

A New Type of Mobile Genset Supplied to a Power Utility Company

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Abstract

Since 1968, the first production, we have accumulated supply records of more than 2000 mobile gensets. Our market share of mobile gensets for power utility companies in Japan are now at 70%. Recently, however, due to market entries by other firms in Japan, we have to take action to differentiate our products against competitors to keep our current market share. We have many several track records of medium-voltage mobile gensets with a power utility company in Japan. In the past, we changed the specification of a prime mover engine in 2004. Even since, we have no major specification changes on the mobile gensets. In order to differentiate our product offerings against our competitors, we manufactured and shipped a new type of mobile genset. The features of this new mobile genset are as itemized below.

- (1) Improvement of operability through the introduction of Liquid Crystal Display (LCD) touch screen panel
- (2) Addition of a data-logging function that is useful for investigating the root cause of a failure.
- (3) Conversion function of changing operational logging data into daily and monthly reports in order to lower operator work burden
- (4) Measures for long-hour operation (We reflected this measure to incorporate the operator’s wish from lessons learned from the 2016 Kumamoto Earthquake.)

1 Preface

A new type of mobile genset was supplied to a power utility company. Fig. 1 shows an external appearance of this mobile genset. In order to



Fig. 1 New Type Mobile Genset

An external appearance of the new type mobile genset is shown.

improve operability, a touch panel was adopted for this equipment. This new type of mobile genset was designed by incorporating input from operators who joined the power rescue mission at Kumamoto by driving from distant power utility firms after the outbreak of the 2016 Kumamoto Earthquake.

2 Liquid Crystal Display (LCD) Touch Screen Panel

In the conventional model mobile genset, operation was made through hard switches. Fig. 2 shows an operating panel based on a hard-switch specification. For some customers, a touch screen panel was adopted. The user interface is, in fact, similar to the hard-switch specification. The hard-switch became a graphic image on the LCD touch screen panel. Fig. 3 shows the display of the conventional touch screen panel. In the case of the conventional touch screen panel, there were some issues as described below.

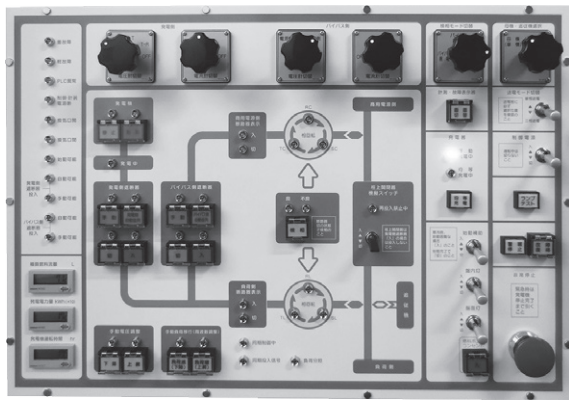


Fig. 2 Operating Panel Based on a Hard-Switch Specification

An operating panel based on a hard-switch specification is shown.

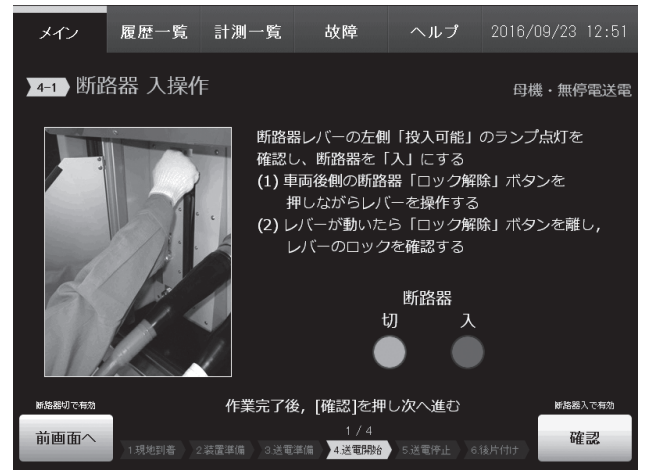


Fig. 4 Touch Screen Panel for the New Type of Mobile Genset

A Disconnecting Switch (DS) screen of operation is shown. A photo telling how to operate is shown on the left. The guidance text is shown on the right. For a DS operation screen, an interlock is there. Unless the DS is "ON," it cannot switch to another screen.

