

# Early Detection of “Silent Quality” changes by leveraging Analytics

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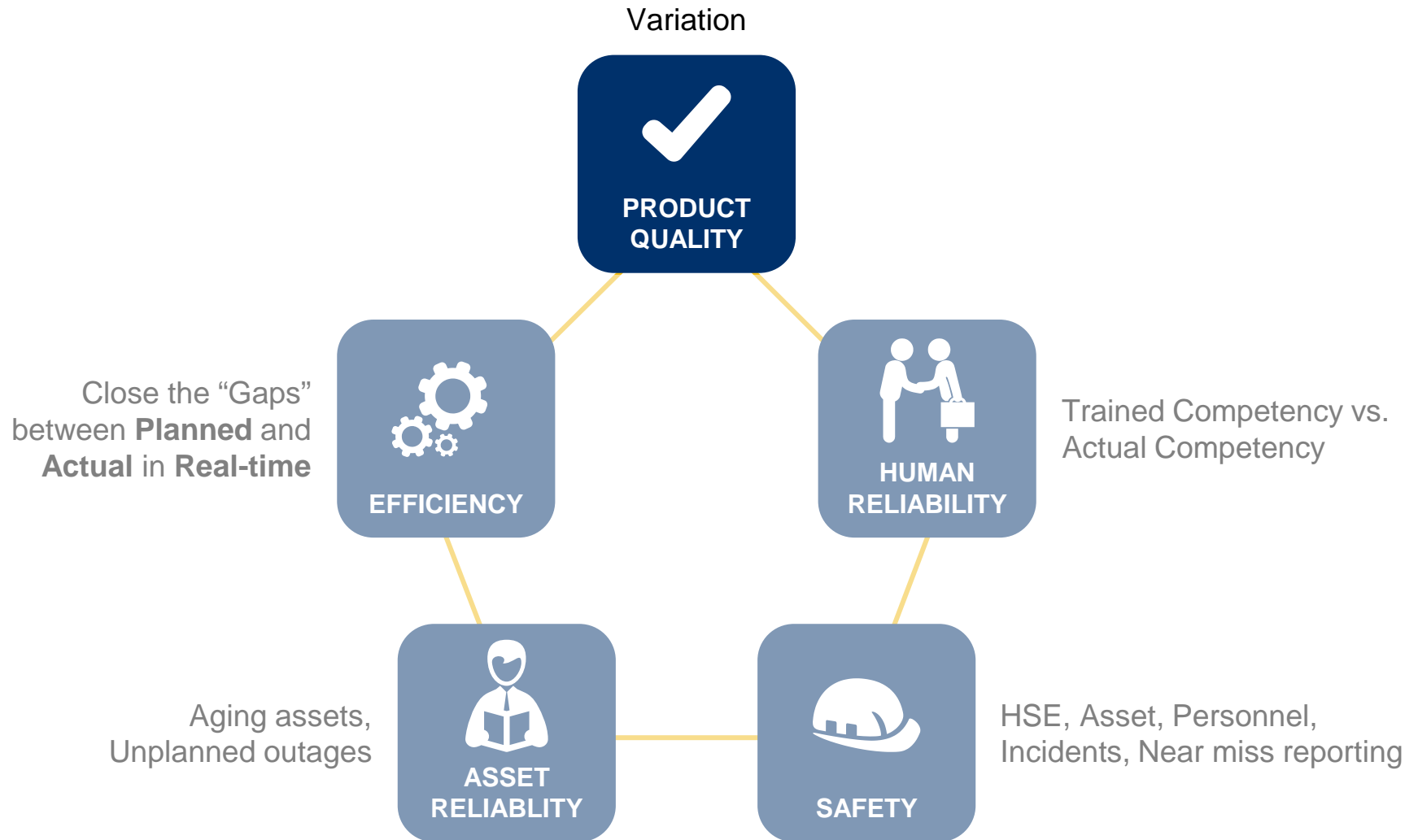
NAMUR General Assembly  
November 2016

# Industry Challenges

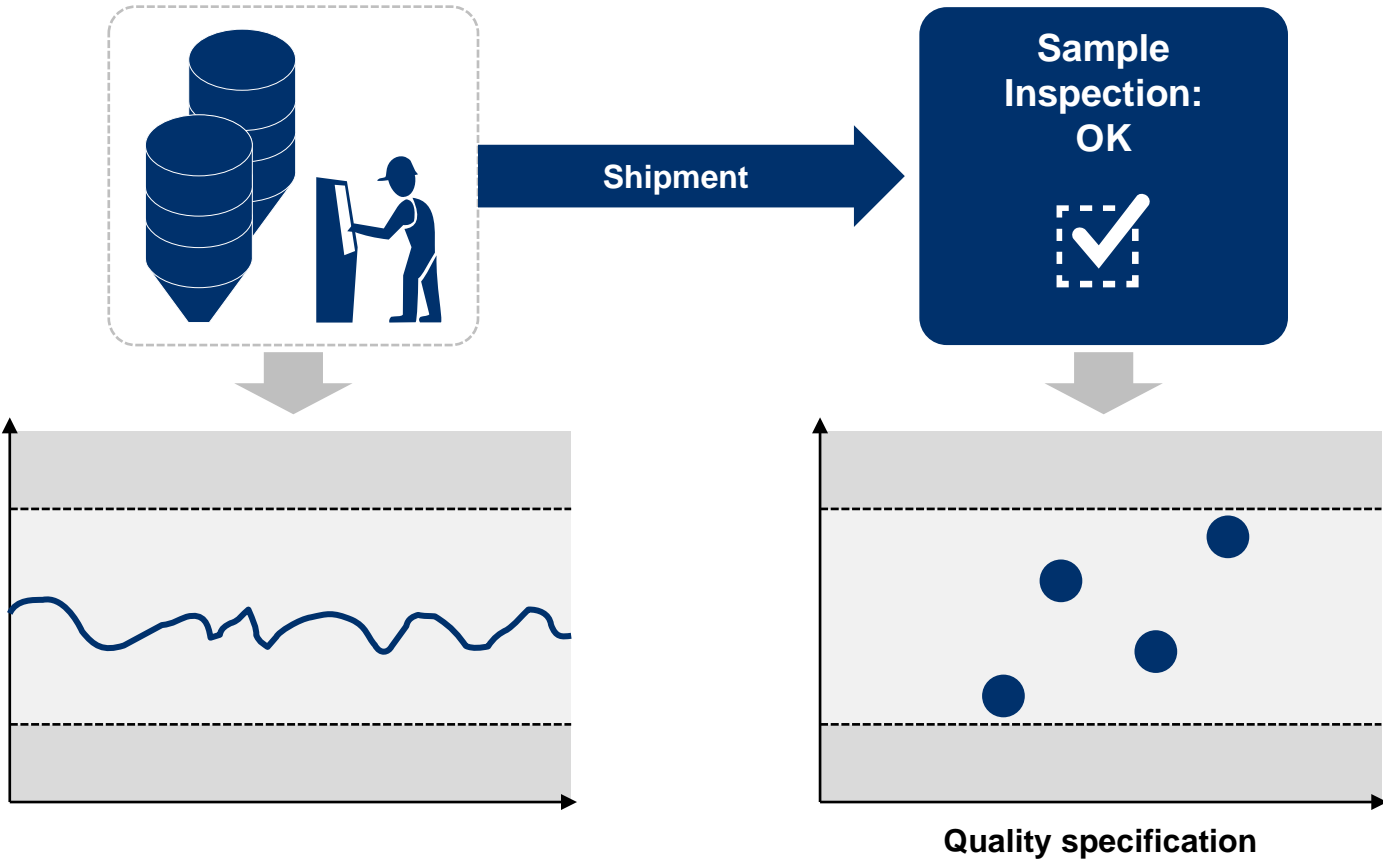
- Increasing low-cost competitors from emerging markets
  
