

Education and Training at Meiden Engineering Center

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Abstract

In order to achieve its mission and secure high quality as a business in offering maintenance services, it is essential to develop and reinforce “human potential power.” In order to make this connection, we founded Meiden Engineering Center in 2000 as a key organization for education and training of service engineers in the Engineering Business Unit. Meiden Engineering Center is in charge of all technical education and training for product-related knowledge, maintenance techniques, and on-site safety management techniques necessary for maintenance services. This facility is therefore provided with products that we handle and treat on-site as well as a training building with actual operational power products and tools specifically for education and training.

1 Preface

In 2000, Meiden Engineering Center was founded next to the premises of Meiden Numazu Work in Shizuoka Prefecture. This was intended to create a core facility for the training of technical knowledge and skills. Meiden Engineering Center focuses on at training system engineers so that they acquire the reliable technical knowledge and skills needed. Focusing on hands-on experience with authentic products, trainees can learn from wide variety of educational content such as knowledge about systematic and individual products or related maintenance techniques. The education of maintenance-related engineers is a particularly important target.

This paper outlines the features of Meiden Engineering Center and its educational facilities, plus some examples of major educational and training approaches.

2 Outlined at Meiden Engineering Center Facilities

The main features of Meiden Engineering Center are described below.

(1) Meiden Engineering Center

Site area: 3750m²

Training Building: 3-storied steel structure 1200m² (400m² × 3 floors)

Practical Training Building 1: Flat steel structure

750m²

Practical Training Building 2: Flat steel structure 255m²

Practical Training zone with extra-high-voltage equipment (outdoor): 690m²

3 Training with Actual Machines at Meiden Engineering Center

Corporate education is classified as either On-the-Job Training (OJT) or Off-the-Job Training (OffJT). It is generally believed that OJT plays a great role for imparting engineering techniques and skills to trainees. In particular, the mastery of various jobs skills to be performed at the customers' project sites requires long-term many work experiences there, as the conditions at each work site are complex and may differ from other locations. Furthermore, OJT training at a project site has some limitations making it difficult to transfer deep technical knowledge and skills to the trainees. Meiden Engineering Center provides more in-depth advanced education and training using in-house facilities that are equivalent to those of the customers.

4 Educational Programs at Meiden Engineering Center

Fig. 1 shows the contents of the major education programs offered at Meiden Engineering Center.

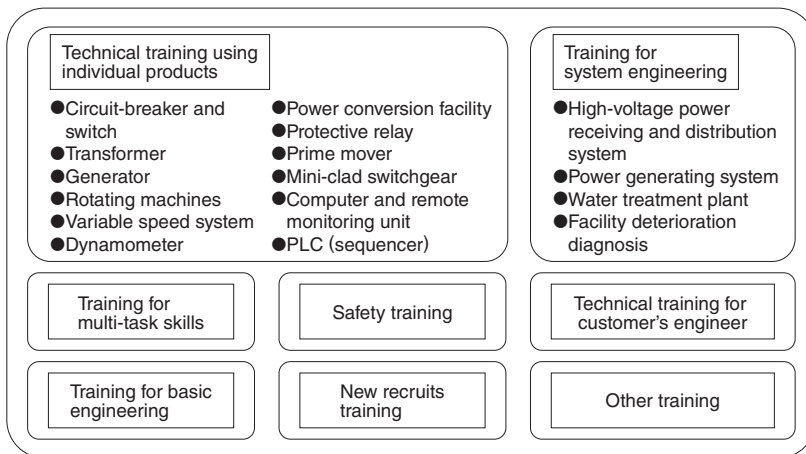


Fig. 1 Contents of Training Conducted at Meiden Engineering Center

This shows the contents of the major training programs conducted at Meiden Engineering Center.



Fig. 2 Training for Protection Relays

For training for protection relays, a facility similar to that of the customers' is used.



Fig. 3 Training for a Rotating Machine

Construction of a rotator is explained with the use of a cutaway model.

4.1 Technical Training with Individual Product

Workers study to obtain technical knowledge such as equipment configuration, method of operation, and maintenance and inspection by using actual machines and equipment. Training is carried out by using the same equipment as found at a customers' facility. Such equipment includes a cutaway model for trainees the configuration of its internal structure, drill operation of a circuit-breaker and/or a disconnecting switch, testing on various protection relays, operation of an in-house power generating system, power converters and inverters, and variable speed products. For training, trainees can use

equipment similar to that of the customers' project site facilities. Fig. 2 shows a view of training for protection relays and Fig. 3 shows a view of training for a rotating machine.

