

# Virtual Reality Power Plant Operation Powered by Cloud Simulator



Mitsubishi Hitachi Power Systems, Ltd.

There are various approaches to train operators and hand down technologies in power plants such as long-term training plans, sharing the experience and knowledge of highly-experienced engineers as well as work standardization. An operation training simulator is very effective as a tool to directly support operation training. In particular, there are few opportunities to experience start and shutdown operations at plants where base load operations are carried out, and to learn how to deal with problems. Therefore, by introducing an operation training simulator it is possible to continuously accumulate experience that suits the actual plant and to provide high-quality education in a short period of time.

Mitsubishi Hitachi Power Systems, Ltd. (MHPS) has been providing customers with operation training simulators with a high-fidelity, equivalent to that of actual power plants, making use of its expertise as a manufacturer of major machinery for power plants. Utilizing Information and Communication Technology (ICT), the simulator has been installed on the cloud (Cloud Simulator) to improve convenience and maintainability while maintaining the simulator's quality.

## 1. Features of MHPS's operation training simulator

Our operation training simulator can be operated in the same manner as the actual plant by using the operation and monitoring functions of our DIASYS Netmation<sup>®</sup> control system. The control logic and control parameters are the same as those of actual plants. In combination with a high-fidelity plant model that makes use of design data, trial operation data, and expertise, which are our strengths as a plant manufacturer, it is possible to conduct high-fidelity simulations that include both dynamic and static characteristics. **Figure 1** shows a comparison between actual plant behavior and calculation results of the simulation model. Malfunctions (simulation of abnormal conditions) have also been selected by MHPS based on the actual abnormal events that have occurred in a similar model, so actual examples can be experienced more realistically, to meet the high level of customer needs.

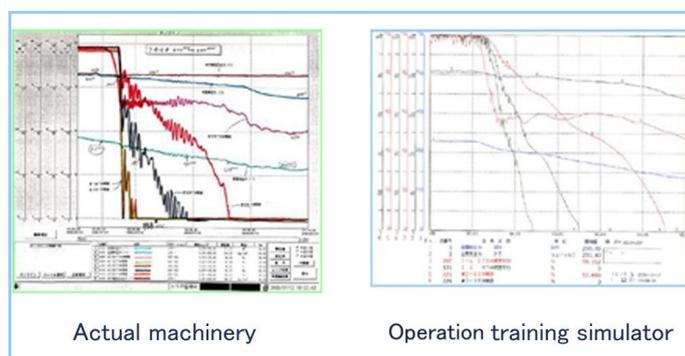
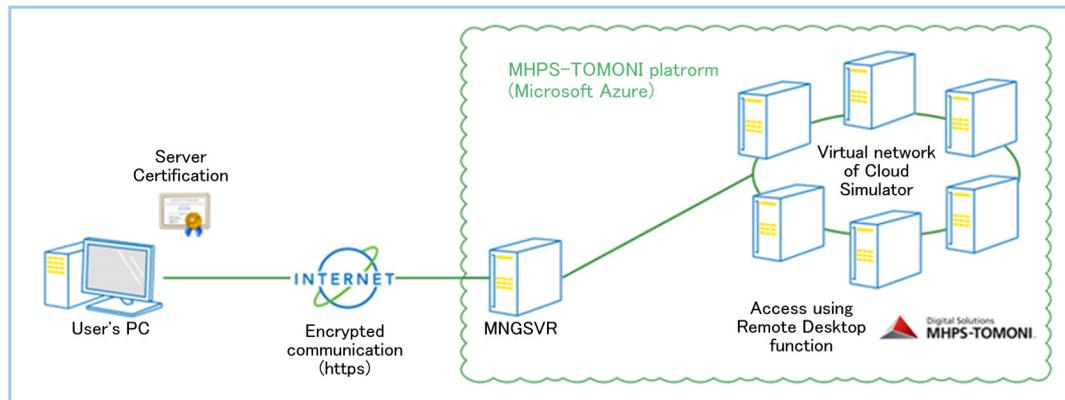


Figure 1 Comparison of simulation model and behavior of actual machinery

## 2. Features of Cloud Simulator

### 2.1 Installation of Operation Training Simulator on the Cloud

Our MHPS-TOMONI® digital solution service offers a variety of services utilizing cloud environment to solve the problems faced by each customer involved in power plants. The Cloud Simulator is added as one of the services, where an operation training simulator is installed on the cloud. By simply accessing the web from a personal computer, customers can experience the operations of power plants without being restricted by place or time. The simulator model is not customized for each customer's facility, but is a representative model for our GTCC and steam power plants. **Figure 2** illustrates the system configuration of the cloud simulator.



**Figure 2** Cloud simulator system configuration

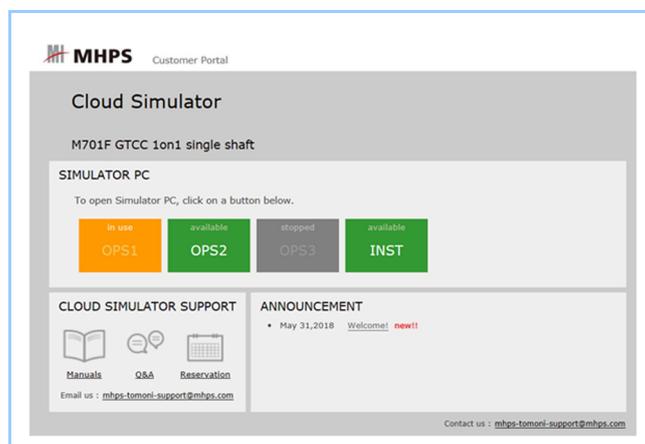
### 2.2 Features of Cloud Simulator

#### - Flexible usage environment

The installation of the Cloud Simulator does not require capital investment in specialized equipment, and customers can use it simply by accessing the Internet from any PC. Under our management, the simulator runs on a virtual server on the cloud, eliminating the hassle of starting up the simulator, and enabling rapid learning. It can be used for both team training and self-learning.

#### - Maintenance Free

All the maintenance of the simulator, including security patching of various software and software updates, can be carried out remotely by MHPS and requires no effort by customers. In case of problems, customers can receive online support through the dedicated portal site of the Cloud Simulator. The portal also offers features such as news releases, manuals and web-based reservations. **Figure 3** depicts an image of the portal site of the cloud simulator.



**Figure 3** Exclusive cloud simulator portal site

- Continual Update of Simulator

The maintenance described above ensures that the system is functioning securely and soundly at all times. Furthermore, since the basic service includes the periodic addition of malfunctions, the simulator is continuously updated. This is a standardized menu item, which was found to be in high demand from customers.

### **3. Future developments**

In accordance with the development of ICT, the need to make operations and maintenance more efficient by utilizing cloud environments is increasing day by day. We will continue to work to improve the functions of Cloud Simulator by expanding the simulator model and using it to provide information to customers in order to respond to increasingly diverse customer needs.

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