- More difficult to maintain high productivity than ever
  - ◆ Variability and volatility of customer demand
  - ◆ Complex patterns of customer demand
  - ◆ Rising expectations from the final consumer
    - Short lifecycle of products
    - Product diversification



# How to Address the Requirements

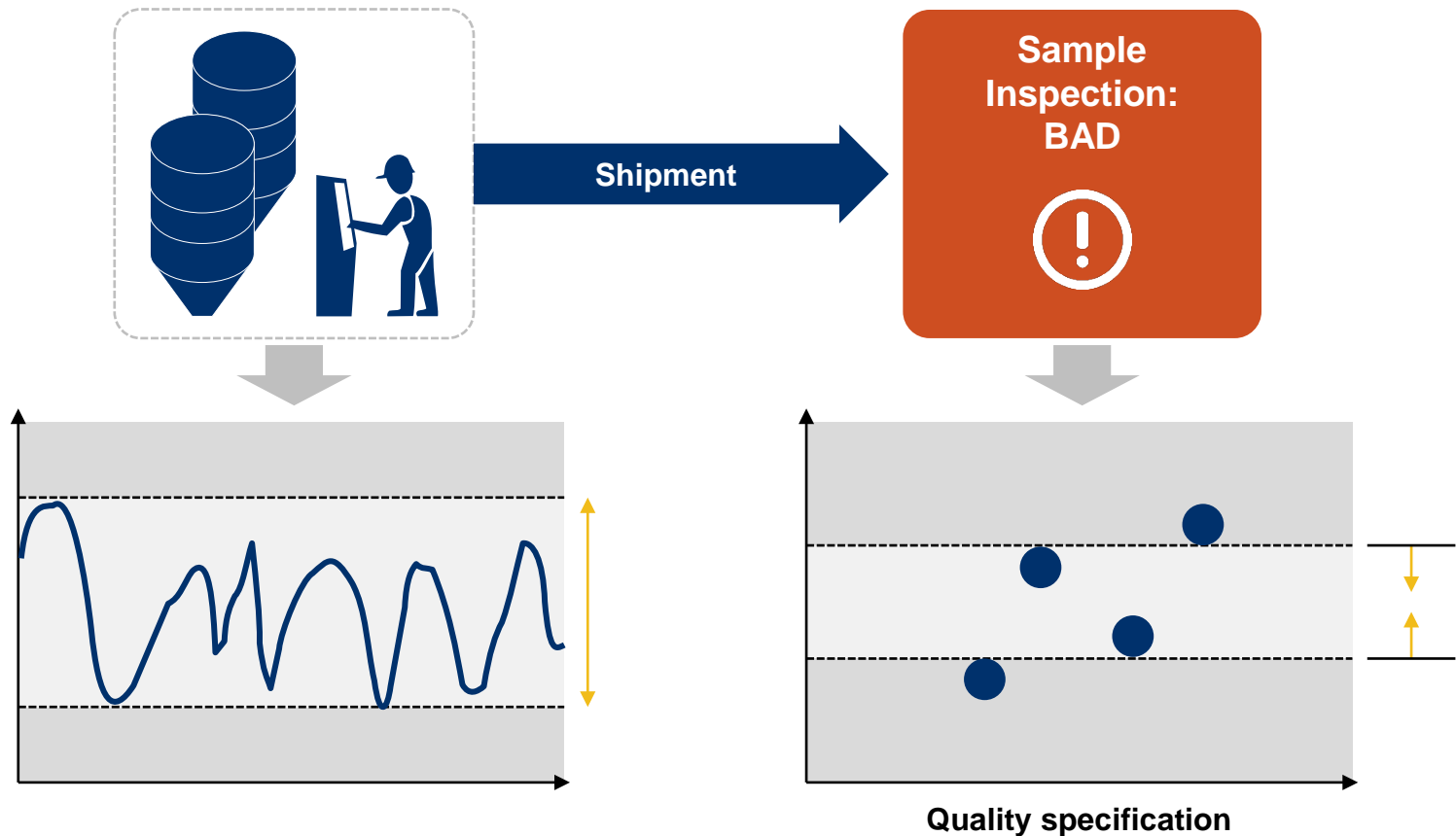


# Customer challenge: Unknown quality variance



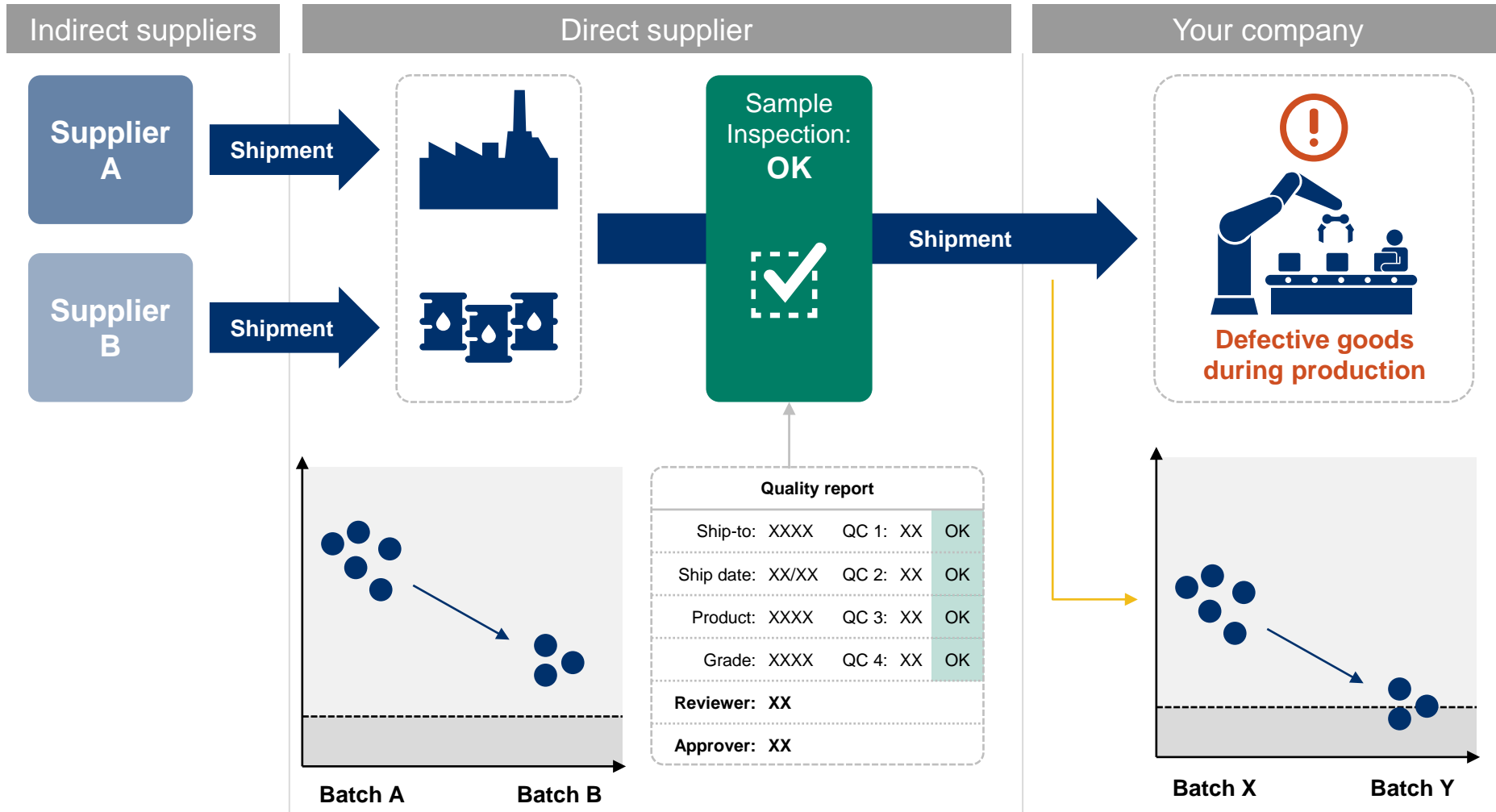
# Customer challenge: Unknown quality variance

