The Best Choice for HVAC Maintenance Service

LG *BECON* cloud
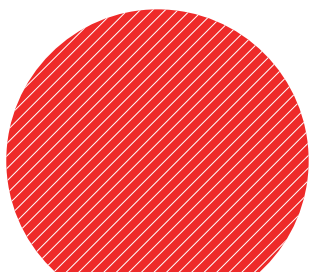

LG

BECON cloud

LG *BECON* cloud

Why do **professional HVAC** [1] **environments** need professional **maintenance solutions**?

HVAC systems are complex in structure and control, so they require specialized knowledge to check the operating status and systematic management through abundant experience and know-how.

Building Owners
Concern about
cost savings

"

Is there more economical solution in order to reduce annually increasing energy and maintenance cost?

"

Facility Managers
Concern about
efficient operation

"

Is there an effective way to improve operational efficiency while managing various air conditioning solutions installed in the building?

"

End Users
Concern about
a pleasant environment

"

It's very inconvenient to take a long time to repair a breakdown that occurs during the peak season, so is there a good way to make a more comfortable environment last longer?
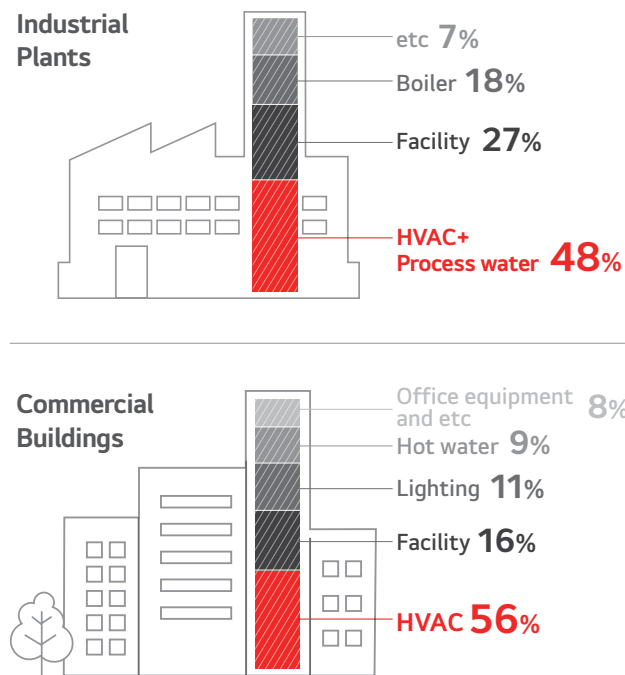
"

1) HVAC stands for Heating, Ventilation, and Air Conditioning. It is a system that controls and regulates temperature, humidity and air flow.
* These images are designed to help customers understand.

Characteristics of HVAC

It is used in a variety of industrial / commercial environments, and the high cost of operation and maintenance requires a reliable and economical system.

Industrial / Commercial Energy Usage

Industrial Plants

- etc **7**%
- Boiler **18**%
- Facility **27**%
- **HVAC+ Process water** **48**%

Commercial Buildings

- Office equipment and etc **8**%
- Hot water **9**%
- Lighting **11**%
- Facility **16**%
- **HVAC 56**%

* Public Data Portal Energy Census Statistical Table (2020 year in Korea).

High Maintenance Cost of HVAC System

- etc **7**%
- Technical management **11**%
- Depreciation **23**%
- Maintenance **30**%
- **Energy 30**%
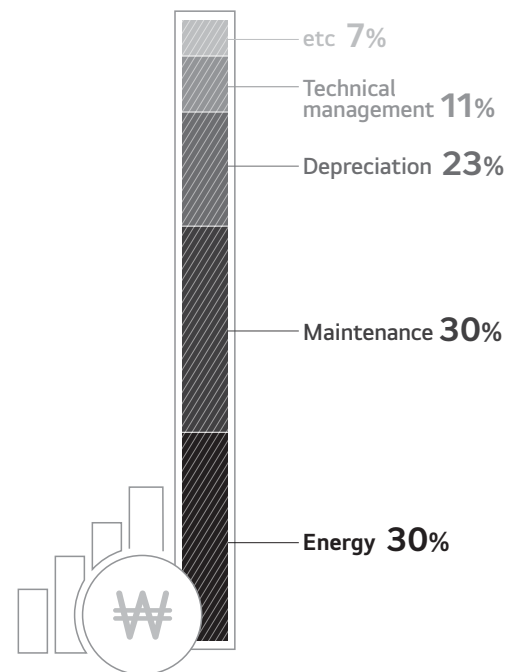
The Importance of HVAC Maintenance

Regular inspections and professional maintenance are essential to maintain performance, prevent device failures, and operate the system efficiently and stably.

Stable Operation

Failure prevention
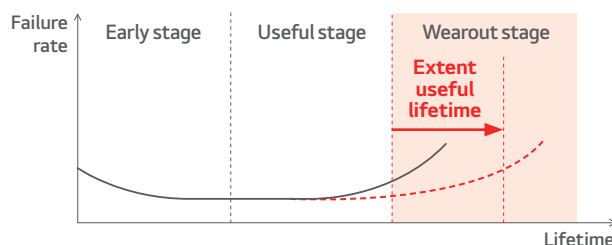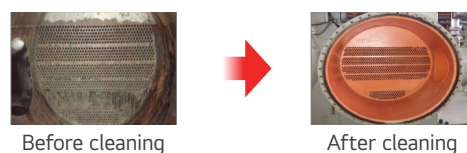
Rapid response within the promised time

24

Span lifetime

Failure rate

Early stage | Useful stage | Wearout stage

Extent useful lifetime

Lifetime

Reduced Operating Costs

Need the optimized service to operate within your budget

₩

Minimizing energy loss

Before cleaning   After cleaning
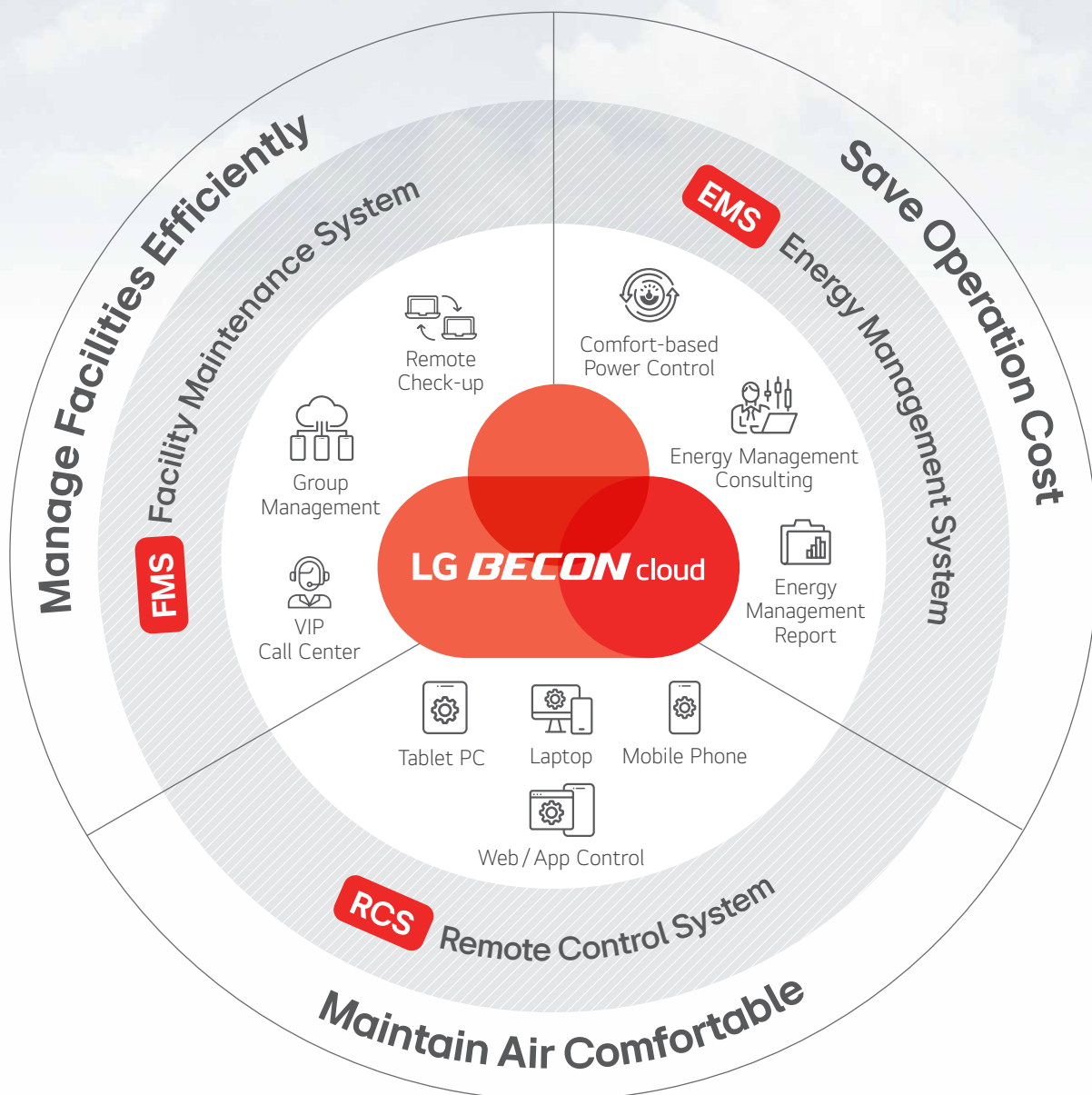
By removing foreign substances and scale from the heating tube, it is possible to improve the heat exchange capacity of the condenser and reduce energy loss.

