IoTurbine System

~New services using IoT Technology~

IoTurbine
SHINKO IND.LTD.

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1. Services

IoT+Turbine ⇒ “IoTurbine”

Our steam turbines meet “IoT technology”.

【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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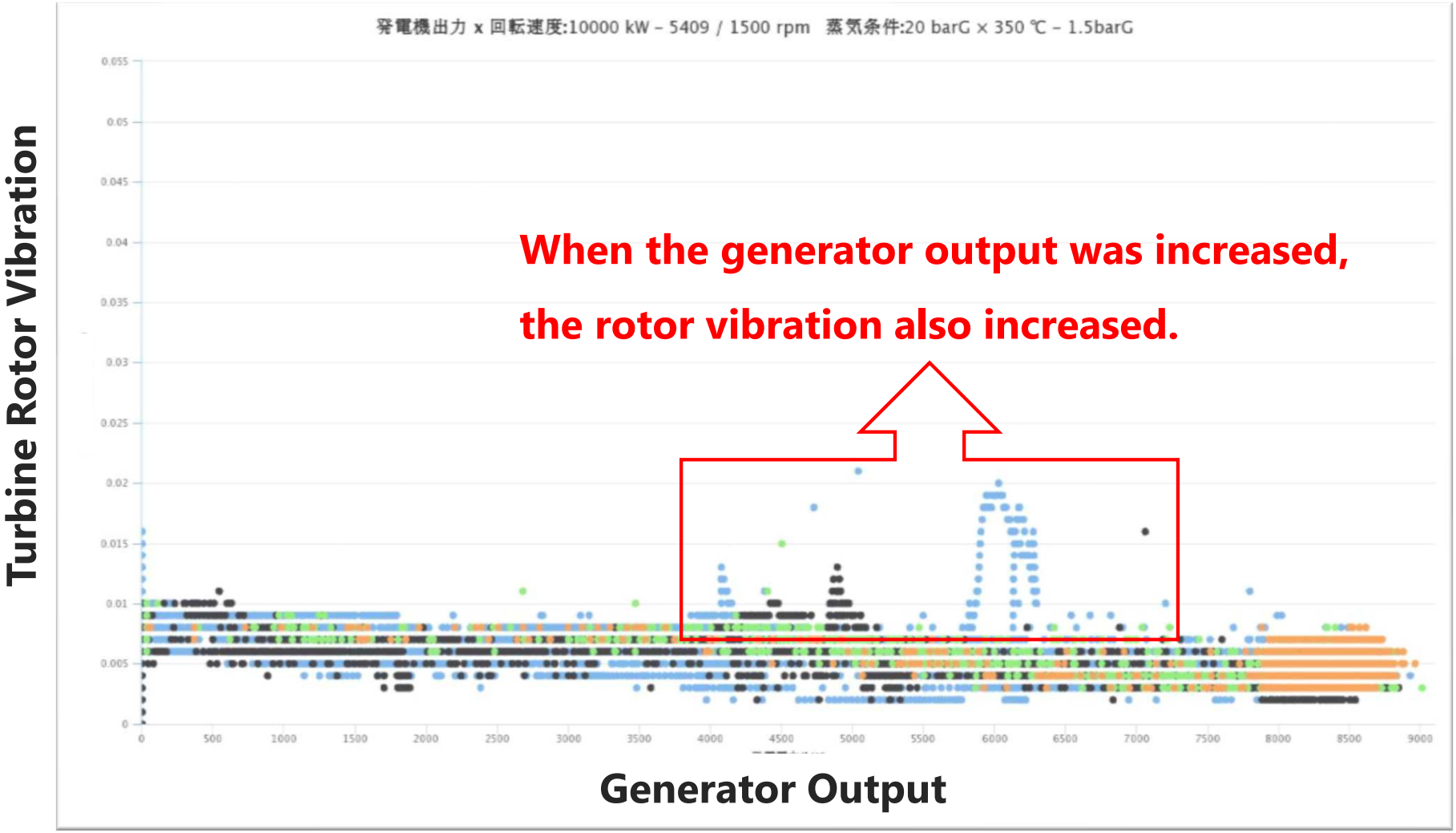
2. Benefits

