Trends in Smart Industrial Safety in Japan

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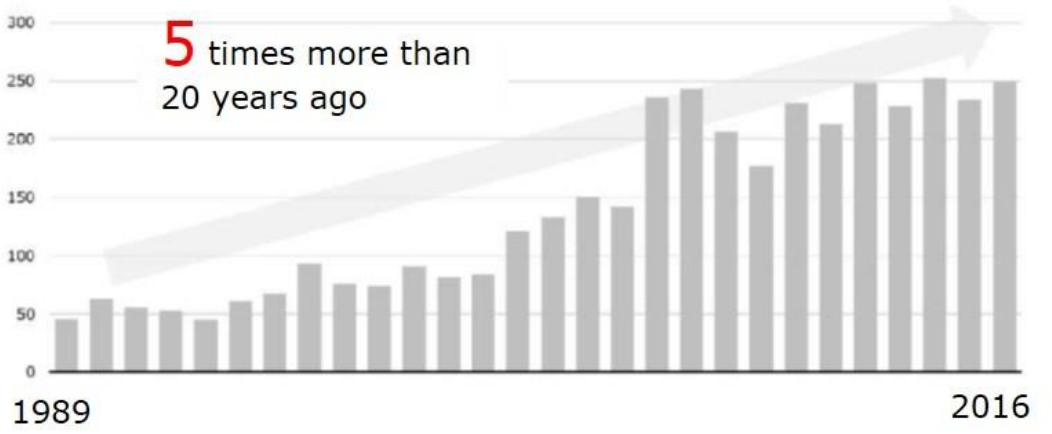
Necessity of Smart Industrial Safety