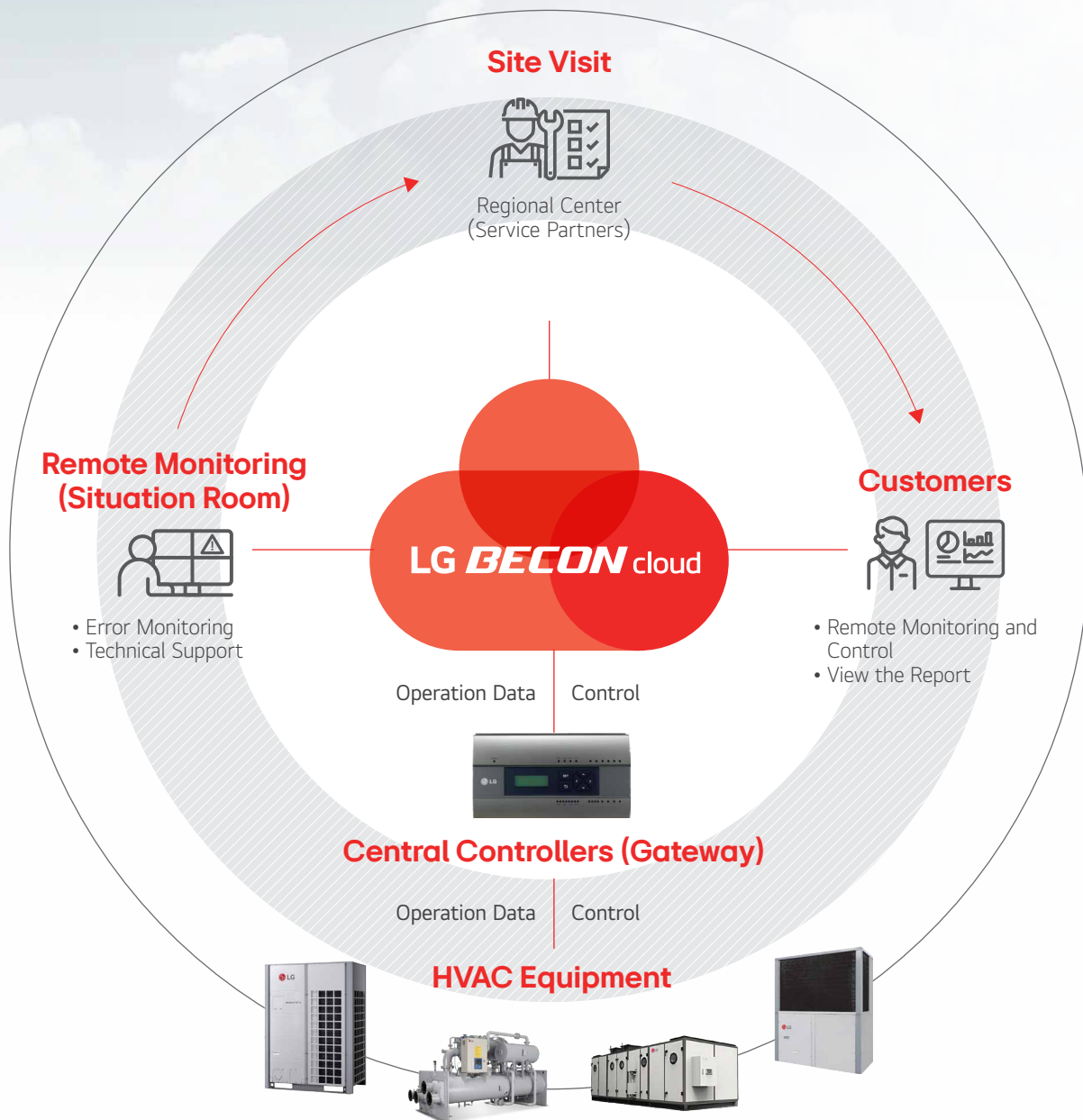# Integrated maintenance solutions optimized for HVAC environments

BECON cloud

Manage Facilities Efficiently

Facility Maintenance System

FMS

Remote Check-up

Group Management

VIP Call Center

Save Operation Cost

Energy Management System

EMS

Comfort-based Power Control

Energy Management Consulting

Energy Management Report

LG BECON cloud

Tablet PC   Laptop   Mobile Phone

Web / App Control

RCS Remote Control System

Maintain Air Comfortable

* In order to use BECON cloud service, you must sign up membership and install BECON cloud app to use on a mobile device.
* For Android or iOS Users : Search for "BECON cloud" on Google Play or the Apple Store and proceed with the download
* A maintenance service contract is required to use various service described this catalog.
* Features described may vary by regions or countries.

BECON cloud is a cloud-based platform that provides
total maintenance services for Air Solution products,
offering prompt dispatch services through real-time monitoring,
efficient management of facilities, and energy management.

Operation Process

Site Visit

Regional Center
(Service Partners)

**Remote Monitoring
(Situation Room)**

• Error Monitoring
• Technical Support

LG *BECON* cloud

Customers

• Remote Monitoring and
  Control
• View the Report

Operation Data   Control

Central Controllers (Gateway)

Operation Data   Control

HVAC Equipment

What makes BECON cloud different?

> **You can keep peace of mind even if sudden breakdowns or unexpected problems occur!**

Rapid response to problems

BECON cloud monitors remotely connected devices in real time to quickly identify problems based on operation information in the event of a failure, reduces downtime by quickly handling faults through the supply of necessary spare parts, and enables prompt technical consultation support.

The 2nd Visit (Repair)

6

5 Parts Preparation

The 1st Visit 4

3 Engineer Dispatch

Service Registration 2

1 Service Reception

Call Center

General Service Operation

4 **The 1st Visit** (Repair)

3 Parts Preparation

2 Remote Analysis by Engineer

1 Remote Error Notification

Situation Room

Proactive Service by BECON cloud

Real Time Monitoring

* These images are designed to help customers understand.

" BECON cloud makes it easy to control connected devices anytime, anywhere, preventing unnecessary energy waste and improving operational efficiency! "

Easy to manage

In the cloud-based Web / App environment, monitoring and control are possible without time and space limitations, and users can maintain a comfortable environment and self-manage unnecessary energy use, improving operational efficiency.

Monitoring and Control

Data Analysis and Report

" BECON cloud can have an excellent cost-saving effect through systematic energy management! "

Cost savings through energy management

BECON cloud provides energy-saving services that prioritize a comfortable environment. It analyzes energy usage patterns in various environments and applies cloud-based optimized energy saving logic. It can also help increase cost savings by preventing unnecessary energy use.

Control more conveniently! Manage smarter!
BECON cloud Key Features

Manage faster and more conveniently in real time!
Remote Monitoring & Control

| **Easy management of devices and energy** | **Reduced downtime** | **Accessible to multiple users** |

Through the real-time remote control function (Web / App), it is possible to monitor, control the status of the device anytime, anywhere. In addition, it is easy to manage each tenant or floor of the building through the assistance site manager function (App only) that can manage the control authority for each occupant.

Remote Monitoring

Real time error monitoring by a dedicated engineer 24 hours a day, 7 days a week

* This service is only available to customers who have contracted an applicable offering.

Before dispatching to the site, the cause of the failure is remotely identified and dispatched, reducing the time to complete the repair of the fault.

Remote Control (Customers)
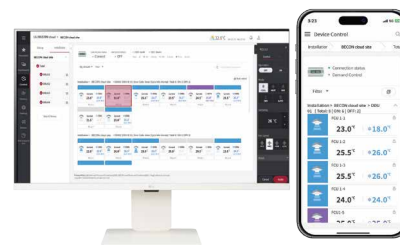
Device operation monitoring and remote control (Web / App)

 - Operation On / Off, Mode, Temperature setting

→ Maintain a pleasant environment and manage energy use

Respond quickly with fast detection of device abnormalities!
Notification Function

| **Rapid response (Customer)** | **Check operation in advance (Engineer)** |

When an error occurs, real-time notification is provided to the user to enable prompt service based on detailed device operation information.
It can assist you in receiving service call and technical support from professional engineers.