- **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

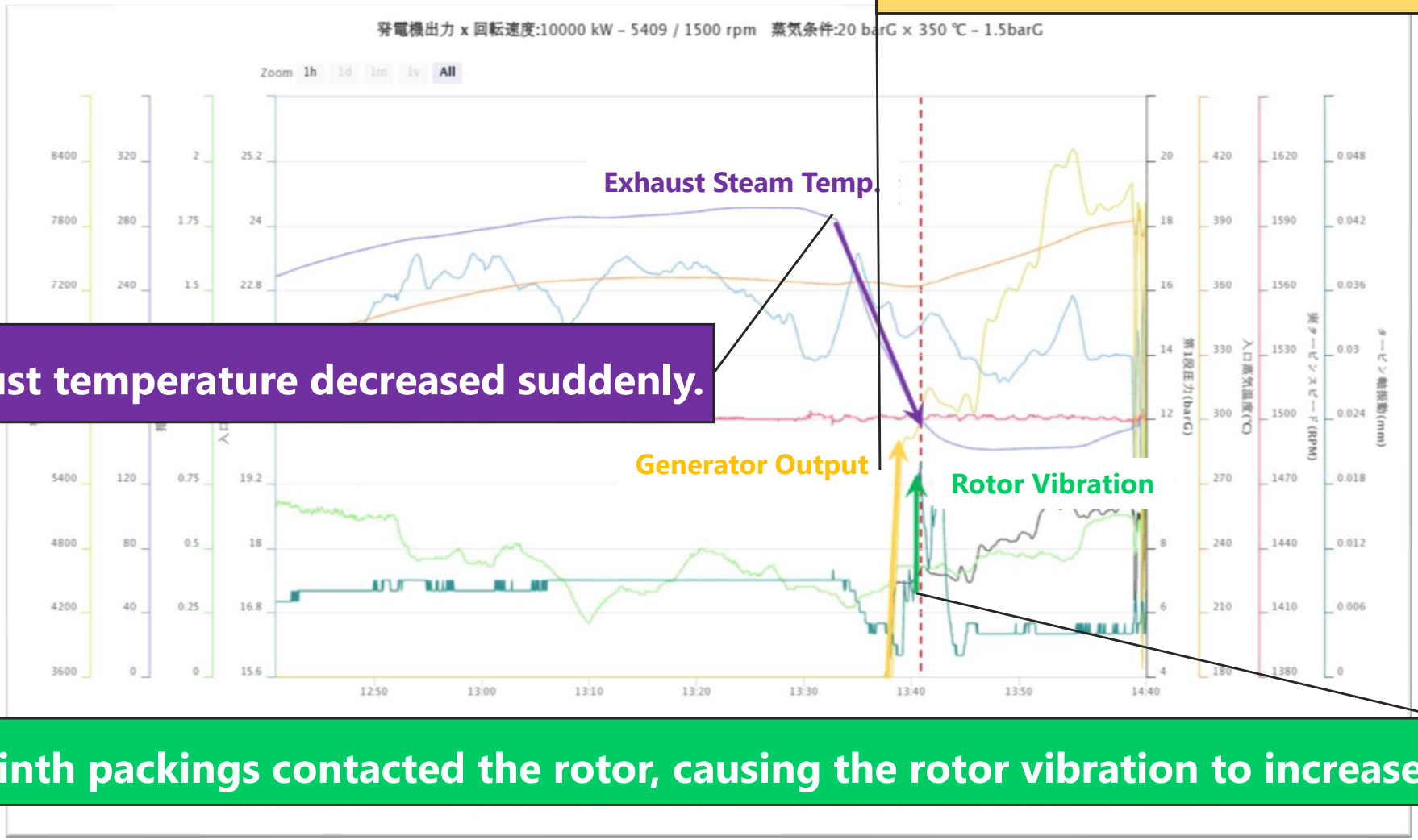
CASE ①



2. Benefits

CASE ①

① Output was increased rapidly.



② Exhaust temperature decreased suddenly.

③ Labyrinth packings contacted the rotor, causing the rotor vibration to increase.

