

# Kazakhstan Energy Week-2019

## Application of AI in Plant Data Analysis -JGC's Recent Projects-

JGC Corporation  
Technology Innovation Center  
Takuya Ono

Sep 26<sup>th</sup> , 2019

# Corporate Overview



- Established in 1928
- Independent, not member of a group
- Net Sales: US\$ 5.6 Bil. (Fiscal' 18, ending March 2019)
- JGC Group Manpower: 10,000 (Domestic: 4,700 + Overseas: 5,300)
- Listed in Nikkei 225 (Nikkei Stock Average of 225 selected issues)

# Business Areas



**Up & Mid Stream**



**Refineries**



**Petrochemicals & Chemicals**



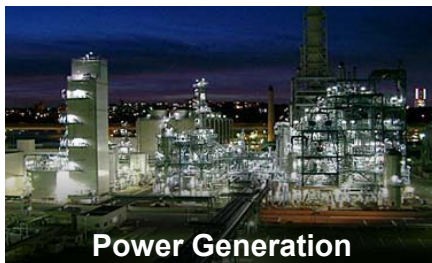
**Environmental & Energy Conservation**



**LNG**



**Industrial**



**Power Generation**

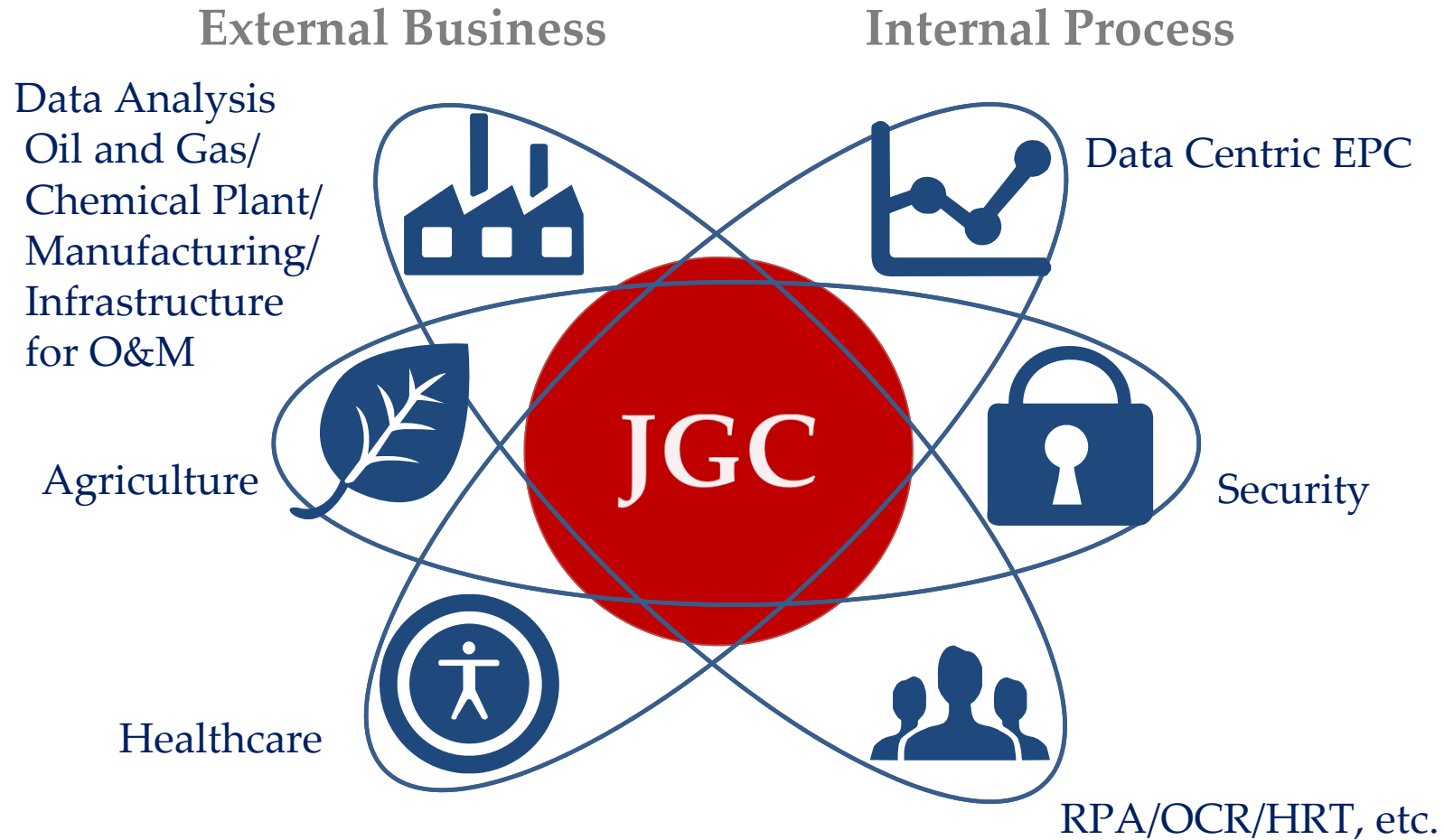


**Gas Processing**



**Medical Facilities & Research Laboratories**

# JGC Activity with AI



## **AI for Plant Data Analysis**

**Engineers make AI  
with process-wise data analyzing techniques,  
powered by engineering knowledge.**

**The AI augments engineers' intelligence  
and plant operator's performance  
to improve services and products.**

# JGC Digital Solutions

## Our Services

### Visualize Operation

- For more efficient operation
- For more stable operation

### Detect Anomaly

- For less down time
- For finding cause of trouble

### Predict Longevity

- For condition based maintenance
- For extending life of materials

### Increase Production

- For maximizing production rate
- Even weather condition analyzed

# JGC Job Reference of Plant Data Analysis

Client	Subject	Status
Refinery	To prevent reoccurrence of an unprecedented amine foaming in TGT.	Solved