4.2 Training for System Engineering

Using a system equivalent to that of the project site of the customer, training is carried out for equipment operation, inspection, and remedial actions to be taken in the case of an emergency. Training with individual products and system engineering are combined so that complete education training can be provided. This includes individual product training of the structure of various products, their method of operation, and skills for maintenance and inspection. For system, training, knowledge of operation and control, inspection work, and remedial procedures to be taken at the time of an emergency lead to the overall system engineering expertise.

Training for the diagnosis of facility deterioration is also offered for the purpose of bringing service engineers up to the level of making accurate diagnosis of the state of a facility during normal operation. Fig. 4 shows a view of an inspection training for a high-voltage substation facility and Fig. 5 shows training for the diagnosis of facility deterioration.

4.3 Training for Multi-Skilled Service Engineers

This training is intended to make trainees acquire basic knowledge and skills on equipment and facilities other than those handled at their



Fig. 4 Inspection Training for High-Voltage Substation Facility

Training for inspection is carried out with high-voltage substation facility that is equivalent to that of the customers’.

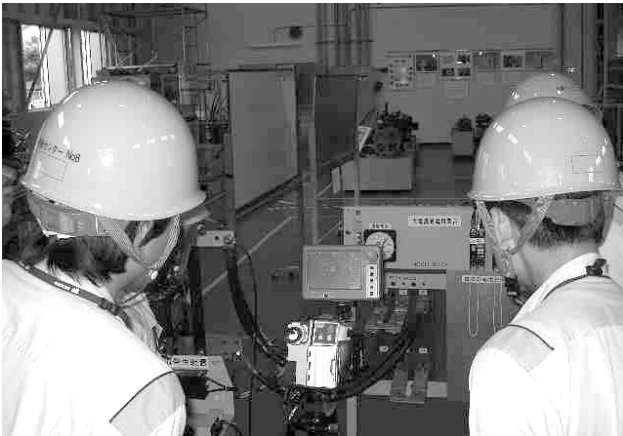


Fig. 5 Training for Diagnosis of Facility Deterioration

A thermo-tracer or similar equipment is used to study the method of diagnosing facility deterioration.

respective business units and it is required that each trainee is able to perform the standard work alone. Mid-carrier service engineers from each business unit can attend lectures and training programs in small groups in order to realize higher technical skills training so that service engineers gain the added valuable skills in addition to their current ones.

Fig. 6 shows a view of training for speed control equipment **Fig. 7** shows a view of training for a power converter.

4.4 Safety Education

(1) Training for supervisors (**Fig. 8**)

We define the meaning of a supervisor in order



Fig. 6 Training for Speed Control Equipment

Actual machines are used to learn basic knowledge on speed control equipment like inverters.



Fig. 7 Training for Power Conversion Equipment

Training is carried out by using the PCS for a 10kW solar power facility.



Fig. 8 Training for Supervisors

Field safety training is carried out using a facility similar to that of the customers’.



Fig. 9 Safety Training for New Recruits

Our low-level electric shock-experience machine is used for training. Danger of electric shocks can be felt strongly by experiencing an electric shock with this machine.

to help supervisor candidates understand their related duties and responsibilities. This course is intended to make engineers capable of making correct decisions at the project sites by using sound judgment.

(2) Safety training for new recruits (**Fig. 9**)

New recruit trainees get basic practical training for the correct use of industrial tools and attend lectures on the basic knowledge of electric shocks. It focuses on safety awareness prior to the OJT training. In particular, they will learn about the dangers of electric shocks with the experience of an actual electric shock by the use of a machine that mimics the shock-experience.

4.5 New Recruit Training

Professional training related to maintenance is provided for 3 to 4 months to new recruits from the maintenance-related business units and those from other Meiden Group firms. The trainees obtain knowledge about operational principle and the structure of each product. In practical training, they see, touch, and operate actual products. In this manner, they deepen their knowledge on each product. A special training program for producing a relay sequence circuit is also offered. It employs relays and timers and trainees can simulate a crossing signal indication by using their own designed relay sequence. **Fig. 10** shows a view of switchgear inspection training and **Fig. 11** shows a view of presentation during practical training by original sequence circuits.



Fig. 10 Switchgear Inspection Training

Special training for the maintenance of switchgear is given to new recruits.