* Email error notification : EHP / GHP, Chiller
* APP push notification : Chiller

Error Events

Notification error

Technical consultation

Service call reception

Procedure to repair

* In order to receive real-time notifications, you need to install the BECON cloud APP, the user sign up, and set the notification ON on smartphone.
* These images are designed to help customers understand.
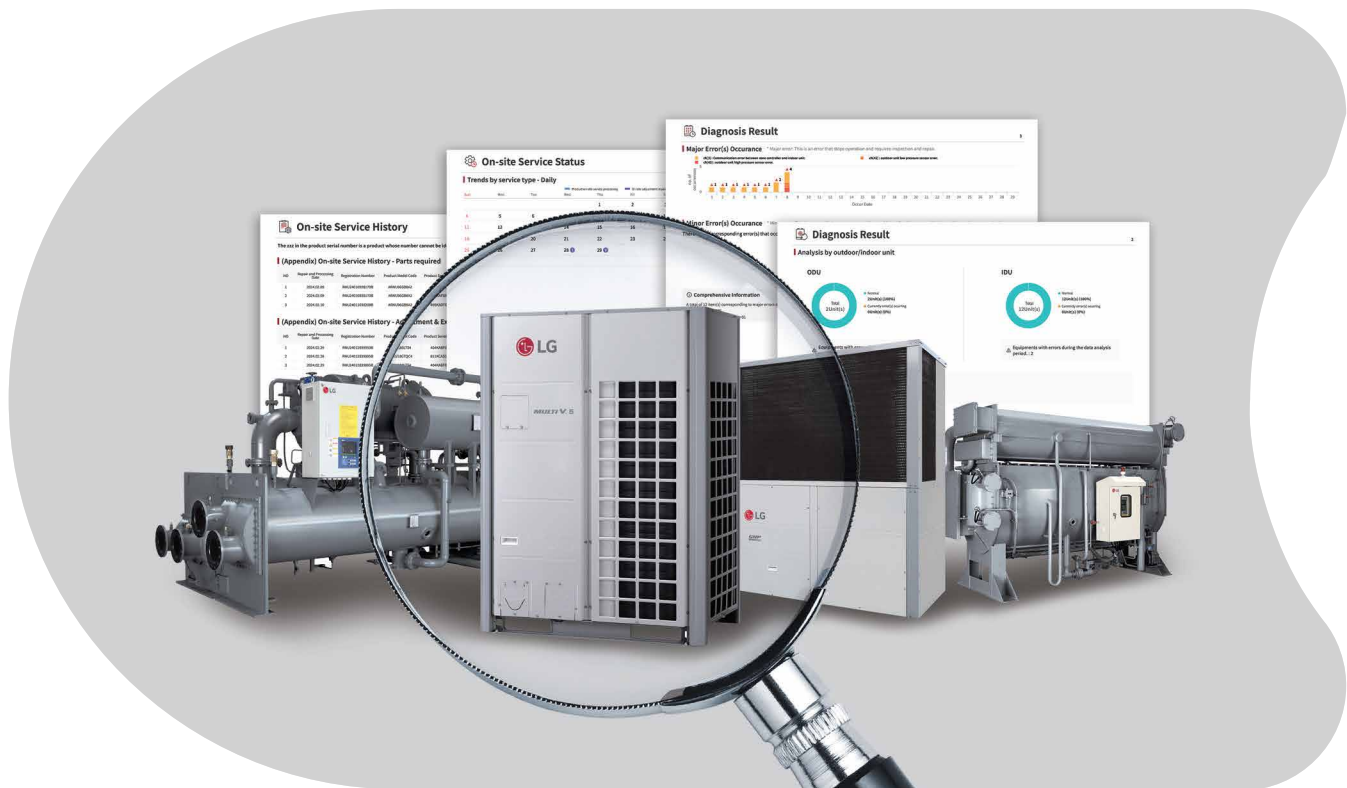* Features described may vary by regions or countries.

Systematic operation with continuous predictive management!
Regular Reporting

| Prevention of breakdown | Reduced operating costs |

By providing situational reporting for each device, it is possible to predict unexpected situations or failures in advance and make them into a database.

EHP/GHP

EHP / GHP Device Status

It is possible to manage the operation history of all devices installed in the field and can grasp the exact operation status at a glance.

For facility managers

EHP AI Diagnosis [1]

AI diagnosis reports are provided so that you can check the current performance status of your products.

For facility managers

EHP Energy Management [1]

Efficient energy management is possible with regular reports up to last 12 months of energy savings prediction and actual savings analysis.

For building owners and facility managers

Chiller Smart Diagnosis [2]

It analyzes the product operation data to diagnose the condition of the device and provides the diagnosis report.

For facility managers

1) These services are available in South Korea. These features will become available in other countries soon and may vary by regions or countries. Stay tuned for updates.
2) Chiller Smart Diagnosis report supports centrifugal and absorption chiller.
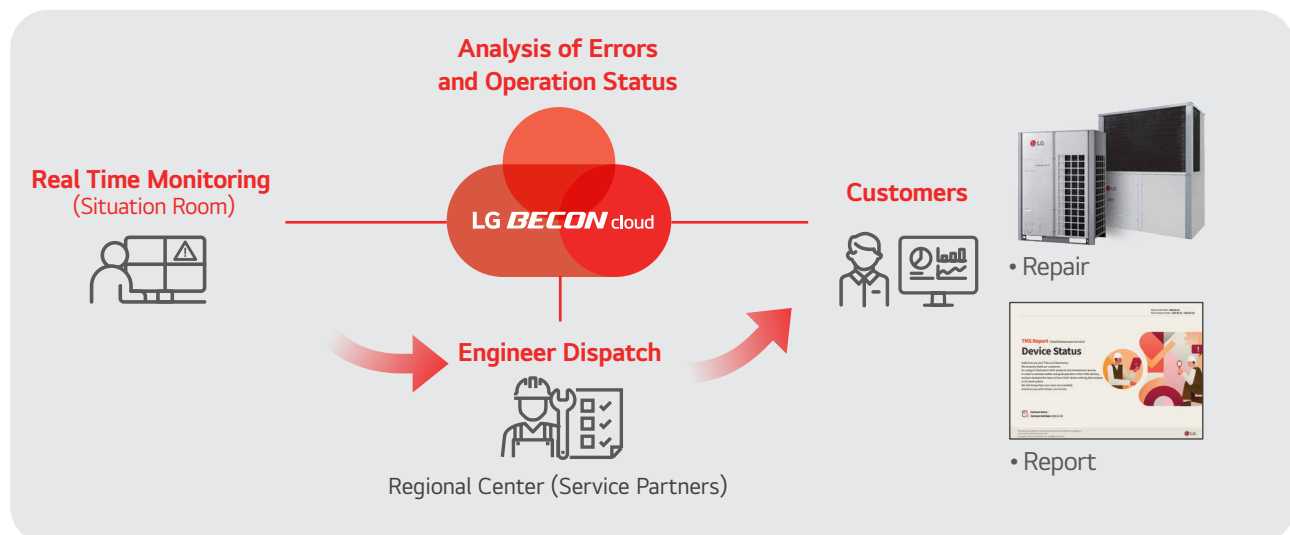
EHP / GHP [1)]

EHP / GHP Device Status

* This feature is available now. Renewed design and new content will be updated soon. Stay tuned for updates.

It provides pro-active service in the event of a failure through real-time monitoring of devices connected to BECON cloud, and provides reports of failures and service history, including operation status.

Analysis of Errors and Operation Status

Real Time Monitoring
(Situation Room)

LG *BECON* cloud

Customers

• Repair

Engineer Dispatch

Regional Center (Service Partners)

• Report

1) EHP stands for Electrical Heat Pump, which is a heating and cooling system that uses an electric motor to drive a compressor. GHP stands for Gas Heat Pump, which is a heating and cooling system that uses a gas engine to drive a compressor.

Report Contents

Comprehensive Device Inspection

Check the installed and connected device information, as well as the status of breakdowns and service that occurred while operating.

Error and Service History (Up to 12 months)

Check the detailed error diagnosis results by day or month and the service history according to the service type.

Device Operation Information Trend

Check the average operation time and rate of your device per day or month.

* This feature will be included soon. Stay tuned for updates.

GHP Engine Operating Time / Oil Change Time

It shows the engine running time and oil change time at the GHP installation site.

EHP AI Diagnosis

* This service is available in South Korea. These features will become available in other countries soon and may vary by regions or countries. Stay tuned for updates.

Analyze the operation data of devices connected to BECON cloud and conduct on-site inspections based on the diagnosis results to prevent breakdowns by taking proactive measures before problems occur.

