mcframe

mcframe SIGNAL CHAIN
An Introduction

b-en-g ビジネスエンジニアリング株式会社

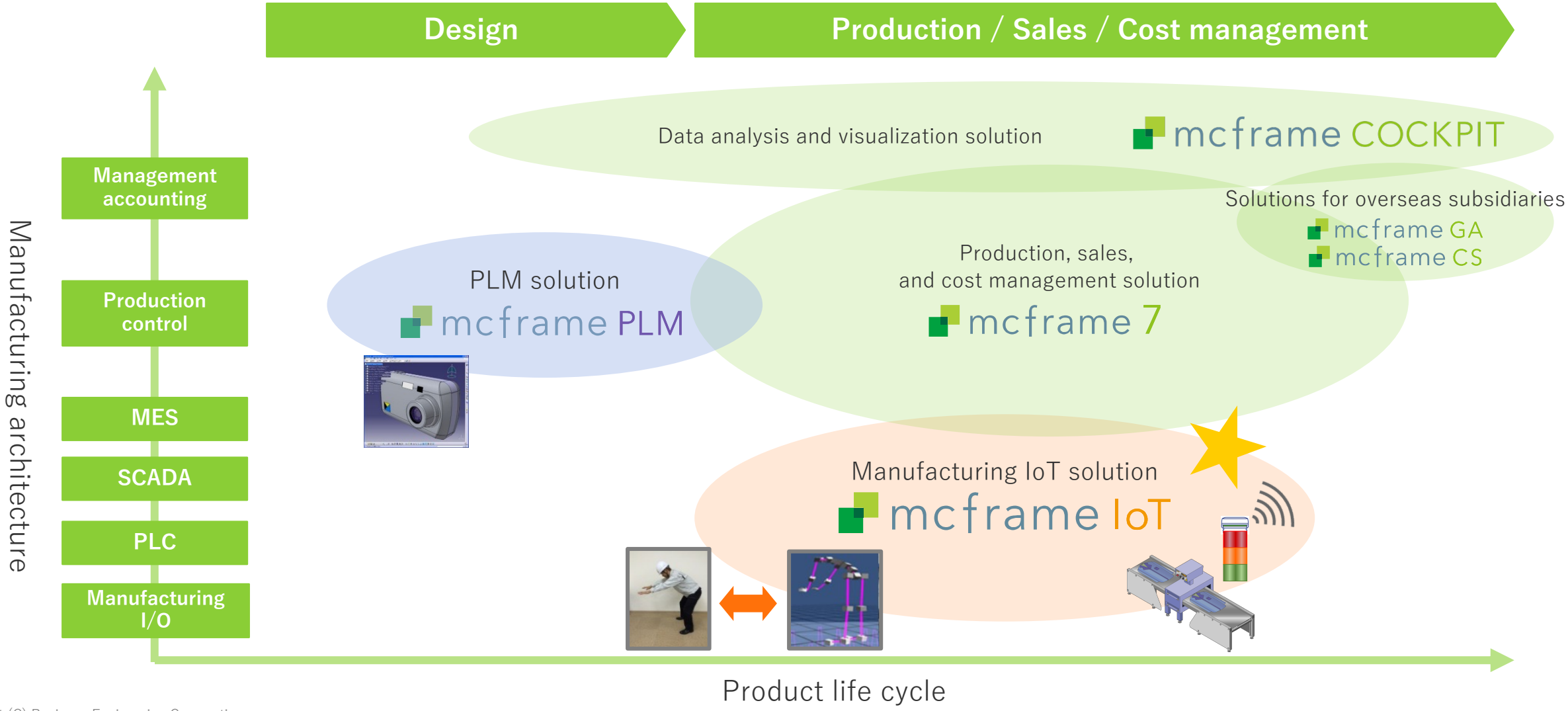
r2.00 (20200825)

CONTENTS

1. About Our IoT Solution

"Manufacturing Digitalization“ with mcframe

Manufacturing platform in the digital age



b-en-g's IoT solutions

Our ready-to-use IoT solutions connect business processes, equipment, and people.

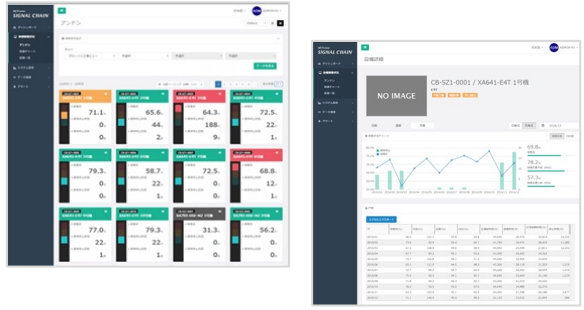
Connects business processes

mcframe RAKU-PAD

You can collect and analyze result data. It works on a tablet.

Connects equipment

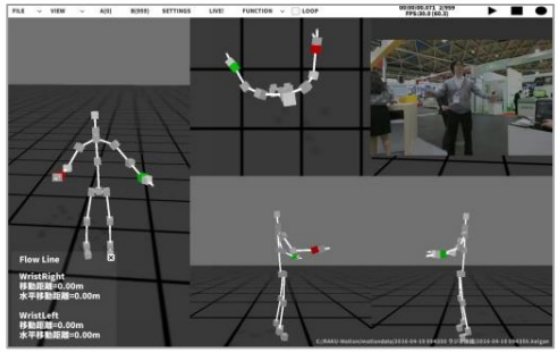
mcframe SIGNAL CHAIN



You can monitor operation and maintain equipment.

Connects human movements

mcframe MOTION



You can analyze human movement and posture.

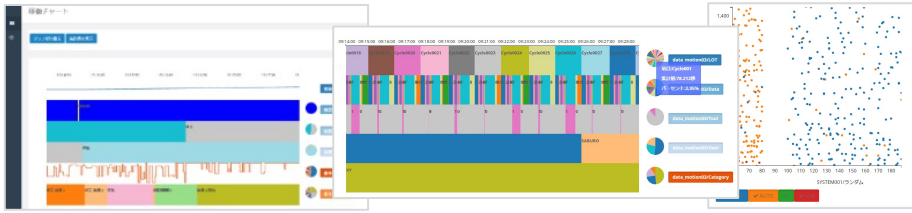
Connects non-standardized data

mcframe SIGNAL CHAIN Edge — Collects

mcframe SIGNAL CHAIN Data Store — Stores

mcframe SIGNAL CHAIN Quick Viewer — Visualizes

SIGNAL CHAIN IoT Platform

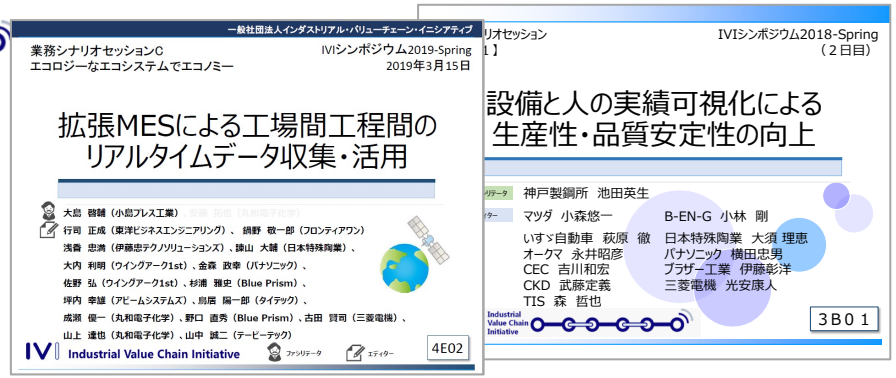


Initiatives for IoT

We have been actively promoting our IoT solutions in both public and private sectors in Japan and overseas.

Industrial Value Chain Initiative
つながる！ものづくり

Copied from "IVI Public Symposium 2018 -Spring-"



Copied from "IVI Public Symposium 2019 -Spring-"

Signed the Memorandum of Understanding (MOU) with the Ministry of Industry in Thailand

Copied from "NNA ASIA" published on May 14, 2018

ロボット革命イニシアティブ協議会
Robot Revolution & Industrial IoT Initiative

Smart manufacturing support tool

In 1st convention (2016), Judge's recommended tool

mcframe SIGNAL CHAIN

https://www.jmfrri.gr.jp/info/314/

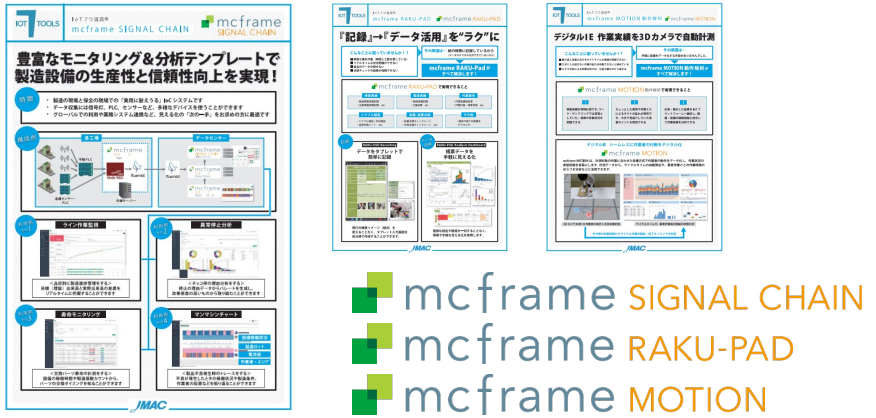
In the 3rd convention (2019), Judge's recommended tool

mcframe RAKU-PAD

https://www.jmfrri.gr.jp/event/seminar/1223/

JMAC
JMA Consultants Inc.

