# Congratulations Fuji Oil Company, Ltd
# Winner of the 2020 Excellence in Automation Award!

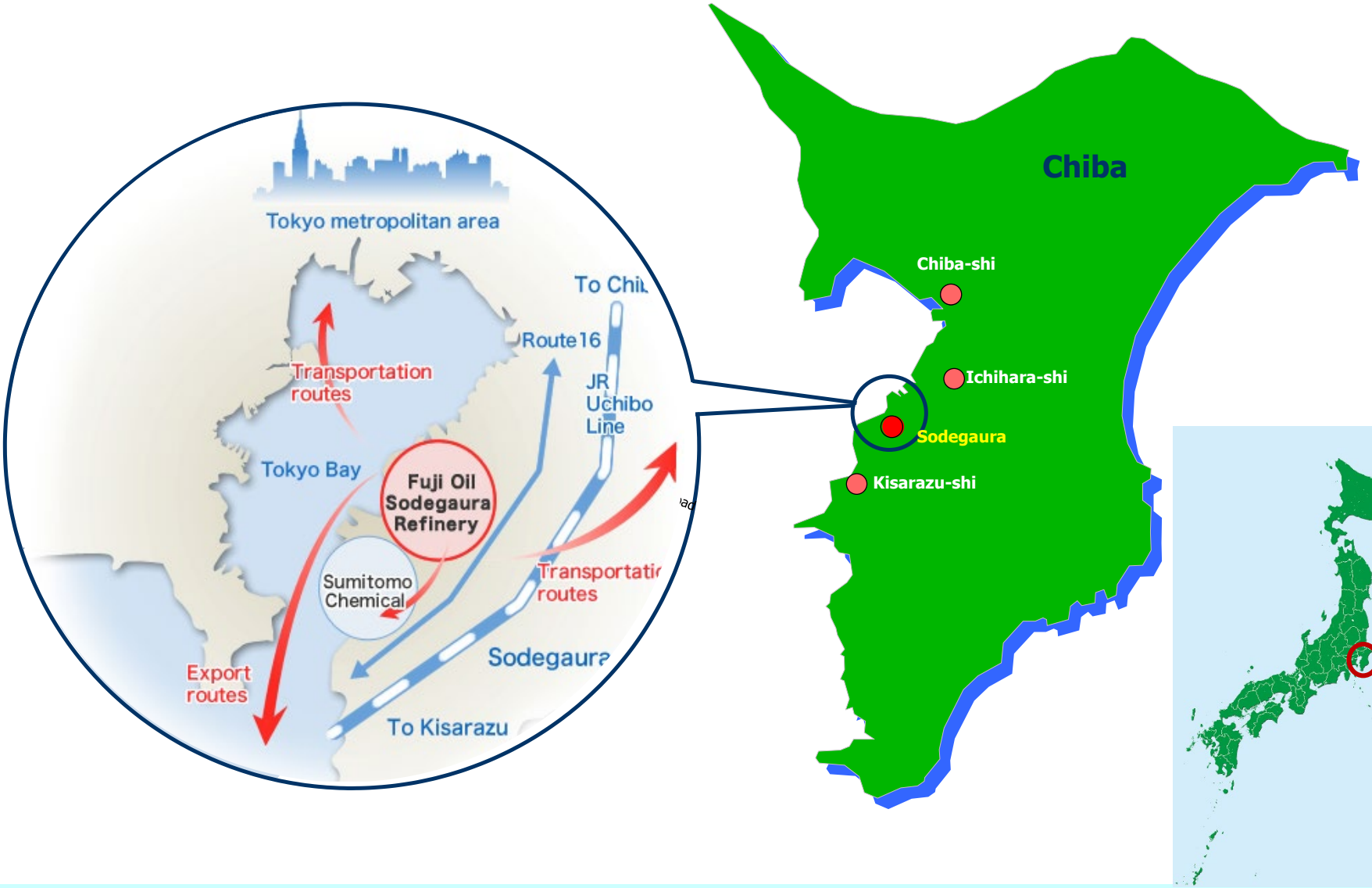

**Mr. Atsuhisa Nakata**
**Fuji Oil Company, Ltd.**

**Mr. Masahito Endo**
**ISA100 WCI Board**

# *Exploring visualization of field data utilizing the Industrial IoT*

Atsuhisa Nakata
Sodegaura Refinery
Fuji Oil Company, Ltd

# Location of Fuji Oil Sodegaura Refinery



# Overview of the Fuji Oil Sodegaura Refinery

Stockpiling base

Refinery

Area: 1,182,000 $m^2$

Capability: 143,000 BPSD

# Background for adopting industrial wireless

- **Challenges**
  - To keep safe plant operation with limited resource
  - To improve risk management of plant operation
  - To avoid unplanned shutdown
  - To improve productivity
- **Solutions with industrial wireless technology**
  - To improve efficiency of on-site inspections
  - To enhance continuous monitoring where are unable to monitor today
  - To reduce plant maintenance cost and work load
  - To reduce project lead time such as adding monitoring points in the field

# Why chose ISA100 Wireless ?

**Comprehensive considerations were made based on initial cost, running cost, and project lead time.**

- **Initial cost**
  - Advantages of total cost including installation of cables although hardware cost of wireless devices and gateways are expensive if compare with wired instrumentation
- **Running cost**
  - Wireless devices require battery maintenance, however battery life can be extended by changing the data update period
  - Lower cost than field patrol if compared to battery replacement
- **Project lead time**
  - To minimize lead time of project since cable laying is not required