Operation Data → **Anomaly Analysis** (LG BECON cloud) → Notification Inspection Needed Items → **On-site Inspection (Off seasons Pre-inspection)** → **Customers Report (Web / App)**
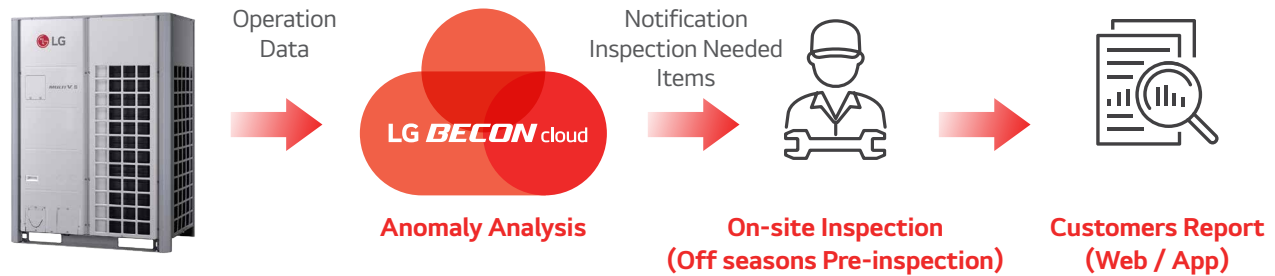
Core 6 Items Diagnostics -
Compressors, Sensors, Fans (motors),
Refrigerant Amount, Drain Pumps, Weak Operation

- Compressor : Operation history / abnormal signal (including PCB) inspection notification
- Sensors : Inspection notification through short-circuit / deviation, atmospheric and sensor temperature analysis
- Fan (Motor) : Inspection notification based on RPM / sensor information (including PCB)
- Refrigerant amount : Inspection notification based on compressor / valve / refrigerant flow rate analysis
- Drain Pump : Drain pump abnormality / Indoor unit operation-based inspection notification
- Weak operation : Indoor unit sensor / valve operation based on cooling / heating temperature notification

* These images are designed to help customers understand.

Customers Report (Web / App)

Check the status information of the abnormal device.
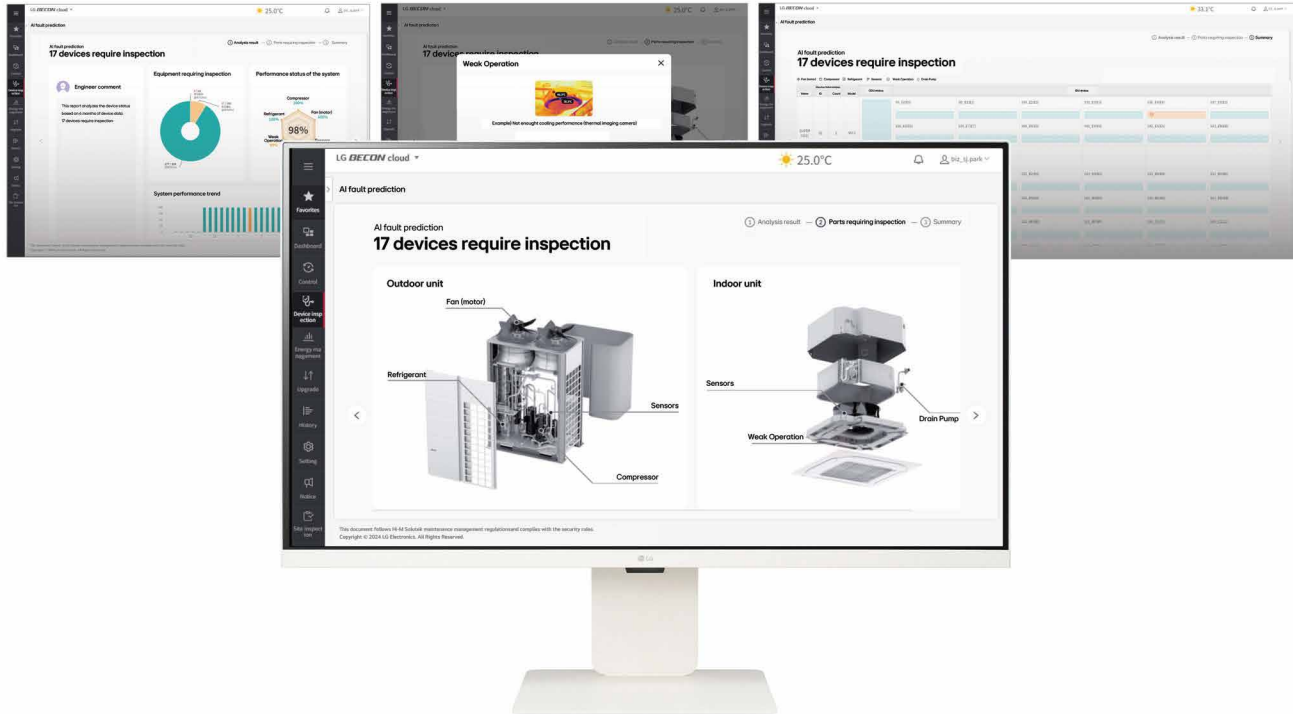
EHP Energy Management

* This service is available in South Korea. These features will become available in other countries soon and may vary by regions or countries. Stay tuned for updates.

BECON cloud is a cloud-based method of adjusting the compressor operating by analyzing the temperature / humidity condition and operation status of the customer's room, and provides energy management through optimal operation that maintains a comfortable environment.

Step-by-step Reports According to the Analysis of the Usage

* Demonstration results in 28 elementary, middle and high schools nationwide in 2023
(The Society of Air-conditioning and Refrigerating Engineers of Korea)

The 1st Stage Prediction Savings

Prediction of savings based on on-site devices operation data

Based on long-term data such as past device usage history, outdoor temperature, humidity, etc., predictive analysis of energy saving effect for up to 12 months
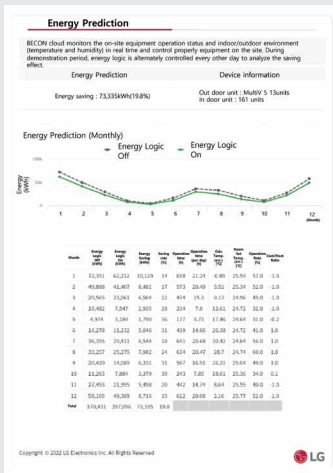
Prediction Report (Example)

The 2nd Stage Demonstration Stage

Analyze your savings by operating energy control on a alternate daily basis
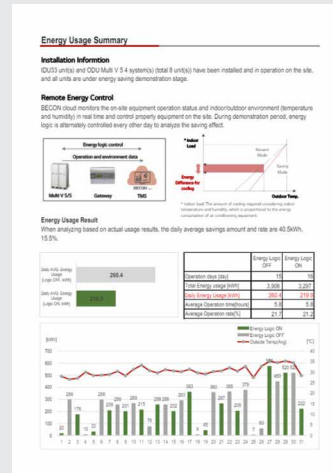
Demonstration Report (Example)

Energy Usage

Mon.

Energy Logic Off

Tue.

Energy Logic On
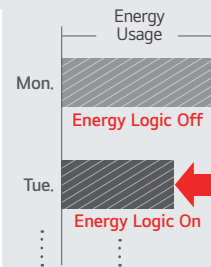
Saving Effect 7%~27%

The 3rd Stage Saving Stage

Energy Saving Results, Device Usage Analysis

Management of accumulated amount of energy savings, analysis of energy during peak season

Periodic report 1~2 times a year, providing the results of the analysis of the energy consumption of the device

Providing an energy waste notification app

* No need to install an additional power meter. (However, it is mandatory to install a central controller to connect to BECON cloud.)

* Daily intersection operation: To eliminate the effects of outdoor environment and indoor use environment as much as possible through repeated application and non-application of control for comparison of power consumption in general.

Energy Waste Notification

Usage pattern analysis detects when energy is wasted, providing administrators with mobile alerts and additional energy management.

Forgetting Turn OFF

"There is an indoor unit that is turned on. Check the air conditioner On / Off."

Defective Insulation

"The indoor unit has not reached the set temperature. Please check the surrounding environment."

Excessive Set Temp.

"There are indoor units that need to be adjusted to the proper temperature. Check the set temperature."

You can use customized mobile alarms for more sophisticated energy management.

Abnormal Indoor Temp.

"The temperature inside the room fluctuates even while the specific indoor unit is operating. Indoor unit and caution Environmental inspection is required."

Excessive Operating Time

"The operation of the indoor unit has been continued for a long time. You need to confirm the use of the indoor unit."

Frequent ON / OFF

"The installed space is presumed to be a space that does not require much cooling / heating. You need to check the usage environment."