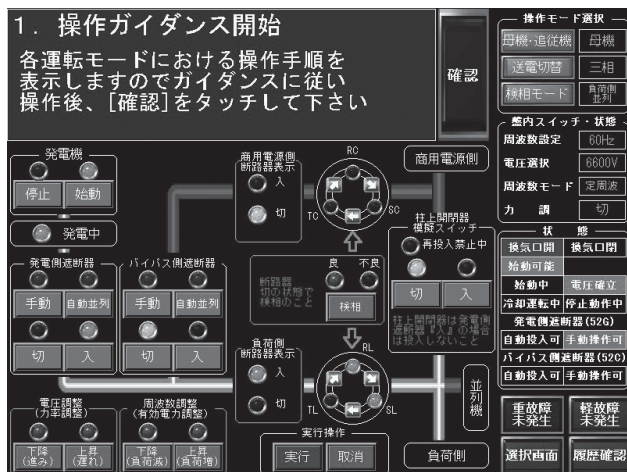


Fig. 3 Display of Conventional Touch Screen Panel

A display of a conventional touch screen panel is shown. Operational guidance is shown at top left, a button simulating the operating switch is shown in the center, and summary of status display is on the right.

- (1) Switches were arranged at random in the screen and this complicated operation.
- (2) Operation guidance in a small window was hard to understand.

When we proposed a touch screen panel-based interface to the power utility company, we received the following requests:

- (1) Operation should be very user-friendly.
- (2) Operation and status display should be indicated on different screens.
- (3) Important operations like start and stop are hard switches.
- (4) Taking advantage of the LCD, guidance should be improved.

We weighed issues on our conventional touch screen panel and requests from the power utility company. We then improved the touch screen panel specifications. The major points for improvement are as follows:

- (1) Simplification of operations by one operation per screen

"One operation per screen" is adopted and the screen is switched one after another. In addition, the screen incorporates an interlock that cannot be advanced to the next screen as an incorrect operation is performed. Fig. 4 shows the touch screen panel for the new type of mobile genset.

- (2) Improved visibility by separating the operation and status display

The touch screen panel is used for operation, and the status display is shown by hard lamps located outside the touch panel screen zone. The operation and status display are separated. It is an easy-to-see the configuration. Fig. 5 shows the operation panel of the new mobile genset.

- (3) Better guidance effect due to introduction of operation-related photos

Each screen displays photos suitable for operation, and visually explains what operations should be performed.

- (4) Improve safety by adopting hard switches

Start, stop, and circuit breaker "ON/OFF" operations are important operations that are directly



Fig. 5 Operation Panel of the New Mobile Genset

A touch screen panel is located in the center and hard lamps are located on the left for status display. The operation and status display are separated from each other. The upper touch panel is used to check engine data and past logging data and it displays countermeasures to be taken in the case of any failure. The lower side touch screen panel is mainly used for operation.

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計測一覧			
計測項目	計測値	計測項目	計測値
エンジン		電圧	
潤滑油圧力	498 kPa	R-S	6600 V
冷却水温度	67 °C	S-T	6600 V
潤滑油温度	75 °C	T-R	6600 V
排気温度	363 °C	電流	
回転速度	1500 min ⁻¹	R	35.0 A
発電機		S	35.0 A
固定子温度	62 °C	T	35.0 A
軸受温度	34 °C	周波数	50.0 Hz
界磁電流	4.60 A	有効電力	340 kW
燃料・その他		無効電力	0 kvar
燃料消費量	0 L/H	力率	0.85
燃料タンク残量	130 ℓ	積算電力量	10 ×10kWh
推定運転可能時間	0 分	積算運転時間	10.6 時間
周囲温度(吸気口)	22 °C		

Fig. 6 Measurement Screen

Measuring items are concentrated in a single screen. These items can be examined at a glance.

related to the power supply to the loads. Since misoperation is not allowed, we adopted hard switches. In doing so, we work on improving safety. (5) Improve work performance by checking measurement items at-a-glance.

For multimeters and analog meters, it is necessary to check the measured values for each meter. The touch screen panel consolidates the measurement items on one screen so that you can check at-a-glance. As a result, work performance is improved. Fig. 6 shows the measurement screen.