- Aging Assets: Reduction in operating consistency/accuracy
- Increasing quality/consistency demand



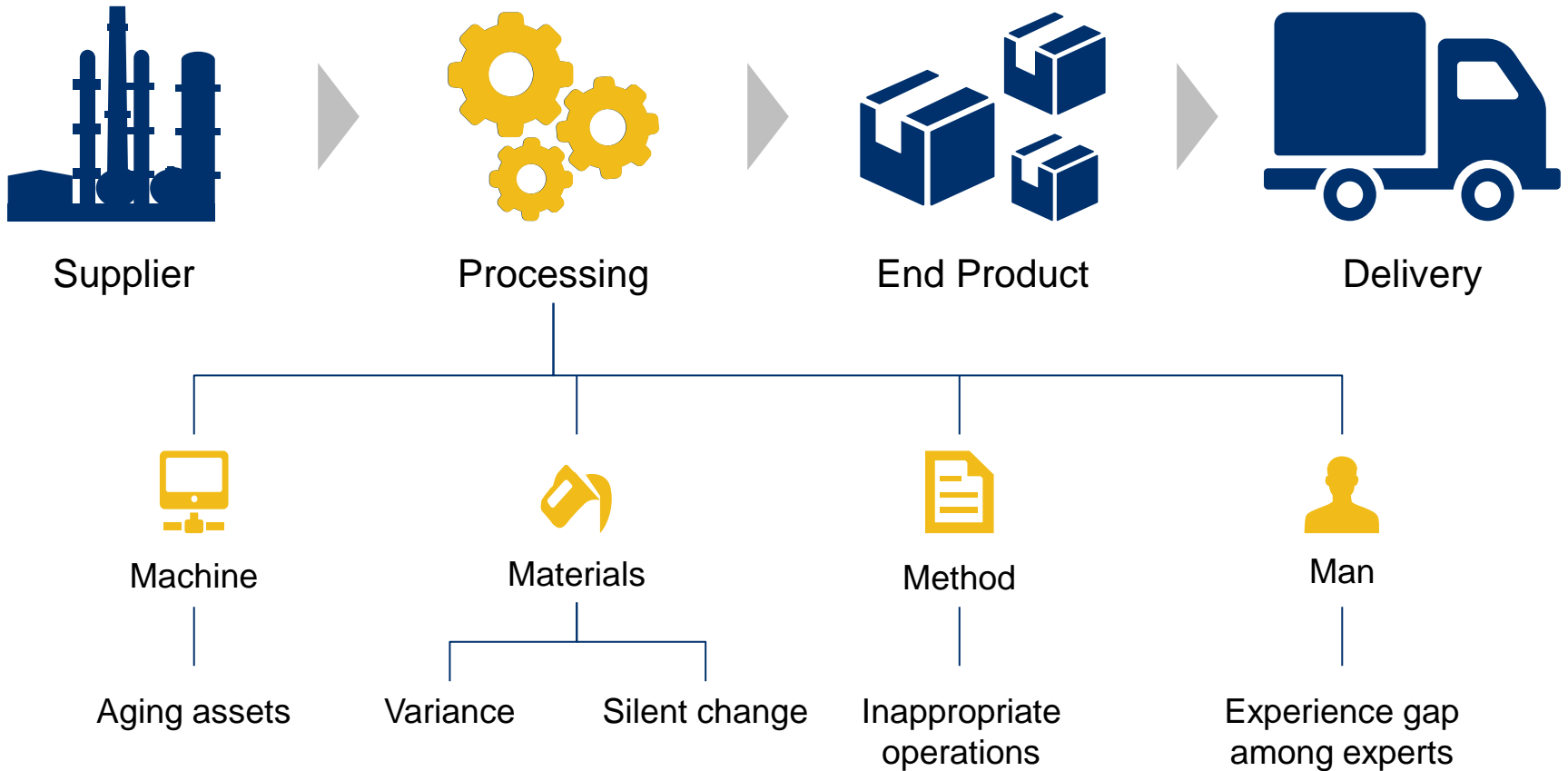
# Customer challenge: Unknown quality variance

