

# IoTurbine System

~New services using IoT Technology~



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**1. Services**

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# 1. Services

IoT+Turbine ⇒ **“IoTurbine”**

**Our steam turbines meet “IoT technology”.**

# 1. Services

## 【Mission】

With “IoT technology” applied to our generator turbines, it can:

- Prevent failures or incidents in advance.
- Maximize profits from electric power generation and minimize the lifetime costs.

# 1. Services



Collect Output / Speed / Steam Condition etc

Monitoring by  
Specilized Application



Analyze collected data

⇒ Collecting operating data based on importance levels.

- ◎ Generator output, speed, main steam conditions, important events, and etc
- ◎ Other data such as steam pressure, temperature, and etc

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SHINKO IND.LTD.

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## 2. Benefits

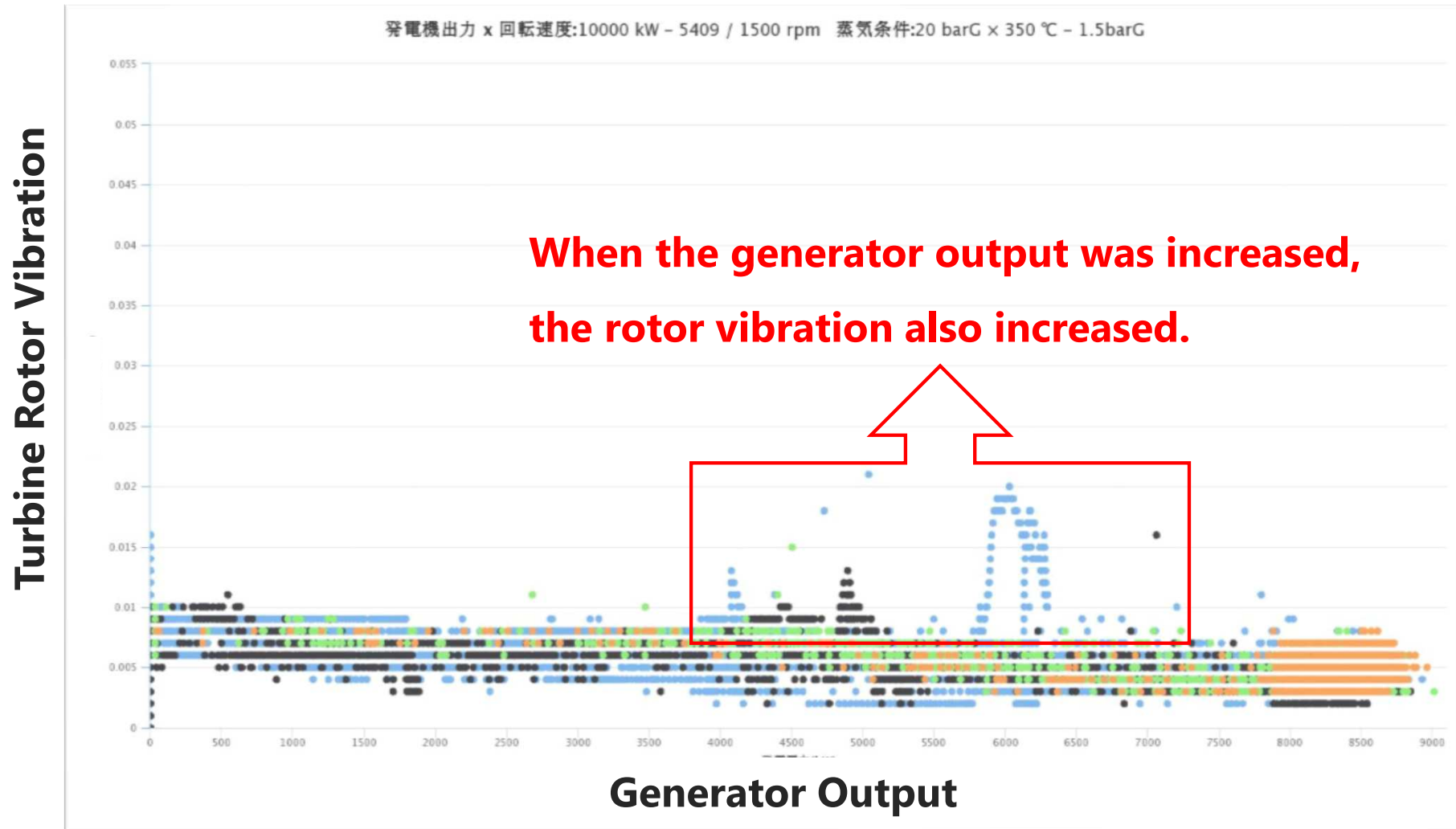
- Ensuring timely maintenance
- Improving operator skills
- Preventing serious incidents by predicting abnormalities
- Supporting highly-efficient operation, and etc.

