Centralized Power Monitoring Systems in the IoT Age

Case Examples

M-System offers a variety of useful components for centralized power monitoring.

They reduce your effort and cost of system construction.

STEP 1: Power Measurement
They make it easy to visualize power usage.

STEP 2: Data Transmission

STEP 3: Data Collection and Monitoring

STEP 4: Information Reporting

Data logger with web server function
Web Data Logger DL30-G

900 MHz ISM Band
Multi-hop Wireless System
HOPSTEP
FCC Part 15 Compliant

Clamp-on Pulse Sensor

Remote I/O
R3 Series
R7 Series and many more

Multi Power Monitor 53U

Parent

Child

STEP 1: Power Measurement

STEP 2: Data Transmission

STEP 3: Data Collection and Monitoring

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M-SYSTEM CO., LTD.
www.m-system.com
By combining M-System's power monitoring components,

Introduction

One can say that the purpose of centralized power monitoring is to collect data in one place. This can come from power-monitoring devices installed on power reception boards and also distribution boards scattered over a large business site. This will enable us to visualize the power usage situation of the entire business site. We prepared this Collection of Case Examples to inform you that a centralized monitoring system will be realized on a low budget with minimal installation work if Internet-of-things (IoT) technology is applied.

Manual maintenance is still observed in many worksites: employees have to walk around and take notes. We have had such customers build user-friendly, high-quality systems that contribute to the energy-saving and labor-saving of their business units. Accordingly, we have decided to introduce these specific case examples based on our experience. We hope that this brochure will be informative for you.

1 Measurement

Remote I/O that can select an optimum power detection method

![Diagram of power detection method](Image)

2 Transmission

Multi-hop Wireless System eliminates wiring work

![Diagram of wireless network](Image)

Device Configuration Example

Conceptual Diagram

![Diagram of device configuration](Image)

See page 8 Introducing various power monitoring remote I/O devices and multi-hop wireless devices.

(*1) This device is approved for use only in the US. (Wireless devices for Thailand and Vietnam are also available. Consult M-System.)

(*2) Be sure to conduct a signal strength site survey before introducing wireless modules.
you can easily build a system that meets your needs on a low budget.

Centralized power monitoring provides many benefits. Let's start with power visualization!

**Efficiently grasping power consumption by remote data collection**
- We eliminated the necessity for monitoring around the site.

**Promoting employees’ energy-saving activities**
- We can raise their motivation!

**Grasping the operation rate and efficiency of equipment**
- We succeeded in production cost reduction with equipment improvements!

**Creation of various reports**
- Ease of billing for electricity charges!

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### 4 Reporting

- **Email notification**
  - The DL8 and the DL30-G automatically make email reports on the operation status of equipment and the generation of alarms.
  - The EDMC automatically makes email reports on predictive over-demand alarms.

- **Linking with a billing management system**
  - The DL30-G and the DL8 automatically collect data on the power consumption of each building tenant and transfer the data over FTP (*3) to the customers’ billing management system.

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### 3 Collection and Monitoring

**No PCs required! Data logger with web server function**

- Accumulating data on-site and generating various web screens simultaneously.
- No special application software is required for power monitoring.
- Automatic notification of alarms and equipment operation status by email.
- Forms (daily report, monthly report, and annual report) are equipped as standard. (DL30-G)

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**Remote graphic panel**

- Possible to edit and show the graphical display of components, such as switches, lamps, and meters, together with the display screen of IoT devices on the same screen.
- HDMI port is equipped as standard, allowing the use of commercially available touch panels.

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**Case 1** Simple Demand Monitoring with EDMC

We adopted simple demand monitoring on a low budget.

The demand data recorded on the EDMC is transmitted to the central monitoring station over a mobile line. If a demand alert occurs, the person in charge is automatically notified of it by email.

(*4) ISP: Internet Service Provider

(*5) If there is no pulse converter, a clamp-on type pulse pickup detector receives the pulse signals.

**Case 2** Power Monitoring Points added to Existing Factory PLCs

The Multi Power Monitoring Unit links to the PLC network, ensuring easy I/O expansion.

A single R9xWTU accepts input from a maximum of eight circuits. By adding an expansion unit, input from a maximum of 16 circuits is possible.

(*6) MCCB: Molded case circuit breaker

**Case 3** Simple Power Measurement in Labs

The clamp-on current sensor eliminates the need for wiring work.

This is an example of power measurement on a lab-by-lab basis at a university. The installation work was easy, due to the clamp-on current sensors. Furthermore, the system was implemented at a low cost by combining the DL8 and remote I/O with 4-point AC input.

**Case 4** Collection of Data on Power and Water Consumption at Train Station Facilities

The system has eliminated the necessity for spending time looking around for data measurement, because the data is collected automatically and wirelessly.

The DL30-G, in combination with the HOPSTEP(1), collects data on power consumption and water consumption of station stores and automatic vending machines. All data collected by the DL30-G is converted into form data that can be viewed on a web site on a PC or saved as CSV files.