“Silent Change” causing significant downstream production challenges



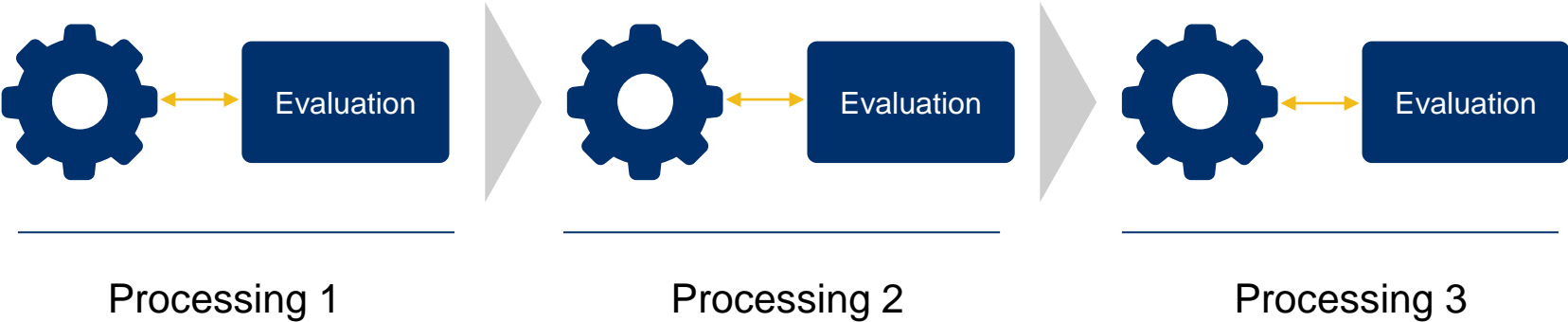
# How to address the challenge

We need to focus on quality assurance system during processing



# Internal Production & Inspection Process

Each stage must ensure that no defective items proceed to the next stage



Final Product Inspection

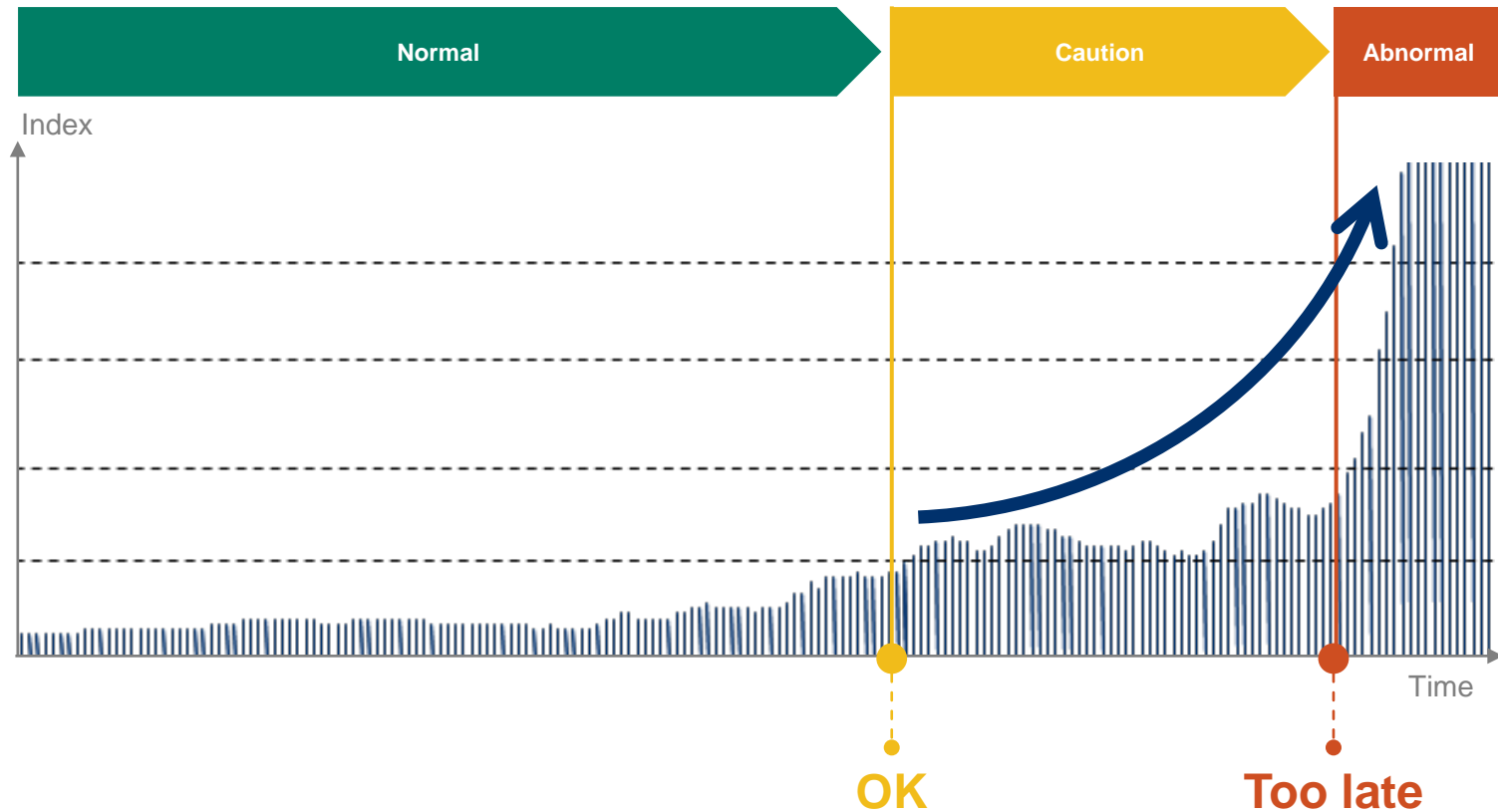
Delivery

*Raw materials, asset, process, people should be evaluated in each process*



# Early Detection of abnormalities is a key

Catch faults that might be overlooked in a conventional pre-shipment inspection by analyzing production process data



# Concerns and challenges still remain



**False detection**



**Lengthy root cause analysis time**

**Abnormal events continuously occur**

**Hard to determine critical process parameters**

# Why? Complexity of quality management

○ Complexity of data analytics

○ Data analysis vs plant operations

○ Lack of experience and knowledge

○ Cross-department implementation required

# You are underserved



Current analytics systems often ignore operators

They give tools  
to “analyze”

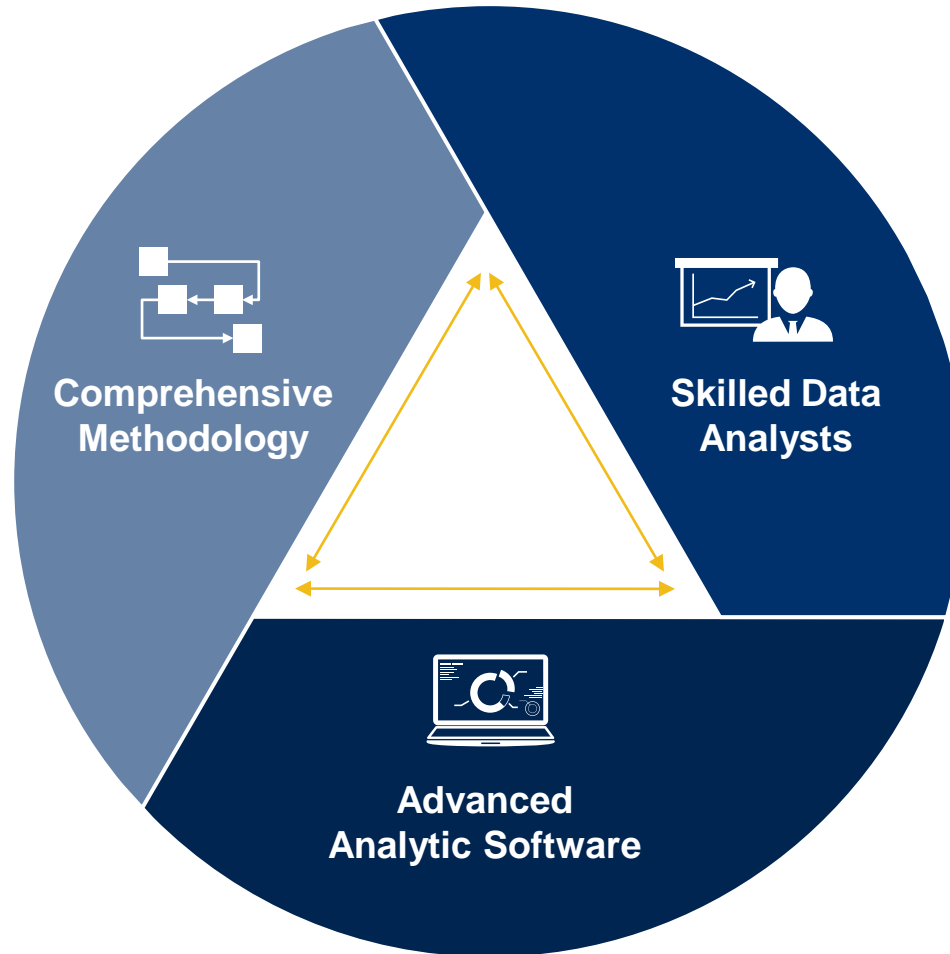
Often too  
complicated to use

Your system  
becomes unused

```
graph LR; A[They give tools to "analyze"] --> B[Your system becomes unused]; C[Often too complicated to use] --> B;
```