⇒ Profits can be maximized from electric power generation, while minimizing the lifetime costs.



## 2. Benefits

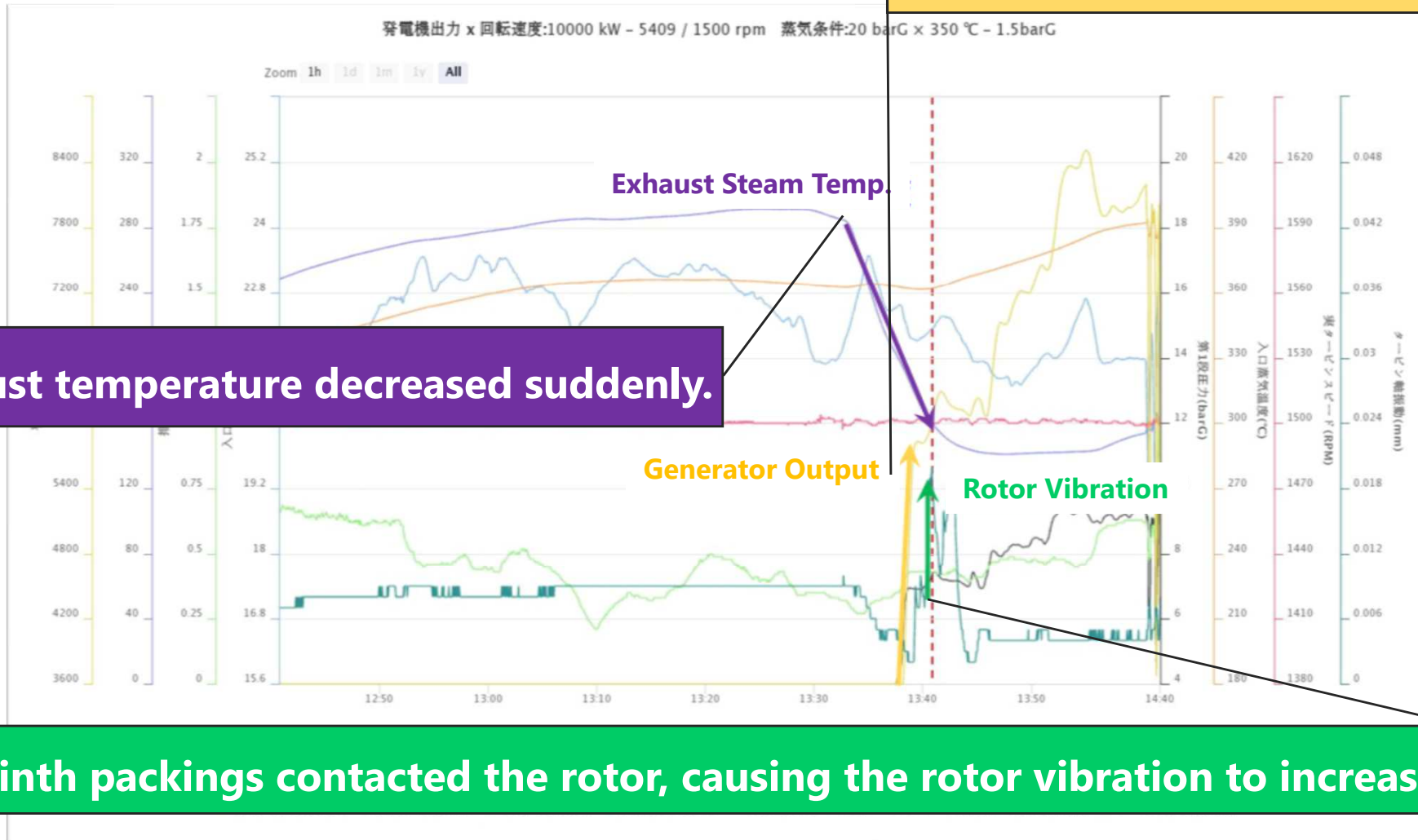
### CASE ①



## 2. Benefits

### CASE ①

① Output was increased rapidly.



## 2. Benefits

### CASE ①

- In cases where the rotor vibration increases, the labyrinth packings can contact the turbine rotor, causing the clearance between them to be widened.  
⇒ **Turbine performance can deteriorate by 1~2%.**
- If a turbine underperforms by 2% for 10 years, **the loss of profits can be USD730,000.- (≒ JPY80,000,000.-) based on electric power generation.**  
(Approx. 100kW(1%) x JPY10 x 8,000h(1 year) x 10 years = JPY80,000,000.-)
- Shinko advised this user by simply improving the operating procedures, so the clearance could not be wide in the future. ⇒ **A big loss of profit was successfully prevented.**



## 2. Benefits

### CASE ②

Boiler water treatment systems were not operated properly.

**Silica** was formed in the turbine.

The steam passage was narrowed, making it difficult for the steam to pass through.

The maximum output decreased, while the 1<sup>st</sup> stage pressure increased.