* In order to receive real-time notifications, you need to install the BECON cloud APP, the user sign up, and set the notification ON on smartphone.

Differentiation Point

Energy control according to indoor and outdoor environment (temperature / humidity) to maintain **the comfort of occupants and save energy**

In 2022, the results of the demonstration of savings at the summer contract site

Business Type	ODU Qty (units)	IDU Qty (units)	Saving Amount (kWh)
A Company in Seoul	10	218	**11,453**
B Company in Seoul	8	116	**10,307**
C Hospital in Daegu	20	196	**15,317**
D Hospital in Changwon	17	134	**11,352**

Chiller

Chiller Smart Diagnosis * It supports Centrifugal and Absorption chillers.

Analyze the vibration, oil and bearing of the chiller compressor, and the gap of the magnetic bearing to diagnose the health of the compressor and guide you through the report.

Operation Data → **LG BECON cloud** → Result Report → On-Site Inspection Result → **Providing Maintenance Service**

Operation Diagnosis　　　　**Customer Consultation with the Report On-site Inspection**
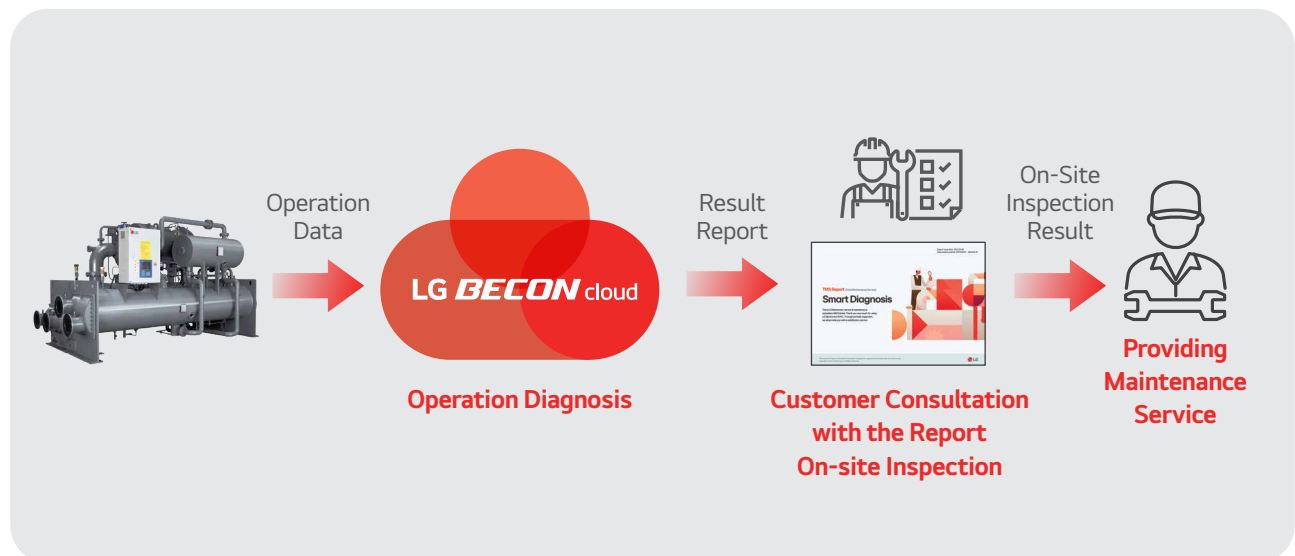
Report Contents

Compressor Health Diagnosis

Chiller compressor vibrations, oils, and bearings and magnetic bearing gaps are analyzed to diagnose compressor health and guide action.

Vibration

Compressor Diagnosis - Vibration

It is the result of analyzing the vibration of the refrigerator according to the customers site situation. We identify the operation status of the chiller, and determine the status of compressors.

· This chiller has operated for **1152.1 hours** since **April 2024.**
· Normal operation time is **983.5 hours** and it is **100%** of total operation time
· The average vibration value of the compressor for last week is **0.0mm/s**, according to ISO 10816. The compressor needs inspection after **6 months**

Vibration Velocity   **Vibration Distribution**

	Operation hour [hrs]	Operation hour [%]
Total Operation hour [hrs]	1152.1	100.0
Normal Operation hour [hrs]	983.5	100.0
Alarm	0.0	0.0
Trip	0.0	0.0

⚠ An abnormal noise and vibration may indicate a damage to the chiller. If you experience any of those, please stop operation and request service.

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Analyze the vibration value of the compressor and let you know when to take precautionary measures.

→ Compressor A needs to be serviced within month 0.
→ Compressor B needs to be serviced after 6 months.

※ It can be applied when a vibration sensor is installed.

Oil and Bearing

Compressor Diagnosis - Bearing

This is the result of the bearing analysis. We inspect the average bearing temperature change for the analysis period.

· The maximum temperature of the bearing in last week is 54.2℃, and **is in the normal operating condition.**

Bearing Temperature

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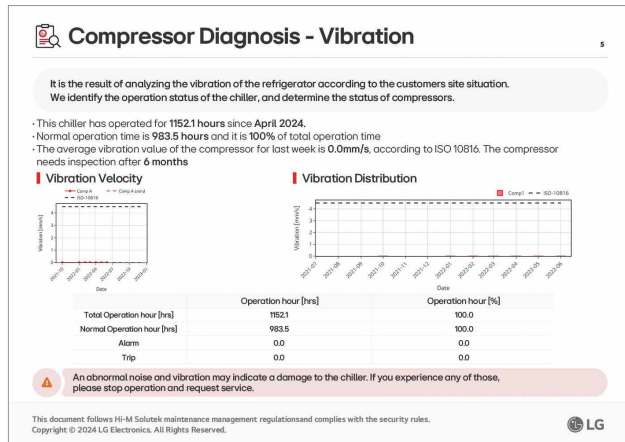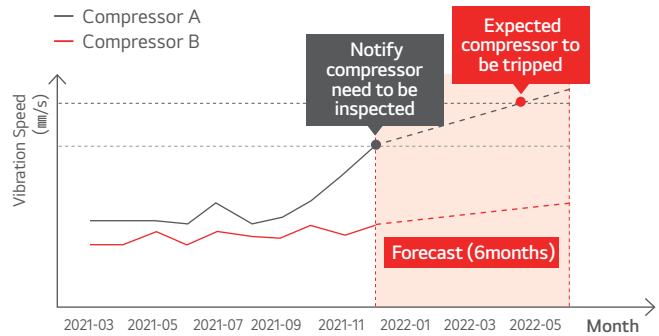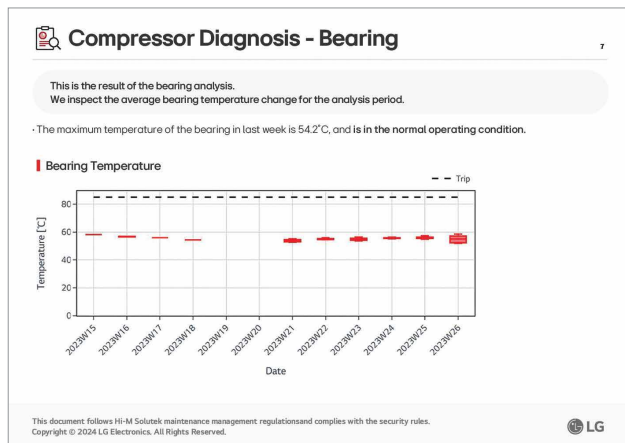
Compressor Diagnosis - Oil

This is the result of oil analysis. We inspect the average oil condition for the analysis period.

· In the recent 1 week, maximum oil temperature is **60.5℃**, and minimum is **56.8℃, which is in normal operating condition.**
· In the recent 1 week, the differential pressure of the oil is an average **2.6kgf/cm²** to be in the **Normal State, and is in the normal operating condition.**

Oil Temperature   **Differential Pressure of the Oil**

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Oil and bearing temperature monitoring prevents compressor burnout.

By using oil differential pressure, you can know in advance when to change the oil filter.

● : Oil Temp
● : Nearing Temp.