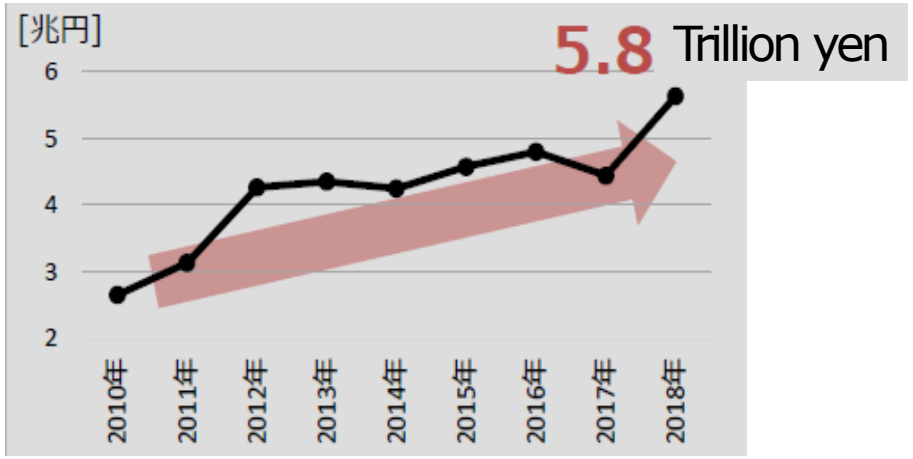
OBSOLESCENCE

Increased risk of accidents due to aging facilities



Number of accidents at oil complexes

Increased maintenance costs



Amount invested for maintenance and renewal

Necessity of Smart Industrial Safety

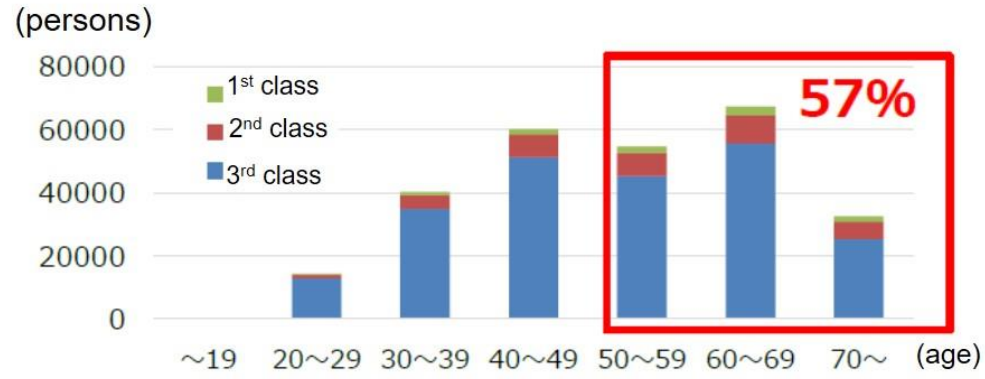
AGING of human resources

RETIREMENT of experienced professionals

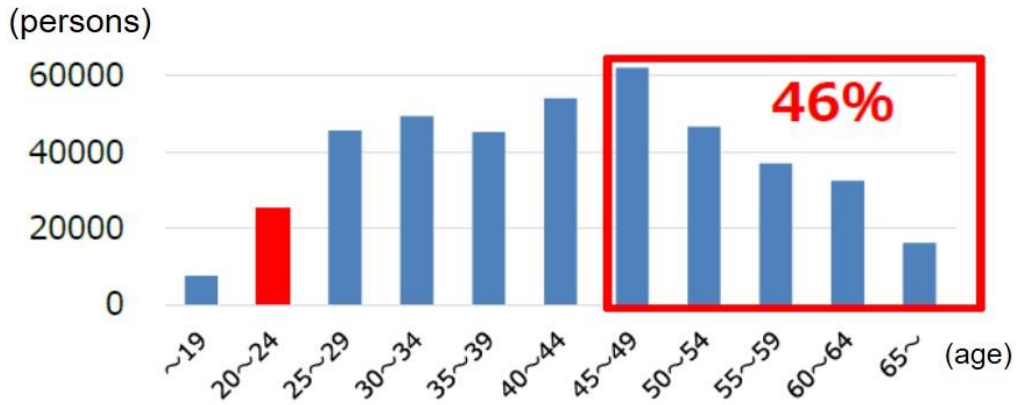
⬇

Lack of know-how

Difficulties in personnel training



Age of chief electrical engineers



Age of employees at plant operators

Necessity of Smart Industrial Safety

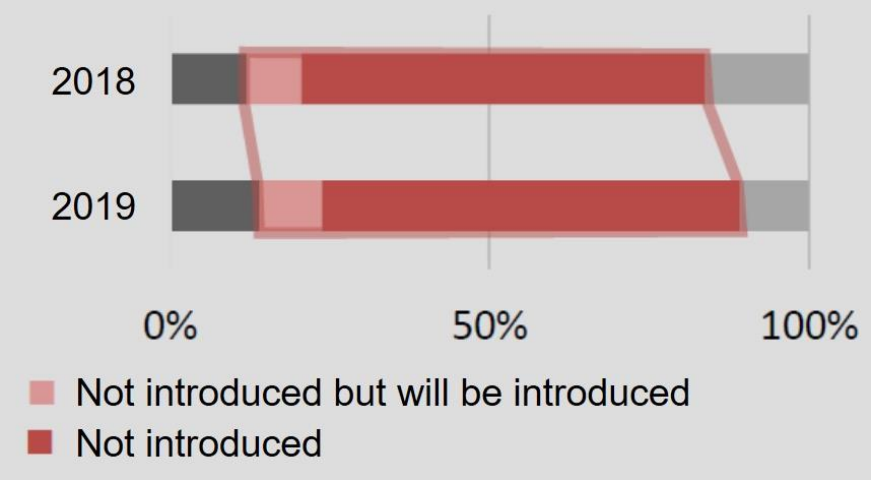
PRICE COMPETITION → High operation rate → Dependence on **HUMAN WORK**