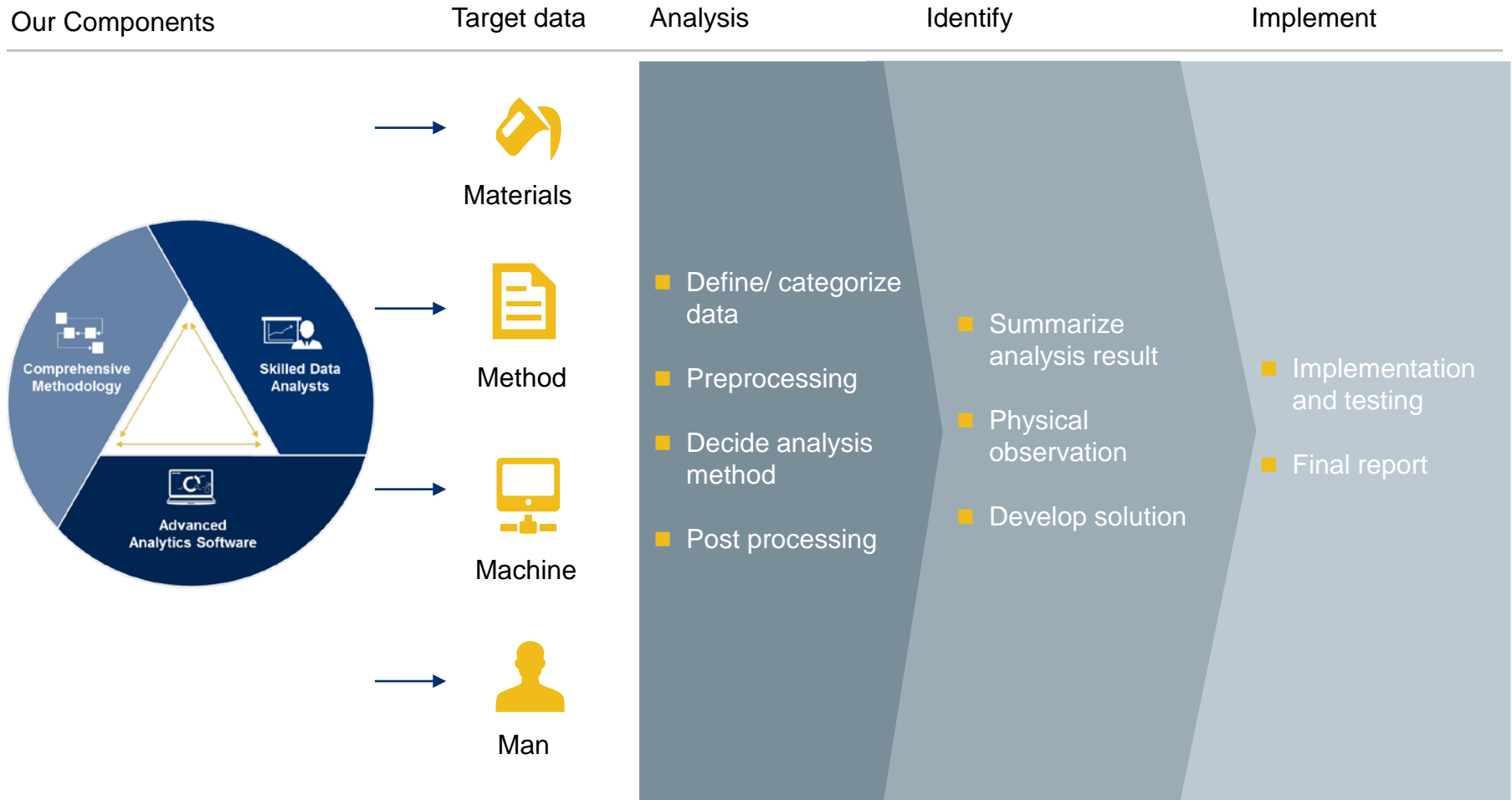
# What We Offer

# 3 Components for Quality Stabilization



# Our Approach

Based on understanding your process, we detect changes in your production process data and find solutions to address the challenges



# Comprehensive Methodology

Solution

  
Minimize false  
detection

Target  
Department

Quality  
Control



 : High quality  
 : Low quality

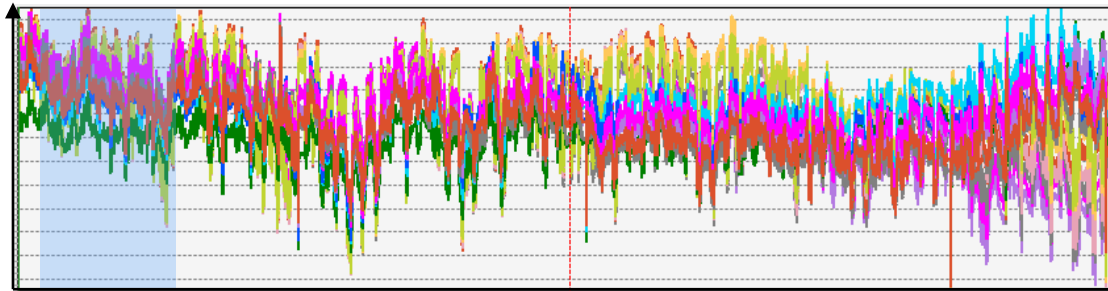


# Process Data Analytics

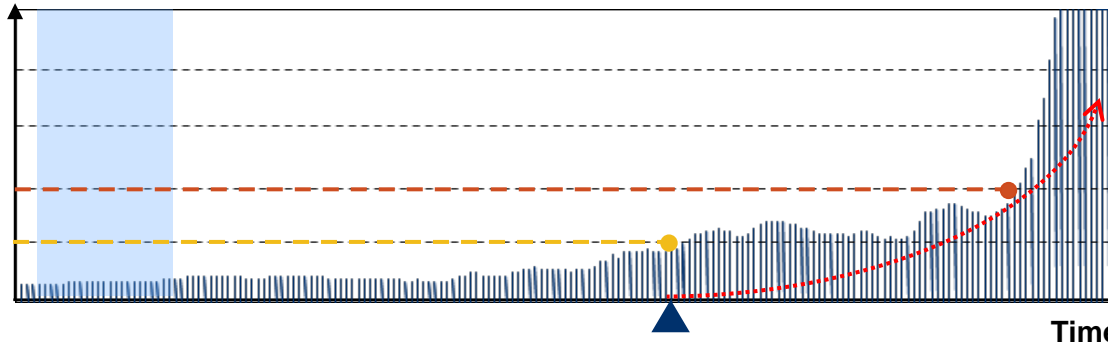
Build a model for early detection of abnormalities in production processes