# Layout of Refinery and wireless projects

Deploy ISA100 Wireless network from 2012

- DF / Pressures : 3 pcs
- Temperatures: 4 pcs
- Vibrations : 6 pcs
- Respirators : 2 pcs

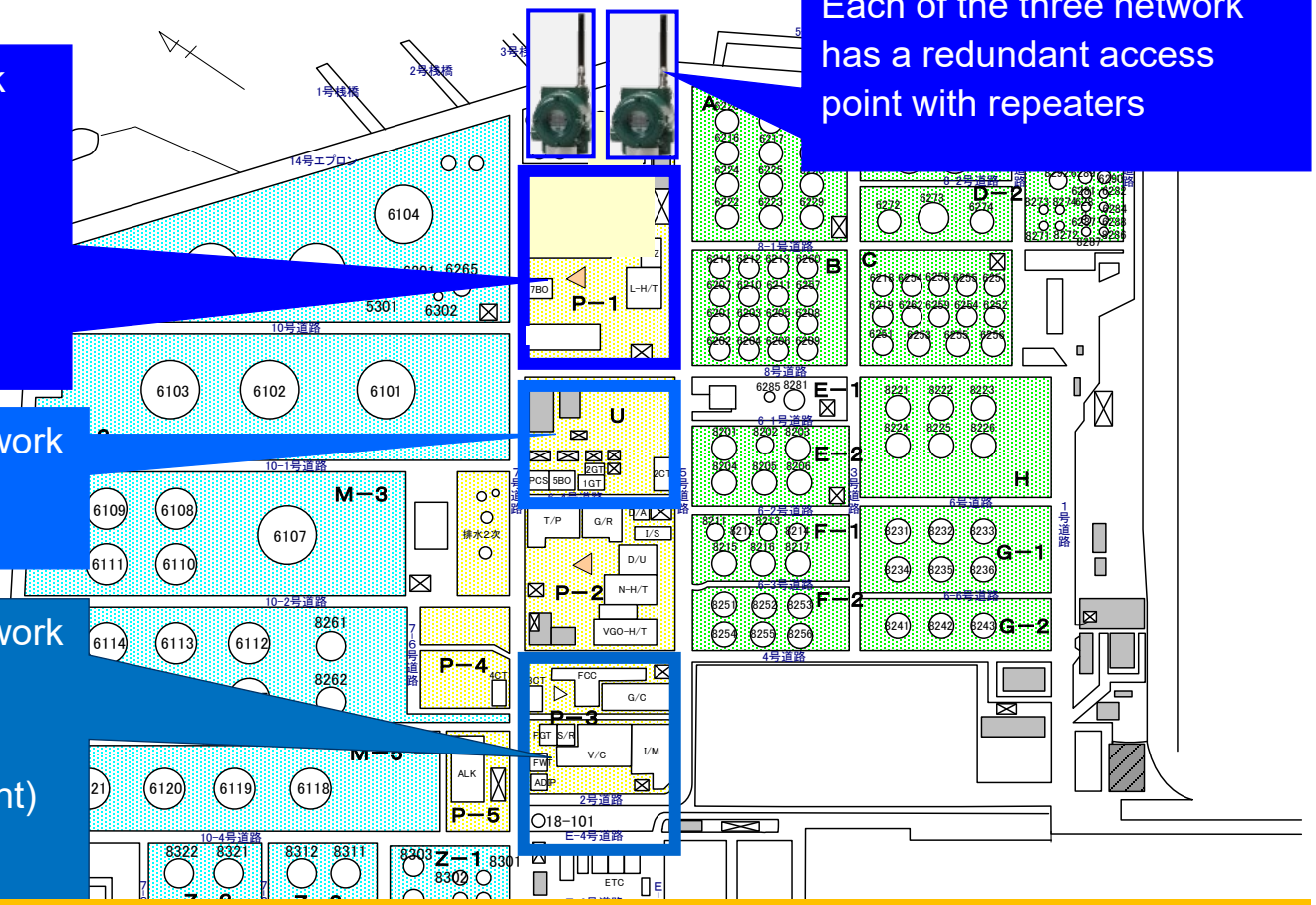
Expansion ISA100 Wireless network in 2019

- Vibrations : 4pcs

Expansion ISA100 Wireless network from October 2017 to 2020

- DF / Pressures: 16 pcs
- Temperatures: 1 pcs (Multi point)
- Vibrations: 20 pcs
- Gas detector: 1 pcs