↓

Increase of work intensity

↓

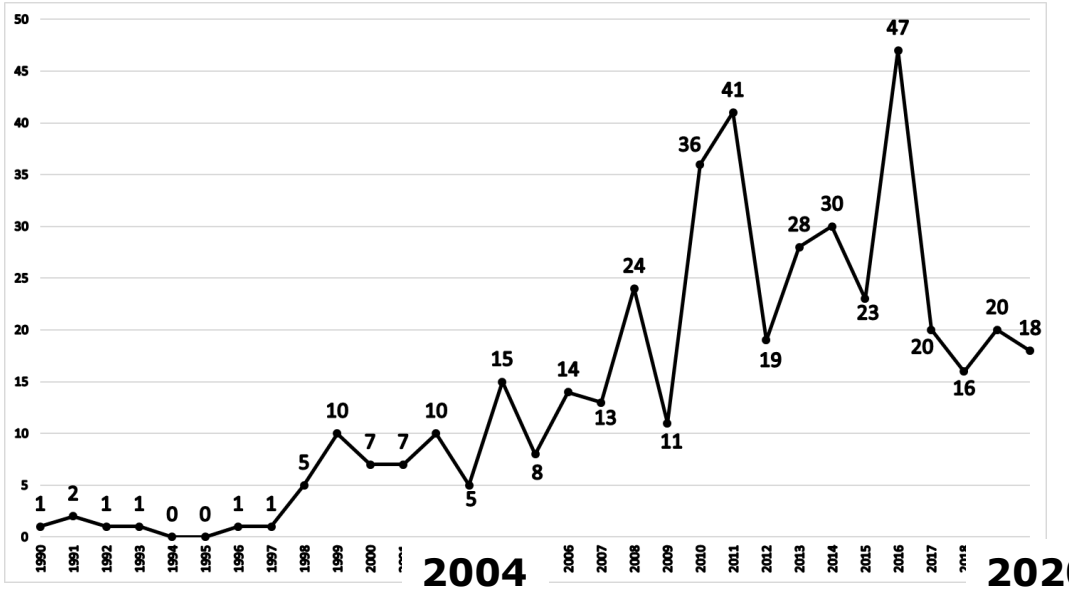
Increased risk of accidents



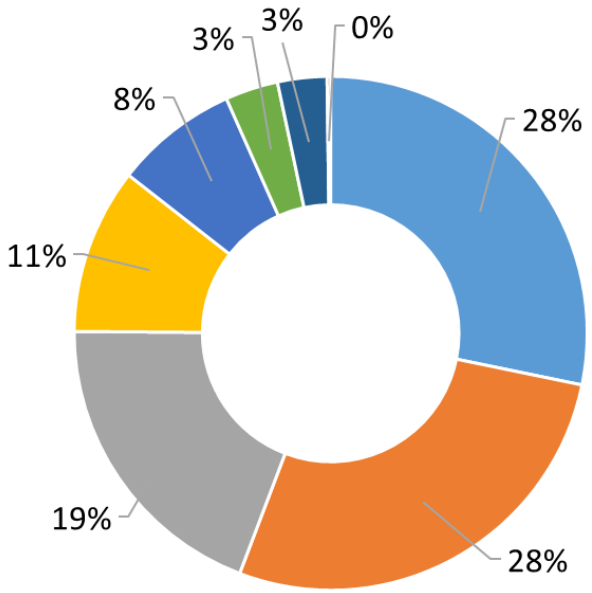
Introduction status of systems and services such as IoT and AI

Trends of Patent Applications

Number of applications



Keywords: AI / IoT / machine learning / deep learning / neural network



- HUMAN NECESSITIES
- CHEMISTRY; METALLURGY
- PHYSICS
- ELECTRICITY
- PERFORMING OPERATIONS; TRANSPORTING
- MECHANICAL ENGINEERING; LIGHTING …
- TEXTILES; PAPER
- FIXED CONSTRUCTIONS

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Public-Private Council on Smart Industrial Safety

PUBLIC

■ Minister of Economy, Trade and Industry

■ Review regulations and systems

・Positioning drones as an inspection standard

・Sophistication and efficiency through remote monitoring

・AI reliability evaluation guidelines

■ Building a system for smart safety promotion, and supporting smart safety promotion

METI
Ministry of Economy, Trade and Industry

Public-Private Council

Established in June 2020

Subcommittees

High Pressure Gas Safety

Power Safety

Gas Safety

PRIVATE

■ Leaders of industrial groups

■ Development, demonstration, and introduction of new technologies such as IoT/AI