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%.**

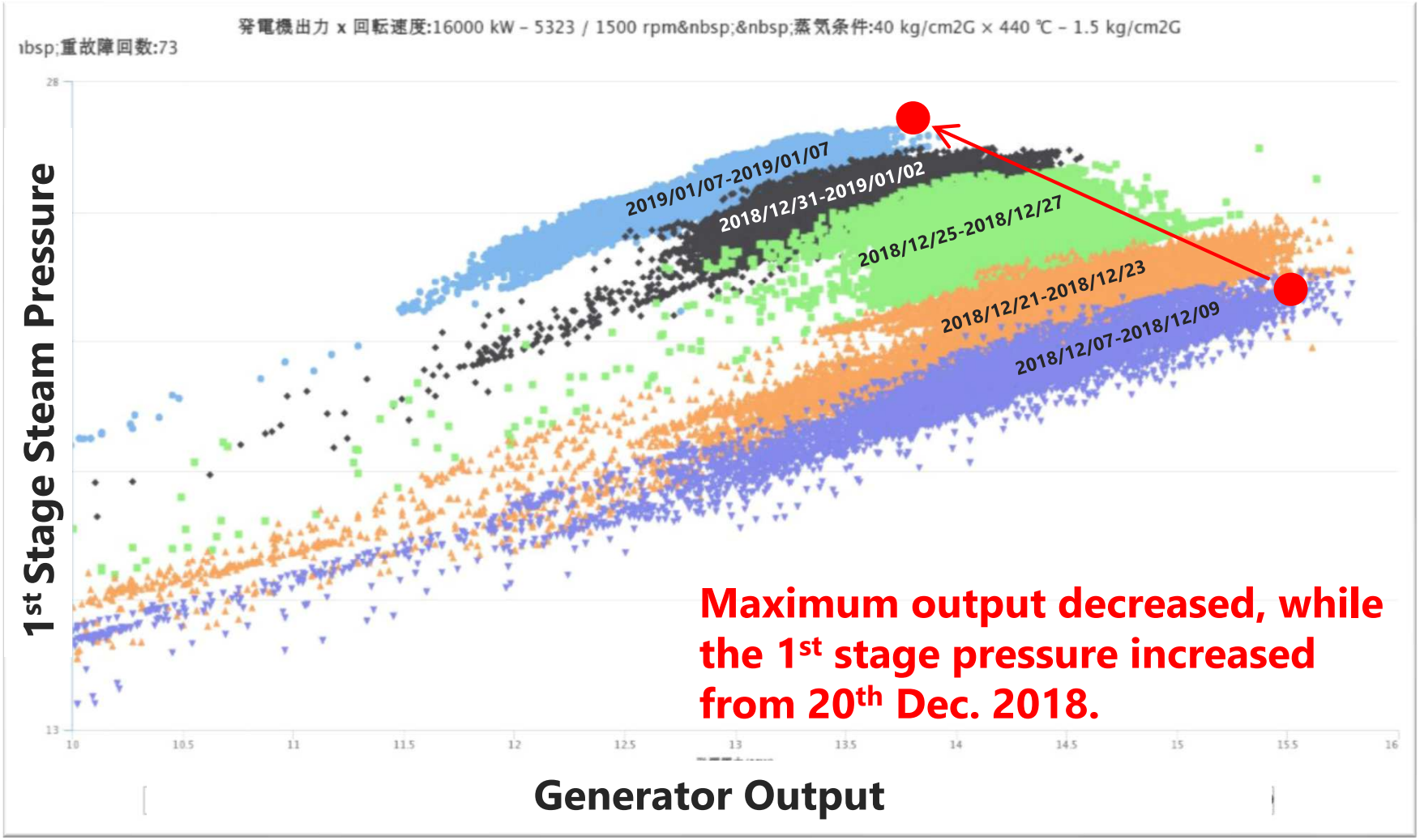
- If a turbine underperforms by 2% for 10 years, **the loss of profits can be USD730,000.- (≒ JPY80,000,000.-) based on electric power generation.**

  (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



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.