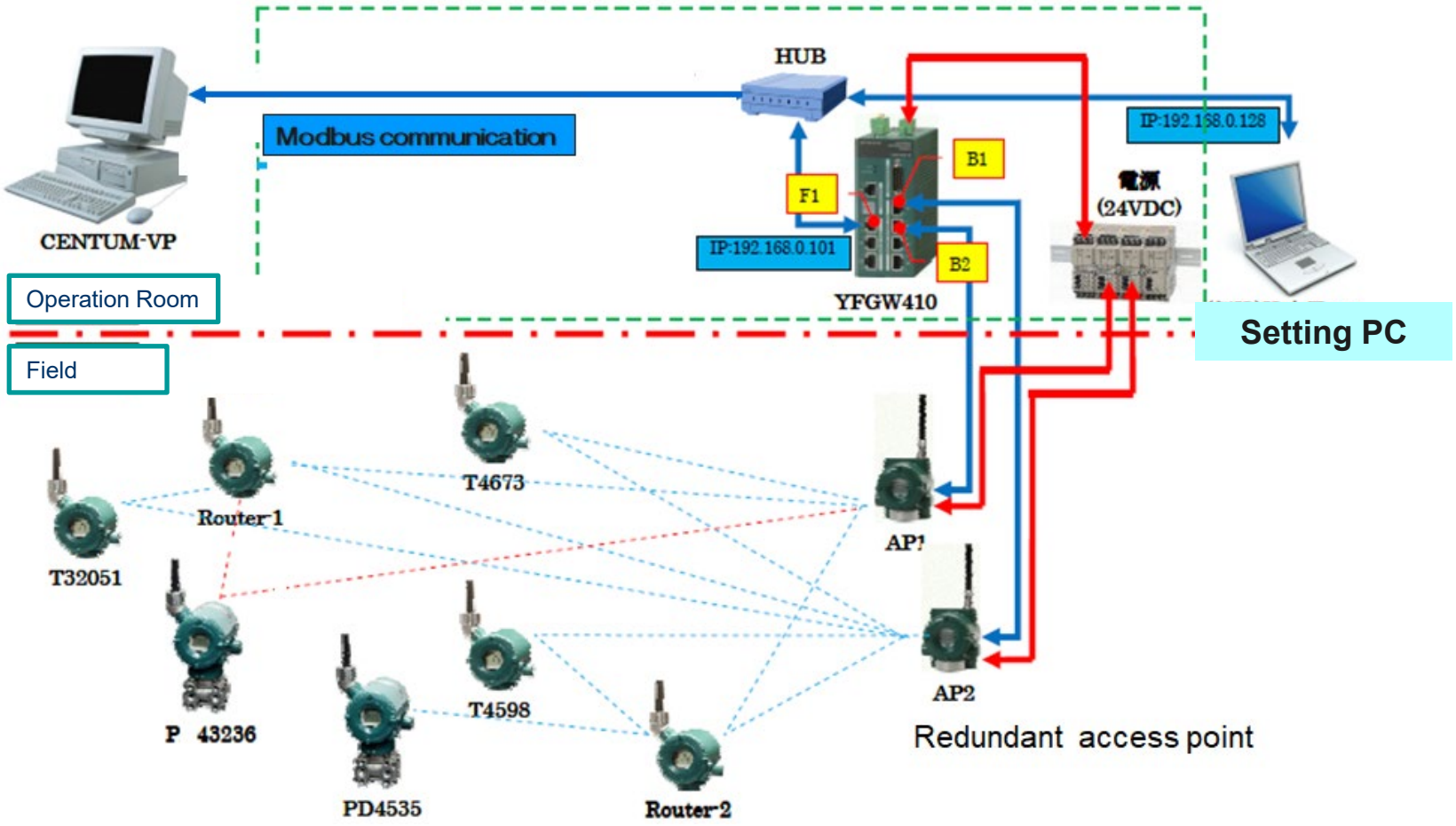
Each of the three network has a redundant access point with repeaters




**Expansion of ISA100 Wireless network**

*Main objective was to predict maintenance timing for critical equipment such as motors, pumps and compressors*

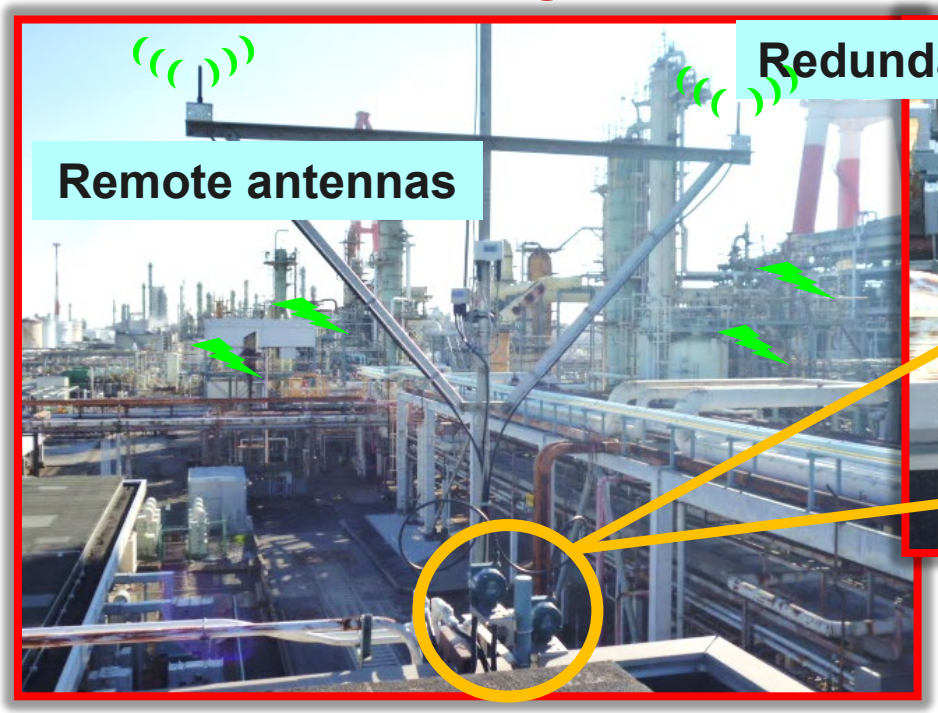
# System configuration of ISA100 Wireless