・Introduction of patrol drones and robots

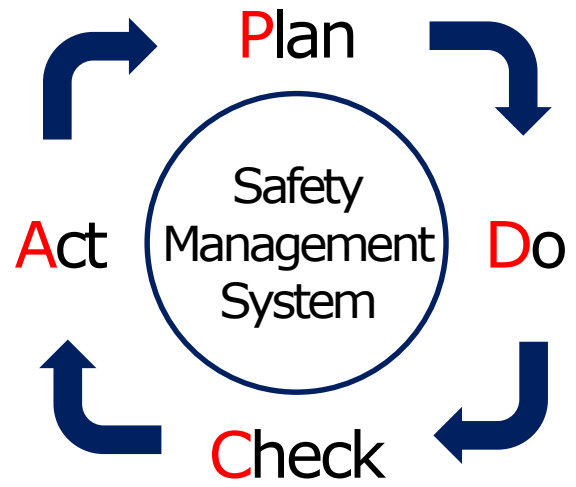
・Constant monitoring by IoT/AI, detection and prediction of anomalies

・Efficiency of the site, replacement of personnel

■ Developing human resources to support smart safety

Super Recognition System

Super Recognition



- Target
  - Petroleum plants
  - Petrochemical plants
- Requirements
  - Advanced risk assessment
  - Introduction of new technologies such as IoT and big data
  - Implementation of advanced education
  - Continuous improvement of safety system through PDCA cycle
- Incentives
  - Extension of continuous operation period
  - Operators can freely set inspection methods

Self-Safety Recognition System

Self-Safety Recognition

➢ Target

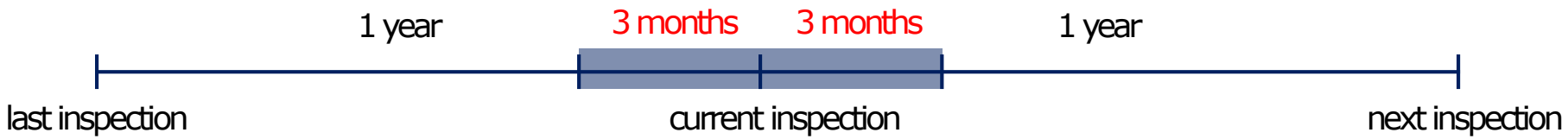
- Businesses that do not operate continuously (e.g., batch processing)

➢ Requirements

- Conducting risk assessments
- Continuous improvement of safety system through PDCA cycle

➢ Incentives

- Expansion of the scope of minor alterations that do not require permission
  (e.g., replacement work for high-pressure gas equipment,
  alteration work for certified products)
- Extension of security inspection grace period



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AI Prediction System for Internal Corrosion of Pipes

thickness | temperature | pressure | flow rate

AI → predicted value

C → theoretical value

predicted value ⇔ theoretical value

Reduced risk of overlooking obsolescence

Take action before anomalies occur

Reduction of risk of accidents

Continuous Monitoring of Gas Leaks using IoT

TOKYO GAS CASES

lightweight drone

laser falcon

laser methane

Regular inspection	**Suction type detector**	➡	Using drone with **laser falcon**
Action for leakage	Worker **enters** a location where gas is leaking	➡	Worker locates leaks using **laser methane**