Adopted as significant tools for on-site IoT



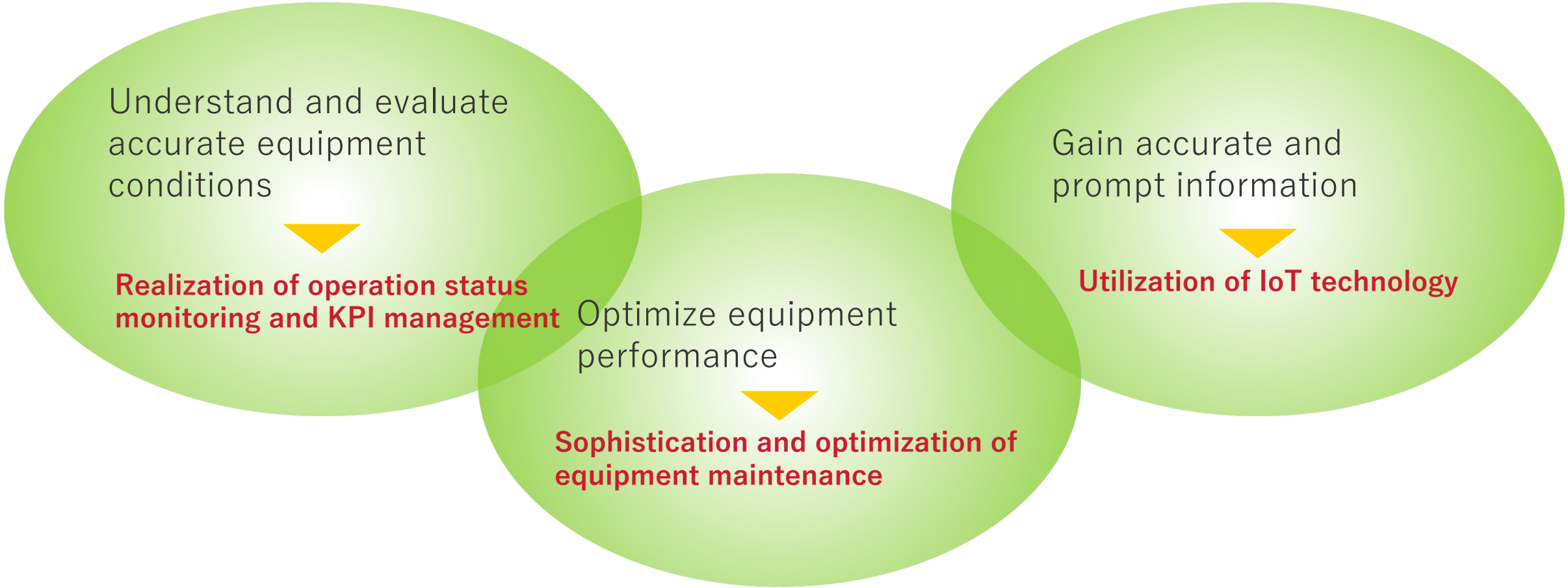
mcframe SIGNAL CHAIN
mcframe RAKU-PAD
mcframe MOTION

https://go.jmac.co.jp/ics/article/category/genba-iot/

2. What Is mcframe SIGNAL CHAIN ?

What is mcframe SIGNAL CHAIN ?

With mcframe SIGNAL CHAIN, you can:



It promotes **formalization of technical information** at manufacturing sites and supports **continuous improvement** of processes.

Features of mcframe SIGNAL CHAIN

Ready-to-use

- Necessary and sufficient functions in consideration with variety of tasks
- Just one week at the earliest to start using the operation monitoring function
- Flexible adjustment of management items without customization
- An intuitive and easy-to-understand user interface

Works everywhere

- Works on both cloud and on-premises
- A lot of experiences on overseas introduction. On-site support systems are well-prepared, mainly in Asia.
- Uses web browsers and some functions of iOS native app for on-site input. Offline input is available.

Easy to deploy

- Can be deployed on just one equipment as a start. Increase equipment if you feel the effects.
- Available to deploy just a specific module
- Two types of licenses are available: Perpetual and subscription. A license can be selected according to the installation method.

Easy to expand

- Connectivity with core systems and BI (such as API disclosure and CSV import)
- Easy to add modules and expand functions according to the maturity of use
- Can optimize equipment management across the enterprise as one system by expanding the targets such as equipment, departments, and factories

Functional overview

A highly expandable package that considers the linkage between modules and other systems as well as deployment of a single module

Equipment Management

Operation Monitoring

You can check equipment operation statuses and manufacturing progresses and **understand the cause of loss.**

- Monitoring
- Alert notification
- Operation analysis
- Evaluation & aggregation

Equipment Maintenance

You can check equipment conditions and **prevent breakdowns before they happen.**

- Equipment ledger
- Lifetime management
- Inspection
- Spare parts management
- Repair management
- Evaluation & aggregation

AirGRID®

PATLITE®

Operation results, Production results

Operation Results, Production results

Maintenance results

Operation results, Production results

Various counting information (for lifetime management)

IoT Platform

You can accumulate the information on equipment and manufacturing and **share the knowledge.**

Edge

Data collection and shaping

Data Store

Non-standardized data storage

Quick Viewer

Time series visualization & analysis

Operation results, Production results, Other numerical values

Sensors, PLCs

Various results

Other system information

External systems

Features of Equipment Management

Make factories stronger and smarter by digitizing operation monitoring and equipment maintenances

Strong and smart factory

A factory that does not make losses and does not stop

can be realized by visualization of operations and active equipment maintenances

mcframe SIGNAL CHAIN OM

Operation Monitoring

- ✓ Visualization of on-site works
- ✓ Early recovery from abnormal state
- ✓ Extracting improvement points by operation analysis
- ✓ Standardization of evaluation index

<No losses>

mcframe SIGNAL CHAIN EM

Equipment Maintenance

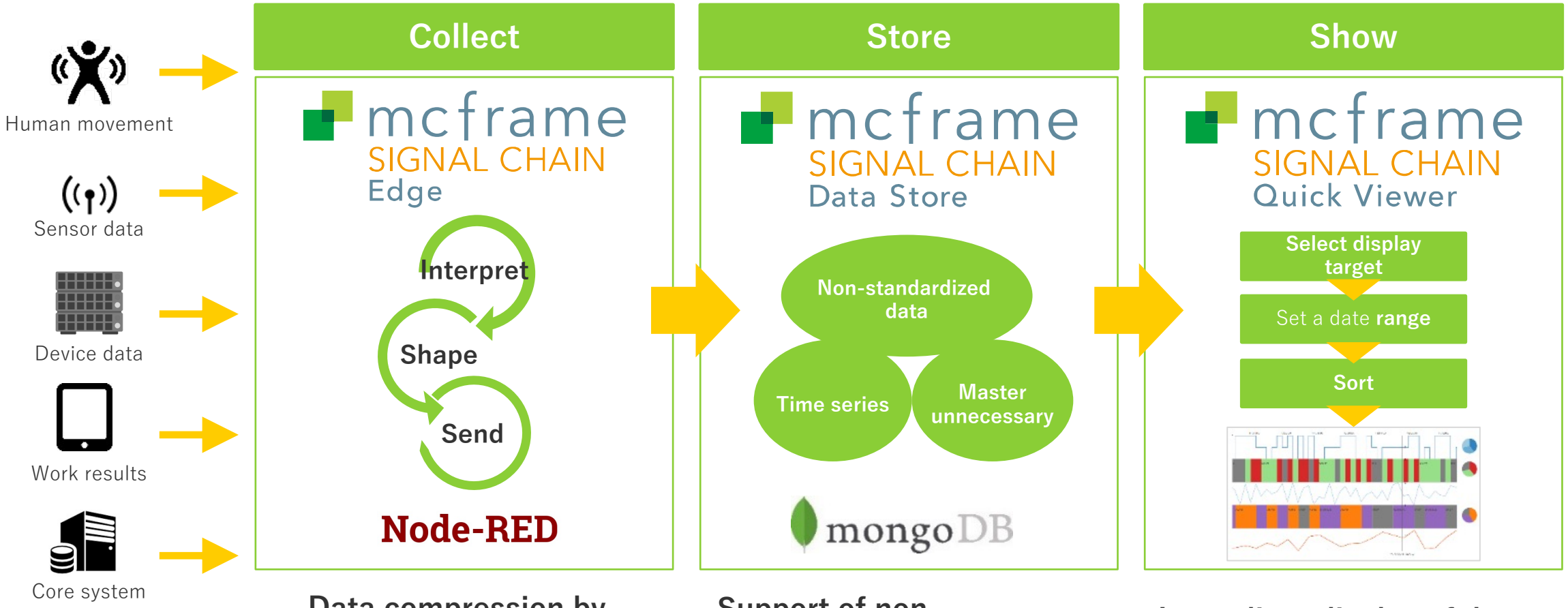
- ✓ Standardization of personal tasks
- ✓ Planned maintenance works
- ✓ Accurate prediction of equipment lifetime
- ✓ Optimal allocation of maintenance costs

<Not to stop a factory>

It is effective to rotate the KAIZEN cycle
from both wheels of **monitoring** and **maintenance**.

Features of IoT Platform

Utilizes integrated data on people, things, and equipment with IoT technology



Data compression by edge processing

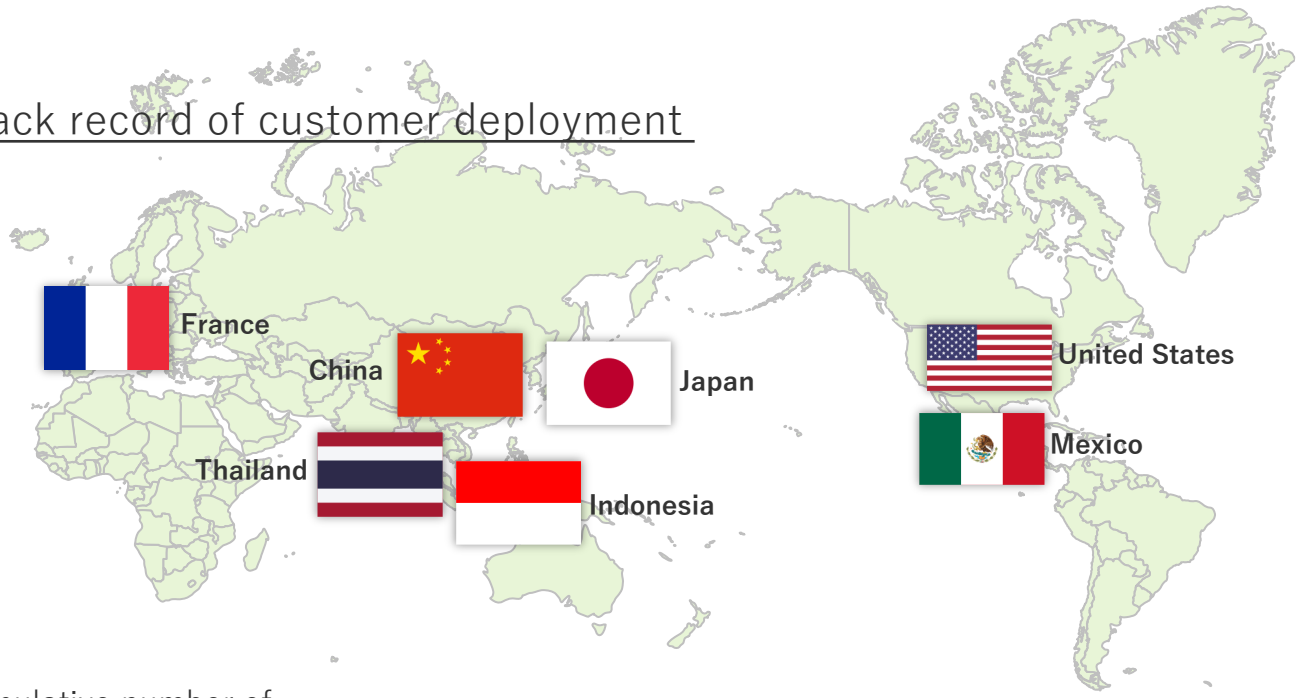
Support of non-standardized data with NoSQL

Immediate display of data in time series

Customer deployments

Sales have been steadily increased since 2016, and in many cases worldwide.

