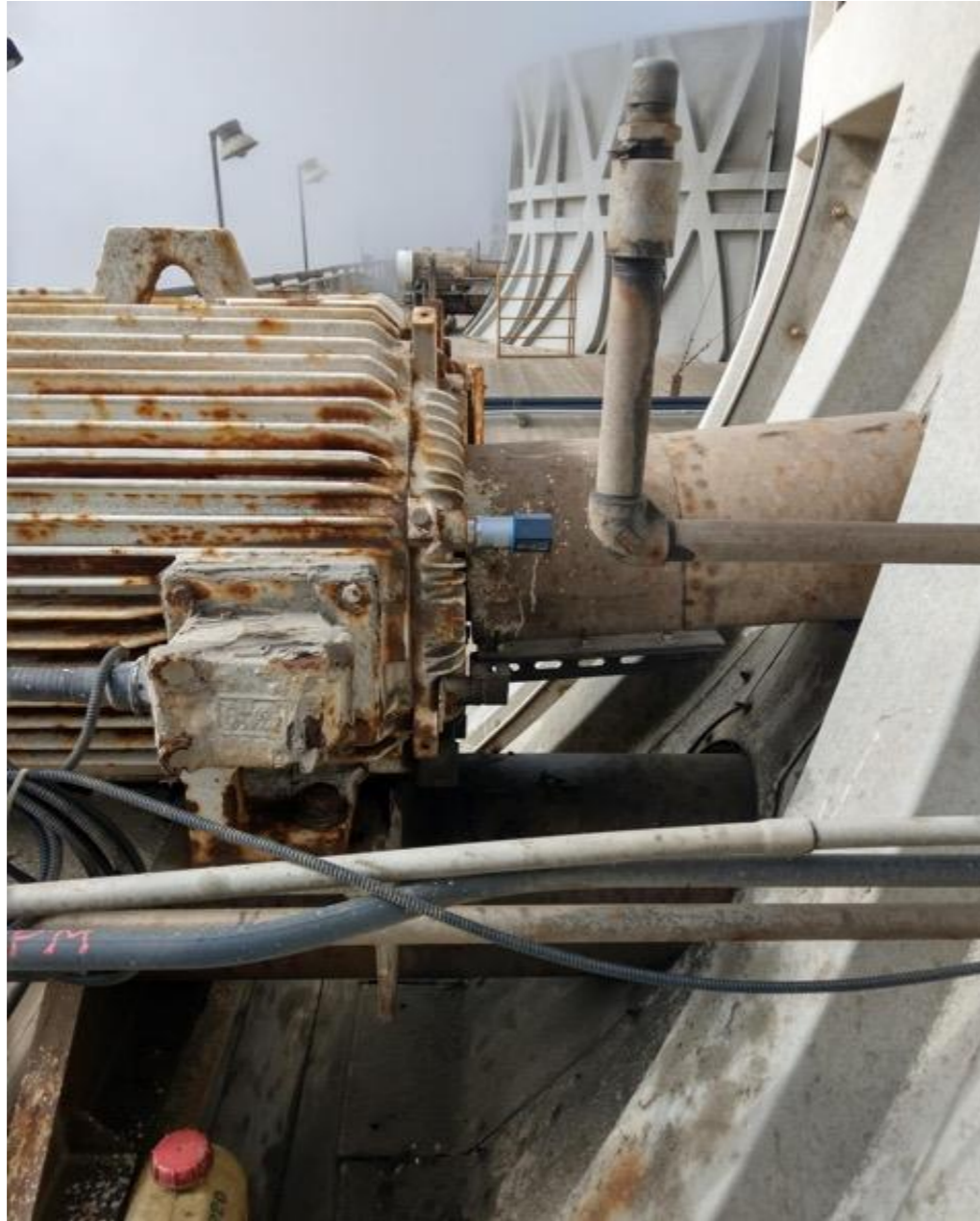
Testimony- PCB industry



The more demanding plant performance, the more pressure on machinery. If motor can't run at peak or even a breakdown will lead to tremendous finance loss, even worse, the company's reputation. Implement RM-IO-B to ensure 24/7 peak performance.



Testimony- Cooling tower Chiller monitoring



Chiller is the critical equipment for various plants. However, overhead location comes along with safety concerns, people have difficulties doing the inspection. RM-IOT-B solves all the hassles, realizing true accessibility.



?

What is the battery life cycle? Special spec. design adopted?