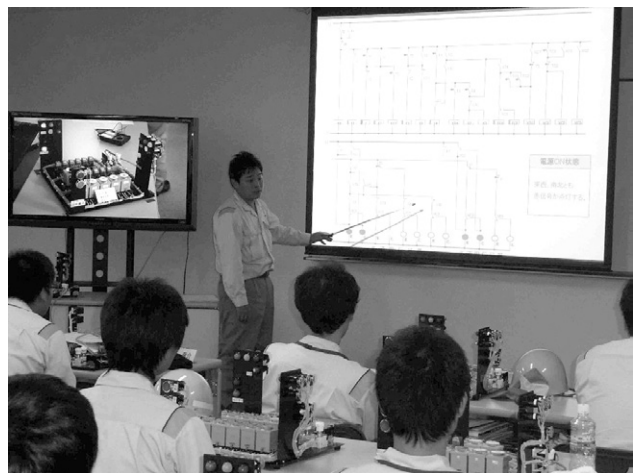


Fig. 11 Presentation During Practical Training by Original Sequence Circuits

Each trainee designs and makes an original sequence circuit for a presentation session.

4.6 Education at Basic Engineering Course

A basic engineering course is offered to study basic principles and structures of our products. It is intended to improve the capability of engineering solutions. When young engineers learn and understand products other than those of their handling, they can broaden their scope as a result of this training. According to a comment from a trainee, he reported having “a real feel of the studied products rather than knowledge from images since before the training he only saw such interlinked power products on the design drawing or comprehensive test.” **Fig. 12** shows the training for the power conversion system (Uninterruptible Power System: UPS) and **Fig. 13** shows training for power generation facilities



Fig. 12 Training for Power Conversion System

Trainees learn the UPS functions and the method of a Run/Stop operation.



Fig. 14 Training for Meiden Group Overseas Engineers

Meiden Group overseas engineers are attending to maintenance technology programs using our various products.



Fig. 13 Training for Power Generation Facilities (Auto-Start Generator Panel)

Trainees learn the auto-start functions of a generator panel and the method of a Start/Stop operation.

(auto-start generator panel).

4.7 Technical Training for Customer's Engineers

Technical training is also provided to the customer's engineers who are currently using our products. This program involves training on electrical facility engineering covering daily maintenance, inspection, and cases of emergency response. This training is carried out by using actual power products and the customer's engineers who received this training gave us very positive reviews about it. Together with our customers, we aim to make stable facility operation with improved reliability.

4.8 Miscellaneous Education

(1) Training for Meiden Group overseas engineers (Fig. 14)

Since 2011, as a part of a policy of reinforcing overseas business strategy, we have a Technical Education and Training Course (TETC) program for junior engineers selected by our Meiden Group or related firms in Southeast Asian countries. This TETC program includes "learning of basic knowledge on power-related products (types, structure, characteristics)," "learning of maintenance technologies by practical training such as product inspection, testing, etc.," and "learning of production processes through factory inspections." This program aims not only to increase each trainee's capability but also provide opportunities for deepening exchanges among lecturers and trainees. As a result, it fosters a strong sense of group unity.

(2) Training for engineers from Meiden Group firms in Japan (Fig. 15)

Through applications for facility use from Meiden Group firms, our facilities are used at Meiden Engineering Center and they provide their unique technical training programs. These programs received positive reviews as the trainees can receive operation trainings such as On/Off or Run/Stop using the electrical facilities. Such a task is not possible in the course of their daily business.

5 Postscript

We introduced some examples of our main education and training programs, using the facilities



Fig. 15 Training for Engineers from Meiden Group Firms in Japan

Using our facilities at Meiden Engineering Center, Meiden Group firms in Japan can give technical education programs of their own.

at Meiden Engineering Center.

Our products are in operation as essential facilities for various public, water processing, electric power, and industrial fields. The key requirements

for these facilities are high availability with stable conditions for 24/7, 365days operation. Supporting such requirements are the duty and mission at the maintenance service business units. To this end, required technological levels and organizational excellence can always change by the social trends or environmental changes of the times. In 2012, we introduced a 10kW solar power system for maintenance training for solar power and a cutaway model of a 400kVA gas turbine generator for training.

In the future, we hope all sales representative and service engineers at Meiden Group's 34 servicing locations across Japan will continue to offer quality maintenance services to our customers. This is achieved by getting the customer's precise requirements correctly and efficiently and by making necessary preparations and organizing for such services. We aim to further improve our training and educational programs there.

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