Refinery	To precisely predict a catalyst longevity.	Solved
Refinery	To precisely predict an equipment clogging speed.	Solved
Refinery	To prevent reoccurrence of a start-up failure of the hydrogenation unit.	Solved
LNG Plant	To eliminate occurrence of frequent amine foaming troubles in AGR.	Solved
Refinery	To eliminate occurrence of frequent amine foaming troubles in FCC.	Solved
Chemical Plant	To eliminate occurrence of frequent equipment clogging troubles.	Solved
Metal Smelting	To eliminate occurrence of frequent trouble in conveyers, and other two problems.	Solved
Remote Monitoring	To detect anomaly of troubles in a gas turbine power plant.	Solved

Jan.,2016~

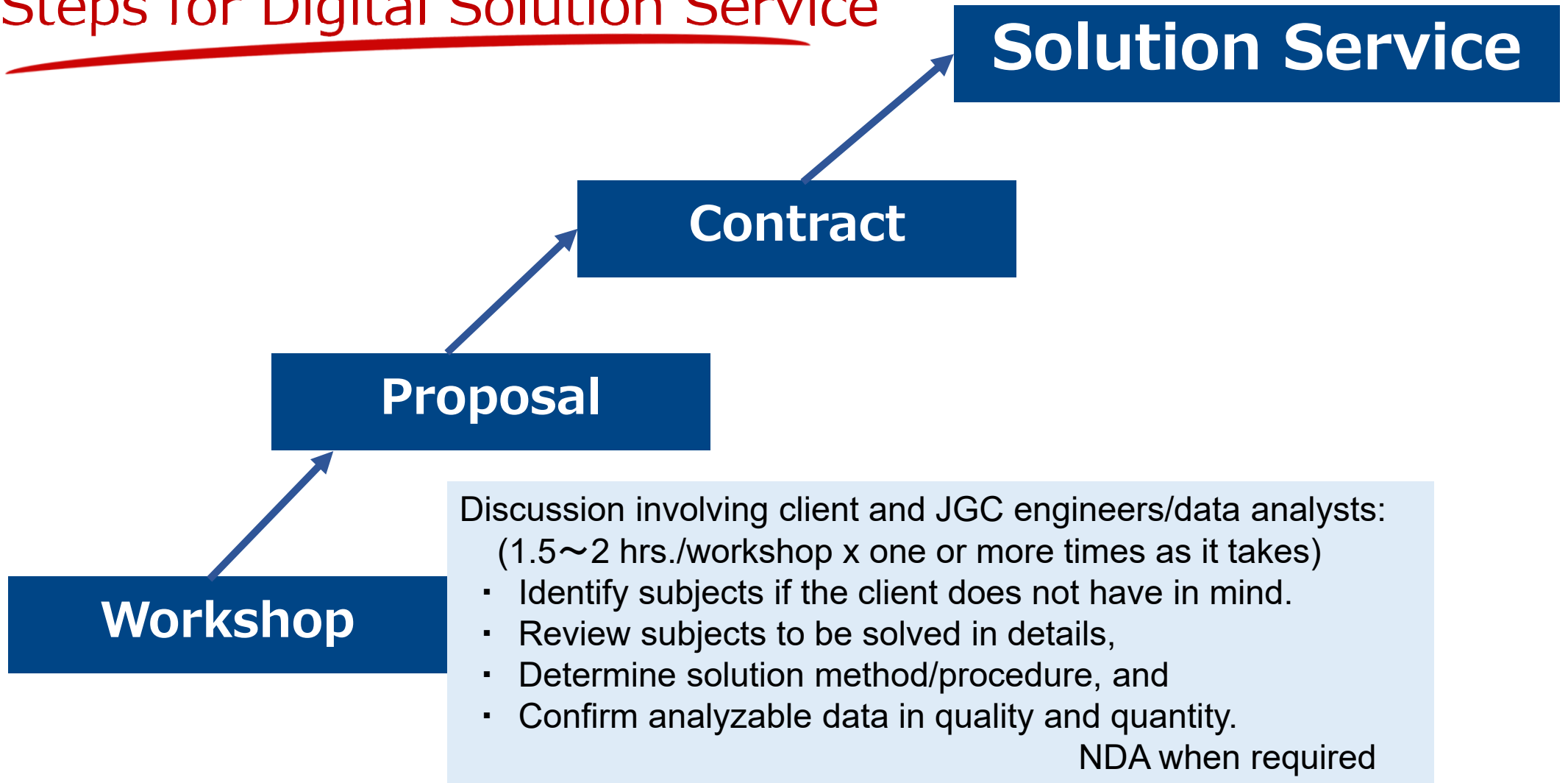
# Digital Solution Projects In Coming

Client	Subject	Status
LNG Plant	To minimize weather related production loss. Initiation of LNG Digital.	Service on going
Metal Smelting	To minimize metal loss.	Service on going
Remote Monitoring	To provide anomaly detection system for 50 or more power plants.	Service on going
Refinery	To prevent reoccurrence of a compressor functional failure.	Cost estimate
Refinery	To renew or replace its old anomaly detecting system.	Cost estimate
Chemical Plant	To digitalize skilled operator's work procedure.	Cost estimate
Oil & Gas Upstream	To predict Hg adsorbent longevity and provide automation of waste water treatment.	Workshop
O&M Company	To digitalize sludge combustion systems.	Workshop
Refinery	To precisely predict equipment corrosion speed.	Workshop
Chemical Plant	To visualize the plant power consumption trend.	National project