Battery life varies according to the data retrieving interval. Under the circumstances of 1hr data transmission rate, the battery life is sustainable for 2 years. We adopt the generic design of an industrial 3.6V AA lithium battery, which can be easily purchased on every industrial battery platform.

A

?

The definition of data transmission interval?

Configuration of 1-hour transmission interval means one data collection per hour, not continuously collected during one hour.

A



Any alternative to the battery power supply?



Apart from battery power, the triaxial sensor is equipped with one **Micro USB port for alternative 5V power supplied**, no battery replacement is required. Considering IP66 protection, Micro USB power supply is more recommended for the inner scenario other than outdoors.



What if the sensor is out of function, any backup mechanism?



If the sensor is not working and you need to replace it with a new one. The **"Inherit" function** can save and back up all the specific configure and all the historical data trends.

RM-IoT-B data sheet

Specification	
RM-IOT-B System	
Target measured object	All rotating machinery
Diagnostic display	ISO norm (ISO10816/ISO2372) criticality trend
	Temperature alarm
	X, Y, Z Vibration parameter criticality trend(Velocity in RMS, Acceleration in o to Peak/ RMS, Displacement in Peak to Peak, Kurtosis, Crest Factor, Skewness, Deviation)
	AI degradation criticality trend (Optional)
Alarm notification	Line APP & Mail message
Display units	Acceleration: g ; Velocity: mm/s ; Displacement: mm
Control Console	Dashboard, Pie chart, Tabular summary, Equipment schematic graphics, Measuring point drawings
Data export	All measurements in CSV format
RM-IOT-B Vibration kit	
Gateway	923 MHz ; support up to 100 nodes ; 1x RJ45 Ethernet port, 4-way Molex mini-fit connector ; Dimension: 150(W) x 37.5 (H) x 83 (D) mm(5.9 x 1.48 x 3.27 in.) Operating Temperature: -40°C to 75°C (-40°F to 167°F) ; Storage Temperature: -40°C to 80°C (-40°F to 176°F) ; DIN-rail / Wall mounting supportive ; IP30 certified
Triaxial Accelerometer(X, Y, Z)	Powered by 3.6V AA Battery *2pcs ; Frequency range: 10-1000Hz ; Operating Temperature: -20 to +85 °C (-4 to +185°F) ; Dimension (H x D): 84.7 x 48.3 mm ; IP 66 certified

Order info / Anatomy

Order guide	
Option 1: Main system with Max.10 measurement points	RM-IOT-B license x1 IPC (Atom CPU)
Option 2: Main system with Max. 50 measurement points	RM-IOT-B license x1 IPC (Core i3 CPU)
Option 3: Main system with Max. 100 measurement points	RM-IOT-B license x1 IPC (Core i5 CPU)
Gateway(100 nodes connection)	LoRaWAN gateway x1
Wireless accelerometer package	Triaxial wireless accelerometer x1 , Magnetic sensor base x1
Mobile device application	Smart phones and tablets synchronously review the measurement and diagnostics result

Root cause analysis

Thanks to RM-IOT-B' s two functions, **Rule-based rotor management** & **AI degradation inference trend**, we are aware of anomaly conditions. How can we find out the root cause afterward?

Go **with SMS-RC, a portable vibration analyzer** to decode machine faults.