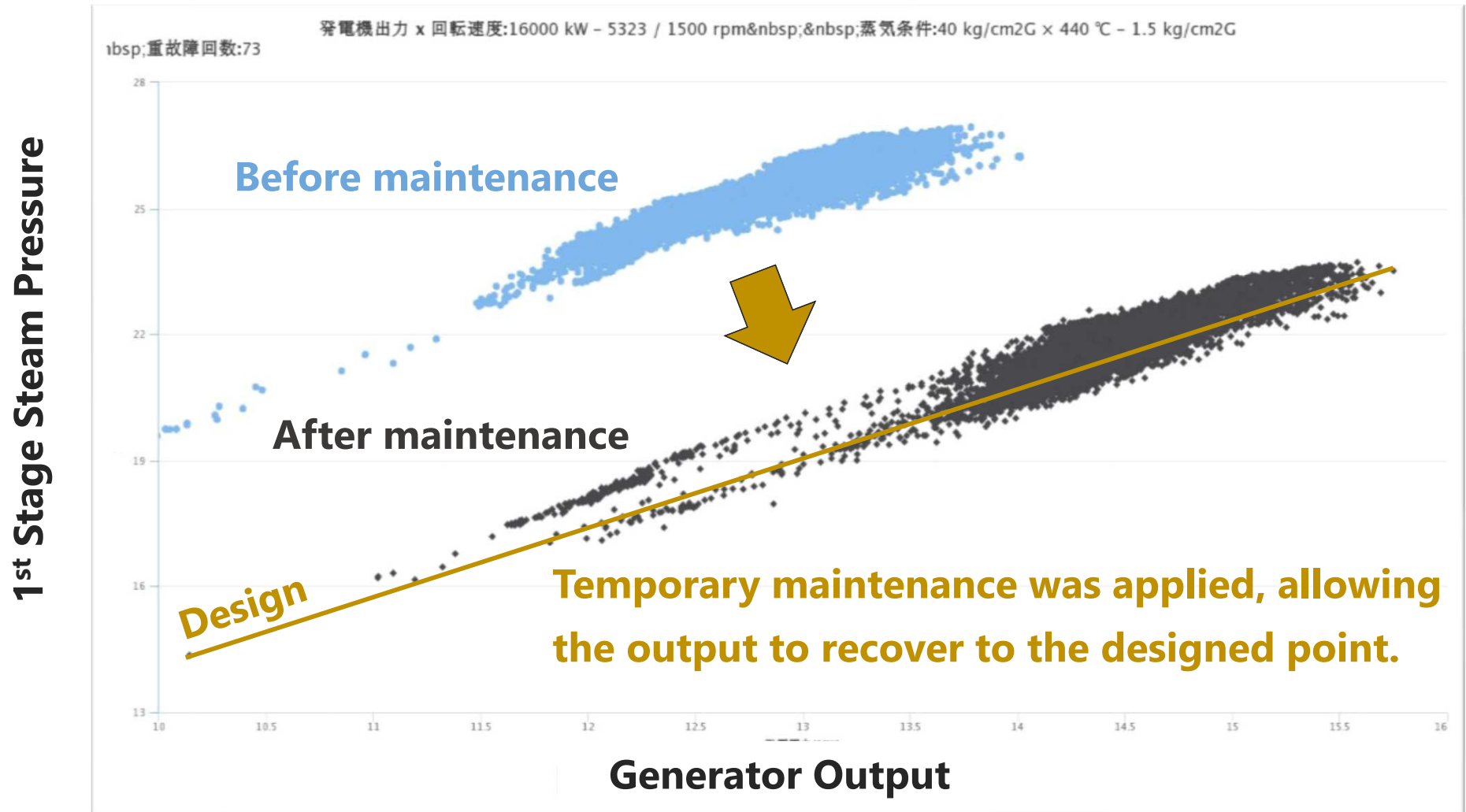
**Silica** formed on the nozzles



**Silica** formed on the moving blades

## 2. Benefits

### CASE ②



## 2. Benefits

### CASE ②

Until the next planned shutdown in 5 months...

- Supposing the turbine continued to operate without any maintenance, **the loss of profits on selling electric power could have been about USD660,000.- (≒JPY72,000,000.-).**

(Approx. ; 2,000kW x JPY10 x 720h x 5months = JPY72,000,000.-)

