MEIDEN CONNECT for Problem Solving and Value Creation

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Abstract

MEIDEN CONNECT, which is currently under development by our company, is a solution platform that connects existing products to a network and solves the problems of various stakeholders. By adopting an agile development process that emphasizes value exploration and provision, we are realizing continuous value creations.

As a demonstration of the application, we applied MEIDEN CONNECT to an extra-high voltage substation located on the premises of Meiden Numazu Works in Numazu City, Shizuoka Prefecture, Japan in 2021 and "smart maintenance" was realized. We are currently conducting a field verification project there to streamline inspection work and collect data. Through this verification, we aim to enhance electrical maintenance, improve the productivity of maintenance work, and maintain as well as improve maintenance capabilities.

1 Preface

In the social infrastructure field, many electrical facilities have been in operation for an extremely long time, with many products in operation for more than 30 years. After installation, social infrastructure has been supported by rapid maintenance and troubleshooting.

Currently, social infrastructure faces many problems, such as the aging of equipment and a shortage of maintenance workers due to an aging society. In addition, there are many other problems, such as responding to global warming and the increasing severity of natural disasters.

The social infrastructure of the future will be required to be resilient and sustainable. As one solution to achieve this, we have developed "MEIDEN CONNECT". MEIDEN CONNECT is a solution platform that connects existing products to a network and responds to the problems of various stakeholders.

This paper introduces MEIDEN CONNECT and our activities to solve problems and create value by using this platform.

2 MEIDEN CONNECT

Fig. 1 shows a screen image of MEIDEN CONNECT. Our remote product monitoring service aims to create new value by collecting on-site data and storing it in the cloud. Long-term data is stored in the cloud and used for the maintenance service of contract facilities.

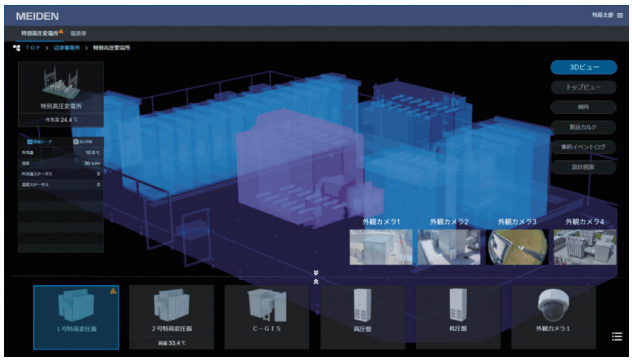


Fig. 1 Screen Image of MEIDEN CONNECT

A screen image of MEIDEN CONNECT is shown.

By constantly monitoring on-site data at Meiden Customer Center, we aim to improve the quality assurance level by managing the efficient dispatch of our field service engineers to the contract facility site and giving timely equipment upgrade proposals according to the contract facility's condition. In addition, we analyze the accumulated data and provide feedback to our research

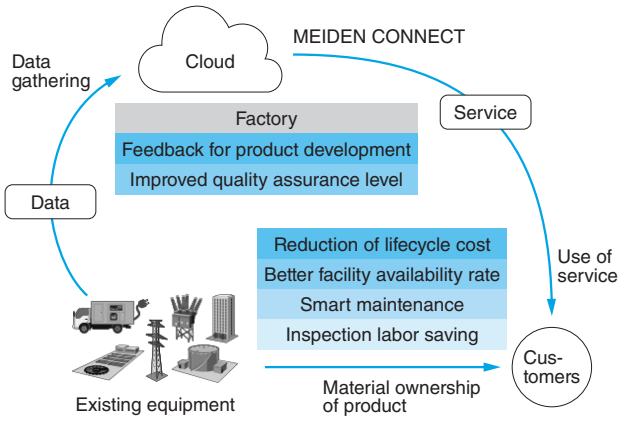


Fig. 2 Example of How MEIDEN CONNECT is Used

Data obtained from on-site facility is stored in the Cloud. These data are utilized for a variety of applications. By grasping the conditions of remote facilities, support and optimization of on-site works can be realized.

and development team to review product designs. We aim to use such data to improve products (e.g., shorter delivery periods, compact design).

In this way, we are developing MEIDEN CONNECT as a solution platform to provide better products and services to customers. Fig. 2 shows an example of how MEIDEN CONNECT is used.