Tour inspection vibration analyzer, decoding your machine faults

SMS-RC

Standard Management System
Rotor Care



Easy Operation

Rotating Machinery Vibration Analyzer

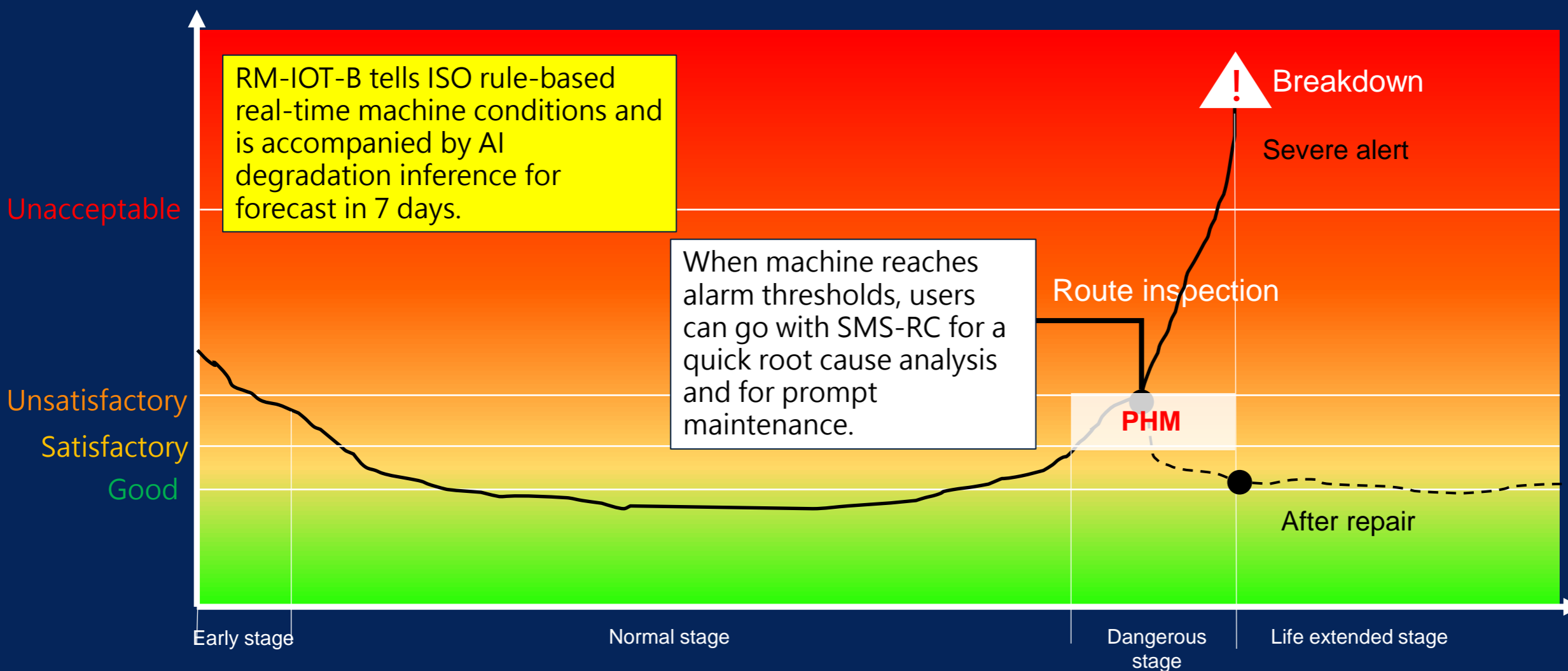
4 in One

- ✓ Rotor Quality : All rotating machinery applicable
- ✓ Spectrum Analysis : Root cause analysis
- ✓ Dynamic Balance : ISO1940 G level detection
- ✓ Vibration meter : Shock pulse identification





RM-IOT-B & SMS-RC manage machine' s failure values



RM-IOT-B offers insights into machine real-time conditions. When ISO results in Unsatisfactory and Unacceptable grades, AI results in a moderate level, we suggest going with **SMS-RC for a quick Root Cause Analysis**, meanwhile, a mechanism to validate the repair effect.



Benefit of RM-IOT-B & PHM

Benefit: avoid exceeding maintenance

The condition-based predictive method realizes precise & scientific maintenance.

Your maintenance plan is still routinely based on calendar marks? Take annual inspection and maintenance, for example, batch after batch delivery for a third party inspection, or directly replace them with a new batch, the above cost is jaw-dropping. Listing down machine conditions after inspection can avoid unnecessary maintenance expenditure, saving annual costs up to **66%**.

66%

Item	Repair cost	Repair Qty	Sum up	Repair Qty after CBM	Real cost
Huge motor (pump)	500k	5	2.5M	2	1M
Big motor (pump)	200k	10	2M	3	600k
Medium motor (pump)	50k	20	1M	4	200k
Small motor (pump)	10k	40	400k	10	100k