↓

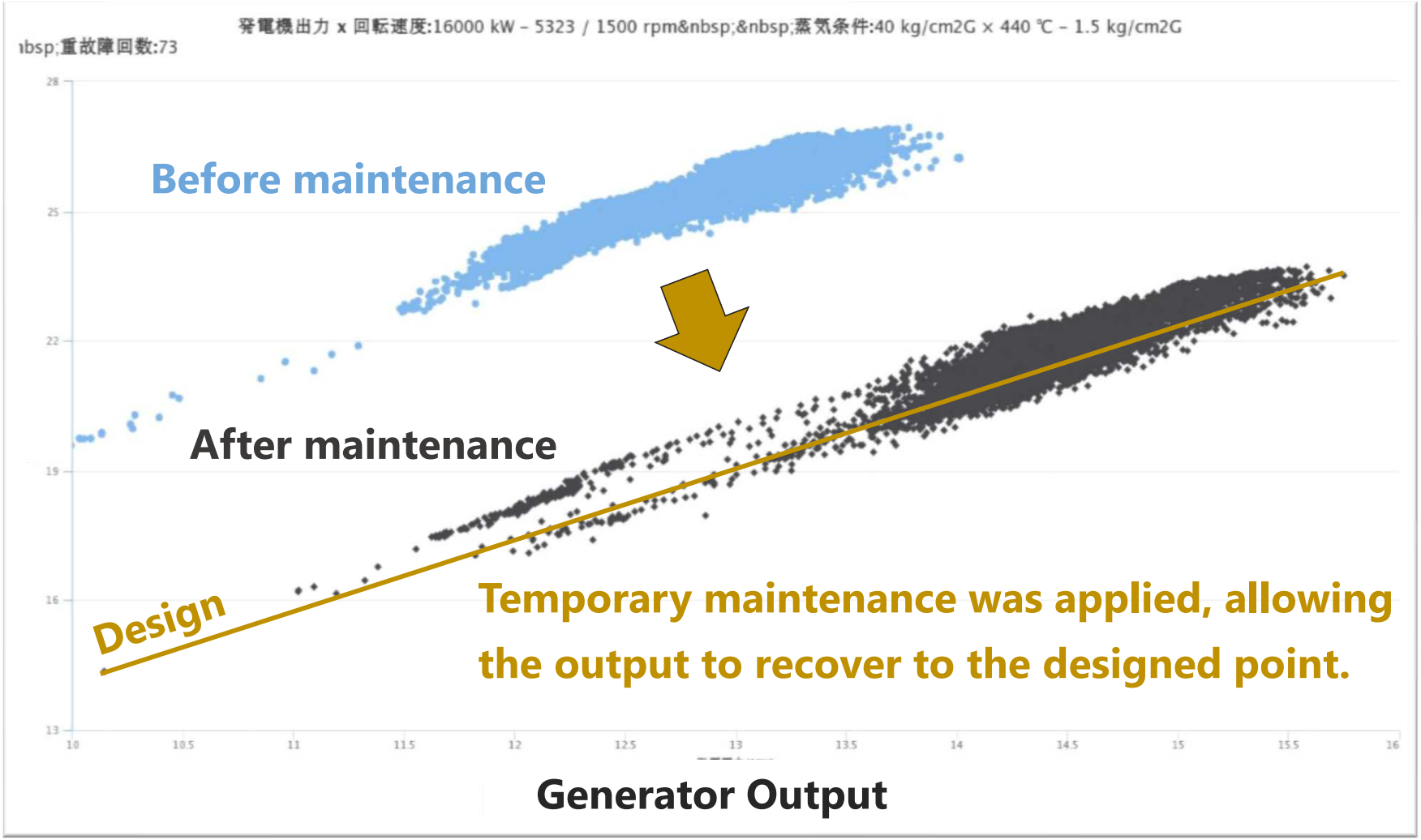
The maximum output decreased, while the 1st stage pressure increased.