Track record of customer deployment



Cumulative number of companies deployed:

71 companies

Number of operating equipment:

Approx. **3,000**

Overseas factories account for:

52%

* Based on sales results as of the end of March 2020

Actual examples of the effects

before: 480 min. ▶ after: **10 min.**

Time required to grasp the operation status of production lines at overseas factories

before: 60 min. ▶ after: **40 min.**

Daily meeting duration

before: 50% ▶ after: **65%**

Utilization of installed equipment

Case studies

More details are available on our website (mcframe.com).

Ahresty

Ahresty Corporation

Visualized the operational status of processing lines by linking mcframe SIGNAL CHAIN and HMI devices, in global environment.

https://www.mcframe.com/case/ahresty_sc

At Ahresty, the issue was how to reduce the non-operating time due to temporary stops such as blade replacement and dimensional adjustment and maximize the operating time of the processing for die-cast products. Therefore, the company decided to introduce a mechanism to visualize the operational status of the processing line. By introducing the IoT package mcframe SIGNAL CHAIN, it has become possible to grasp the operational status in real time, to find bottlenecks in the manufacturing line, and to utilize them for improvement activities. It has expanded to factories in the United States, Mexico, and China.

DAIDO METAL

Daido Metal Mexico S.A. de C.V.

Rapidly introduced IoT to the Mexican factory. Reduced the time to understand the operation status of production lines, which took 8 hours, to 10 minutes.

https://www.mcframe.com/case/daidometal_mexico

Daido Metal Co., Ltd. manufactures and sells bearings used in various industrial fields such as automobiles, ships, construction machinery, and general industries. At Daido Metal Mexico, S.A. de C.V., one of the company‘s global bases, improving the utilization of production lines and reducing unnecessary costs were major issues. Therefore, they introduced mcframe SIGNAL CHAIN to the factory in Mexico. Since then, they have been accelerating activities that can improve production efficiency by understanding the operational status of equipment quickly.

KANEFUSA

Kanefusa Corporation

Visualized equipment utilization rate with mcframe SIGNAL CHAIN. Raised awareness of improvement at sites.

https://www.mcframe.com/case/kanefusa

Kanafusa, which boasts a history of 120 years and has manufactured industrial machine blades for all types of processing, has decided to build an equipment operation monitoring system that can numerically express the state of equipment in order to increase utilization of production equipment and improve profitability. The company has introduced mcframe SIGNAL CHAIN. They had decided to adopt it not only because of the ease of use, but also because of its support system, such as a small deployment and quick responses for any problems.

Deployment and support

Consistent support not only for system deployment but also for operation and expansion

b-en-g can support you globally

Our local subsidiaries can work on deployment and operational support. They strongly backup global Japanese companies.

Deployment support

We provide various installation support tools such as connection guides for operation monitoring and deployment plans for equipment maintenance.

Customer success guide

We provide self-study documents that describe how to operate and utilize the application.

Operational support and consultation for expansion

In addition to regular support to maximize the use of the system, we provide consultations on step-by-step expansion and linkage with other systems.

Example of deployment process

The key to success is “Small Start, Long Growth”.

Pre-deployment	PoC		Go live (Establish improvement and step-up cycle)		
-	Data verification	Operation verification	Production	Collection data expansion	System linkage
-	Asynchronous operation data	Real-time operation data	Entry of additional data (Manual entry)	Advancement of additional data (Expansion of devices to be linked)	Maintenance system linkage, Factory visualization

1st step

1-4 weeks

・ Radio wave investigation
・ Installation of AirGRID WD transmitter/receiver
・ Master preparation
・ Construction of system environment

2nd step

1 month

・ Communication verification of AirGRID WD
・ Master check, master maintenance
・ Operation data check

3rd step

2 months

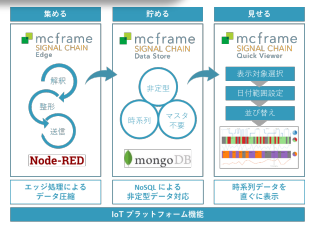
・ Communication verification between AirGRID WD and servers
・ Master check, master maintenance
・ Goal setting, effect verification

4th step

・ Reason for abnormal stop
・ Manufacturing quantity, item, person in charge
・ OEE

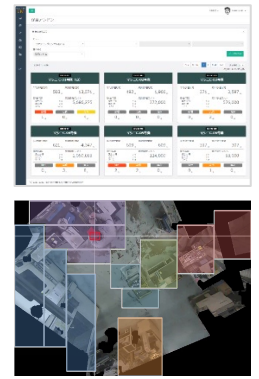
5th step

・ Utilization of IoT platform functions
・ PLC, NC controller linkage

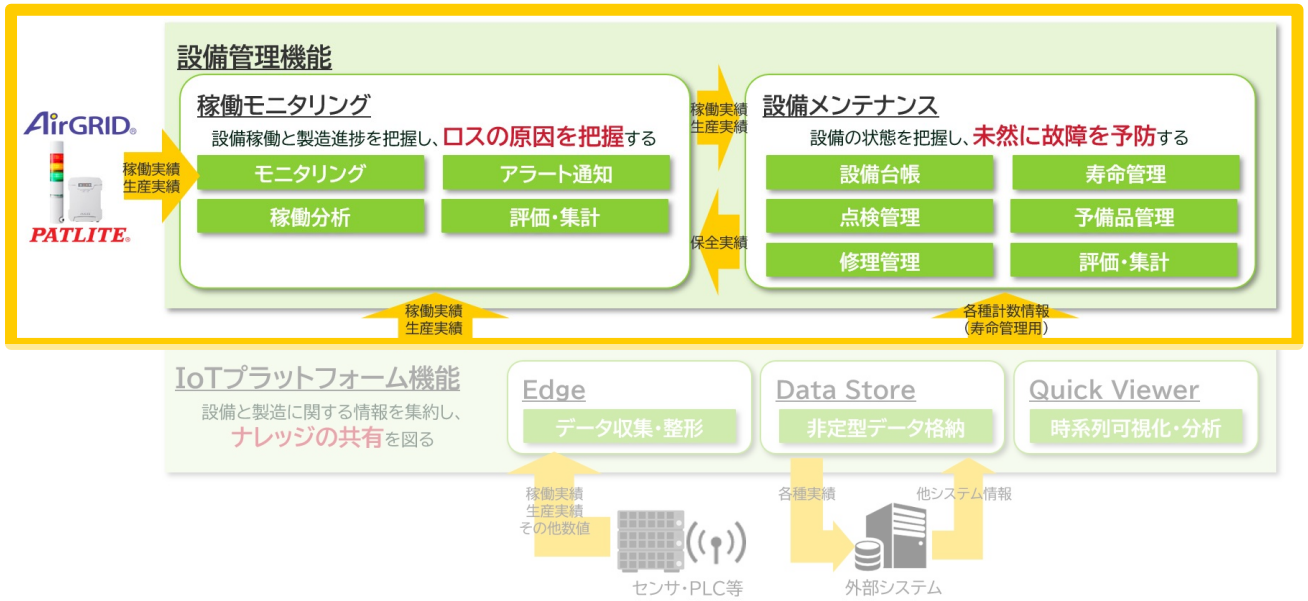


6th step

・ Integrated data analysis (people, things, equipment)
・ Systematization for maintenance work



3. About mcframe SIGNAL CHAIN Equipment Management



Operation Monitoring

Real-time collection of operation results

Automation of operation monitoring can easily be done.

AirGRID® WD
made by PATLITE Corporation

Utilize existing equipment and start IoT

Equipment operation results

CSV file

Register data from a system outside the facility

Production results, production count, number of passed goods

Sensor and PLC

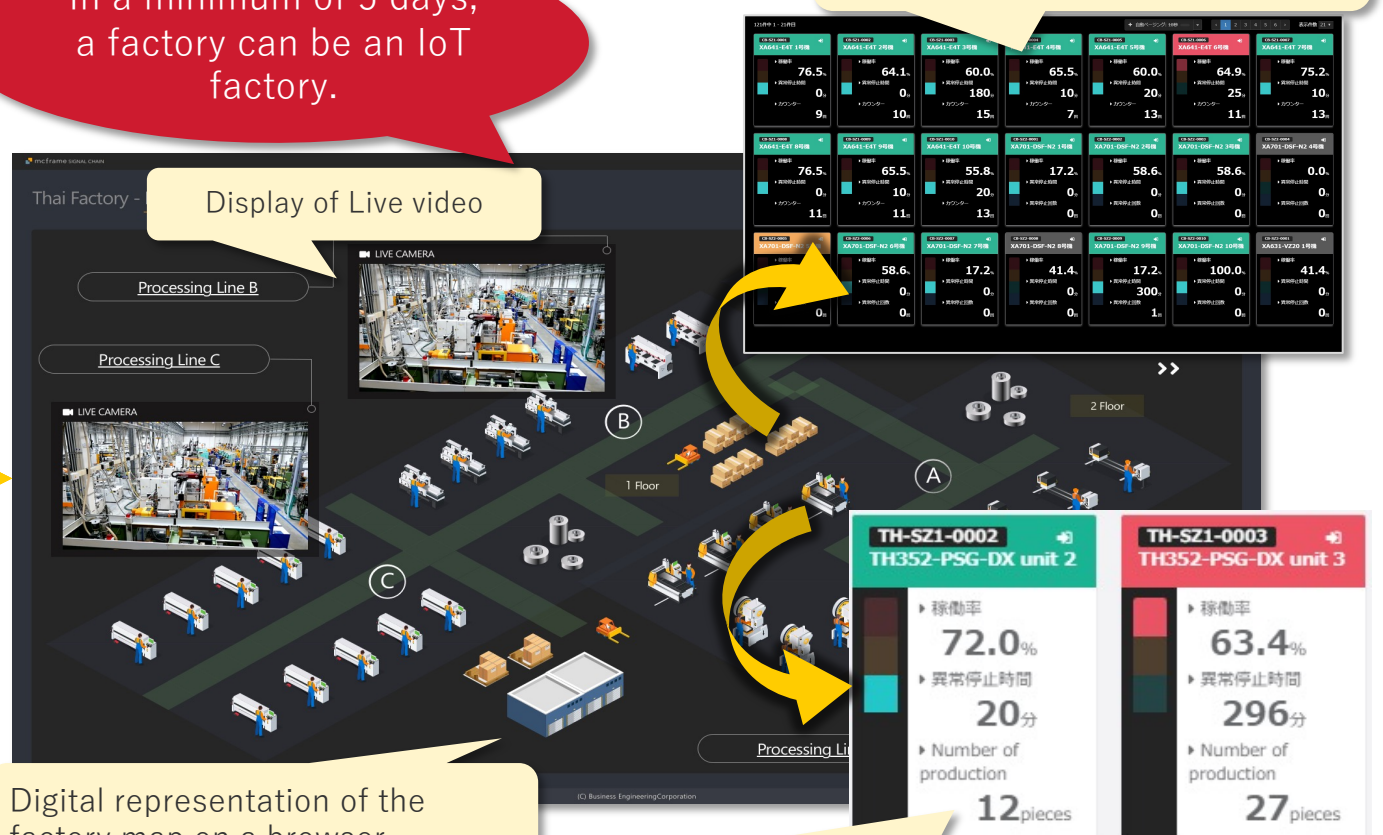
Works seamlessly with sensors and PLC*

* IoT platform function

Equipment operation results, production results

In a minimum of 5 days, a factory can be an IoT factory.