Ensure worker safety

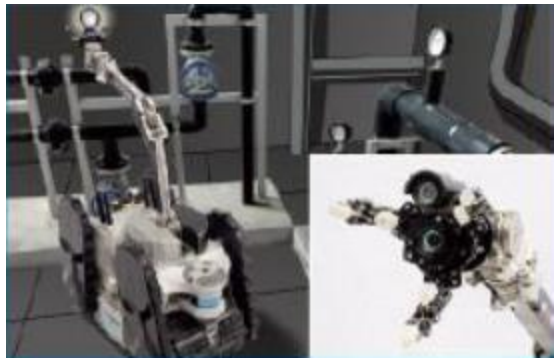
Improved safety quality

Explosion-proof Robot for Automatic Patrol Inspection of Plants

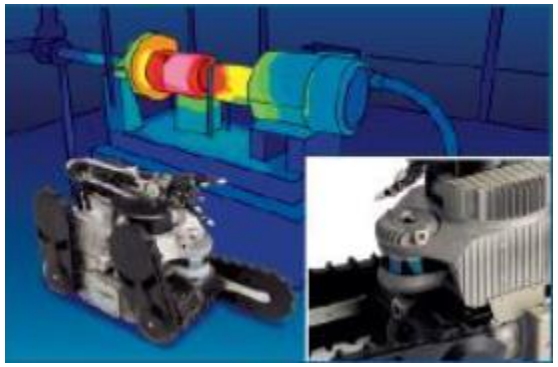
MITSUBISHI HEAVY INDUSTRIES

CASES

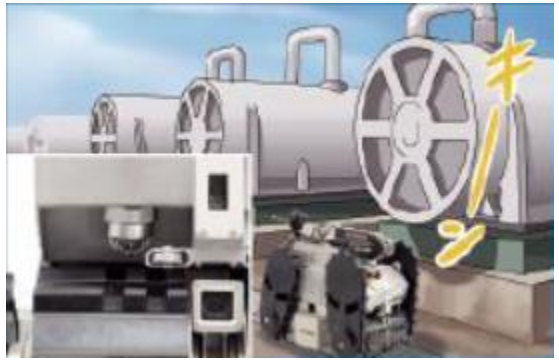
visual inspection



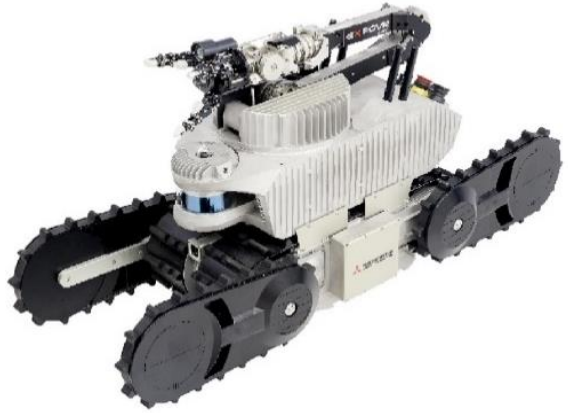
thermal measurement



sound collection



gas concentration measurement



work

Explosion-proof Robot for Automatic Patrol Inspection of Plants

MITSUBISHI HEAVY INDUSTRIES

CASES

TECHNOLOGIES

- Explosion proof function
- Manipulator (6-DOF)
- Self-driving (LiDAR)
- Data accumulation
- Mobility
- Automatic charging

Patrol inspection	24-hour patrol **by worker**	➡	Automate patrol **by robot**
Operation / Data acquisition	Manual operation **by worker**	➡	By **equipment** mounted on robots
Data processing	Summarize data on **paper**	➡	Store on **cloud**

Shorter working hours

Reduction of risk of accidents

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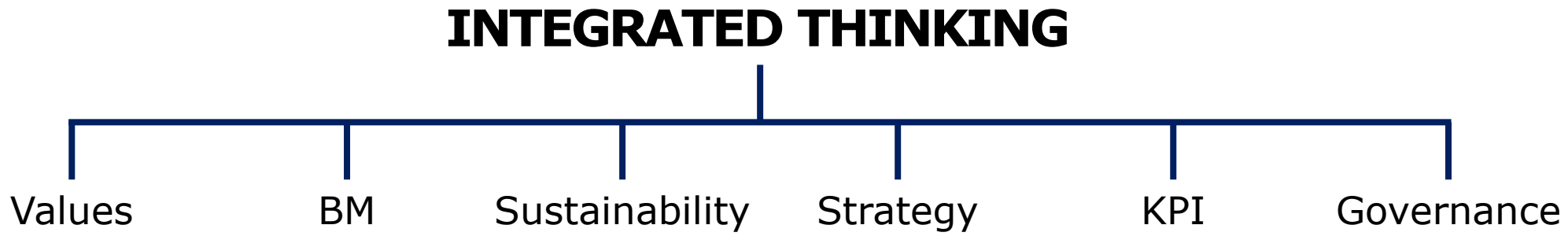
Guidance of METI (Ministry of Economy, Trade and Industry)



- Importance of safety should be said by managers in their own words
- Present a story for sustainable growth by linking it with business activities to achieve the SDGs
- Indicate efforts to improve safety through technological innovation
- Show safety KPIs that lead to business growth
- Indicate the management system for industrial safety and product safety, and the system for accidents.