As of Sep., 2019



# Steps for Digital Solution Service



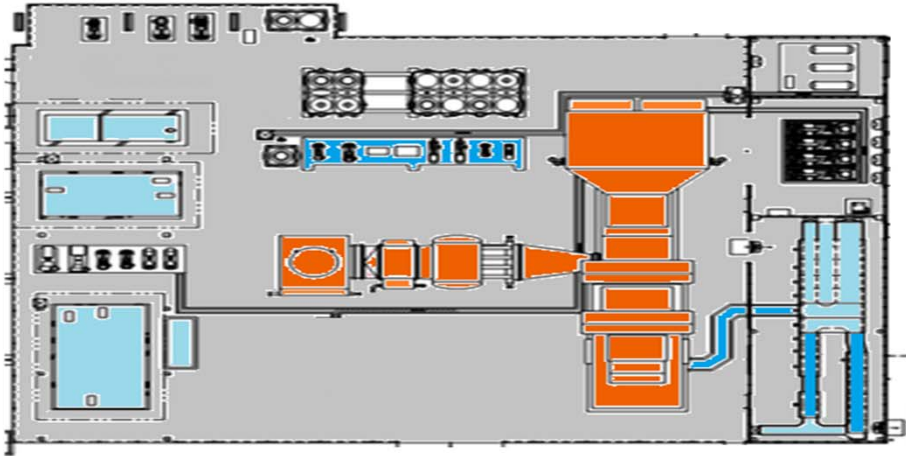
# Visualize Machine Condition

## 【Subject】

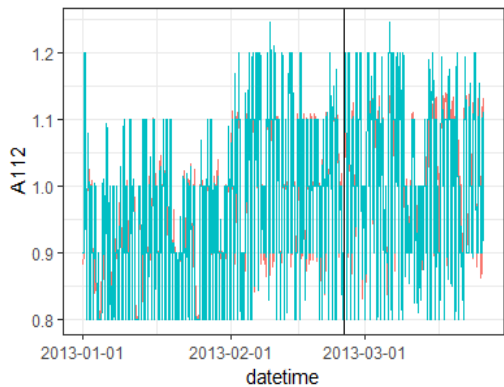
To visualize gas turbine condition and detect anomaly.

AI visualizes machine condition for helping  
avoid unplanned shut-down and  
eliminate root cause of the failure for  
preventing re-occurrence of the trouble.

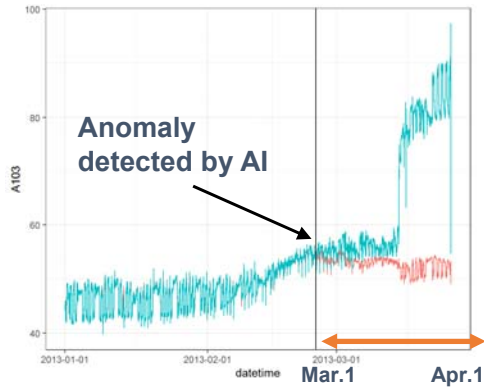
# Visualize Gas Turbine Condition



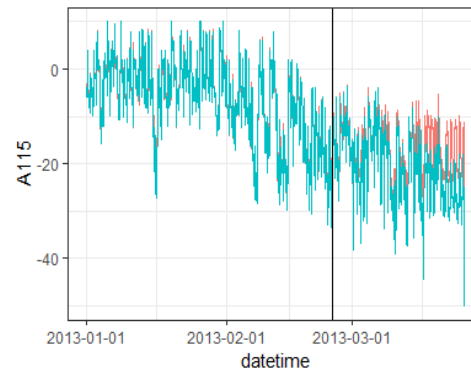
✓ Plant-wide data analysis detects anomaly of a machine at earliest stage of the failure developing period, and helps find root cause.