The Watch list of equipment operation status



Digital representation of the factory map on a browser

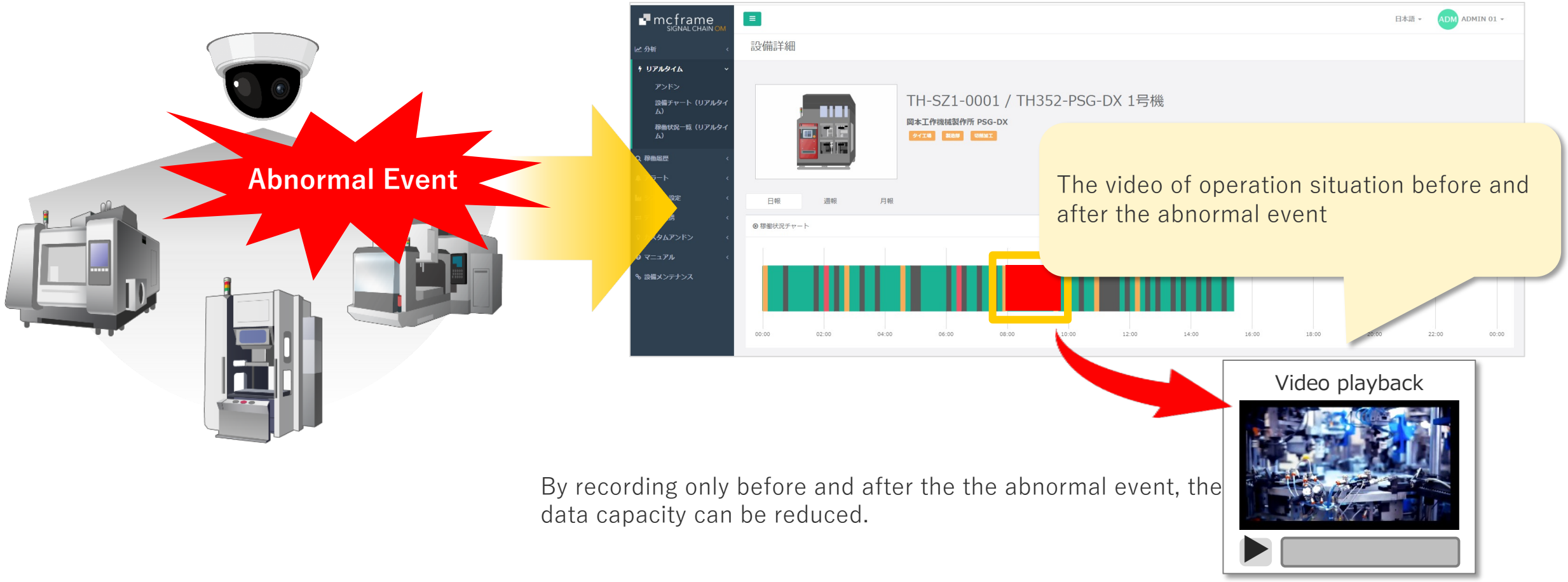
You can freely display and set KPIs and production information you want to monitor.

※ To use the video function, you need a server with XProtect® installed that is compatible with thousands of types of devices.

Operation Monitoring

Utilization of live and recorded videos

You can utilize videos to know failures and to investigate the cause of them.



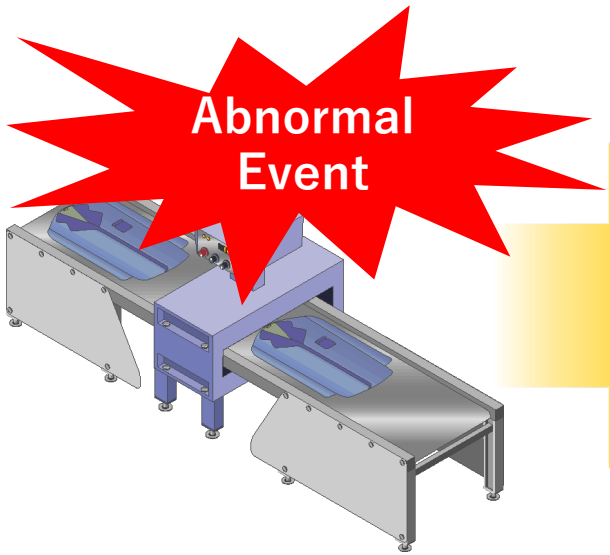
By recording only before and after the the abnormal event, the data capacity can be reduced.

※ To use the video function, you need a server with XProtect® installed that is compatible with thousands of types of devices.

Operation Monitoring

Instant notification of abnormal events

It allows you to response to troubles quickly and share the information to seek fundamental solutions.



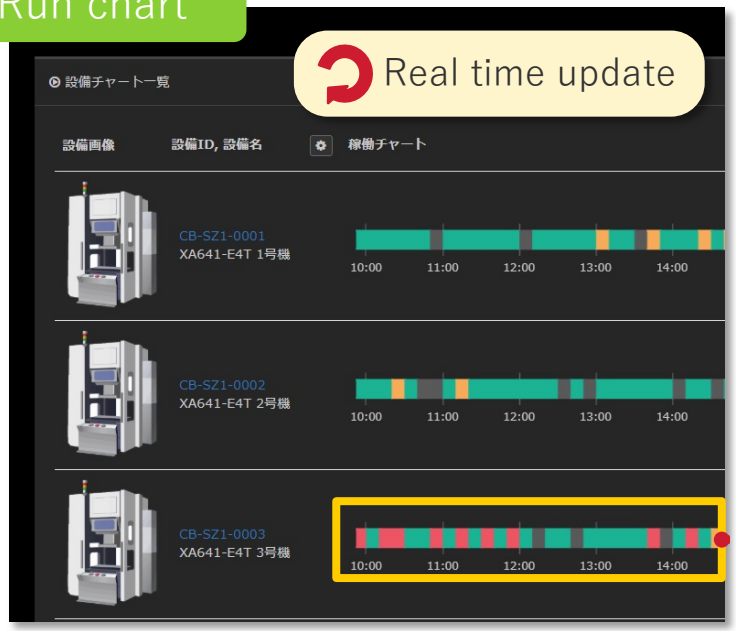
Now		A person in charge of the line sees the alert and runs to the equipment to recover.	Could be just one-time solution
With IoT		Real time display of alerts on your computer at the office.	No longer require extra manpower
		Auto-notification of the failure to related teams by e-mail.	Faster information sharing with related teams
		Notification conditions can be specified for each device group.	Can prevent failures with automated notification

Operation Monitoring

Visualization of accumulated daily operation status

Seeing trends from the past data allows you to notice problems.

Run chart



Color-coded display of device status such as shutdown, idle, and power off.

Normal operation | Idol | Abnormal stop | Power off

✓ Is the time zone of abnormal stop biased somewhere?

✓ Is the number of temporary stops increased before the long stop?

See trends and notice problems with visualized data.

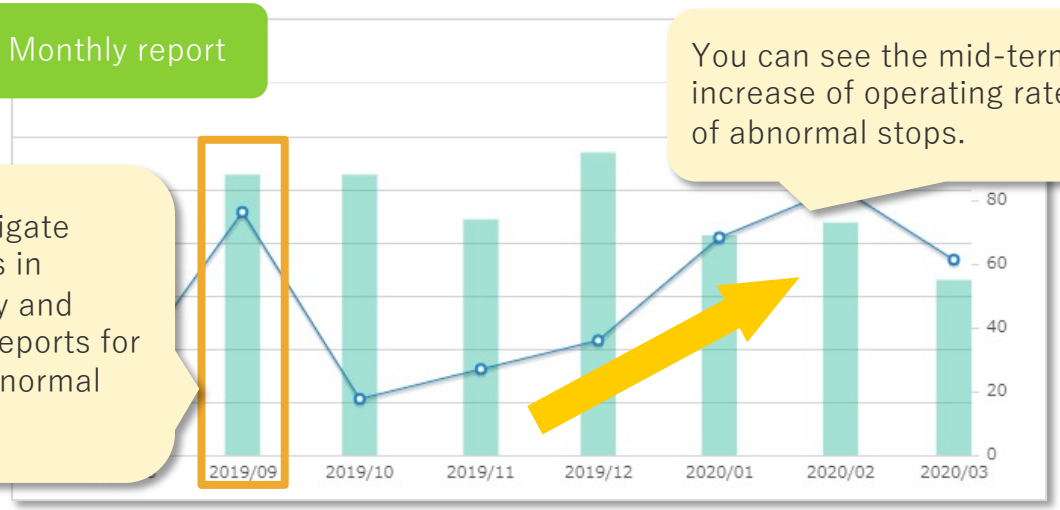
Operation analysis on monthly, weekly and daily basis

You'll identify the area that needs improvement by seeing monthly and weekly trends and break those down into daily reports.

Monthly report

You can see the mid-term trends such as increase of operating rate and decrease of abnormal stops.

Investigate details in weekly and daily reports for an abnormal result.