Temperature, pressure, and flow



Quality index



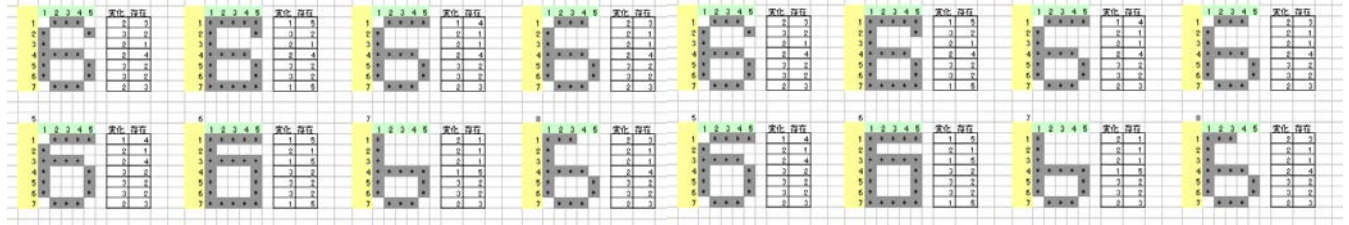
Identify 'potential' abnormalities by monitoring the quality index in real time  
before it's too late

# Process Data Analytics

## Example: Recognition of a number

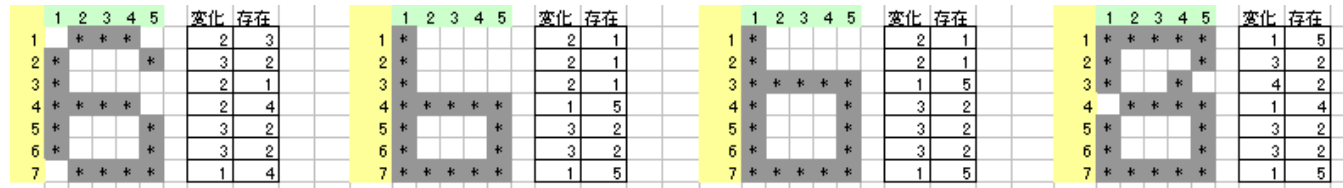
### Step 1

Registration of normal data and normal space creation



### Step 2

Select compared data



### Step 3

Computation of MD

3.4797

3.2655

2.8011

31.4676

- MTS generates an index for normal data from pattern comparison data
- MD is the method near human feeling

## Epsilon Rocket Launch System



**Conventional  
Control Room**



**Mobile Control System  
(2 PC)**

**Inspector**

**100**

**8**

**Launching  
Cost**

**73M USD**

**37M USD**

**Inspection  
Schedule**

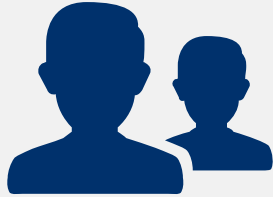
**42 days**

**7 days**

*JAXA: The Japan Aerospace Exploration Agency*

*AngleTry Associates contracting with Yokogawa provided the software to JAXA*

# Process Data Analytics



**Very practical for  
engineers**

- Developed by Yokogawa data analysts
- Enables to identify any strange behaviors/relations in the process data



**Customized processing  
for complex analysis**

- MATLAB, 3rd party analysis software by The MathWorks, Inc.

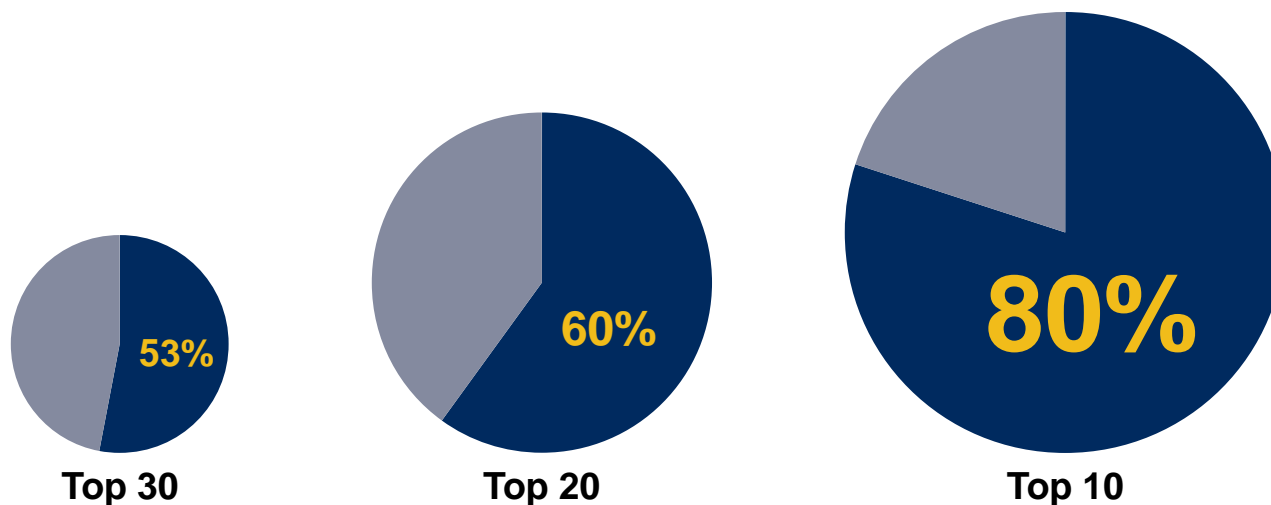
# Skilled data analysts

## ■ Combined Knowledge within Yokogawa

- ◆ Plant measurement/control
- ◆ Statistical analysis
- ◆ Chemical engineering
- ◆ Quality engineering
- ◆ Process engineering