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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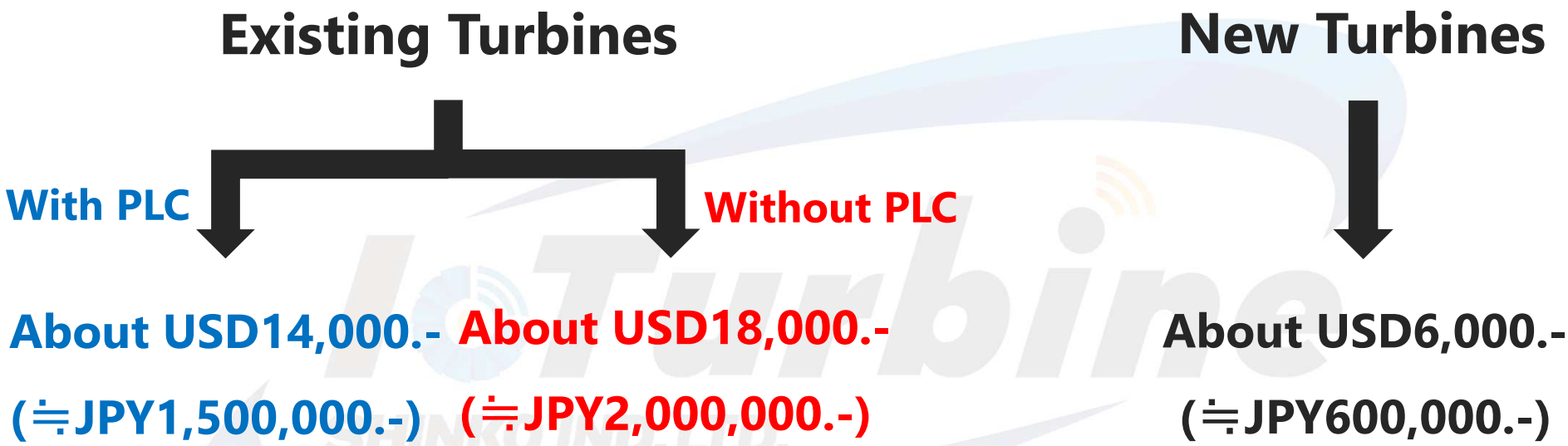
3. Introduction Costs

＜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)