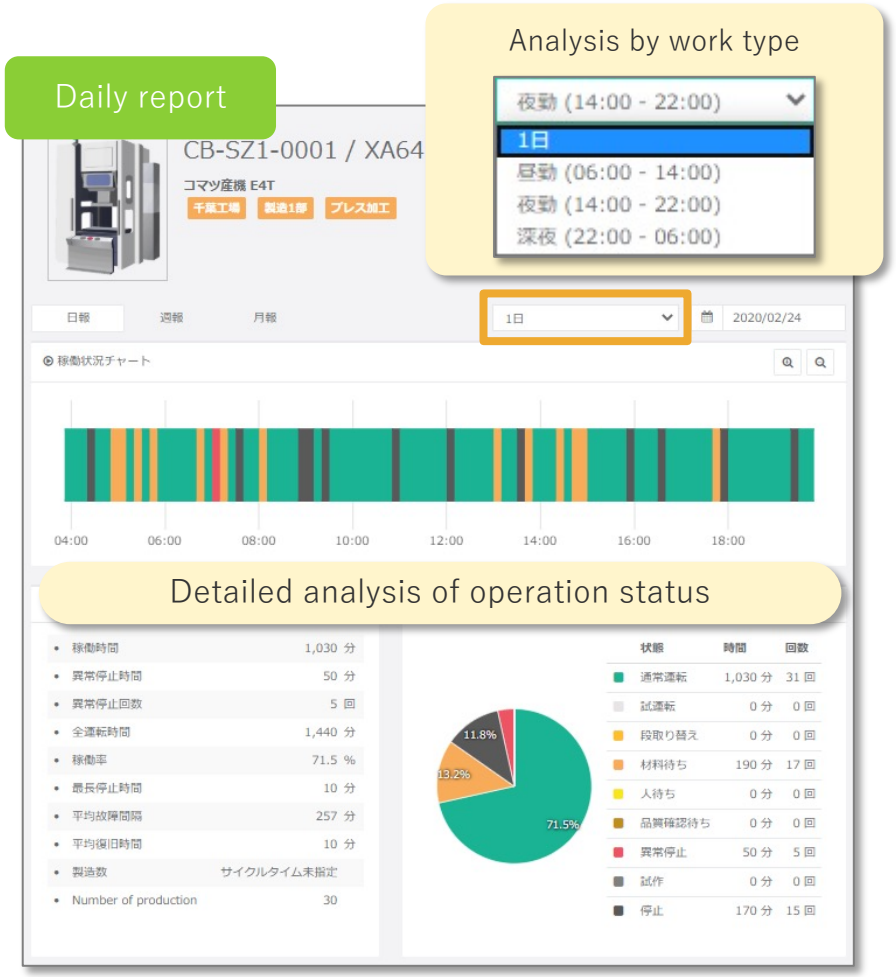
Weekly report

When a big abnormality occurs, see if there is a sign the day or 2days before.

See if there is a difference in efficiency depending on the day of the week, the timing of switching equipment, or the timing of switching work shift.

Daily report

Analysis by work type



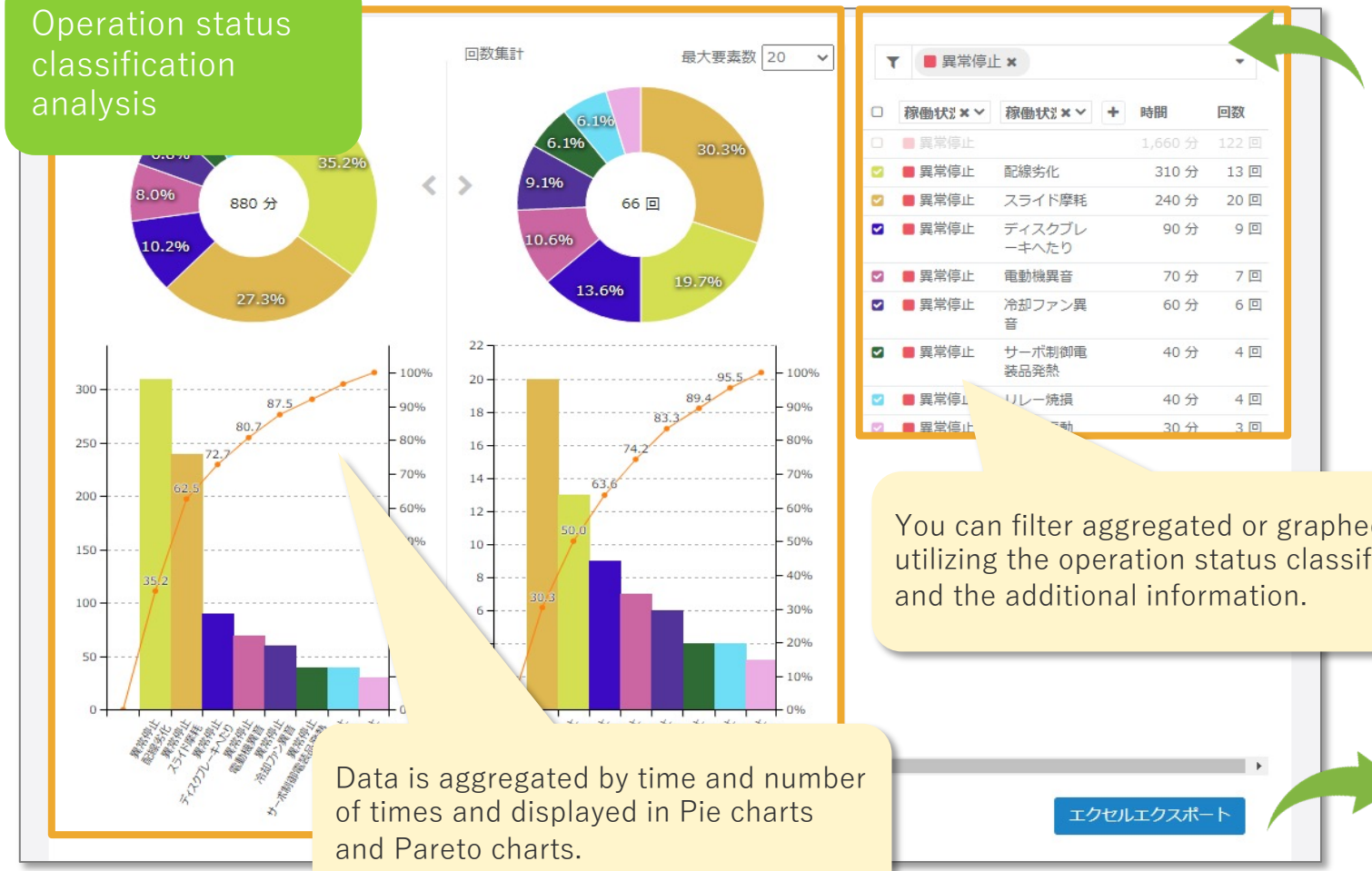
Detailed analysis of operation status

Operation Monitoring

Detailed analysis of equipment that can provide clues for improvement

Our easy-to-use tools support effective analysis that leads to improvement.

Operation status classification analysis



Analysis accuracy can be improved by entering detailed status on a tablet or other devices.

You can filter aggregated or graphed data by utilizing the operation status classification and the additional information.

Data is aggregated by time and number of times and displayed in Pie charts and Pareto charts.

Excel output for secondary aggregation is also available.

Operation Monitoring

KPI management for each factory or department that leads to activation of PDCA cycle

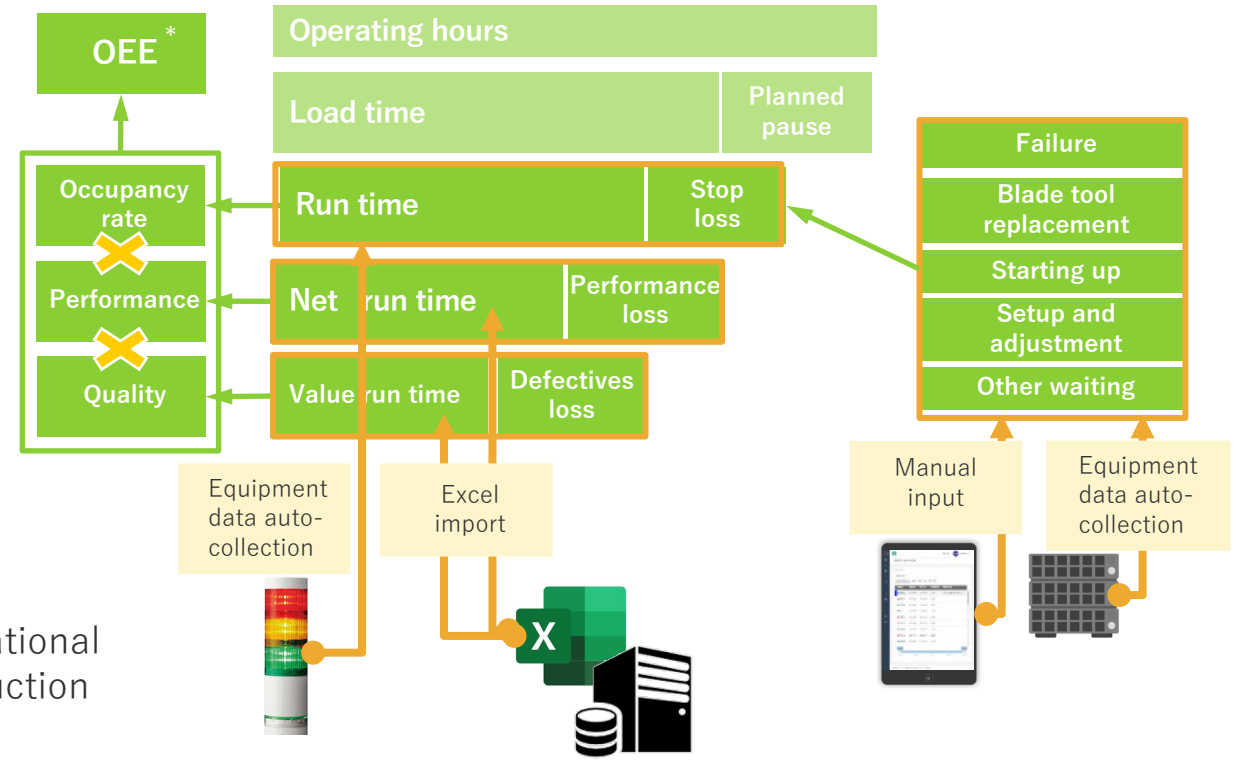
Comprehensive analysis of data can be done by linking equipment operation information with other various information.

You can freely aggregate data from factory level to equipment level.

Example: If only “1. View type" is selected, data is aggregated by “2. Factory”.

If “1. View type” and “2. Factory” are selected, data is aggregated by “3. Department”.

You can comprehensively analyze operational history, loss records, and production results for equipment.



