M-System’s IoT devices support the safe operation and energy saving of Road facilities.

The period of closing roads under construction has become short. The snowplow can now be mobilized quickly. The maintenance interval of service vehicles has become longer.
Introduction

The road network covered throughout the country supports people’s lives. Many stakeholders are working in the background to maintain and manage the road network. M-System utilizes the latest IoT technology to contribute to the safe operation and energy conservation of road facilities. The 16 Cases Examples arranged on pages 4 to 7 have been selected from our past achievements. We hope that these examples are informative to users.

Case 1: Power Demand Monitoring
Case 2: Temperature Management of Asphalt Finisher
Case 3: Alarm Display of Construction Survey on Bridge Girders

Case 4: Data Logging of In-tunnel Fire Point Position Detector
Case 5: LED Replacement for Toll Booth Indication Board
Case 6: LED Replacement for On-vehicle Bulletin Board

Case 7: Tunnel Traffic Management
Case 8: Tunnel Gas Concentration Record
Case 9: Tunnel Disaster Prevention Equipment
Case 10: E-mail Report on Flood Warning

Chairman of the Board
M-System Co., Ltd.
Shigeru Miyamichi
### Products Introduced in Case Examples

#### Web Data Logger
**Model: DL6**

The Web Data Logger is an Internet-of-things (IoT) terminal incorporating versatile functions, including a remote monitoring function, data logging function, and event reporting function, available through a website screen.

**Basic functions**
- Simple web server
- FTP function
- Modbus/TCP communications function
- Data logging
- Email notification function

*See Cases 4, 10 to 13*

#### Tablet Recorder
**Model: TR30-G**

The Tablet Recorder is a data recorder that displays collected and accumulated trend data on a website screen using a tablet or PC via an IP network, such as a Wireless LAN network.

**Basic functions**
- Trend data/Event data recording
- Simple web server
- FTP function
- Modbus/TCP communications function
- Various calculation inputs
- Email notification function

*See Case 8*

#### Web Data Logger
**Model: DL30**

The Web Data Logger is a data logger of onsite-installation type incorporating versatile functions, including a remote monitoring function, data logging function, and event reporting function, available through a website screen as well as a report creation function.

**Basic functions**
- Simple web server
- Data logging
- Email notification function
- FTP function
- Modbus/TCP communications function
- SLMP communications function

*See Case 16*

#### 900 MHz ISM Band Multi-hop Wireless System WL40F Series

FCC Part 15 compliant wireless module

The WL40F Series uses 900 MHz radio waves that have excellent wraparound and propagation characteristics with long-distance reachability, transmitted in a multi-hop system (in relay mode via child units).

- Free communication charges.
- No license fees.
- Reaching a long line-of-sight distance, up to 1 km (0.62 mile)

(*1) This device is approved for use only in the US.
(*2) Be sure to conduct a signal strength site survey before introducing the WL40F Series.

*See Case 16*
Case 1: Power Demand Monitoring
Road Construction

The construction site had a contract electric power limitation. We were afraid of the penalty for the power consumption exceeding the contract power.

Before
- We connected the IT40SRE to a PC over the LAN. Since then, we have been able to display alarms with ease.

After
- The construction site had a contract electric power limitation. We were afraid of the penalty for the power consumption exceeding the contract power.

Case 2: Temperature Management of Asphalt Finisher
Road Construction

We wanted to control the temperature of the screed (3) of the asphalt finisher (4), and we were looking for a compact temperature transducer with a wide operating temperature range.

Before
- We introduced the EDMC. Since then, we have been able to monitor the electric power demand on a tablet at the construction site. An alarm turns ON when the power consumption is likely to exceed the limitation.

After
- We introduced the 26TS1, a compact model with an operating temperature range of -40°C to 85°C. It has the ideal specifications for use on the asphalt finisher.

Case 3: Alarm Display of Construction Survey on Bridge Girders
Road Construction

We wanted to use a PC to judge the measured values of the laser rangefinder and to output the anomalies, if any, to the LAN for display, and we were looking for an effortless method.

Before
- We wanted to use a PC to judge the measured values of the laser rangefinder and to output the anomalies, if any, to the LAN for display, and we were looking for an effortless method.

After
- We connected the IT40SRE to a PC over the LAN. Since then, we have been able to display alarms with ease.

Case 4: Data Logging of In-tunnel Fire Point Position Detector
Road Maintenance

We wanted to make an accident analysis by adding a function of temperature logging to an existing fire point position detector (5), and we were looking for an inexpensive, effortless method.

Before
- We wanted to make an accident analysis by adding a function of temperature logging to an existing fire point position detector (5), and we were looking for an inexpensive, effortless method.

After
- We introduced the DL8 and we succeeded in temperature data retrieval and logging. The DL8 incorporates communications and logging functions as standard features. We succeeded in solving the problem inexpensively and easily.