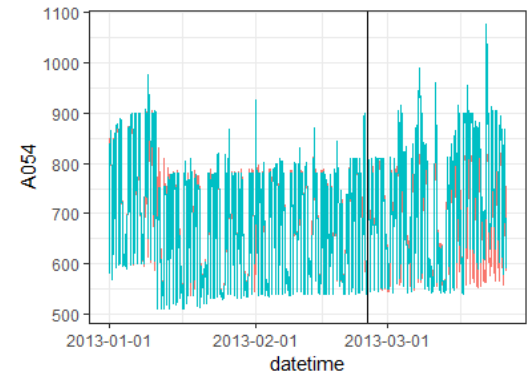
GT decelerator casing vibration speed



GT bearing vibration



GT thrust position



GT intake filter differential pressure

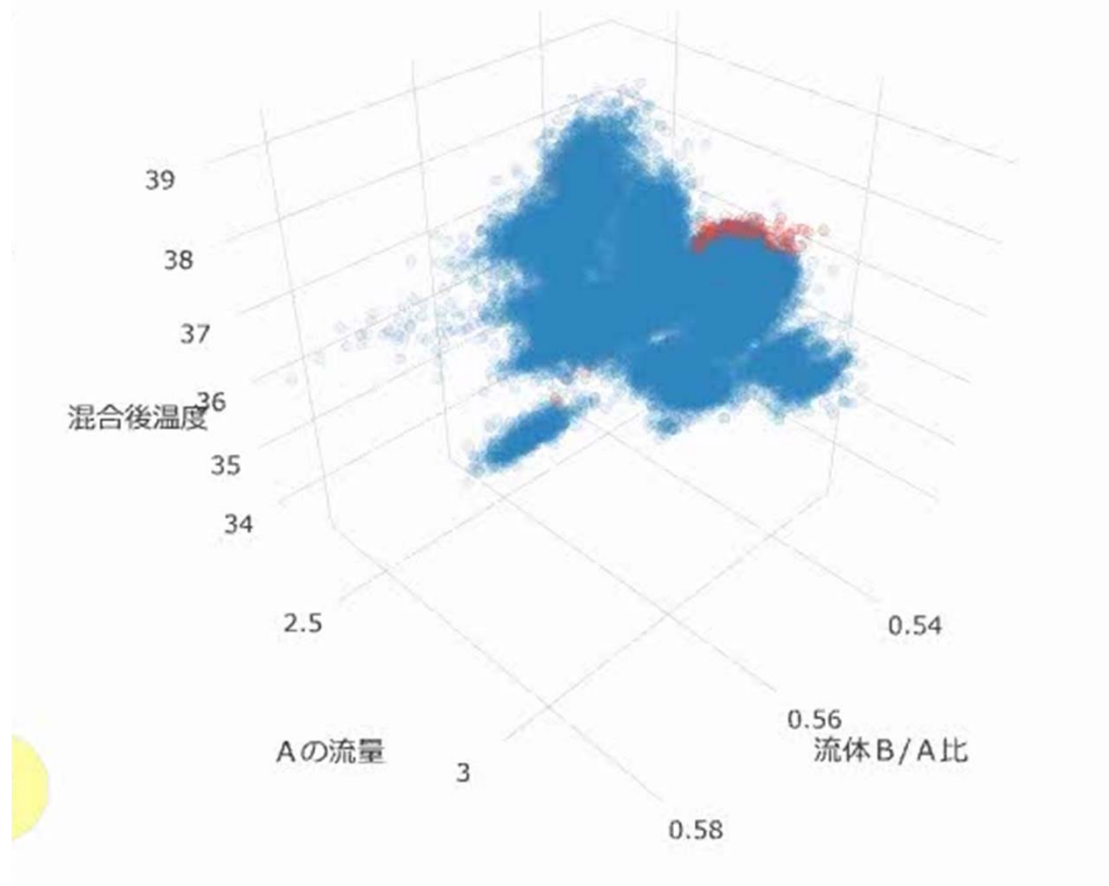
# Visualize Operation

## 【Subject】

To find out cause of frequent occurrences of  
an equipment clogging.

AI found out a several most affecting factors  
from thousands of sensor data  
to help operators learn how to keep the trouble from reoccurring.

# AI visualizes relations between clogging trouble and operating conditions:



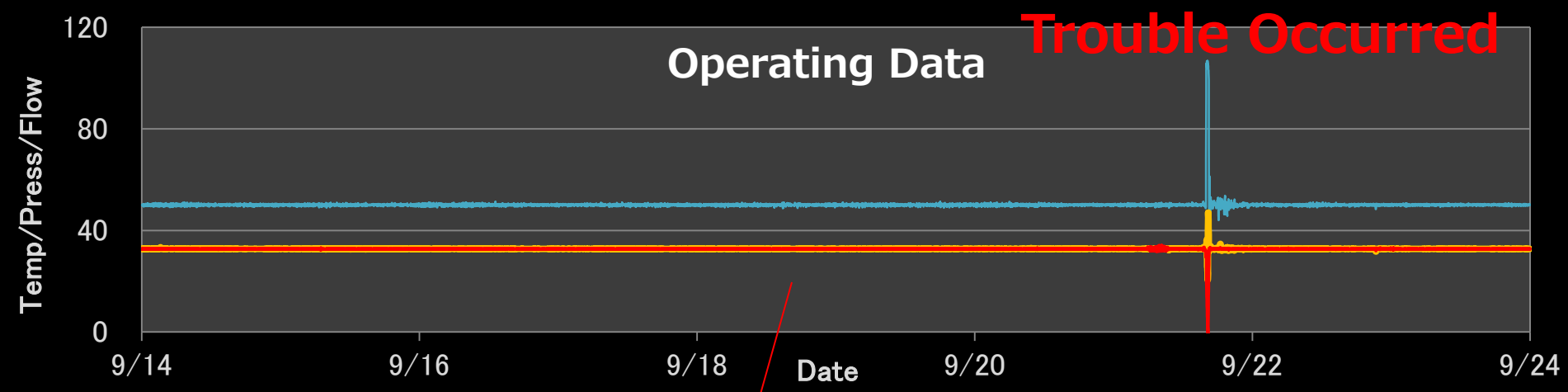
- Clogging zone
- Normal zone

# Detect Anomaly

## 【Subject】

To find out anomaly and cause of an amine foaming occurring for the first time in the refinery history.