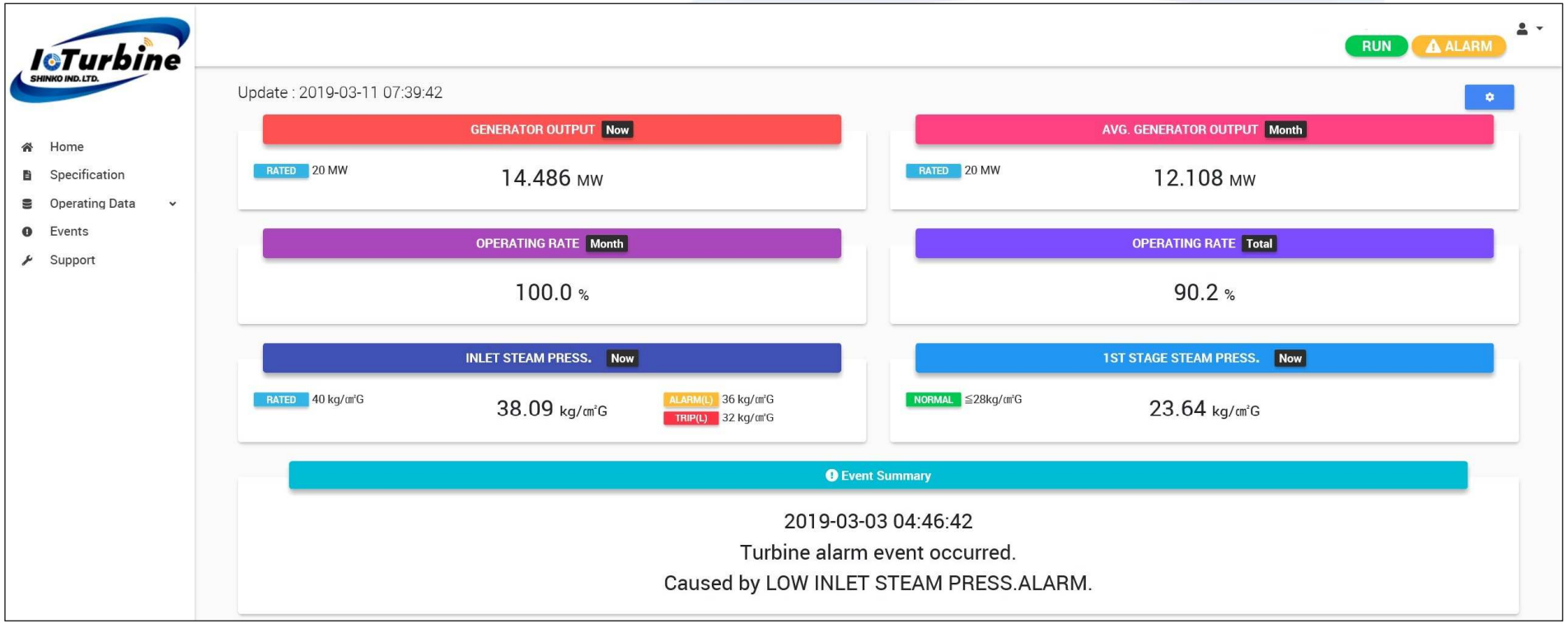
Login screen

3. Introduction Costs

<Running Costs>

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

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



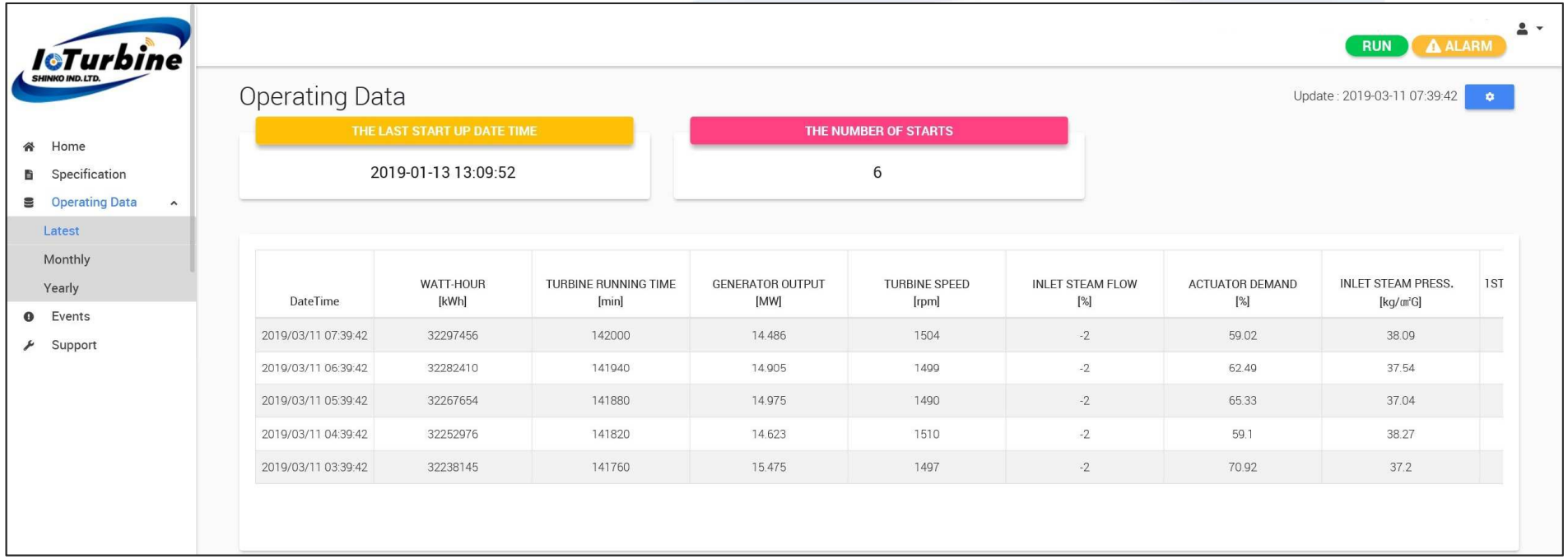
Measured data screen ①

3. Introduction Costs

<Running Costs>

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

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



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~