Strengthen KPI management such as OEE*

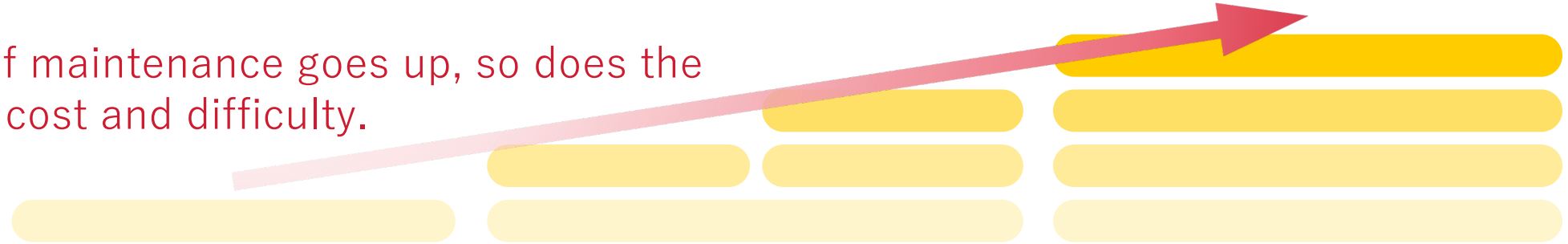
by adding the additional data from tablets and equipment to the operational status information that is automatically acquired and linking the production result information.

* OEE (Overall Equipment Effectiveness): A comprehensive index that measures the operational efficiency of equipment.

Operation Monitoring　Equipment Maintenance

Optimal maintenance according to risks

As the level of maintenance goes up, so does the maintenance cost and difficulty.



Type	Breakdown maintenance	Time based / Condition based Preventive maintenance	Predictive maintenance
Maintenance timing	Maintenance after failure	Maintenance according to elapsed period and condition	Maintenance based on prediction
Suitable equipment	- Has little impact by downtime - Can be restored quickly	- Whose downtime should be reduced - When planned maintenance can lead cost reduction	- Important that cannot be stopped - Has huge impact on maintenance cost
Point	Digitization of maintenance (Exclusion of personal tasks)	Standardization of inspection and repair (Execution of planned works)	Focused management for each equipment (Advanced use of data)

Equipment Maintenance

Digitization of equipment ledger

The first step to eliminate personalized tasks and standardize maintenance works.

Just filing papers.
Nobody utilizes the data.

Only the person who inspected knows the regular inspection results.

Inspection records and repair records are not organized.

Nobody knows where the past trouble history is.

Equipment details

Ledger

Equipment information
- Optional (such as basic information, location, manufacturer, and contact information)

Master
- Inspection format for each equipment
- Maintenance BOM for each equipment

Karte

Inspection results
- The latest inspection result information
- Quick access to details of past results

Inspection results

Repair results
- The latest repair result information
- Quick access to details of past results.

Repair results

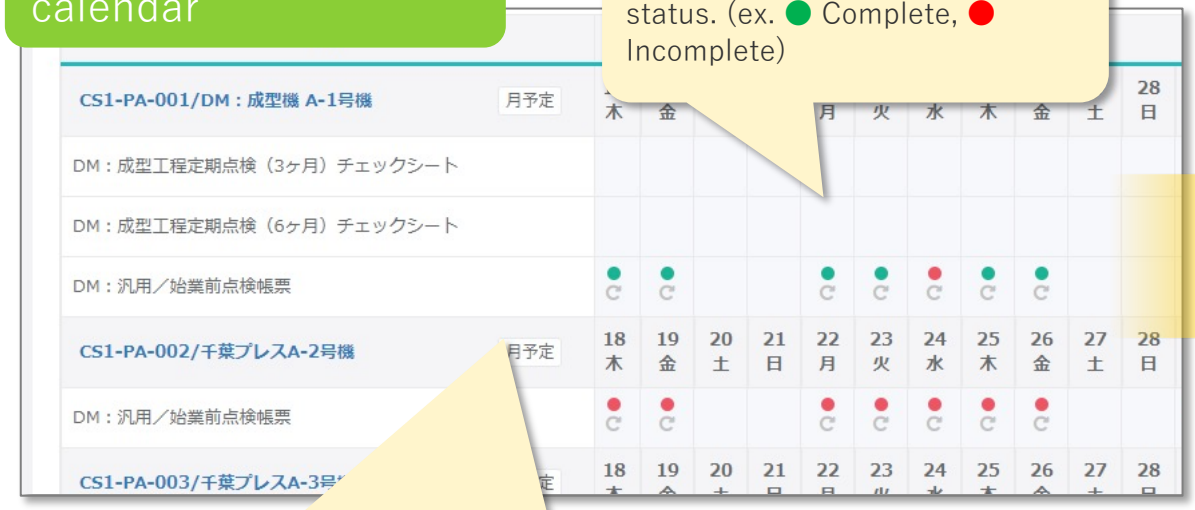
Digitization allows your enterprise to make effective use of past result data.
It promotes the depersonalization and standardization of maintenance works.

Visualization and sharing of inspection plans and results

The inspection cycle of planning, schedule sharing, result entry, and result check can be taken with the utilization of a calendar.

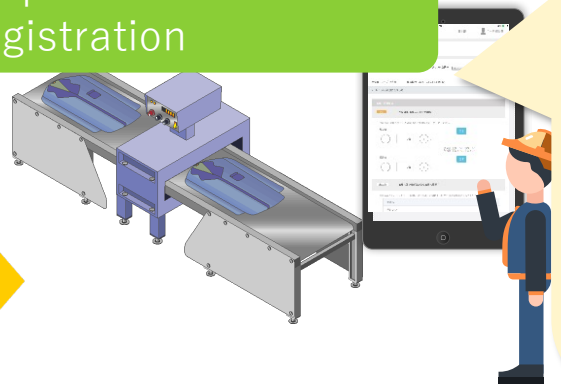
Inspection schedule calendar

The color of icons indicates the status. (ex. ● Complete, ● Incomplete)

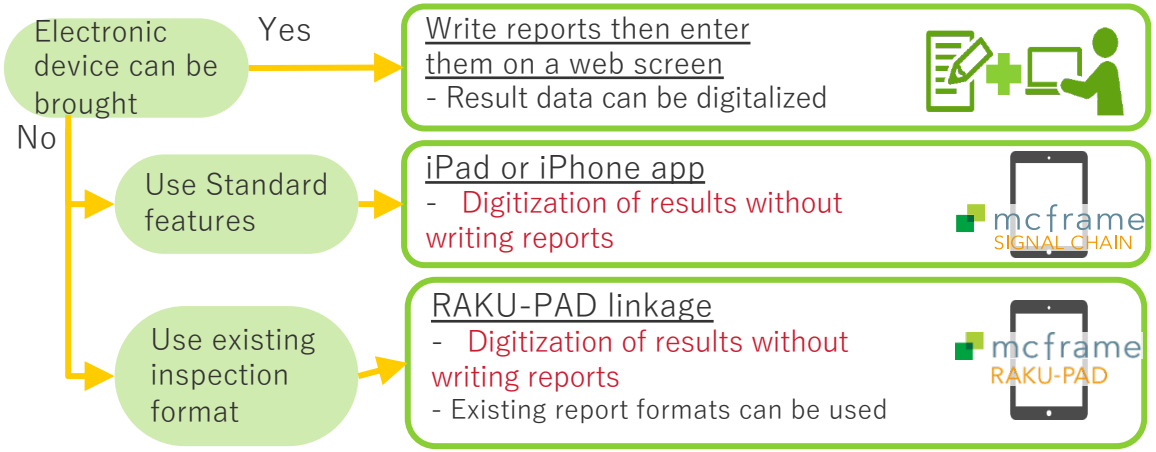


- Inspection schedule can be entered collectively by specifying repetitive conditions (unnecessary, day, week, month, year), intervals, handling of non-operation days, and period.
- By specifying the person in charge, equipment, and final decision in search conditions, you can easily refer to the past inspection results and export them to Excel for secondary use.

Inspection result registration



- Inspection items can be set freely.
- It is possible to specify the threshold value to be abnormal or warning.
- Various data can be entered (e.g., Image, video, audio, and handwriting).
- Data entry is possible with a standard iPad app and RAKU-PAD offline.



Equipment Maintenance

Sharing repair tasks in real-time

The entire company shares the progress of tasks. The result information is utilized to analyze failures and to measure the economic efficiency.

List of repair requests

修理番号	修理件名	ステータス	点検番号		
000000259	実績登録画面で依頼だけ登録するテスト	担当割当			
000000258	CA用：スピンドルの交換	依頼申請中			
000000257	CA用：ベアリングの異常摩耗	依頼申請中			
000000169	火災によるホースの溶け	依頼申請中			
000000168	ベアリングの摩耗によるガタツキ	部品手配中			
000000167	LMガイドの交換	暫定措置	0000		
000000166	DM：ベアリングの異常摩耗	修理中	000000		
000000165	ホース内で研磨粉が固まり詰まった	暫定措置		MIDDLE	保全部
000000164	加工途中に銅タンの回転が止まる	部品手配中	000000146	MIDDLE	G班
000000161	割出部から油漏れ	依頼申請中		MIDDLE	保全部

- You can perform the process management (Routing of request, plan, and execution) by setting the status and the person in charge.
- Email can be sent to a person who is responsible for the next task when the status is changed.

Tasks can be adjusted because everyone share the same data

Maintenance department

Production engineering department

Manufacturing department

Repair request

- Enter a request with the following data: failure location, request details, status, desired date of repair completion, and department in charge of response.
- Can attach photos, videos, and audio files.

Execution plan

- Assign a person and enter the planned date and time for stopping equipment.
- Check the necessity of spare parts and arrange them if necessary.

Result entry

- Enter the following data: work results and details, equipment downtime, man-hour results, and repair cost details.
- Can collectively import detailed information by using Excel.

Data utilization

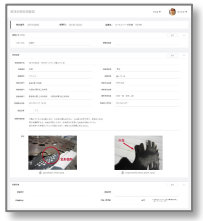
- Can check past cases and handling details quickly
- The dashboard function enables aggregation and analysis of maintenance costs.
- By downloading data in Excel, you can easily utilize it for secondary use.

Highly accurate lifetime prediction in conjunction with the Operation Monitoring

You can perform equipment maintenance and repair based on the accurate operation results.

Operation Monitoring

(Run time and production count)



Equipment karte
(Maintenance information)

Lifetime monitoring
Compares the total measurement time and thresholds for each element in the maintenance BOM.

Maintenance BOM

An alert shows up when a threshold is exceeded.