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Case 5: Power Management of Wastewater Treatment Equipment

With the DL30-G, we have succeeded in live web monitoring and the creation of a daily power usage report. The Remote I/O R3 Series is used to enable the existing FL-net building monitoring system to handle power and temperature I/O. The nickel temperature sensors connect directly to input modules dedicated to the R3 Series and require no external converters.

Case 6: Addition of I/O to a Monitoring System of Air-conditioning Power Consumption

The Remote I/O R3 Series directly connects to the FL-net network. The Remote I/O R3 Series is used to enable the existing FL-net building monitoring system to handle power and temperature I/O. The Nickel temperature sensors connect directly to input modules dedicated to the R3 Series and require no external converters.

Case 7: Collection of Billing Information on Building Tenants

Billing information on each tenant is obtained automatically. The Smart Sensor RGP30, with a simple installation, measures and transmits data via wireless data transmission. The information on generated power is converted into a CSV file that is attached directly to the cloud server. The R3-WTU, Compliant with FL-net communications, is employed to control the R3 series.

Case 8: Wireless Power Monitoring of Each Distribution Board

We could not have achieved centralized power monitoring without this wireless system! Data on various electrical quantities is collected from the distribution board of each building via the HOPSTEP. The wireless infrastructure provides an easy collection of data from the large factory site, which is across the road.

In this example, the DL8 was installed for the email notification of abnormalities in the water treatment equipment, and the DL30-G was added later for the remote monitoring of various data items (e.g., pH, drainage flow, and temperature data) via a web page and the logging of power consumption.
**Case 9: Power Monitoring of a Small Hydroelectric Power Plant**

A daily report is attached to the email notification.

*Point*

Various data (including the power generation amount) is collected by the DL30-G and is monitored remotely through a PC connected to the in-house LAN. In addition, a daily report created by the DL30-G is regularly dispatched via the in-house email server.

**Case 10: Remote Monitoring of a Solar Power Plant**

An email with an attached CSV file is dispatched regularly.

*Point*

Information on generated power is converted into a CSV file that is attached to an email and regularly dispatched. If there is a problem with the facility, an email message will be sent to the facility manager for a prompt response.

**Case 11: Remote Power Monitoring of a Data Center**

Power and temperature reports are uploaded to the cloud server.

*Point*

CSV files are downloaded from the cloud server via FTP.

**Case 12: Centralized Power Monitoring of a Cement Plant**

We succeeded in centralized power monitoring of existing facilities with a simple installation!

*Point*

This centralized power monitoring system uses the HOPSTE (1) to transmit measurement data wirelessly from each facility to the SCADA and is controlled by a PC. Data from some locations, where wireless connections are difficult to maintain, is transmitted via relay stations that communicate with the wireless system.

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Case 13  
**Power Meter Reading at Elderly Care Facilities**

We don't have to walk around and check each power meter anymore. It has saved our time and labor.

The power monitoring system (controlled by a PC) measures the power consumption of each resident's room for billing. Furthermore, if a demand alarm occurs, the IT60SRE indicator will be lit, and the built-in buzzer will sound.

Case 14  
**Centralized Power Monitoring of Dispersed Factories**

We can centrally monitor the power consumption of remote factories through wireless data transmission.

The HOPSTEP transmits measurement data of various electrical quantities from each building wirelessly to the SCADA for data collection and monitoring. The Remote I/O R3 Series Multi power input module is used to measure the various electrical quantities.

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Case 15  
**Centralized Monitoring of Scattered Substations on Wharves**

We have succeeded in the centralized monitoring of power with simultaneous video surveillance of the wharves on a large monitor screen.

The 920 MHz ISM Band Multi-hop Wireless System wirelessly transmits power measurement data on the substations on the wharves to be collected by the DL30-G to generate web pages for use in monitoring. The RGP30 enables the display of multiple web pages and network camera images on the large monitor.

Case 16  
**Centralized Power Monitoring of Cleanrooms**

We have succeeded in centralized power monitoring with many monitoring points on a low budget.

The Remote I/O R3 Series receives data on electric power from the electric room and cleanrooms, and the SCADA in the office collects and monitors it. The SCADA screen is available for any PC in the plant via the in-house LAN.
Introduction of Remote I/O Devices and Multi-hop Wireless Devices for Centralized Power Monitoring

Remote I/O with Flexible Combinations of Signal Types and Points

- **R3 Series**: Numbers of I/O types and models: 50 types / 119 models
- **R7 Series**: Numbers of I/O types and models: 59 types / 261 models
- **R9 Series**: Numbers of I/O types and models: 3 types / 6 models

Multimeter/Transducer with Power Energy Count Pulse Output

- **L53U**: Outputs DC signals as well as totalization pulse signals
- **LTWT**: Provided with totalization pulse output

Wireless Monitoring System

- **WL40EW2F**, **WL40MW1F**: Modbus gateway
  - This device is approved for use only in the US. (Wireless devices for Thailand and Vietnam are also available. Consult M-System.)

Web-enabled Power Demand Monitor

- **EDMC**: Limited to Japanese market

Related equipment

- **CLS Series**: 5 A up to 600 A (CLSD: Up to 2,000 A)
- **CLSP**: Clamp-on Pulse Sensor

Specifications are subject to change without notice. When ordering, use the latest data sheets available at M-System web site: www.m-system.com