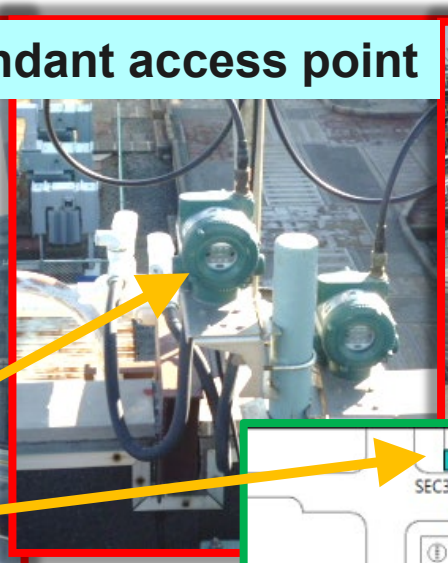



**Wireless sensors can be moved due to plant wide coverage of redundant access point and repeaters**

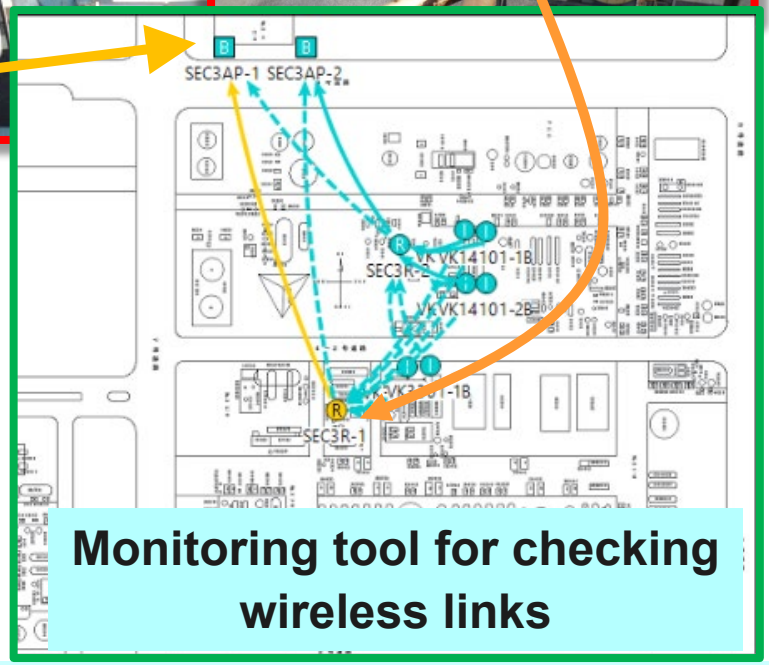
# ISA100 Wireless Infrastructures

## Covering entire plant wide wireless network








**Benefits**

- Reliable wireless network by redundant access point
- Flexible wireless network by covering entire plant
- Easy to expand wireless network with adding new sensors or reallocating existing sensors in the plant

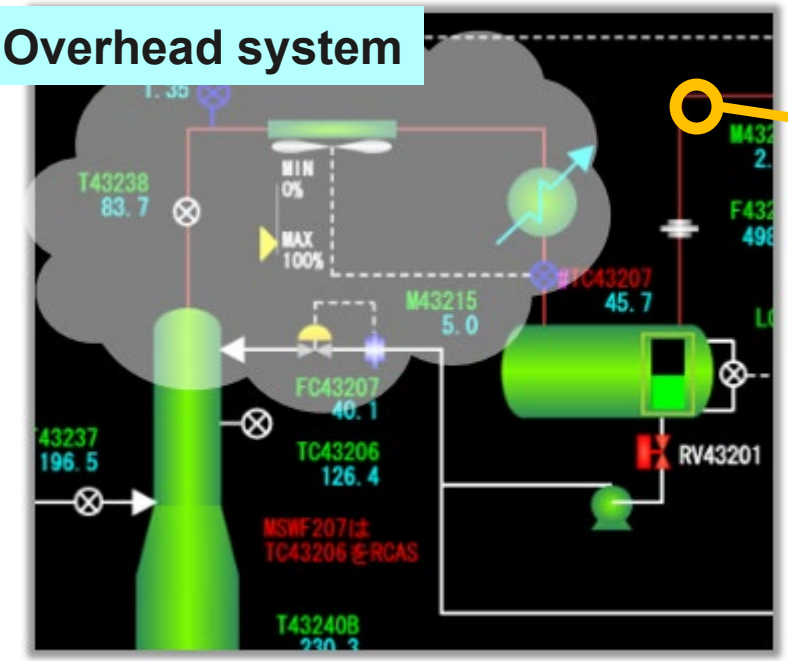
# Project overview and objectives

| No. | Purposes | Wireless devices | Monitoring point |
|---|---|---|---|
| 1 | Monitoring blockage of strainer;<br>To determine the timing of clean up | Differential pressure transmitter | Circulating cooling water strainer |
| 2 | Monitoring blockage of heat exchanger;<br>To determine the timing of washing maintenance of tower; | Pressure transmitter | Heat exchanger tube outlet |
| 3 | Monitoring temperature of surface of turbine;<br>To improve efficient operation | Temperature transmitter | Power turbine inlet |
| 4 | Monitoring trend of purge temperature;<br>To identify state of activated carbon recycling rate | Temperature transmitter | Inlet of activated charcoal adsorption tower |
| 5 | Monitoring flow rate of outlet pump;<br>To confirme material balance | Flow (differential pressure) transmitter | Pump discharge line |
| 6 | Monitoring vibration of reciprocating compressor;<br>To determine maintenance timing | Vibration sensor | Reciprocating compressor |
| 7 | Detecting leakage gas of reciprocating compressor;<br>To determine maintenance timing of actuator rod seal | Gas sensor | Reciprocating compressor |