Enter a repair request and a result

Order spare parts

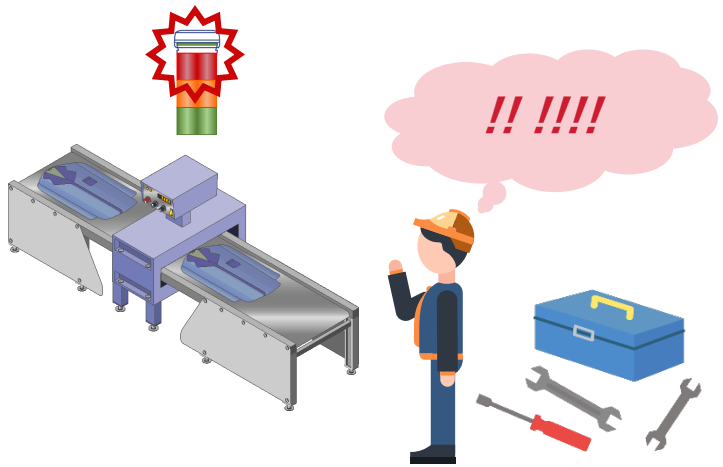
- Element information by equipment (components / parts)
- Lifetime threshold by equipment element
- Spare parts information by equipment element

You can measure the lifetime of each component or part by using the equipment operation results acquired by the Operation Monitoring, and the Maintenance BOM and the repair results in the Equipment Maintenance.

Equipment Maintenance

Reduction of waste by linking plans and results with the spare parts management

Digitizing inventory control tasks of spare parts prevents losses caused by stockouts and reduces excess inventory.



No spare parts when needed.	Inventory of spare parts decreases while nobody knows
Large inventory of infrequently used spare parts.	Nobody knows the total amount of spare parts.

Spare parts management

Ledger management

Spare parts list / Entry
- Basic information (name, unit, type, evaluation unit price), performance, manufacturer, attachments, purchasing information
- Custom property (any item can be entered)
- Location information

Receipt/issue management

Inventory list
- Inventory inquiry by location
- Entry of results (receipt / issue / movement)

Reorder point quantity settings/alert
- Reorder point ordering information (reorder point quantity, minimum reorder point quantity, purchase LT)
- Checking spare parts for ordering required and sending emails

Inventory counting

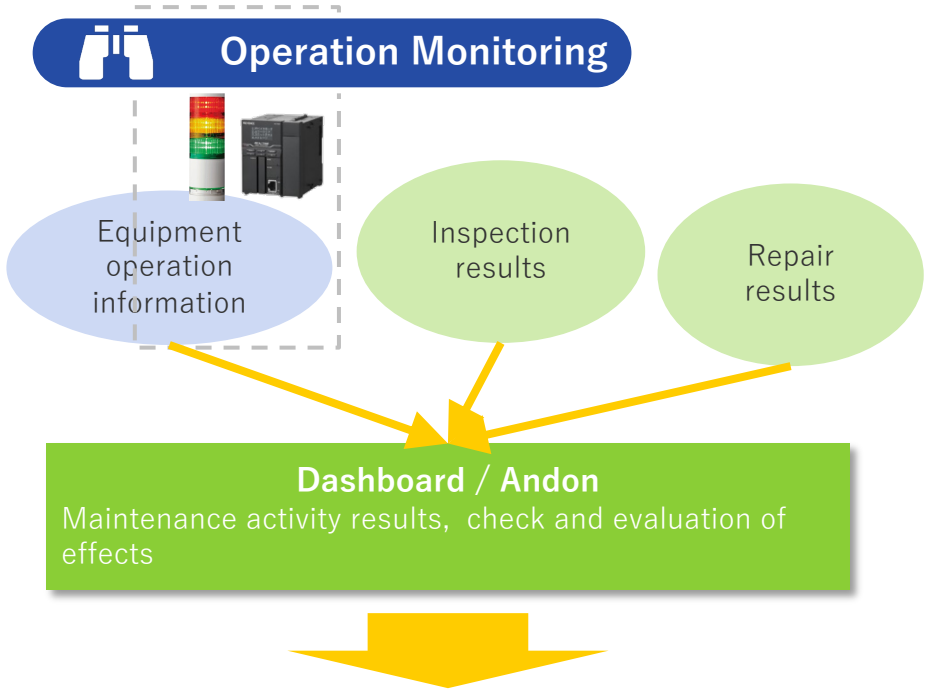
Inventory list / entry
- Inventory adjustment by using Excel export/import
- On-site entry function with iPad native app
- Receipt/issue restriction during inventory counting

You can easily view, aggregate, and analyze historical data.
Standardizing the maintenance tasks can promotes KAIZEN.

Equipment Maintenance

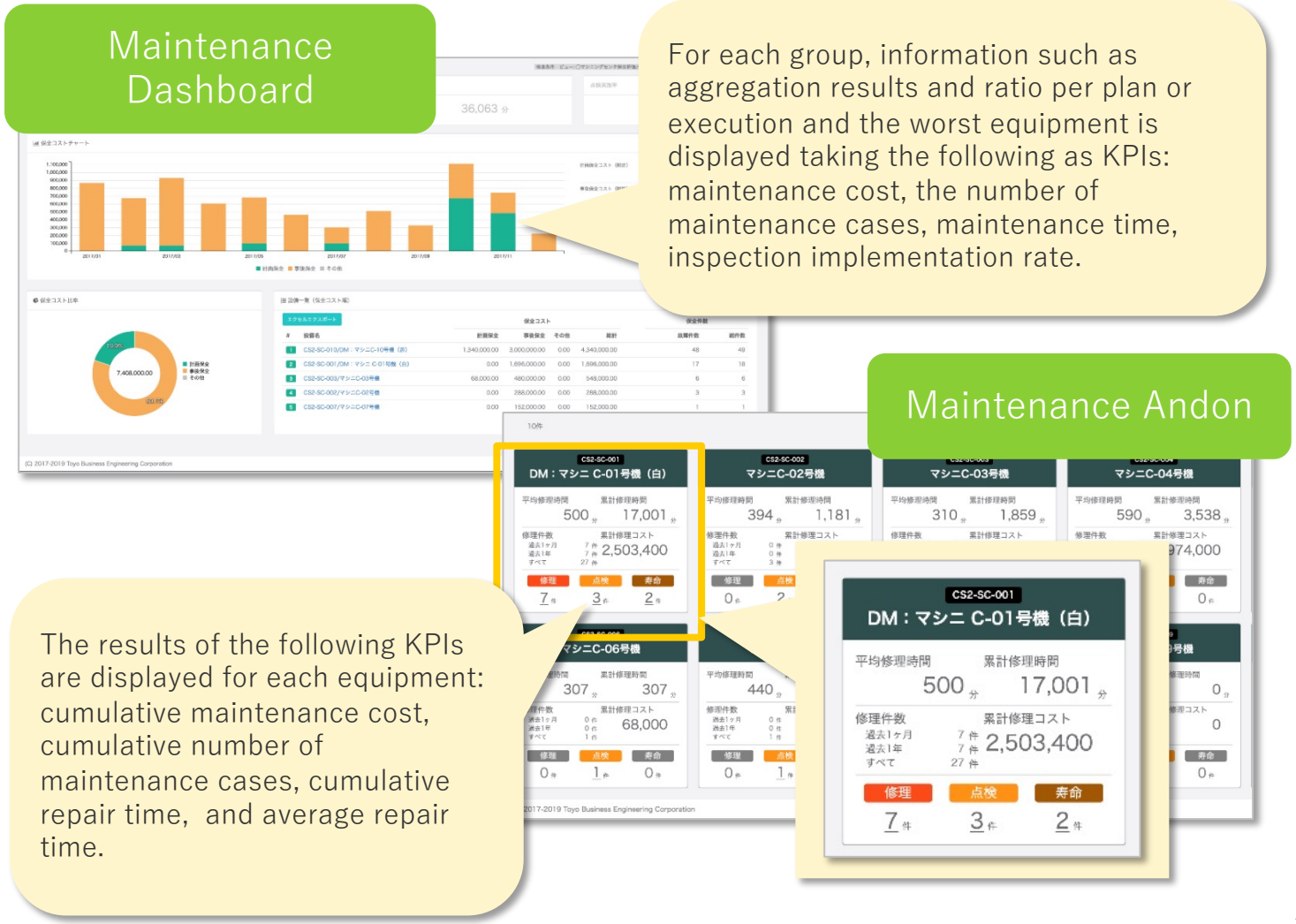
Supporting improvement activities by managing KPIs for maintenance activities

Quantifying the maintenance activities leads to effective improvement.