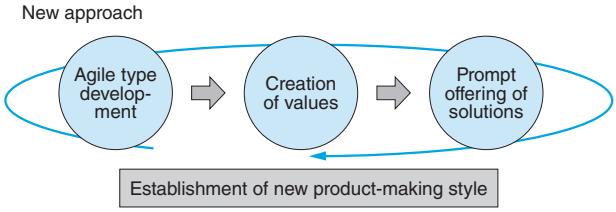
3 Approach to Problem Solving

MEIDEN CONNECT adopts an agile development process that emphasizes value exploration and delivery. By introducing the agile framework called Scrum for the first time at our company, we aim to realize continuous value creation. Scrum is a method of development carried out by small teams. Members with different roles cover the vision, project management, and technical aspects to ensure development is carried out efficiently. A solution is shaped in a short cycle of several weeks and its value is verified. By repeating this process, value is continuously created. Fig. 3 shows the mechanism of value creation by a Scrum team.

4 Case Study of Value Creation: Realization of Smart Maintenance

4.1 Background

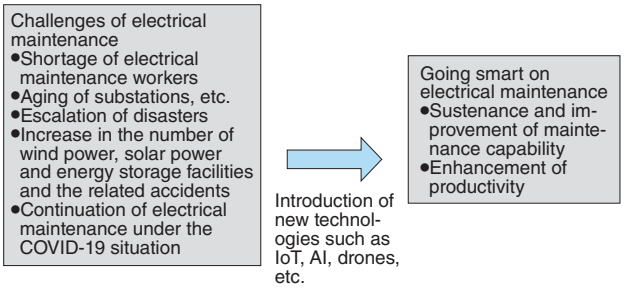
Currently, the electrical maintenance field faces challenges such as the deterioration of facility over time, the aging and shortage of field service engineers for maintenance work, the diversification of maintenance work due to an increase in renew-



Values are created based on the development activities of Scrum team.

Fig. 3 Mechanism of Value Creation by Scrum Team

Repeating the value verification (trial and error) by Scrum approach, valuable things can be created for customers. By making small scale prototypes, effective solutions can be realized sooner.



Source: "Smart Maintenance Action Plan in the Field of Electrical Maintenance", ("Smart Maintenance Public-Private Council, Electrical Security Subcommittee" issued in April 2022), (Ministry of Economy, Trade and Industry of Japan) Established by editing on (https://www.meti.go.jp/shingikai/safety_security/smart_hoan/denryoku_anzen/pdf/20210430_2.pdf)

Fig. 4 Overview of Challenges Surrounding Electrical Maintenance World and How it can be Made Smarter

Overview of challenges surrounding electrical maintenance world and how it can be made smarter are shown.

able energy businesses, the increase in large-scale natural disasters, and the need to respond to changes in the industrial structure and external environment due to measures against the COVID-19.

To address these challenges, as well as maintain and improve safety and efficiency, it is necessary to advance electrical maintenance. To achieve this, it is necessary to utilize new smart maintenance technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and drones, and it is necessary to make electrical maintenance smarter by using these technologies to achieve both a stable supply of electricity and improved productivity[1]. Fig. 4 shows an overview of the challenges surrounding electrical maintenance world and how it can be made smarter.

4.2 Challenges and Hypothesis

Our company built an in-house substation on its premises using our own substation equipment and outsources the electrical maintenance work of

the substation to our group company, Meiden Facility Services Corporation. However, due to the circumstances described above, an increase in facility management load and maintenance work load has become an issue. This is due to the deterioration of equipment over time, as well as the aging and shortage of field service engineers for the maintenance work.

In addition, in conventional inspection work, workers visually checked meter readings and “on/off” displays of devices such as transformers and Cubicle type Gas-Insulated Switchgears (C-GIS). The result of inspection was manually recorded on papers and used as the ledger. This resulted in issues such as accuracy problems such as human error, the labor burden of handwriting, and the difficulty of data storage and utilizing records.

Therefore, we hypothesized that using IoT devices such as sensors and cameras to collect information that workers previously checked visually would lead to a reduction in electrical maintenance work.

4.3 Verification of Effect

To verify the hypothesis, we introduced MEIDEN CONNECT to our extra-high voltage substation for Green transformation (GX) installed at the premises of Meiden Numazu Works in Numazu City, Shizuoka Prefecture, Japan and began a proof of concept initiative aimed at realizing smart maintenance.

4.3.1 Labor-Saving Inspections with IoT

MEIDEN CONNECT collects data necessary for equipment inspections and utilizes it to semi-automate the visual inspection and recording of inspection work, such as meter reading, and even the output of results. As a result, the amount of work required for inspection work in one year was reduced by 90%. This initiative was recognized by the Smart Maintenance Promotion Committee of the National Institute of Technology and Evaluation (NITE), which is under the Ministry of Economy, Trade and Industry of Japan, and was published as a safety technology model in the Smart Maintenance Technology Catalog (Electrical Maintenance)[2]. **Fig. 5** shows the changes in inspection methods due to the introduction of MEIDEN CONNECT.