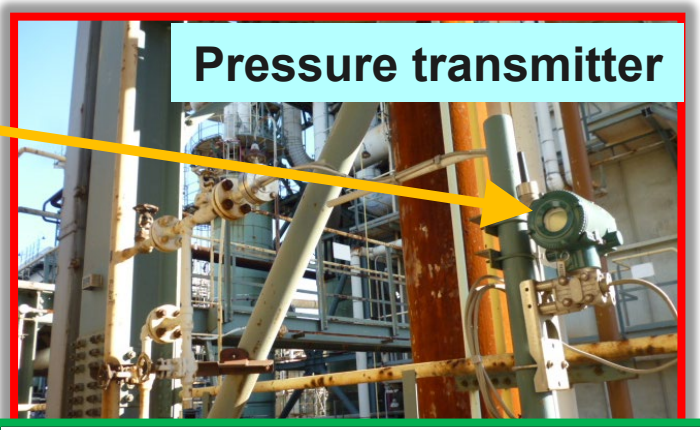
# ISA100 Wireless solutions 1/3

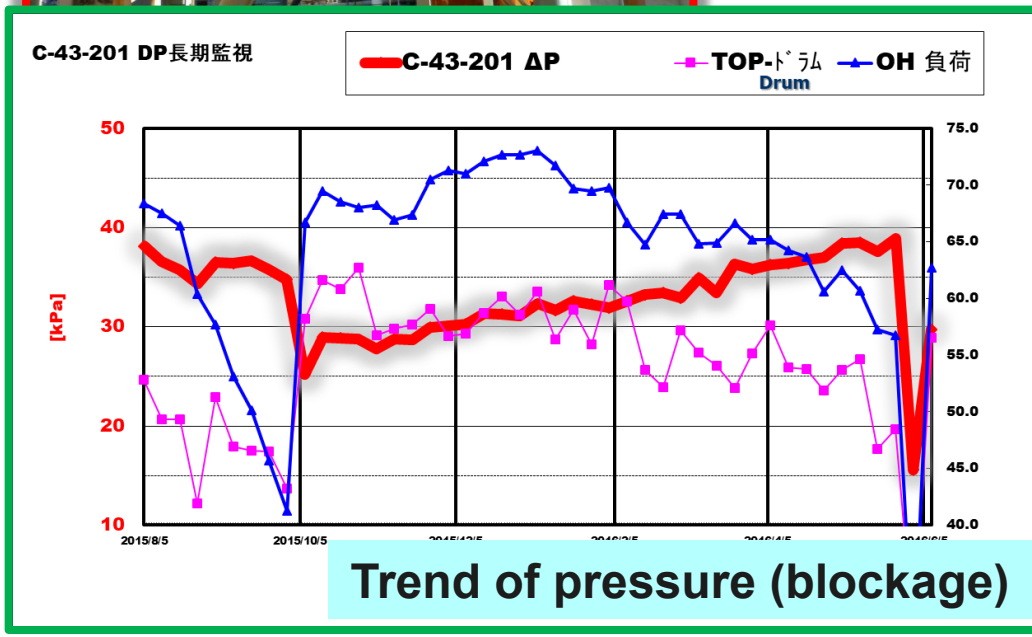
## Pressure transmitter: Condition monitoring of overhead system