## ■ Projects with over 120 Japanese process companies

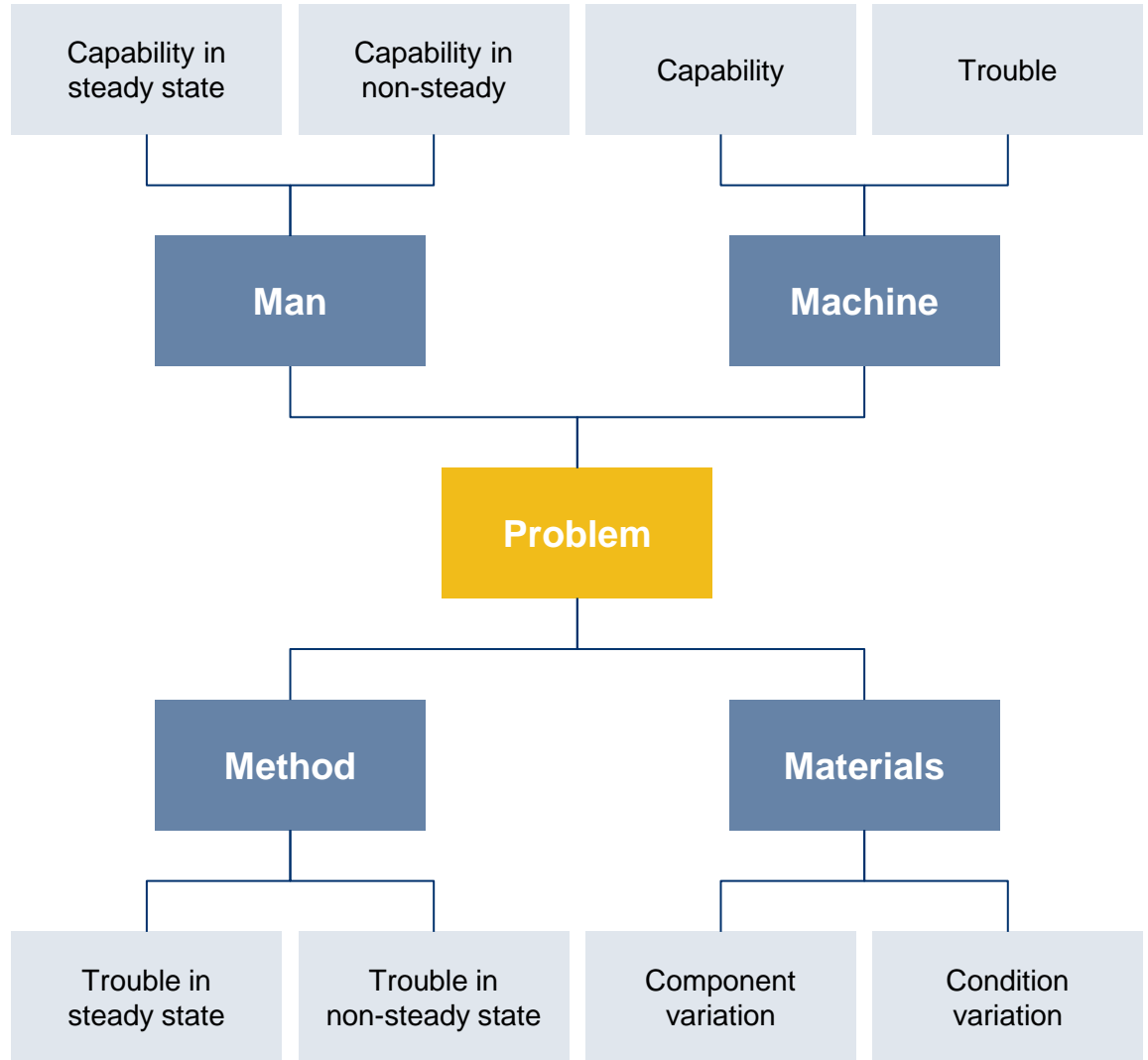
**% of top chemical industries we have provided in Japan (as of August 2016)**



# Implementation process



# 1. Understanding your process



# 2. Data analysis



## STEP 1\*

### Process Data



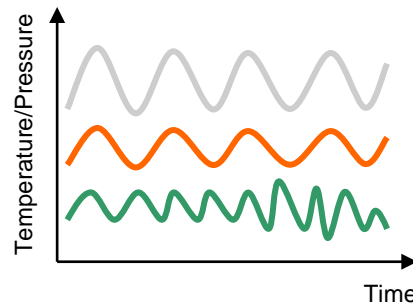
### Quality Data



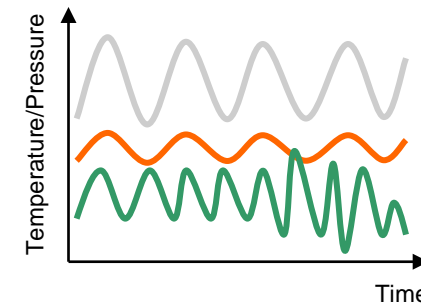
*\*In addition, we use data on facility operations and equipment maintenance collected by a plant information management system (PIMS), DCS, or PLC, depending on your challenges.*

## STEP 2

### Quality - GOOD



### Quality - BAD



LOT	Result	1 <sup>st</sup> Inspection	2 <sup>nd</sup> Inspection
L-01	PASS	7.50	0.925
L-02	PASS	7.68	0.927

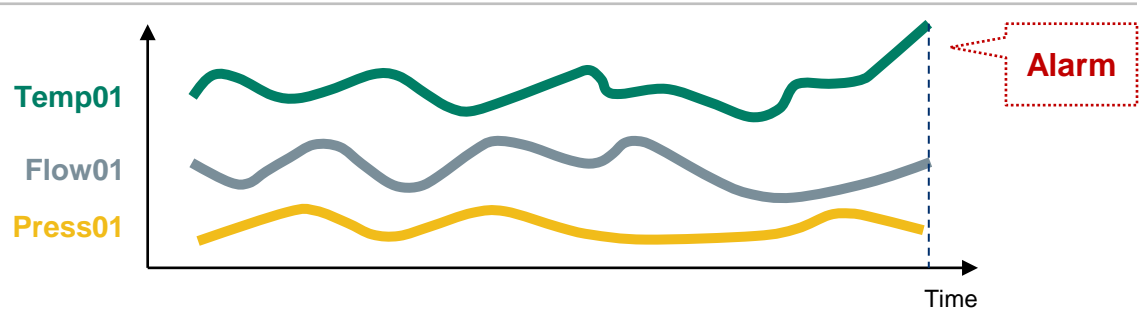
LOT	Result	1 <sup>st</sup> Inspection	2 <sup>nd</sup> Inspection
L-08	FAIL	9.50	0.924
L-11	FAIL	9.68	0.923



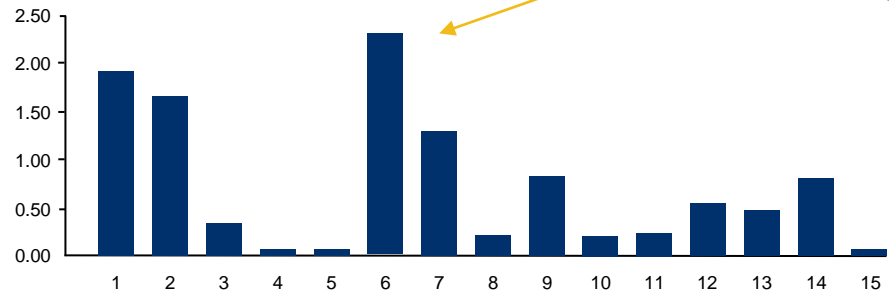
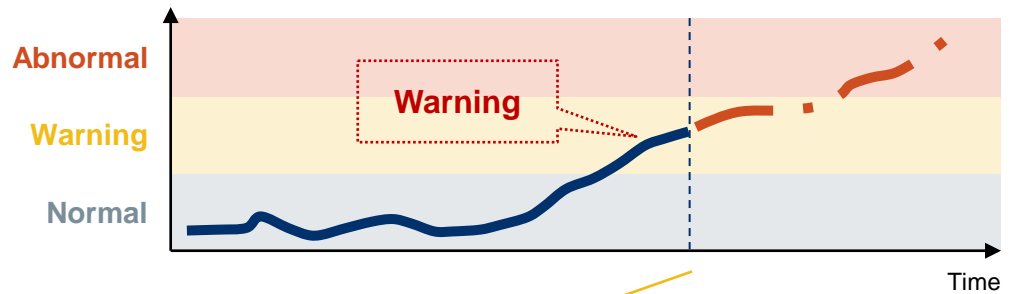
# 3. Evaluation