Assumption cost according to a routine timeline : 5.9M

Real cost after CBM 1.9M

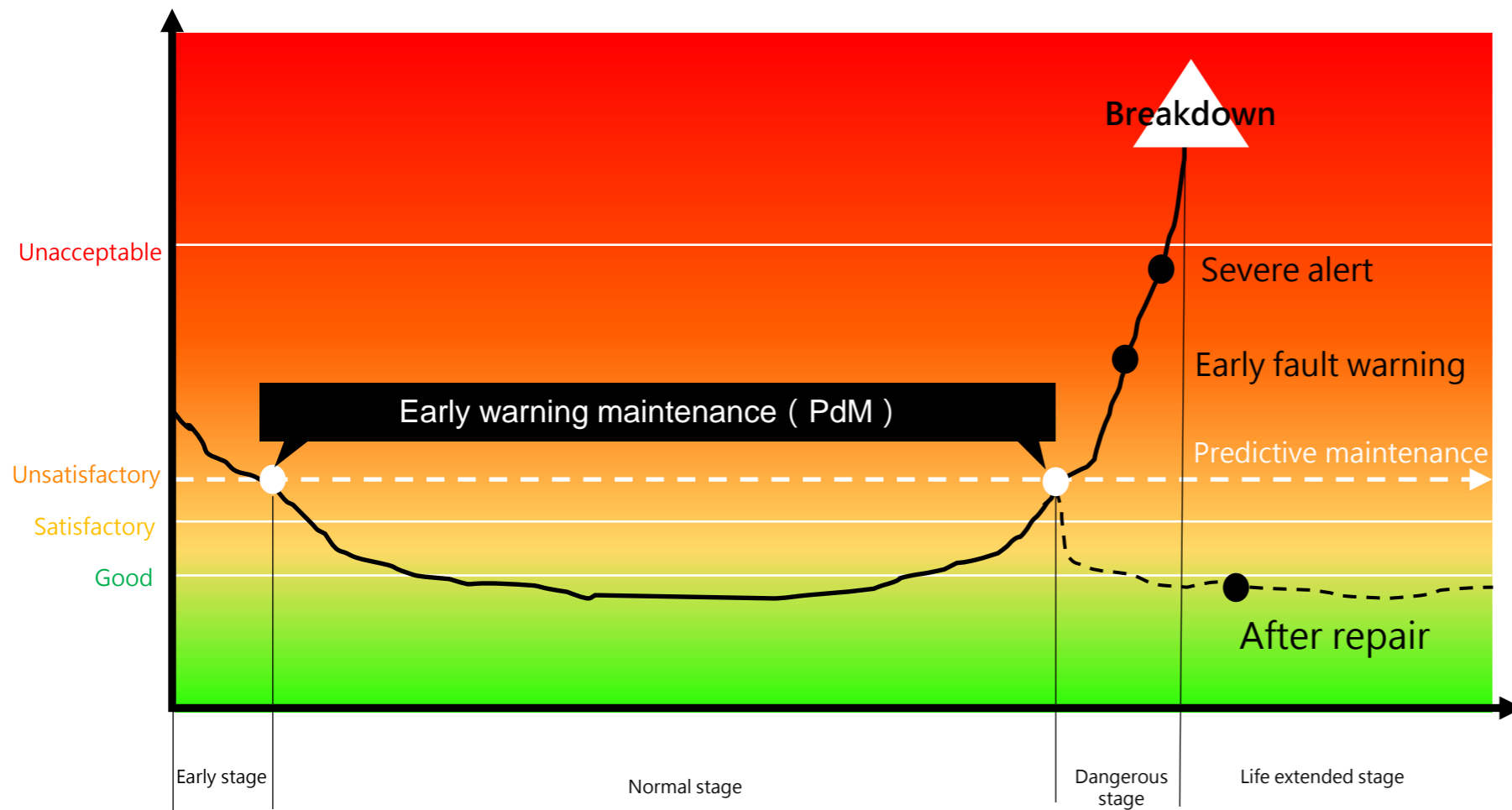
Save 4M

Benefit: avoid unplanned stoppage

Predictive maintenance ahead of the time

Get to know rotor damage in advance by detecting initial indicators. Start immediately the plan of maintenance and spare preparation to decline non-human factors, unscheduled breakdown up to **95%**, and to avoid the following crisis and relevant loss.

95%



Other losses caused by accidental stoppage:



Additional costs arising from the emergency production line.



Quality defects on the semi-finished product.



Additional costs arising from emergency repair.



Fine for late delivery

Rotor PHM process



01

Condition monitoring

Real-time status control

Machine status is in good hands through online monitoring. Hierarchy management prioritizes the maintenance order.



02

Anomaly detection

Root cause analysis

Arrange further inspection(SMS-RC, portable vibration analyzer) to target the root cause and expedite the repair process.



03

Benefit of repair

Acceptance review

Acceptance review for the returning machines after repair. Continuous monitoring optimizes machines' max life cycles.



04

Future degradation

AI inference

The machine degradation chart envisions the golden timing of repair preparation. Precise maintenance timeline realizes asset availability management.




Any vibration measurement related questions, please contact

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