**Overhead system**




**Pressure transmitter**





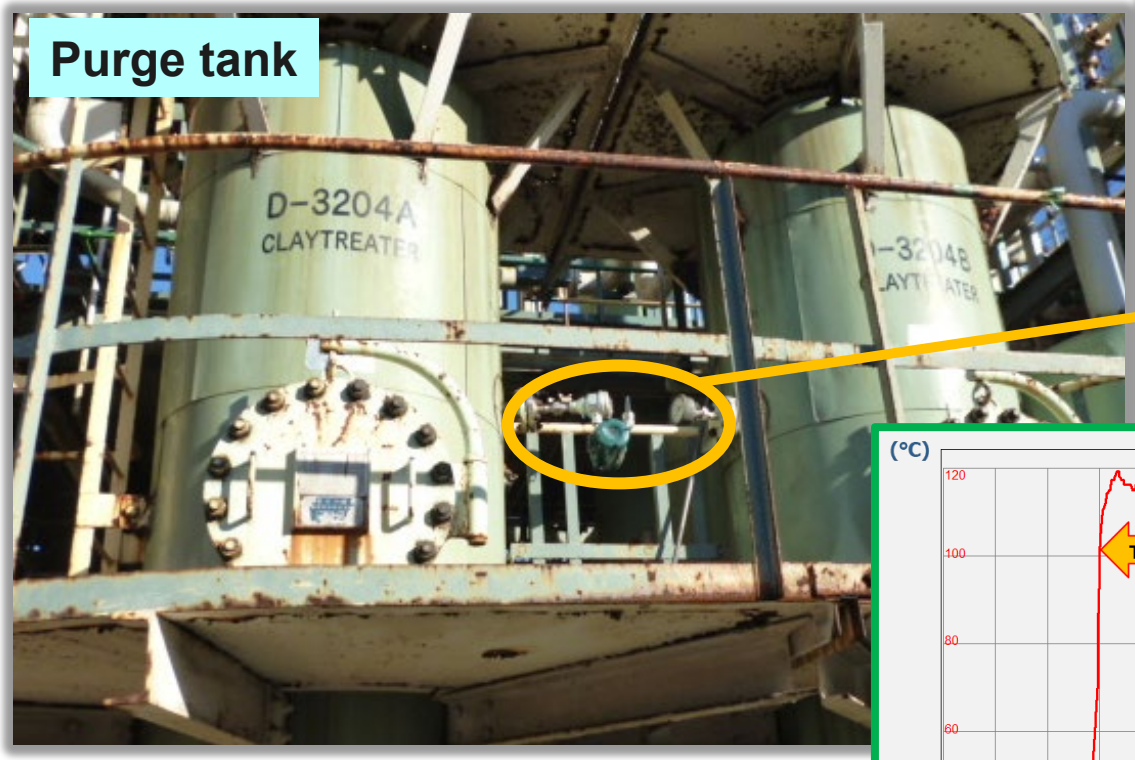

**Trend of pressure (blockage)**

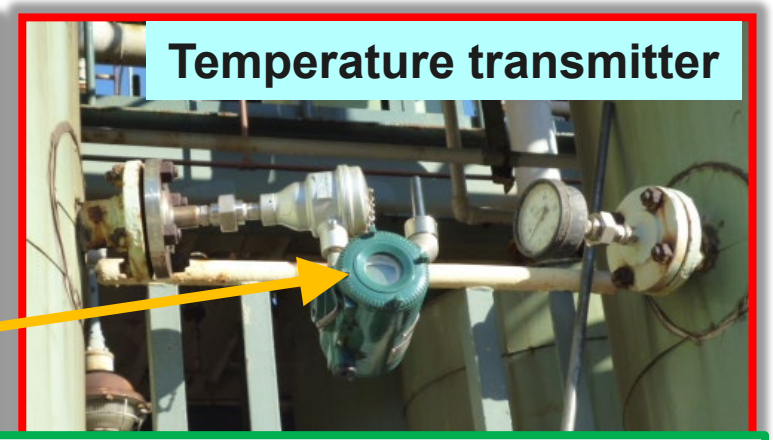
**Benefits**

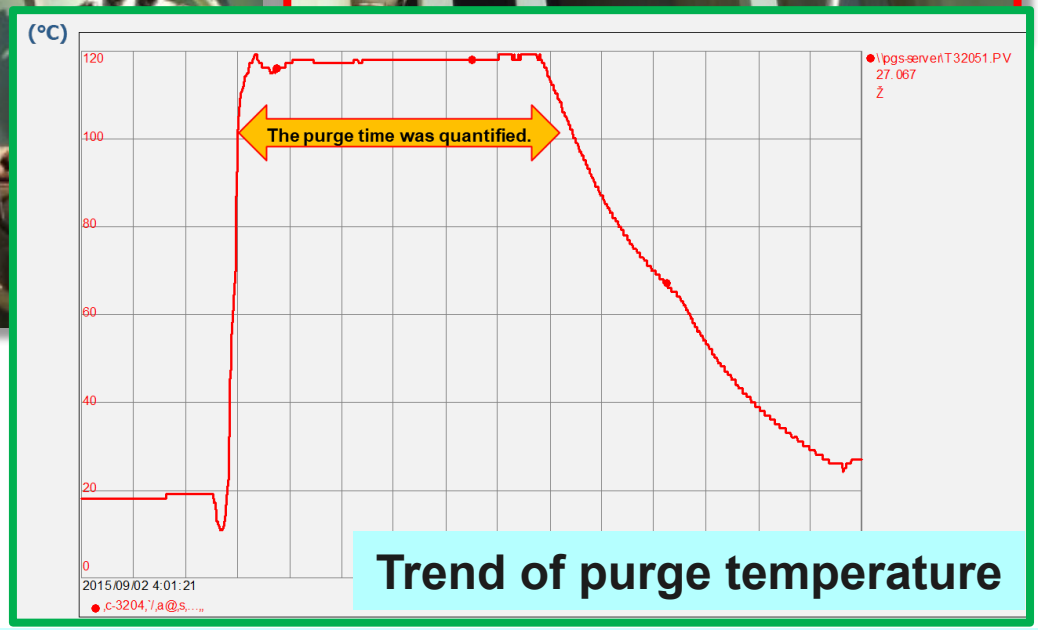
- Determine of the timing of washing maintenance of tower
- Improve availability of plant operation
- Avoid unplanned shutdown

# ISA100 Wireless solutions 2/3

## Temperature transmitter: Monitoring of purge temperature



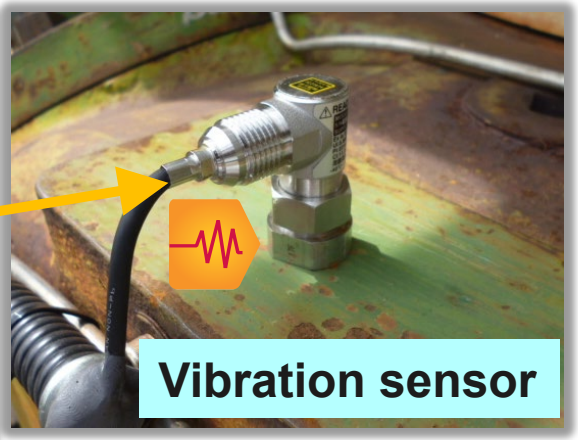




**Benefits**

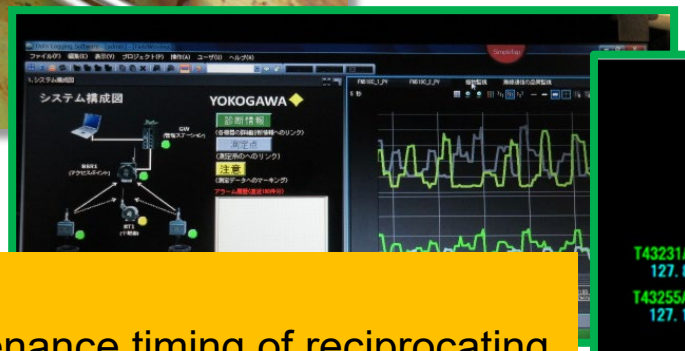
- Shortening the purge time by visualizing trend of temperature
- Reduction of field work time and labor cost