Bearing

Contamination Filters

Increased Oil Temperature

→ Bearing temperature rises and wears (deformation) occur
→ Compressor burnout
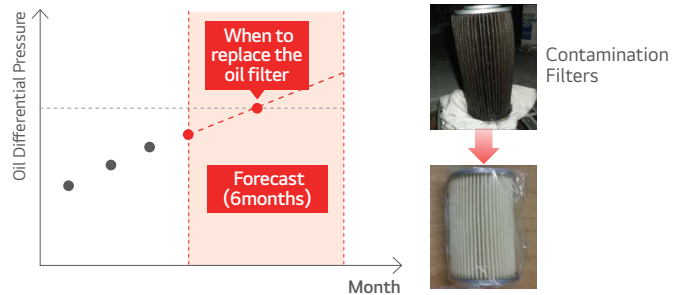
Foreign Materials Accumulates in the Filter

→ Difficulty in supplying adequate oil
→ Loss of key parts such as bearings and gears

Magnetic Bearing Gap Analysis

The position of the oil-free compressor rotor can be continuously recorded to manage the rotor's deviation from the center.
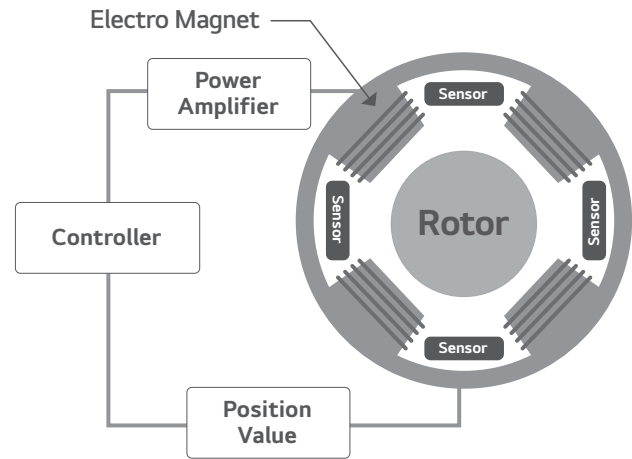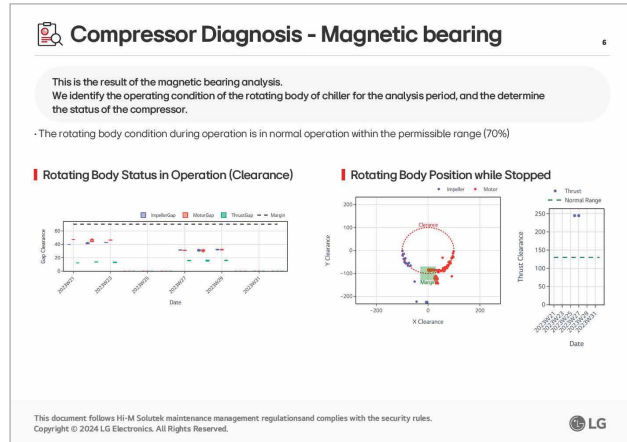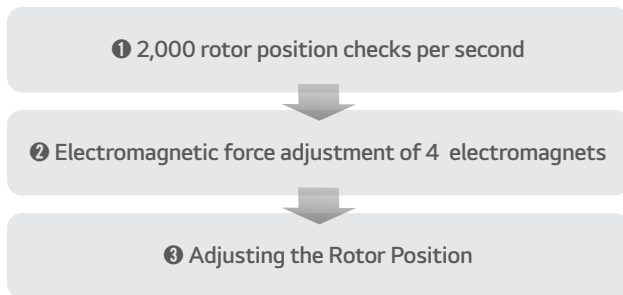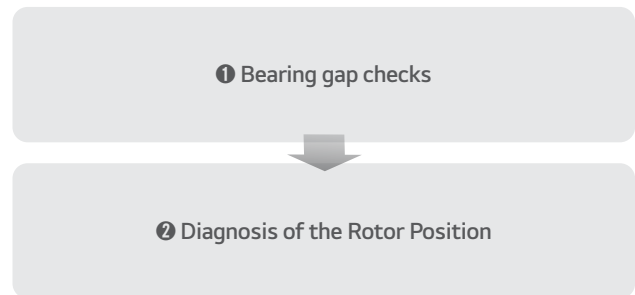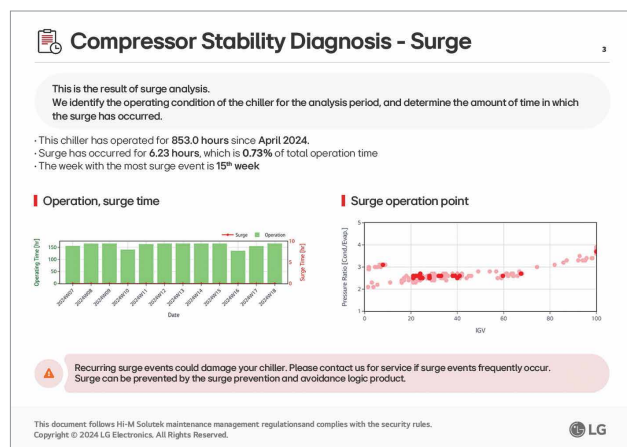

Compressor Diagnosis - Magnetic bearing

This is the result of the magnetic bearing analysis.
We identify the operating condition of the rotating body of chiller for the analysis period, and the determine the status of the compressor.

· The rotating body condition during operation is in normal operation within the permissible range (70%)

Rotating Body Status in Operation (Clearance)   **Rotating Body Position while Stopped**

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Electro Magnet

Power Amplifier

Controller

Position Value

Sensor · Rotor

Operating

❶ 2,000 rotor position checks per second

❷ Electromagnetic force adjustment of 4 electromagnets

❸ Adjusting the Rotor Position

Stalling

❶ Bearing gap checks

❷ Diagnosis of the Rotor Position

Compressor Stability Diagnosis

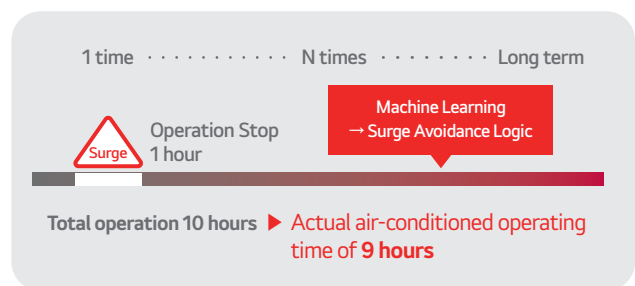### Surge Analysis and Avoidance

By applying machine learning capabilities, the chiller product can learn on its own and dramatically reduce surges.

Compressor Stability Diagnosis - Surge

This is the result of surge analysis.
We identify the operating condition of the chiller for the analysis period, and determine the amount of time in which the surge has occurred.

· This chiller has operated for **853.0 hours** since **April 2024.**
· Surge has occurred for **6.23 hours**, which is **0.73%** of total operation time
· The week with the most surge event is **15th week**

Operation, surge time   **Surge operation point**

Recurring surge events could damage your chiller. Please contact us for service if surge events frequently occur.
Surge can be prevented by the surge prevention and avoidance logic product.

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Machine Learning Continuous Operation

After learning the occurrence of surges based on machine learning, it is updated to avoid driving points that cause surges to prevent surges from occurring.

1 time · · · · · · · · · · · N times · · · · · · · · Long term

Surge

Operation Stop 1 hour

Machine Learning → Surge Avoidance Logic

Total operation 10 hours ▶ Actual air-conditioned operating time of **9 hours**

Pipe Cleaning Optimum Diagnostics

Through diagnosing the condition of the chiller's heat exchanger, we will guide you to the right time for pipe cleaning management.
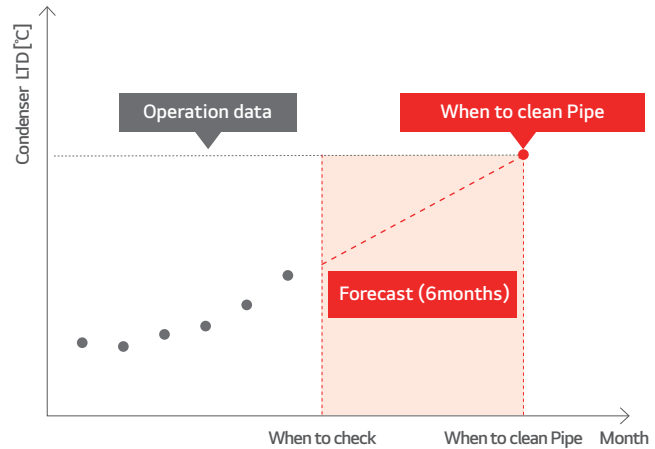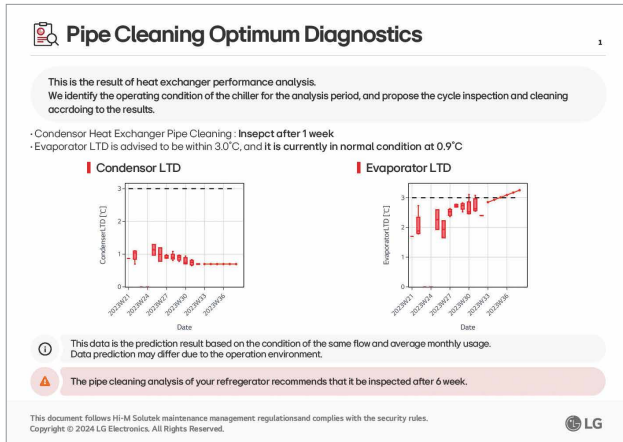
→ Condenser heat exchanger needs inspection after 6 months of customs.
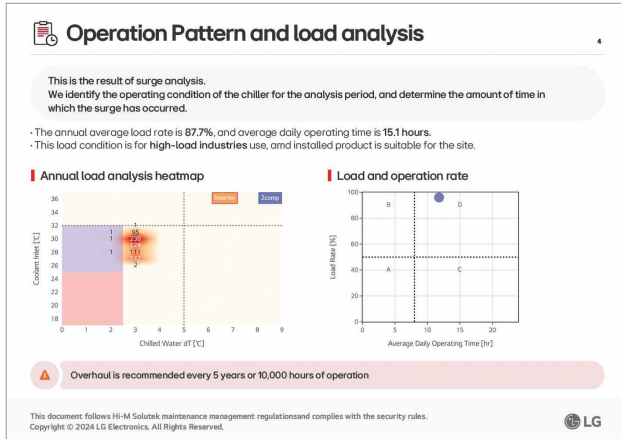
Operation Efficiency Diagnosis