## PV



## Quality index

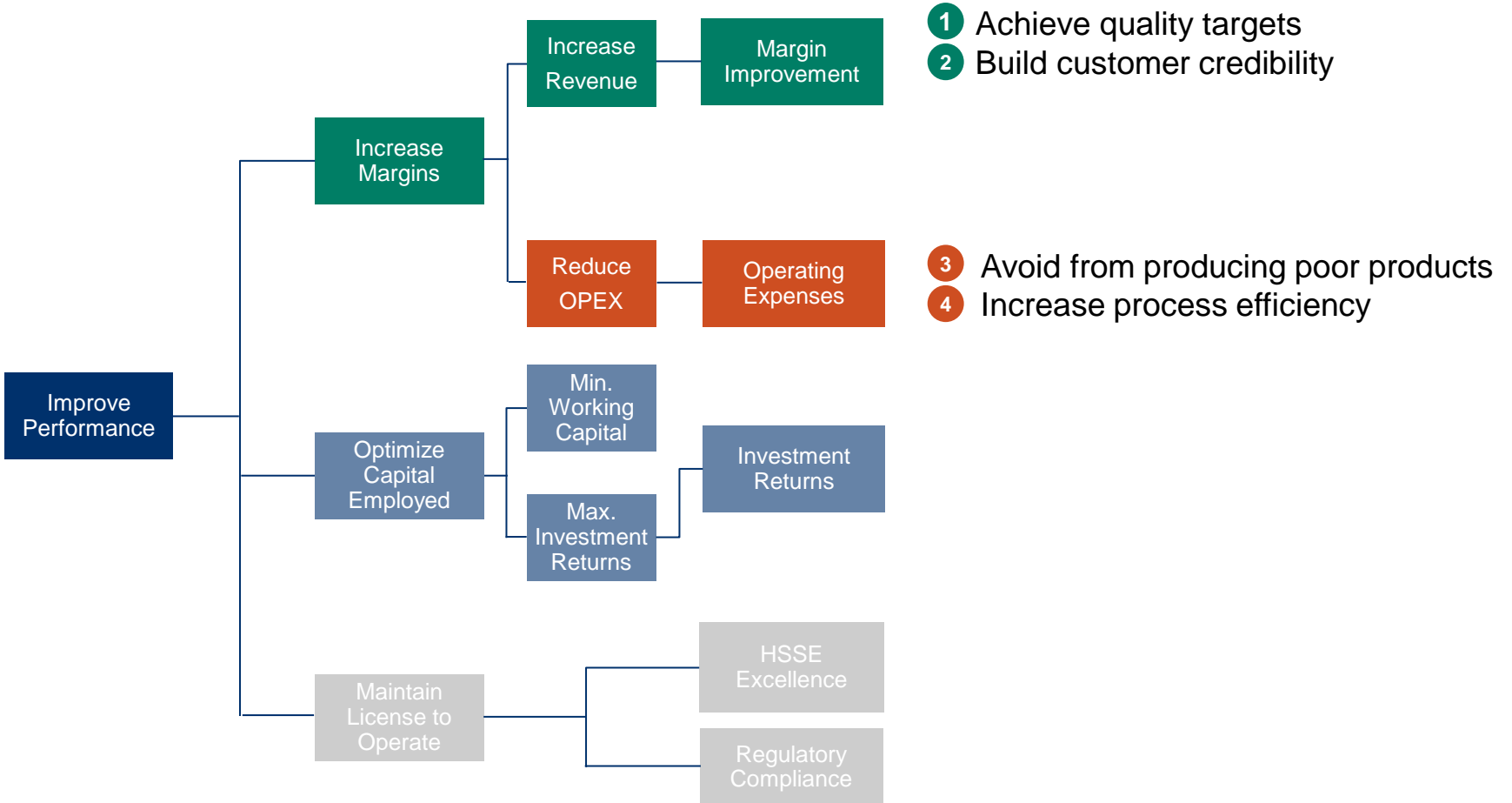


# Your potential benefits

## Corporate Goals

## Functional Goals

## Benefits

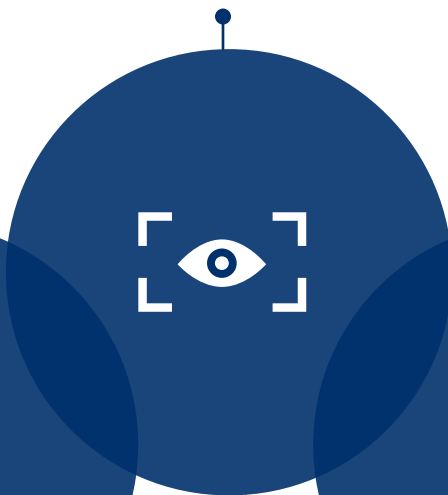


# Why Yokogawa?

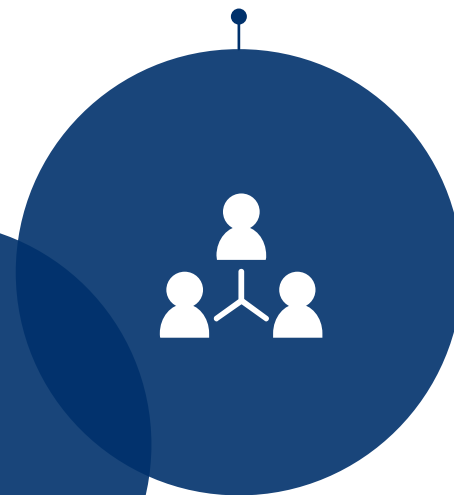
Data analysts with plant operations knowledge



Pattern recognition technology



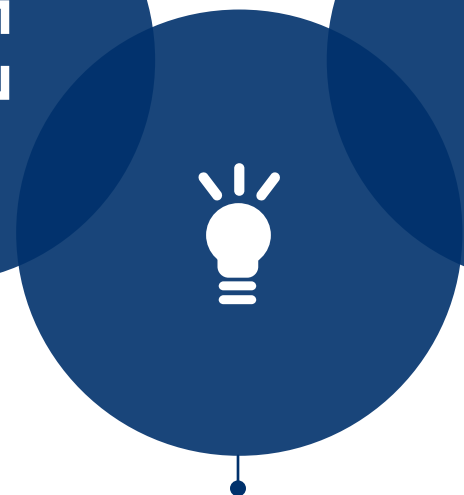
Working together - Internal capability development



Experience of over 120 projects in Japan



Solving problems which cannot be solved



Co-innovating tomorrow™

Thank you!