Fig. 7 Operational Data-Logging Screen

The operational data-logging screen is shown.

3 Data-Logging Function

A data-logging function has been added to the new type of mobile genset. It features a newly adopted liquid crystal display touch screen panel. By using the touch screen panel, the operation and logging data of the operation can be checked (the kind of operation that was made at what time of DD/MM/YY, status data on voltage and current during the power generation and on engine data). When a failure occurs, the data before and after 30 seconds of failure occurrence by the touch screen panel can be checked.

In addition, logging-data that can be checked on the touch panel can be converted into a CSV file by memory devices (USB memory, SD card, etc.) The data can be used to investigate the root cause of a failure or malfunction. The Fig. 7 shows an operational data-logging screen.

4 Data Conversion into Daily and Monthly Report

Fig. 8 shows the daily report and Fig. 9 shows the monthly report. The power utility company requires the operator for mobile genset to submit daily reports. Accordingly, the operator has to check every few minutes the conditions of the mobile genset (voltage, current, engine measurement, fuel tank remaining amount) and fills such data in the daily report. Daily report drafting work had been a burden for the operator.

We, therefore, made software which enables an automatic conversion of the CSV file data dis-

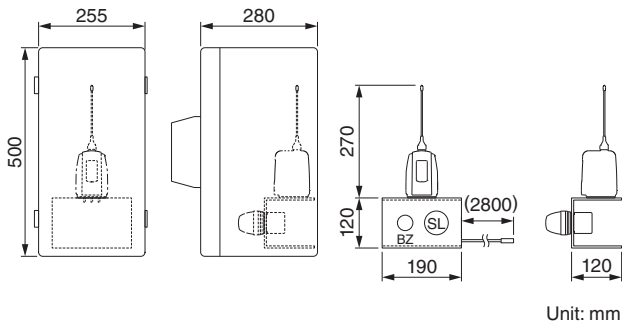


Fig. 10 Dimensional Outline Drawing of Remote Alarm Device

A dimensional outline drawing of the remote alarm device is shown. The device is composed of a signal receiver and an alarming buzzer.

The remote alarm device consists of a receiver and a buzzer. When a failure occurs, a signal is received from the mobile genset and a buzzer sounds. When the operator is away from the mobile genset during the long time operation, the operator can observe the occurrence of the failure of the mobile genset by carrying this device. The operator can make a quick review to solve the failure. Fig. 10 shows the dimensional outline drawing of the remote alarm device.

(2) Automation of fuel refueling

In our conventional mobile genset, the operator would check the fuel tank oil level every few hours and would manually supply the fuel. In the new mobile genset, a fuel supply port (coupler port) in which a fuel hose can be permanently installed, is attached to the fuel tank and the fuel pump is automatically turned on/off according to the amount of oil in the fuel tank. As a result, fuel supply to the fuel tank is automated. Fig. 11 shows the fuel system diagram.

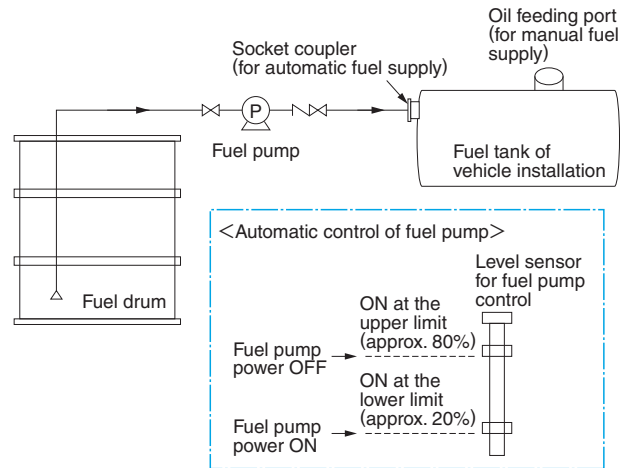


Fig. 11 Fuel System Diagram

The fuel system diagram shows a fuel feeding route through which fuel oil is supplied from a locally furnished fuel drum to a fuel tank of the mobile genset.

6 Postscript

We proposed a new type of mobile genset to each power utility company in Japan. As a result, we received several orders and supplied the mobile gensets to these customers. Going forward, we will continue to incorporate the wishes of our customers and offer them the best product experiences.

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