During the analysis period, we analyze the operating efficiency of the refrigerator and show the trend of change.
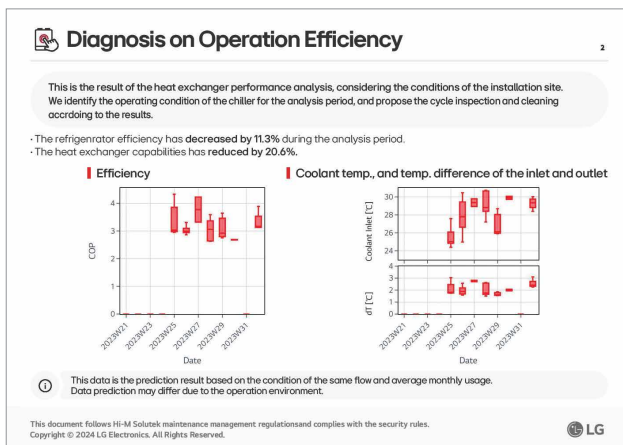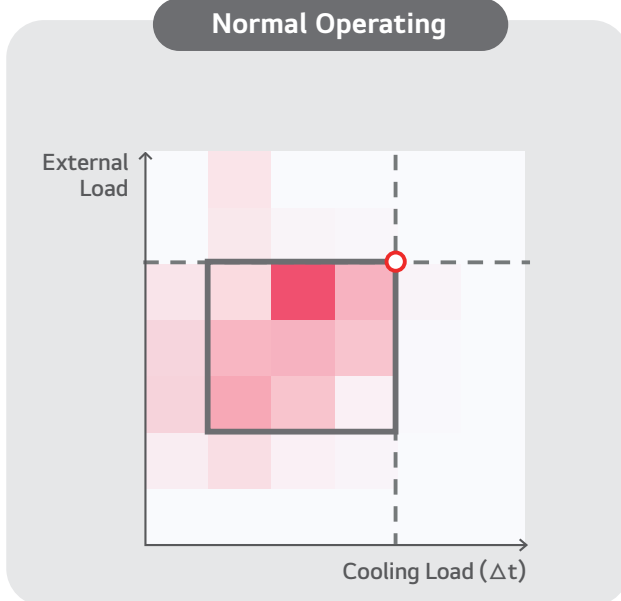

Check the heat exchanger performance and know the increase or decrease in efficiency according to the external load (coolant temperature) and refrigeration capacity (evaporator inlet and outlet temperature difference). Based on the results, we will suggest cycle inspection and customs.
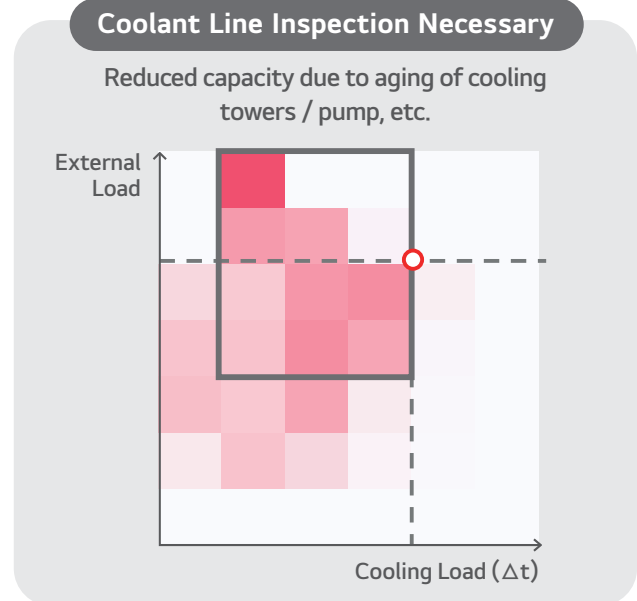
Operating Pattern Analysis

Long-term operation data analyzed to provide customized operation guides for specific sites.
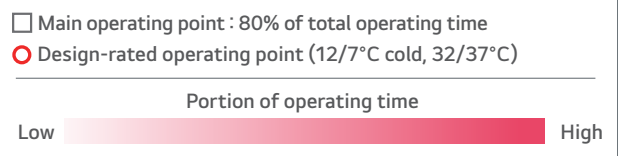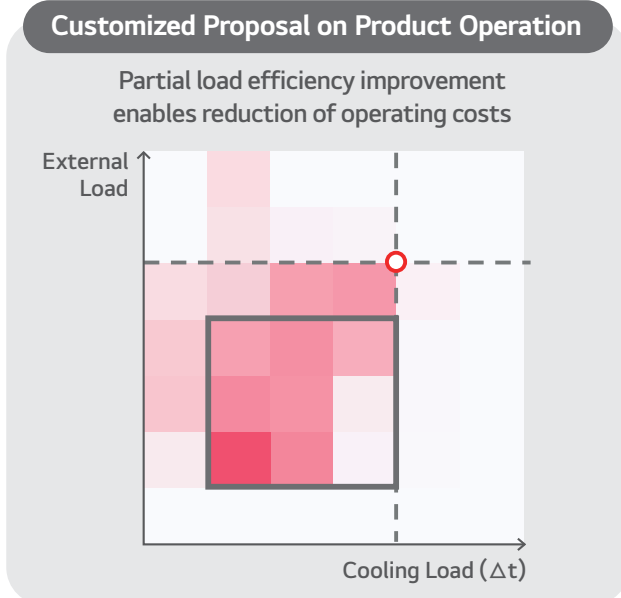

📋 Operation Pattern and load analysis

This is the result of surge analysis.
We identify the operating condition of the chiller for the analysis period, and determine the amount of time in which the surge has occurred.

· The annual average load rate is **87.7%**, and average daily operating time is **15.1 hours.**
· This load condition is for **high-load industries** use, amd installed product is suitable for the site.

❚ Annual load analysis heatmap   **❚ Load and operation rate**

⚠ Overhaul is recommended every 5 years or 10,000 hours of operation

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Normal Operating

External Load

Cooling Load (△t)

Coolant Line Inspection Necessary

Reduced capacity due to aging of cooling towers / pump, etc.

External Load

Cooling Load (△t)

Customized Proposal on Product Operation

Partial load efficiency improvement enables reduction of operating costs

External Load

Cooling Load (△t)

☐ Main operating point : 80% of total operating time
⭕ Design-rated operating point (12/7°C cold, 32/37°C)

Portion of operating time
Low   High

* This is an illustration for illustration purposes only and may vary depending on the actual usage environment.

Operation Data Management & Inquiry

Remotely view the daily operation record for each product and download it as a file. In addition, detailed historical data can be viewed and downloaded by desired time period, making it convenient to record the user's device status.
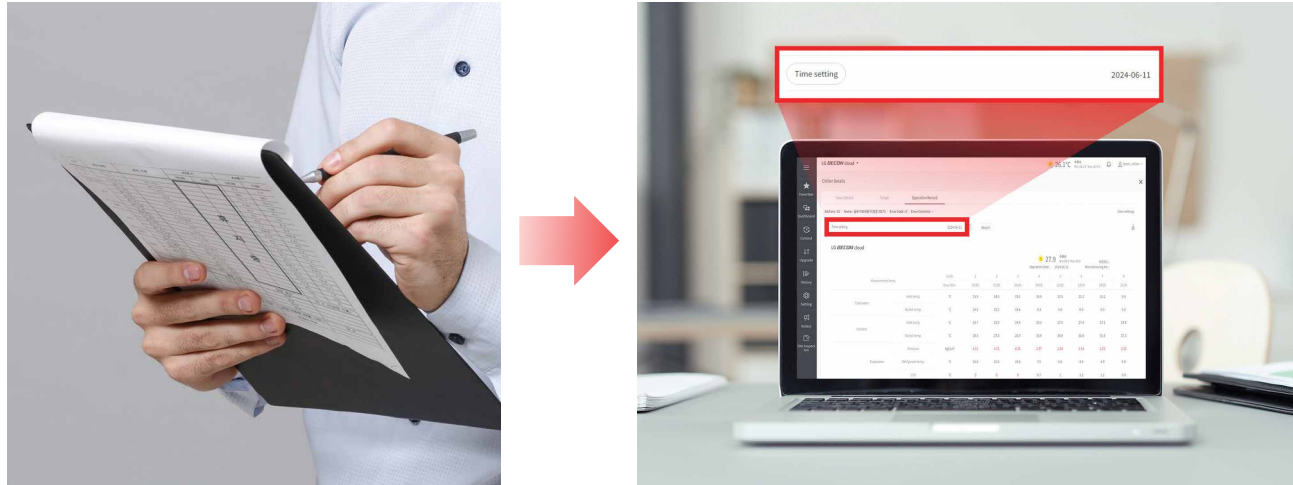
Operation Record File

Download the operation record as a file at a fixed time every day.