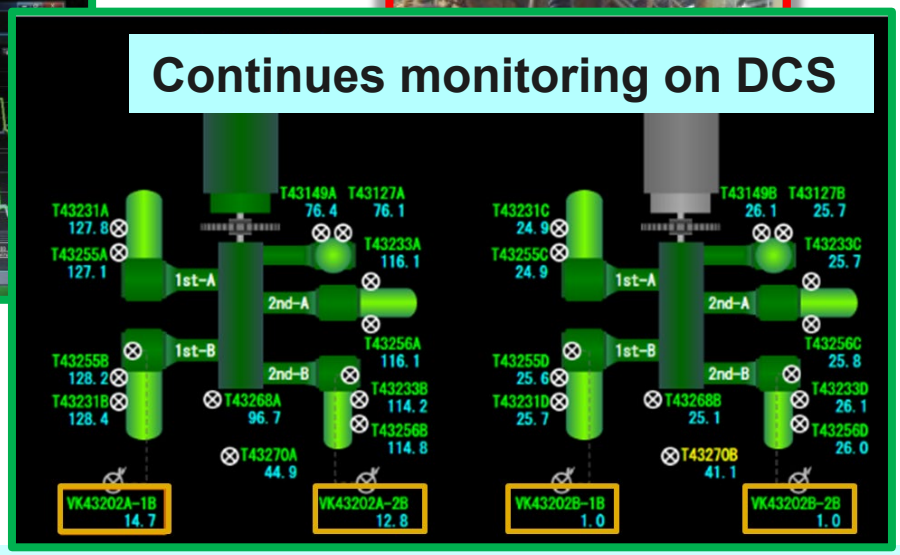
# ISA100 Wireless solutions 3/3

## Vibration sensor : Condition monitoring of compressor



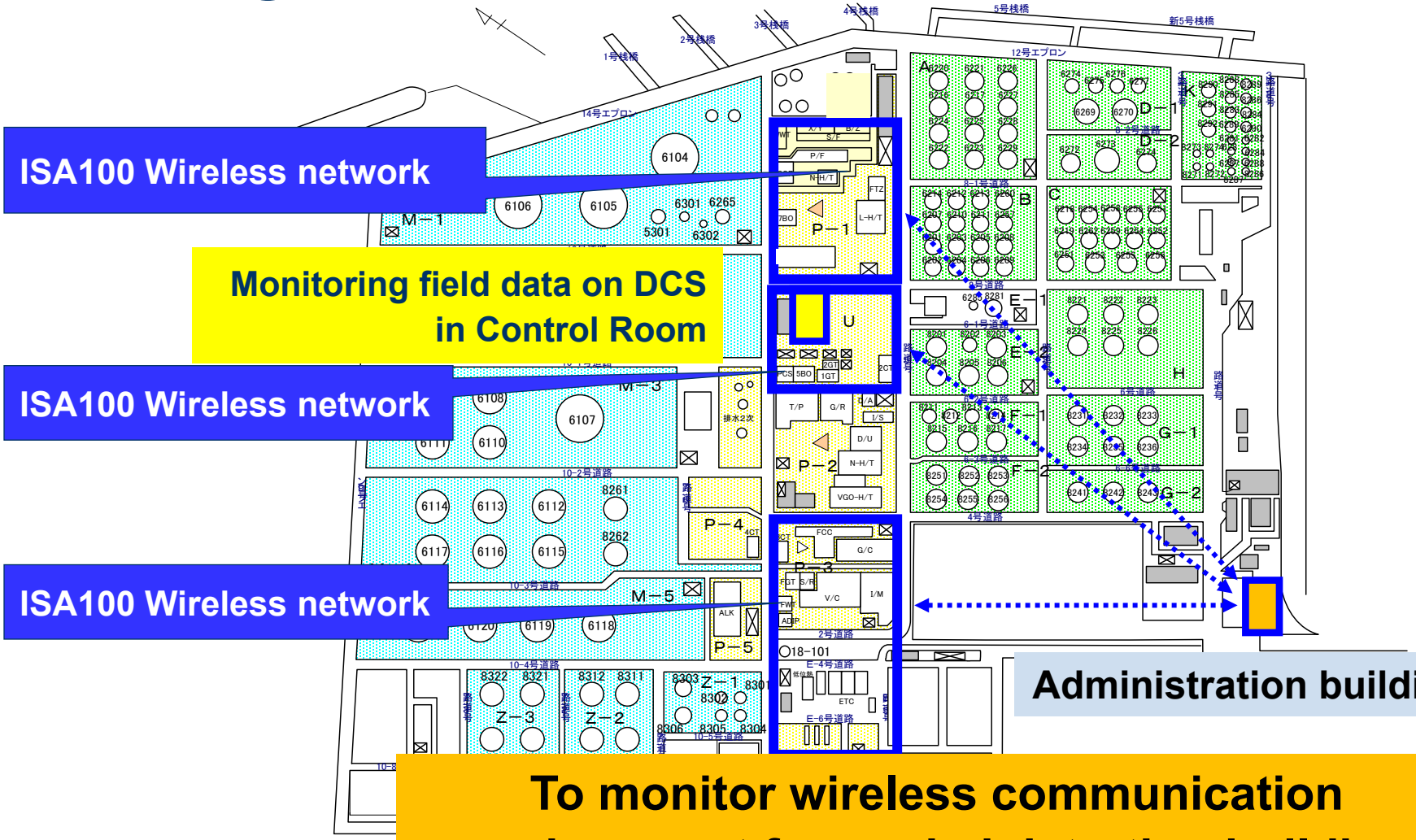


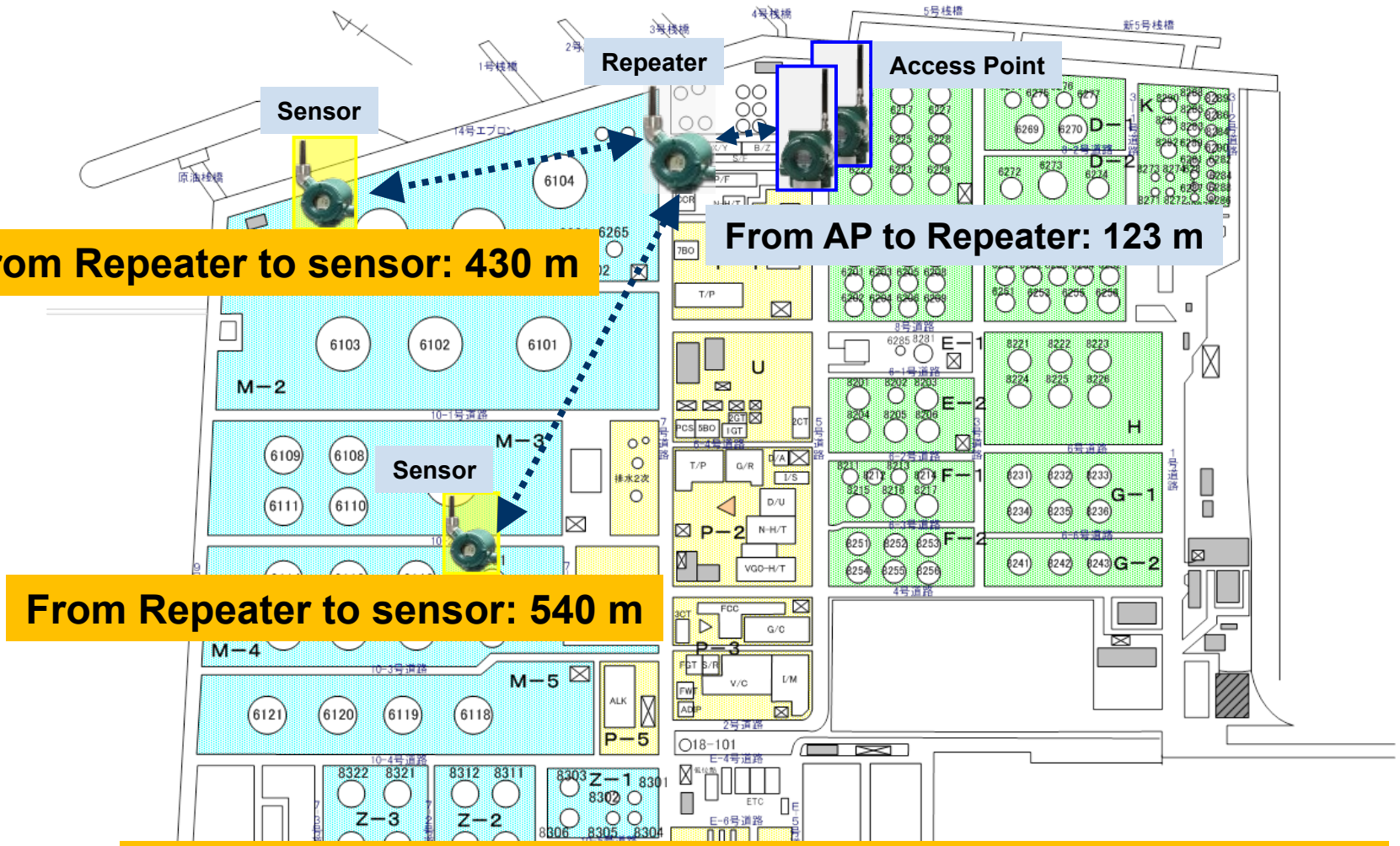

**Benefits**

- Determine maintenance timing of reciprocating compressor
- Improve availability of plant operation
- Improve risk management and avoiding unplanned plant shutdown

# Remote monitoring from administration building



# Preparation of future expansion




**Confirmed long distance communication for future expansion of wireless network to off-site area**

# Lessons Learned

- **Insight**
  - Initial design and planning of wireless infrastructure is very important for deploying the industrial wireless network for future expansions
- **Requests to suppliers**
  - Increasing product portfolio such as wireless camera
  - Low cost sensors
  - Network survey function for large wireless network
- **Future plan**
  - Expansion of wireless network to off-site area
    - To minimize field patrol
    - To replace local gages to online monitoring on DCS
    - To utilize big data and IIoT for smart maintenance

# Thank you very much