4.3.2 Efficient Information Sharing with 3D Models

While continuing to observe inspection work, we discovered that there was a communication cost when bringing back and sharing information obtained on-site during inspections. Therefore, we hypothesized that by utilizing 3D models, we could share information on-site more efficiently and effectively, and built a system for information sharing using 3D models in MEIDEN CONNECT. This enabled the facility owner, electric works specialists, maintenance and inspection personnel, suppliers, and other related parties to share information intuitively, accurately, and smoothly via the Internet. As a result, related parties can quickly grasp the

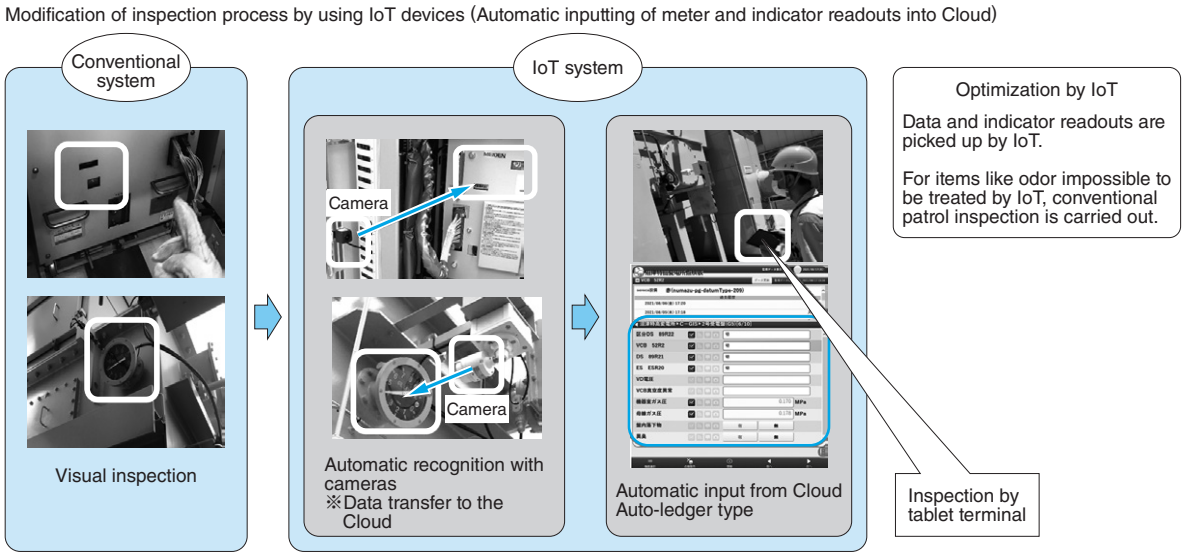


Fig. 5 **Changes in Inspection Methods Due to Introduction of MEIDEN CONNECT**

To reduce labor on patrol inspection jobs, the “eyes” of inspectors are replaced with the IoT devices to reduce the inspection time and paperless performance.

Fig. 6 Example of Information Sharing Using 3D Model

Focusing on the communication cost needed to transmit site information, we made up a system of intuitive and accurate information sharing through a combination of 3D location information by the aid of a 3D model, with text and photo.

Fig. 7 A View of Inspection Tour Program of Extra-High Voltage Substation

For a test bench to pursue value verification, we invited guests from more than 80 firms this year in order to get various feedbacks so that our products and services could be improved.

on-site situation. Fig. 6 shows an example of information sharing using a 3D model.

4.4 Future Developments

We are holding inspection tour programs at the extra-high voltage substation for GX at Meiden Numazu Works. Our customers can experience first-hand our smart maintenance efforts. At the same time, we can collect customer feedback to make the system better. Fig. 7 shows a view of an inspection tour program of the extra-high voltage substation. In the future, we will expand the smart maintenance initiatives to other facilities, use them to accumulate big data, and then leverage AI to diagnose equipment and automate maintenance work.

5 Postscript

We introduced MEIDEN CONNECT, a solution platform, and a case study of value verification. In this development, we adopted a method in which developers and users work together.

In the future, we intend to develop further systems and services that solve user problems by using Scrum approach, and to work on creating truly valuable products not only in cooperation with other related divisions within the company, but also through collaborative innovations with customers.

《References》

(1) "Smart Action Plan in the Field of Electrical Maintenance", Ministry of Economy, Trade and Industry of Japan; Smart Maintenance Public-Private Council, Electrical Security Subcommittee, 2021
https://www.meti.go.jp/shingikai/safety_security/smart_hoan/denryoku_anzen/20210430_action_plan.html (Retrieved on July 10, 2023)
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