- Abnormalities were detected early and corrected promptly, making a big difference in profits. Shinko advised this user to overhaul and clean the turbine immediately. ⇒ **A big loss of profit was successfully prevented.**

Profit loss for the 2-day maintenance was only USD60,000.- (≒JPY6,500,000.-).

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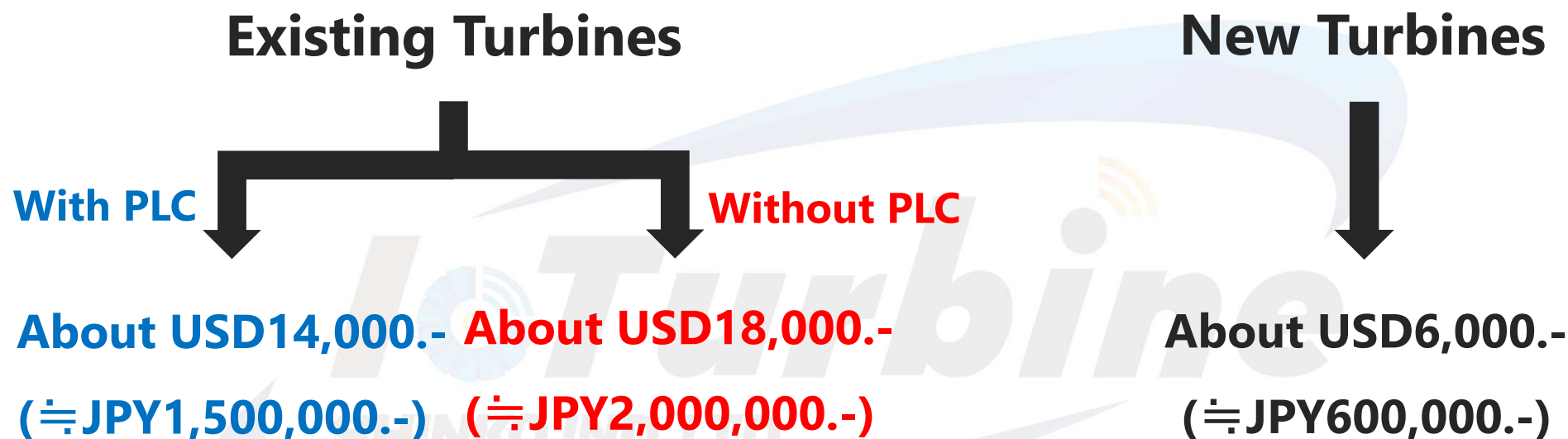
4. Current Status & Future Developments