Fire point position detector: A device of cable structure that detects fire by temperature.
Case 5: LED Replacement for Toll Booth Indication Board

We wanted to replace existing fluorescent lamps for information boards of toll booths on an expressway. We were looking for long-life lighting that could replace the existing lighting within a short time.

Before: Existing fluorescent lamps.

After: We replaced the fluorescent lamps with LS1200. The LS1200 has a long life. It is effectively bright because it allows lighting angle adjustments.

Case 6: LED Replacement for On-vehicle Bulletin Board

Automotive fluorescent lamps were easily broken, and their lifespan was short. We were looking for something better.

Before: Old fluorescent lamps.

After: We replaced them with LS1200, which are provided with a hard-to-break polycarbonate-made cover and have a longer life span.

Case 7: Tunnel Traffic Management

We had to provide a bus service to pass through a railroad tunnel that became abolished due to an earthquake disaster, and we were looking for a device to transmit a safety confirmation signal. It was a temporary service to be constructed within a short time on a low budget.

Before: The tunnel before

After: We introduced the D3 Series, which started working right after turning the power on. We were able to work this out within the low budget.

Case 8: Tunnel Gas Concentration Record

We were troubled when we missed gas concentration data at the time of an abnormality because we could not trace the problem. We were looking for a way to record and track data.

Before: The tunnel before

After: We introduced the TR30-G that can store data in SD cards and view the data on tablets. We can now track the occurrence of abnormalities.
Case 9: Tunnel Disaster Prevention Equipment

We replaced the system with the DLA1 and the Remote I/O R3 Series, and since then, we have been able to monitor data at 10-second intervals. Furthermore, we used a BCD input module (\*6) to retrieve signals from the snow gauge directly.

Case 10: E-mail Report on Flood Warning

We introduced the DL8, which sends us flood warning email, so we can respond quickly.

Case 11: Monitoring of Snow on Roads

Our snow monitoring system updated data at one-hour intervals, which often delayed our response. We wanted to shorten the cycle of data updating. Furthermore, the snow gauge uses BCD signals.

Case 12: Measures to Protect Meteorological Observation Equipment against Lightning

We were planning to a LAN update for weather observation facilities and looking for a lightning surge protector for Ethernet as a lightning countermeasure.

\*6 The R3 Series BCD Input Module with special specifications.
Remote Monitoring and Operation of Water Supply Facilities

We had trouble with our self-managed line for the remote monitoring and control of water supply facilities in the mountain due to its aged deterioration, and it sometimes caused communication failures.

Before

We successfully replaced the system with the DL8 in combination with a mobile router for smooth communication. Because it is wireless, there is no worry about cable deterioration.

After

- Energy count pulse
- Distribution tank level
- Facility alarm

Modbus/TCP Ethernet

- Limited to Japanese market

Measures to Protect Lighting Distribution Board against Lightning

We wanted to take preventive measures against lightning for lighting equipment, and we were looking for a lightning surge protector conforming to the national specifications (7) and fitting in the switchboard.

Before

We introduced the MAT3, which complies with the national specifications. Because the depth is 60 mm (2.36 in), it fitted into the lighting distribution board perfectly.

After

- Distribution tank level
- Facility alarm

Modbus/TCP Ethernet

- Limited to Japanese market

Service Area (SA) Power Monitoring

As SA users increased, the power consumption increased. We wanted to visualize the power consumption, but the SAs on the inbound-lane side and the outbound-lane side are far from each other. We wanted to use the existing self-managed line.

Before

We introduced the D3 Series, which can transmit up to 10 km (6.2 mi) over the existing self-managed line. We will find an excess usage of electric power from now on.

After

- Energy count pulse
- Self-managed line
- D3 Series
- PLC
- Management office
- Ethernet

- Limited to Japanese market

Service Area (SA) Drainage Management

We wanted to renew the drainage facilities in the SAs on the inbound-lane side and the outbound-lane side, but we thought it was hard to go round and check the amount of drainage at the inbound and outbound lanes.

Before

We transmitted the amount of drainage and pH wirelessly over the WL40F Series (*8) to the DL30. Then we were able to see the daily and monthly reports on PCs and smartphones. We have been freed from patrolling work.

After

- Wastewater flow pulses
- pH

Modbus/TCP Ethernet

- Limited to Japanese market
### Products Introduced in Case Examples

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<th>Web-enabled Power Demand Monitor</th>
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<tr>
<td>An LED tube that can easily replace a fluorescent lamp without wiring work.</td>
<td>A telemetering system that can be used on a variety of communications lines, ranging analog leased lines to radio links.</td>
<td>A multiplex transmission device with ease of expansion.</td>
<td>The Multi-channel, Mixed Signal Remote I/O R3 Series supports a wide variety of network types and I/O module types.</td>
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<td>A compact remote I/O of all-in-one construction.</td>
<td>A lightning surge protector that can be connected to Ethernet cable.</td>
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For details of the products introduced here, please visit M-System’s website.

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