AI found anomaly and identified the failure developing route to help operators learn cause of the trouble and ways to prevent it.

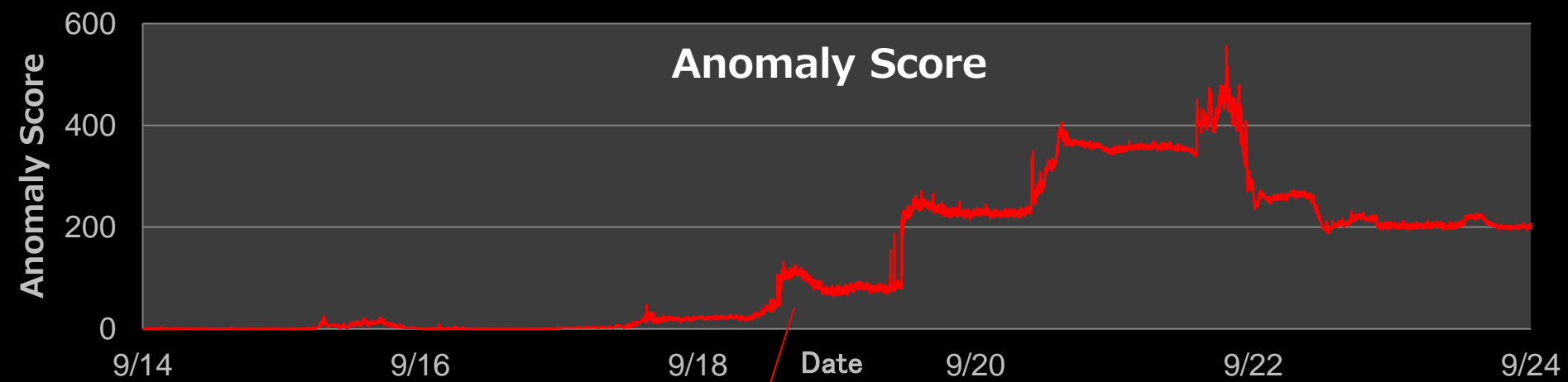


**No Evidence of Trouble**

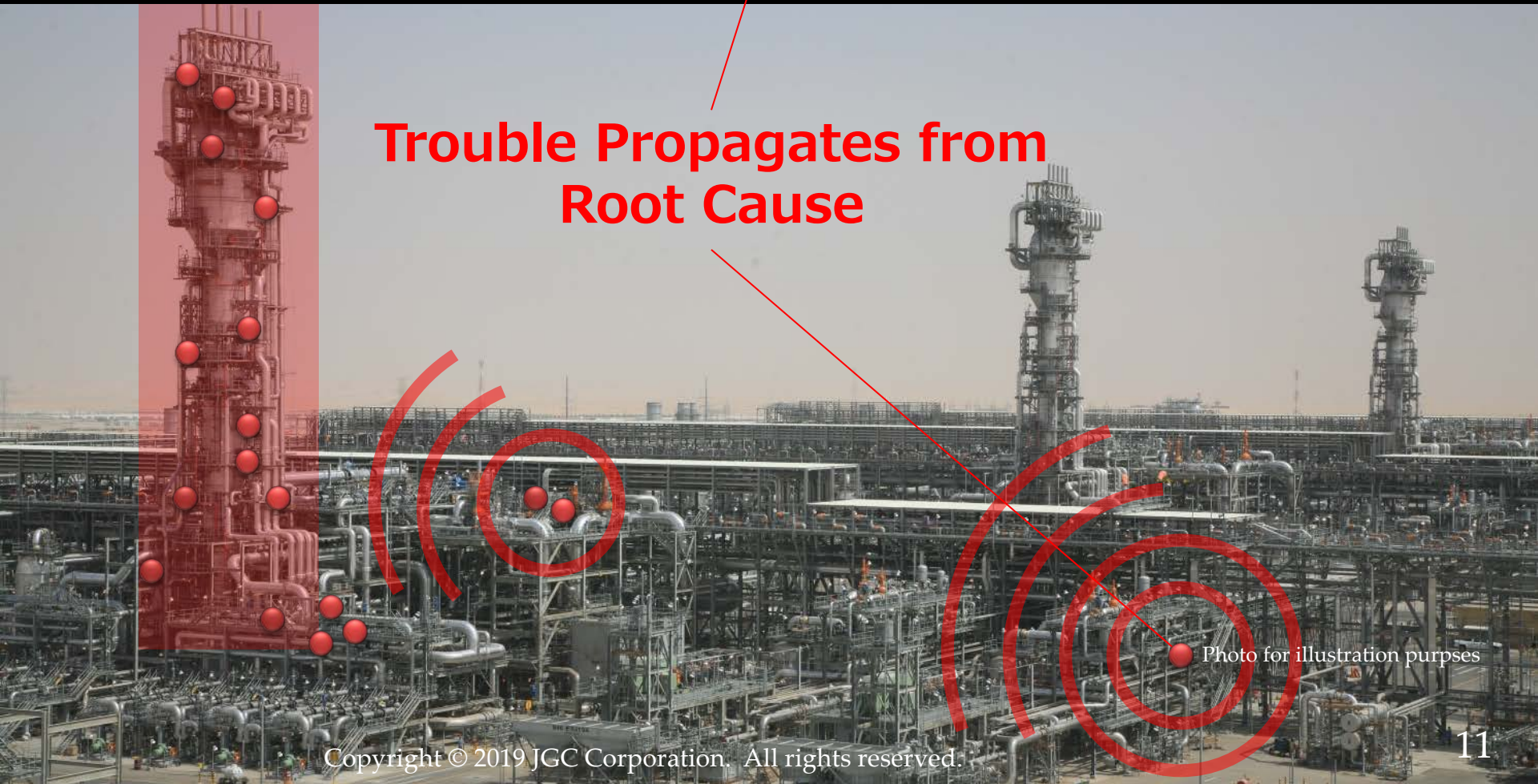


Photo for illustration purposes





**Trouble Propagates from Root Cause**





# Predict Longevity

## 【Subject】

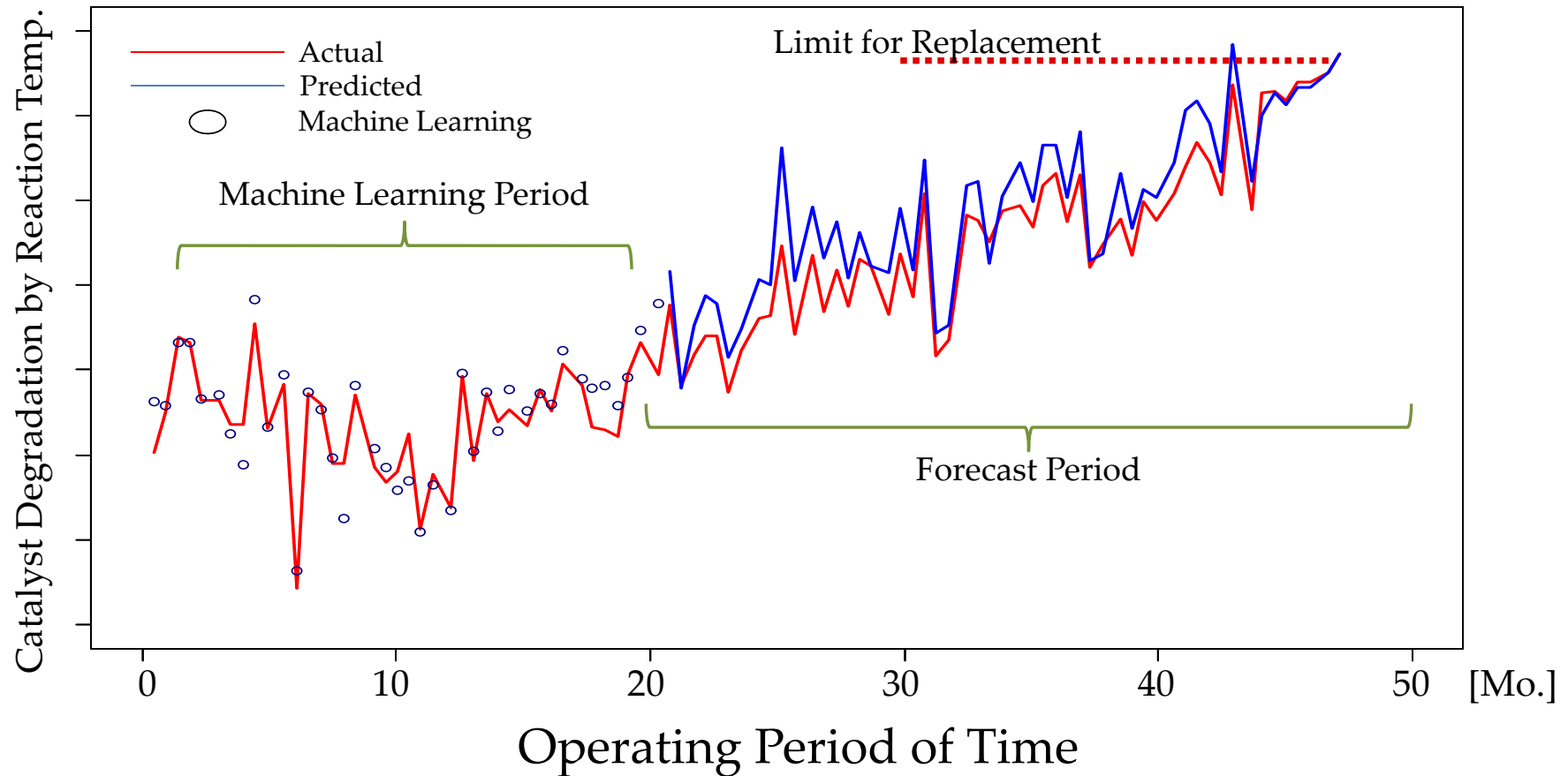
To know catalyst degradation speed  
from operating conditions

AI clarified relations between catalyst degradation speed  
and operating conditions  
to help operators know precise timing of the catalyst replacement  
and ways to extend catalyst life time.

Fouling of heat exchangers also introduced as an example here.