### 3. Introduction Costs

#### <Initial Costs>



- ※For existing turbines, modifications are required to install the IoTurbine system.
- ※These costs include parts, designing, and engineering fees, excluding travel expenses.
- ※Actual costs **without PLC** were: Company A. JPY2.17mil. / B. JPY2.13mil. / C. JPY2.02mil.
- ※For new turbines, additional costs are required to optimize turbine control panels.

# 3. Introduction Costs

## <Running Costs>

⇒ App usage cost ; JPY20,000.- / month

**(Free of charge for the first year of the guarantee)**

A screenshot of the IoTurbine login screen. At the top is the IoTurbine logo, which consists of a blue swoosh above the text 'IoTurbine' and 'SHINKO IND.LTD.' below it. Below the logo is a form with two input fields: the first is labeled 'Email' and the second is empty. Below the second field is a checkbox labeled 'このアカウントを記憶する' (Remember this account) and a dark grey button labeled 'ログイン' (Login).

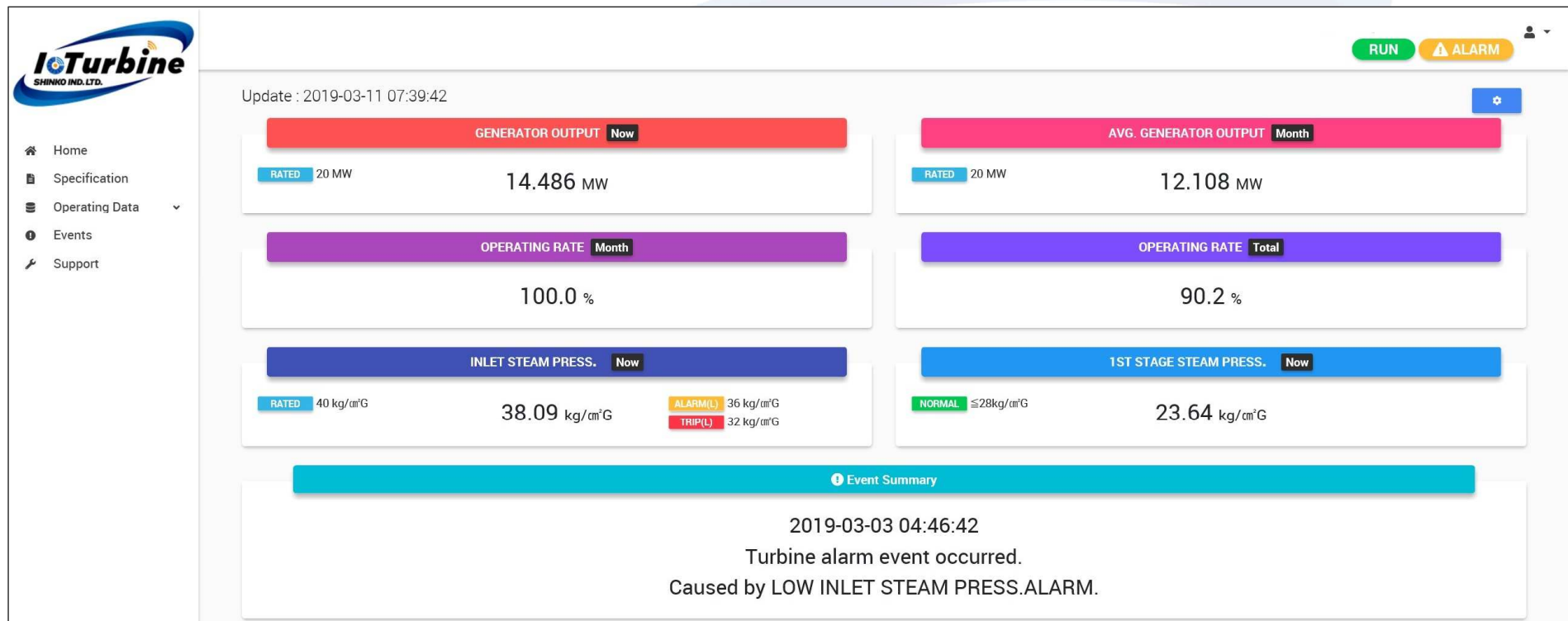
Login screen

# 3. Introduction Costs

## <Running Costs>

⇒ App usage cost ; JPY20,000.- / month

(Free of charge for the first year of the guarantee)



Measured data screen ①

# 3. Introduction Costs

## <Running Costs>

⇒ App usage cost ; JPY20,000.- / month

(Free of charge for the first year of the guarantee)

The screenshot displays the IoTurbine monitoring application interface. On the left is a navigation menu with options: Home, Specification, Operating Data (selected), Latest, Monthly, Yearly, Events, and Support. The main content area is titled 'Operating Data' and includes a status bar with 'RUN' and 'ALARM' indicators, and an update timestamp of '2019-03-11 07:39:42'. Two summary cards are shown: 'THE LAST START UP DATE TIME' with the value '2019-01-13 13:09:52' and 'THE NUMBER OF STARTS' with the value '6'. Below these is a table of operating data with the following columns: DateTime, WATT-HOUR [kWh], TURBINE RUNNING TIME [min], GENERATOR OUTPUT [MW], TURBINE SPEED [rpm], INLET STEAM FLOW [%], ACTUATOR DEMAND [%], INLET STEAM PRESS. [kg/cm<sup>2</sup>G], and 1ST.

DateTime	WATT-HOUR [kWh]	TURBINE RUNNING TIME [min]	GENERATOR OUTPUT [MW]	TURBINE SPEED [rpm]	INLET STEAM FLOW [%]	ACTUATOR DEMAND [%]	INLET STEAM PRESS. [kg/cm <sup>2</sup> G]	1ST
2019/03/11 07:39:42	32297456	142000	14.486	1504	-2	59.02	38.09	
2019/03/11 06:39:42	32282410	141940	14.905	1499	-2	62.49	37.54	
2019/03/11 05:39:42	32267654	141880	14.975	1490	-2	65.33	37.04	
2019/03/11 04:39:42	32252976	141820	14.623	1510	-2	59.1	38.27	
2019/03/11 03:39:42	32238145	141760	15.475	1497	-2	70.92	37.2	

Measured data screen ②

# 3. Introduction Costs

## <Running Costs>

⇒ App usage cost ; JPY20,000.- / month

(Free of charge for the first year of the guarantee)



App on smart phone screens

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## 4. Current status and future developments

- ⇒ **19 sets of turbines are in service now**  
(as of March 2020)
- ⇒ **Another 22 sets of turbines will be in service until 2021.** (as of March 2020)
- ⇒ **Service quality will be constantly improved by introducing AI Technology.**

## 4. Current status and future developments

### SHINKO IoTurbine System

can always support you to maximize your profits and minimize your lifetime costs.



**Always be with you!!**

**~Shinko IoTurbine System~**