Measurement Items		Units	1	2	3	4	5	6	7	8
		Hour : Min.	00:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00
Cold Water	Inlet Temp.	℃	9.9	9.8	9.8	10.1	10.0	9.9	10.2	9.7
	Outlet Temp.	℃	5.9	5.7	6.0	5.9	5.7	5.6	5.9	5.8
Coolant	Inlet Temp.	℃	27.3	27.2	27.4	27.6	28.7	27.3	27.4	27.3
	Outlet Temp.	℃	29.9	29.8	30.0	30.4	31.8	30.4	30.4	29.7
Evaporator	Pressure	kgf/cm^2	2.54	2.54	2.57	2.55	2.51	2.49	2.55	2.57
	Refrigerant Temp.	℃	5.0	5.0	5.3	5.1	4.8	4.6	5.1	5.3
	LTD	℃	0.9	0.7	0.7	0.8	0.9	1	0.8	0.5
Condenser	Pressure	kgf/cm^2	7.54	7.53	7.60	7.71	8.08	7.70	7.75	7.52
	Refrigerant Temp.	℃	33.0	33.0	33.3	33.7	35.2	33.7	33.9	33.0
	LTD	℃	3.1	3.2	3.3	3.3	3.4	3.3	3.5	3.3
Cycle A / Compressor	Current Limit	%	100	100	100	100	100	100	100	100
	Operation Current	A	619.3	614.2	620.5	645.5	679.5	664.5	662.3	599.9
	Inverter Frequency	Hz	-	-	-	-	-	-	-	-
	Coil Temp. R	℃	15.7	15.8	15.4	17.7	20.3	20.2	18.5	14.9
	Coil Temp. S	℃	0.0	-0.4	-0.6	1.3	3.6	4.5	3.2	-0.7
	Coil Temp. T	℃	1.0	1.5	0.5	2.9	6.5	6.1	4.6	0.5
	Bearing Temp.	℃	-	-	-	-	-	-	-	-
	Discharge Gas Temp.	℃	7.3	7.5	7.8	7.2	7.1	5.6	6.3	8.2
	Vane Opening	%	43	43	42	35	21	29	30	48
	Diffuser Opening Status	%	0	0	0	0	0	0	0	0

Make your information safer!
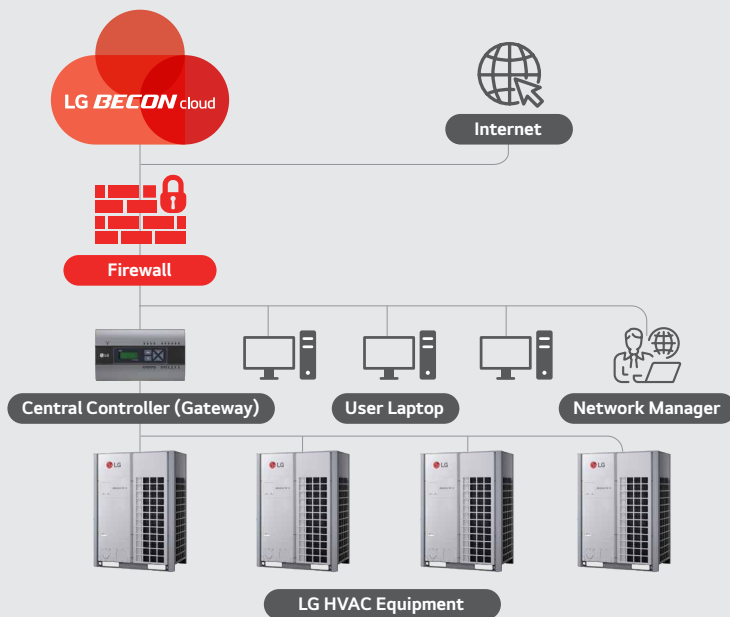# Security is more complete!
BECON cloud network security process

How to Connect to BECON cloud Server Safely

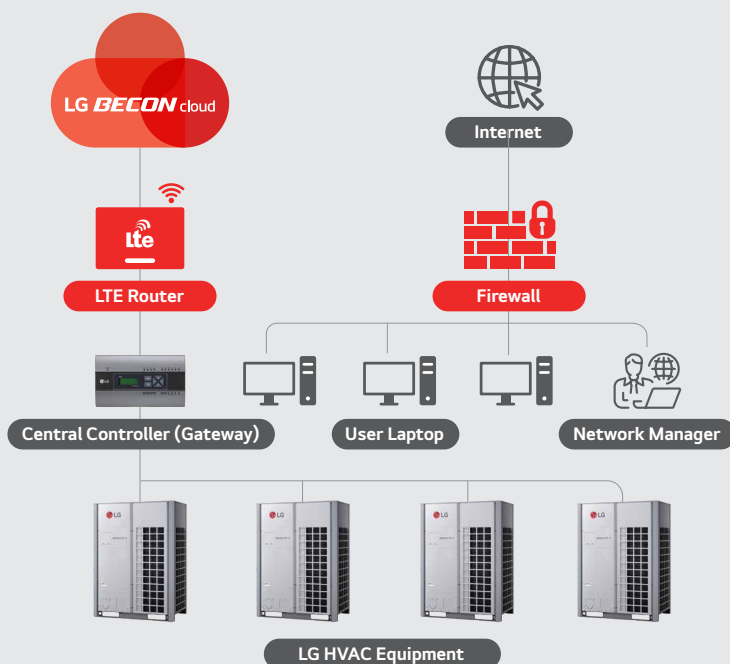### Case 1

Access using the company's Internet network

• Stable communication through on-site security firewall
• No need for additional network expansion

LG BECON cloud

Internet

Firewall

Central Controller (Gateway)   User Laptop   Network Manager

LG HVAC Equipment

Case 2

Connection using LTE network

• Separation of existing internal network by building a new external network
• Increased scope of security due to network expansion

LG BECON cloud

Internet

Lte

LTE Router   Firewall

Central Controller (Gateway)   User Laptop   Network Manager

LG HVAC Equipment

BECON cloud Security Policy

☑ The central controller uses only **outbound calls** with the security **authentication key** assigned by BECON cloud (Inbound calls from the outside can be restricted by network firewall)

☑ The central controller **supports private IP** setting (Static or DHCP IP) according to customers network operation policy.

☑ Encryption-based **Internet security protocol.** (SSL[1]) when connecting to the Internet

1) SSL, or Secure Sockets Layer, is an encryption-based Internet security protocol.
* These images are designed to help customers understand.

Easy BECON cloud connection
Take your service to a whole new level
professional maintenance solutions
for a wide range of products

EHP / GHP

Connectable Gateway		Connectable SAC Products		

ACP 5
PACP 5A000

Number of indoor units connected

Up to 256 units

AC Smart
PACS 5A000

Up to 128 units

AC Ez Touch
PACEZA000

Up to 32 units

Cloud GW
PWEMDB200

Up to 32 units[1)]

EHP / GHP

MULTI V 3 ~ 5
MULTI V S
MULTI V i

GHP GEN1 ~ 3

Single / Multi
* Depending on the detailed model, it is necessary to check whether support is available

Etc

AHU
* Depending on the detailed model, it is necessary to check whether support is available

AWHP
* Interlocking with BECON cloud after production number in October 2021

ERV
* Depending on the detailed model, it is necessary to check whether support is available

1) It only supports up to 16 devices when connected to ThinQ.

CHILLER

Connectable Gateway		Chiller

ACP 5
PACP 5A000

Number of chiller connected

Up to 10 units

Centrifugal

AC Smart
PACS 5A000

Up to 5 units

Absorption

Chiller AI Engine

1 unit

Screw

Chiller AI Gateway

1 unit

Scroll

* When ordering chiller products including BECON cloud, we are expanding interlocked products with BECON cloud by reflecting the development

LG

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