# AI predicts catalyst longevity

- For longer utilization and **condition based maintenance**



# AI predicts fouling speed

- Accurate prediction model → Efficient condition-based maintenance

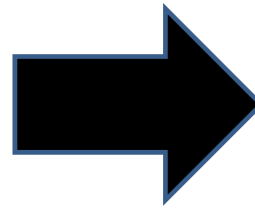
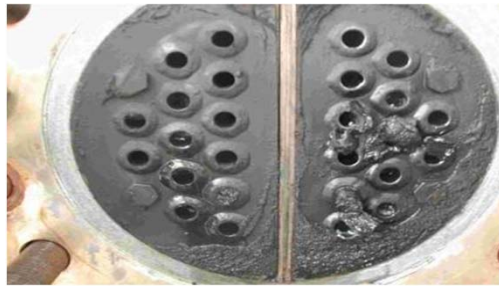
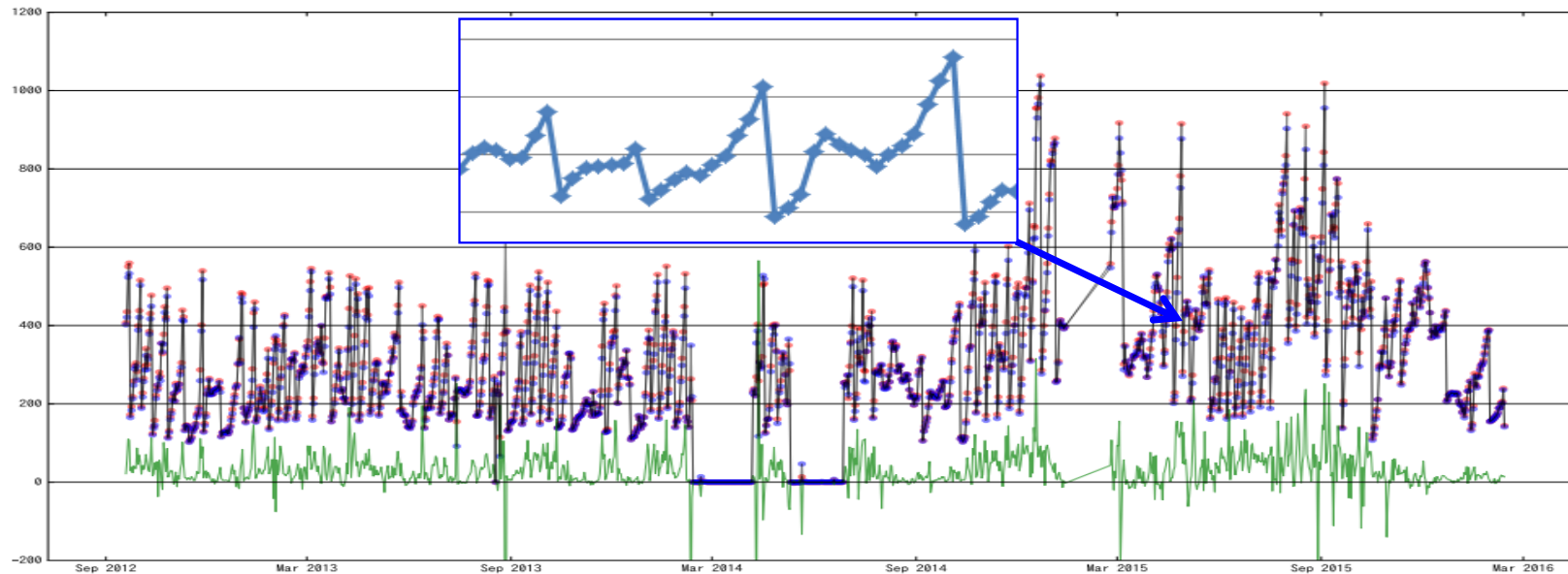