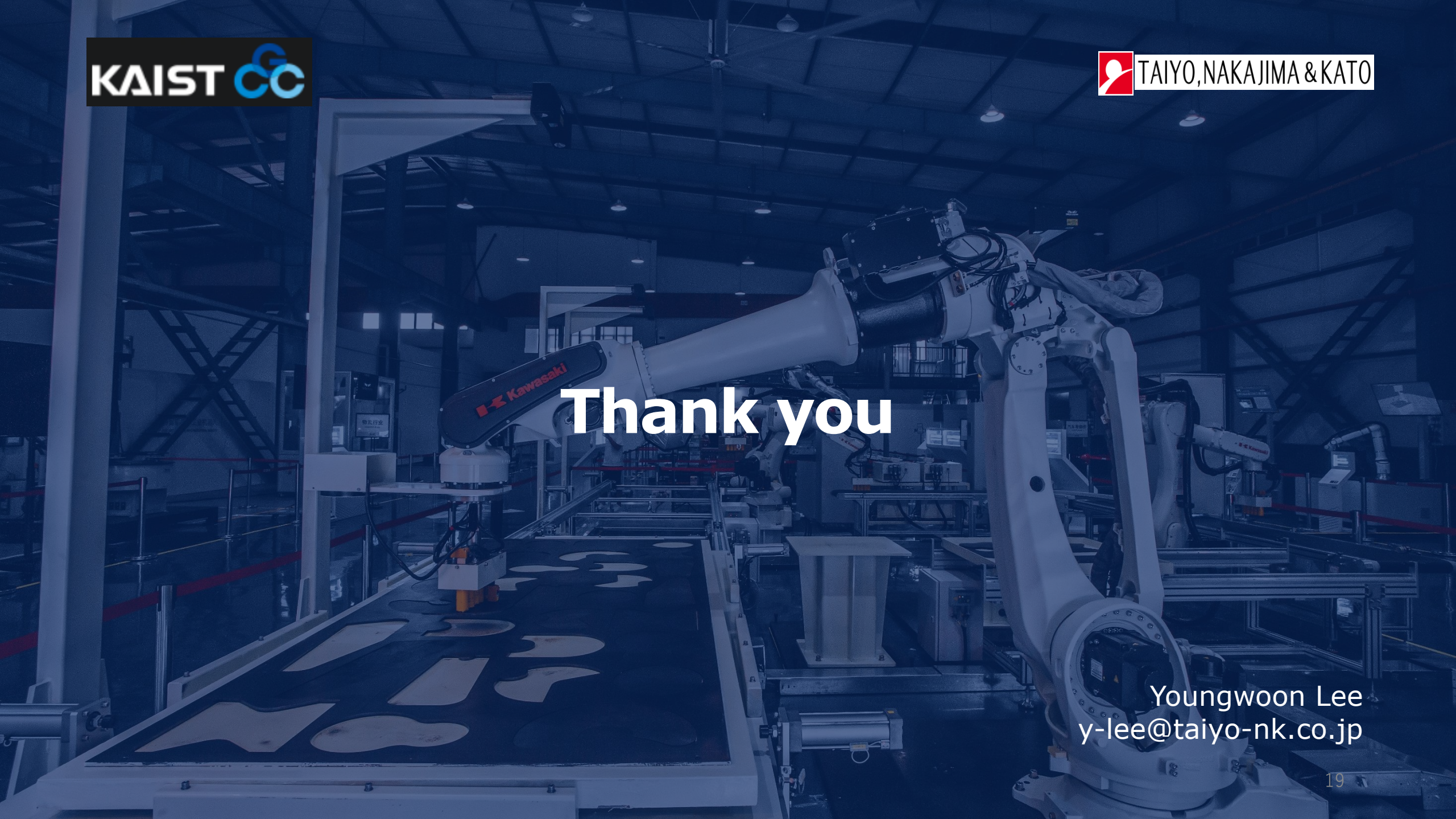
Key Success Factors (Comments from the field)

First of all, we started small by selecting that for which we can confirm the effect.

I was able to gain an understanding from the person in charge of the site
by trying to improve their understanding of the system and resolve their doubts.

It is also necessary to keep in mind that if the technology is too advanced,
it will not be used in the field.

Awareness gained from discussions with external technology-owning companies
triggered the expansion of smart safety initiatives.



Thank you

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