Photo for illustration purposes



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# Increase Production

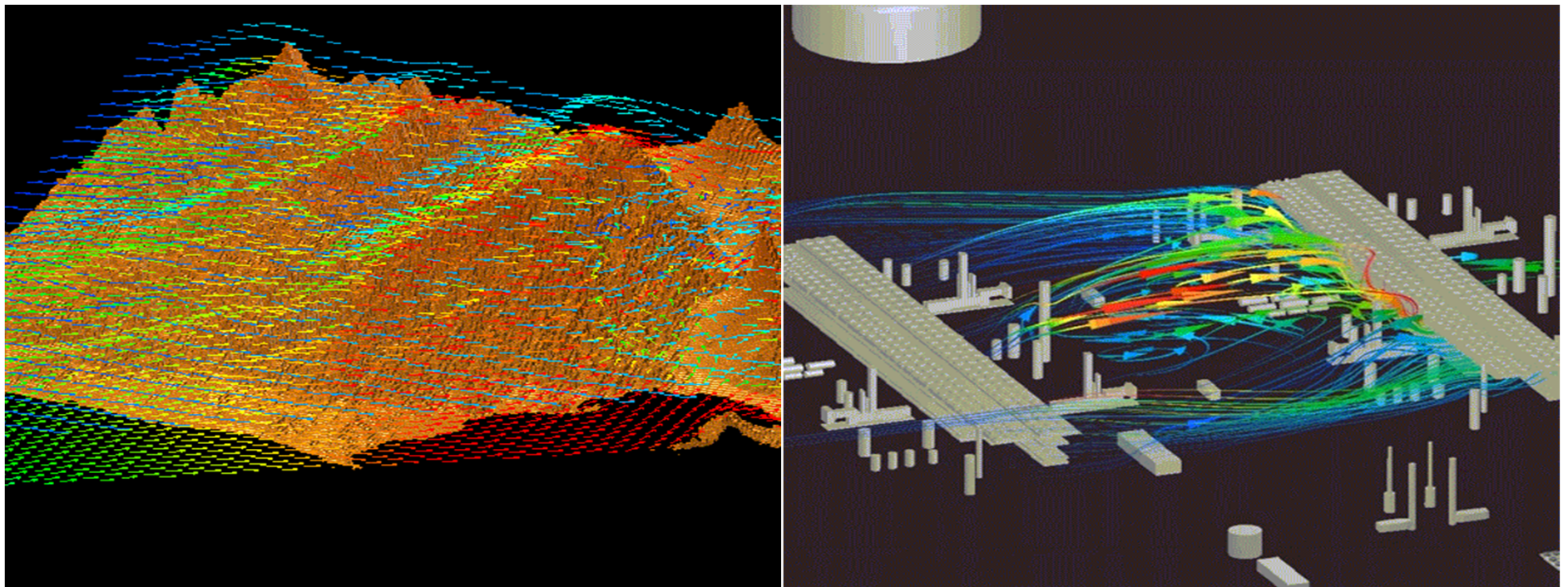
## 【Subject】

To enhance refrigeration efficiency of LNG plant  
for increasing production rate.

AI found relations between occurrence of hot air recirculation,  
and weather and operating conditions  
to help system to automatically function for minimizing production loss.

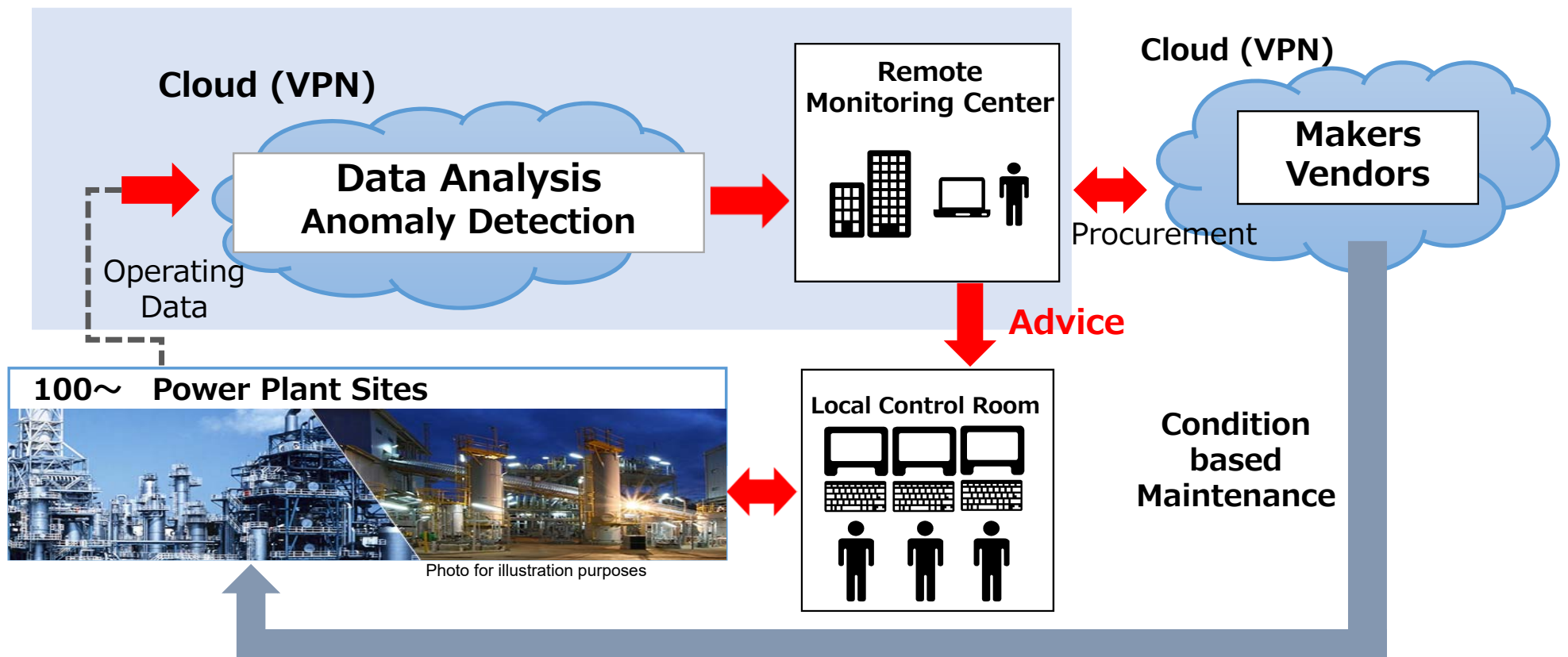
# HARview AIRLIZE LNG

- Predict hot air recirculation and take action before it happens.
- Maximize plant production rate.





# Anomaly Detection System for Remote Plant Monitoring Center



# Summary

## **JGC Engineered AI:**

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- Visualize Operation of Plant
- Prevent Trouble in Plant
- Elevate Production Efficiency
- Realize Condition-based Maintenance
- Improve Plant Design
- Help Improve Engineers/Operators Performance

**Thank you.**



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