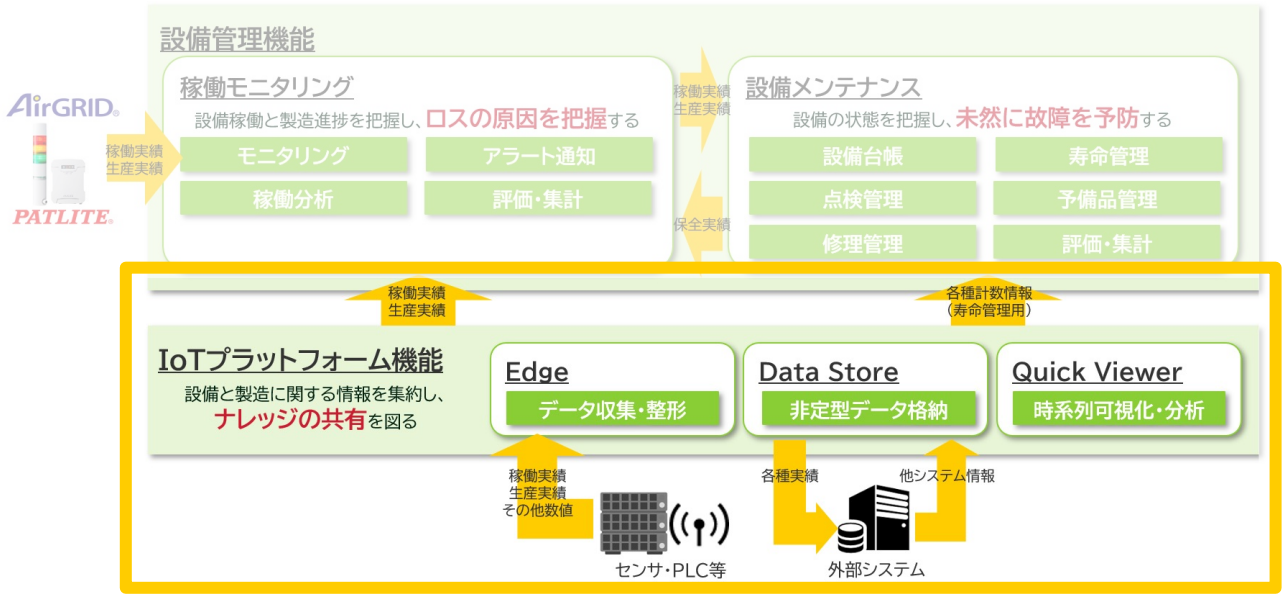


Optimize maintenance activities

- Review the inspection cycle
- Review the lifetime monitoring period

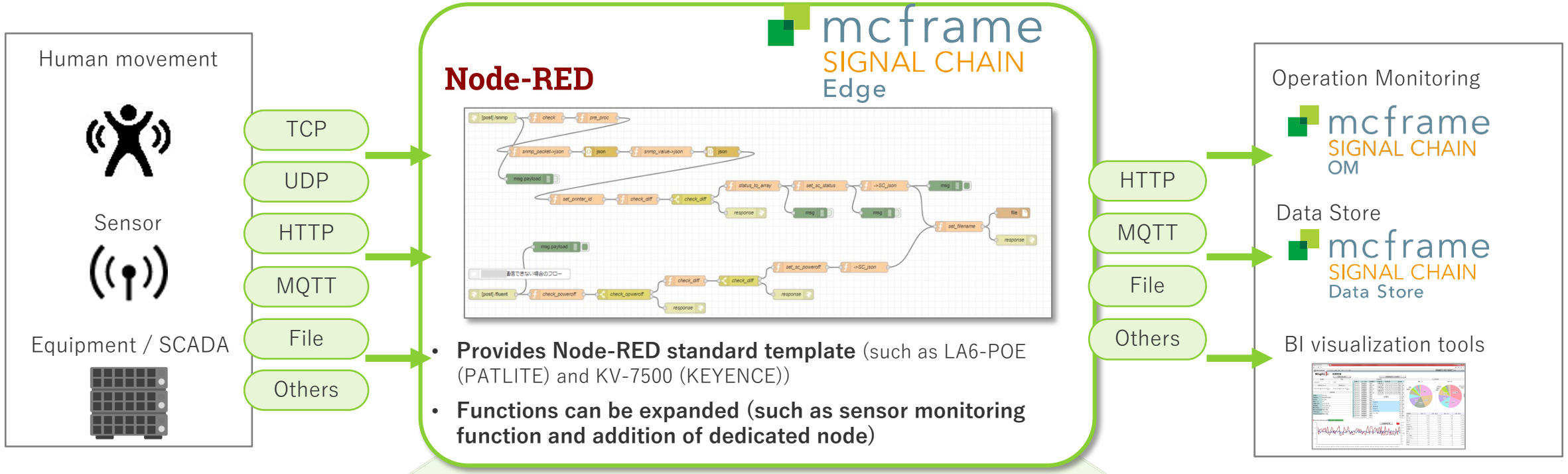


4. About mcframe SIGNAL CHAIN IoT Platform



Edge - Collect -

Edge interprets, formats, and exports data from various devices.



Interpretation
- Interprets various formats of data -

- You can connect devices with the communication method of the device.
- If a device supports the standard template, you can connect it only by setting it up.

Formatting
– Formats data -

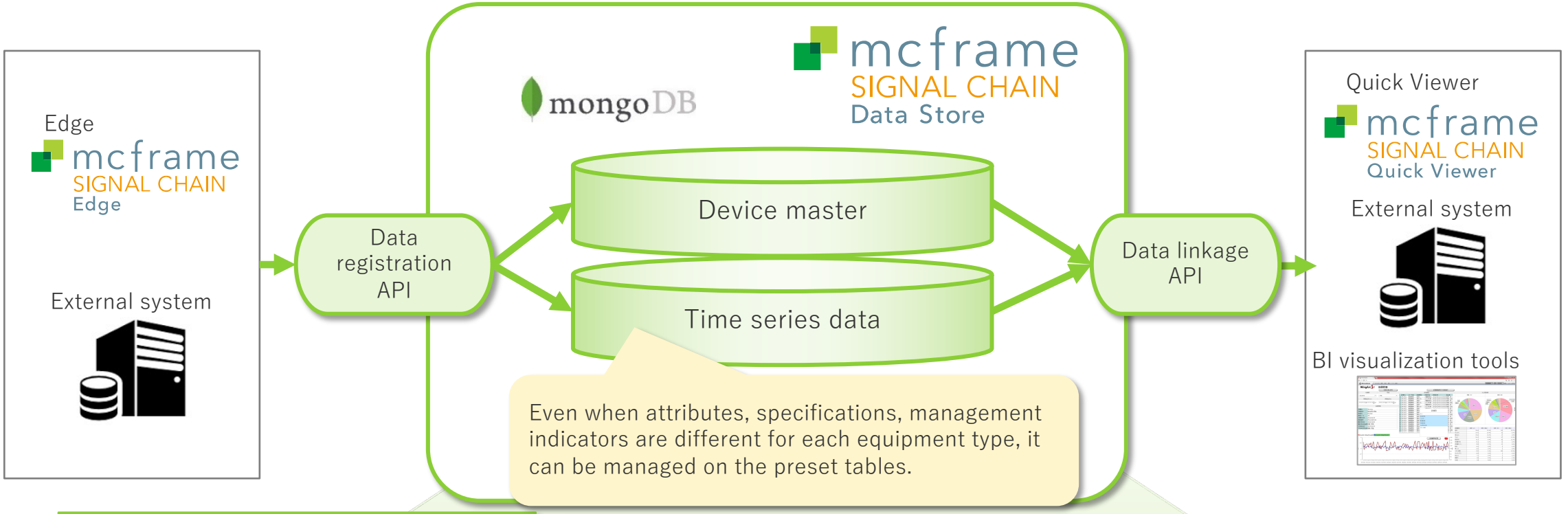
- The standard template has a data compression function that exports only changed data and a connectivity monitoring function that periodically checks the equipment status.

Exporting
- Provides data to multiple systems -

- The collected data can be linked in the communication format according to the system to be linked.
- The standard template links with Operation Monitoring and Data Store.

Data Store - Store -

Data Store accumulates non-standardized data in the same format.



Registration
- Easy Entry with Public APIs -

- New device is automatically registered in the master.
- No need to consider the table structure when registering data. An API is called to register data.

Saving
- Makes non-standard data easy to use -

- Stores non-standard data in an easy-to-use format.
- No need to design tables for each equipment or device.
- No table changes or additions required.
- Up to 5 levels of organization can be set.

Linkage
- Easy linkage with Public APIs -

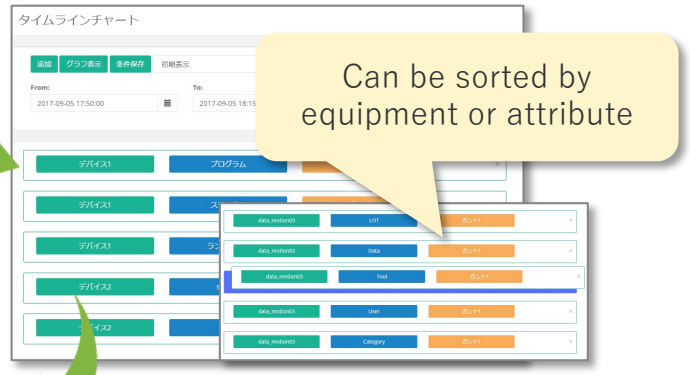
- Can link data with an external system by calling an API.
- Real-time search is available with Quick Viewer and BI tools.

Quick Viewer - Visualize -

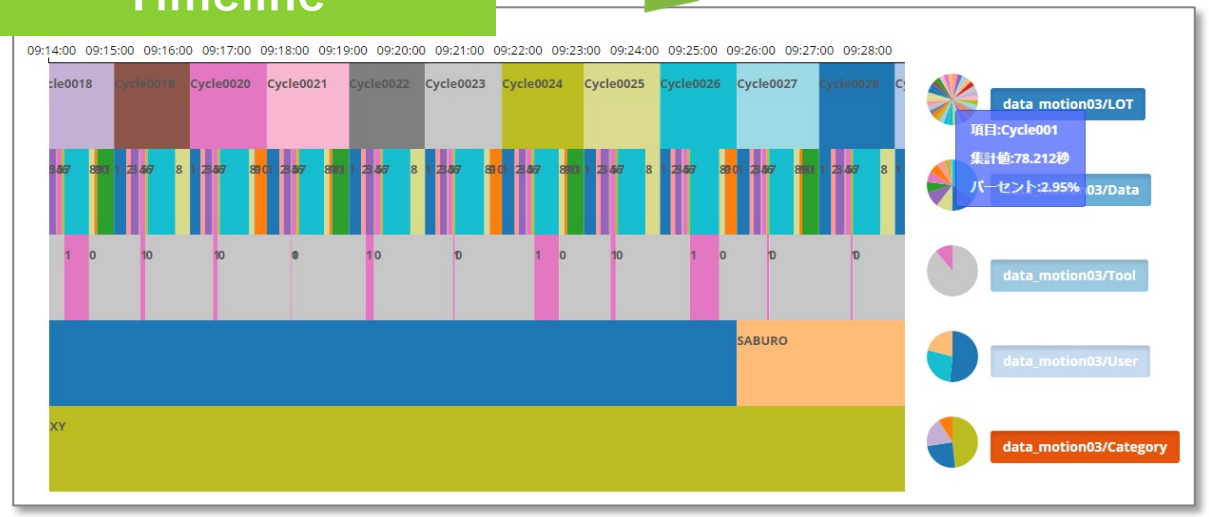
Quick Viewer visualizes the accumulated data in chronological order.

1. Select a device, an attribute, and a graph type.

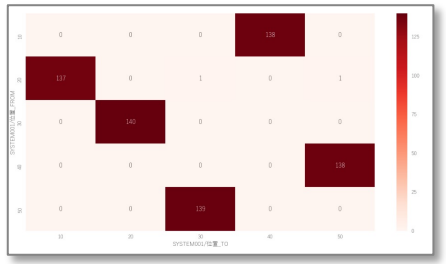
2. Specify a date range.



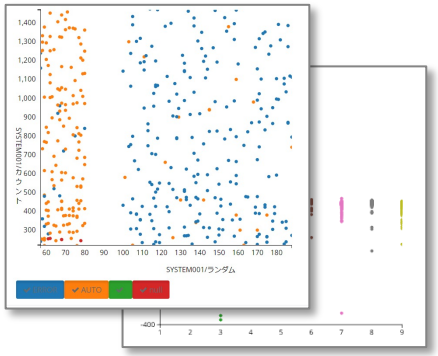
Timeline



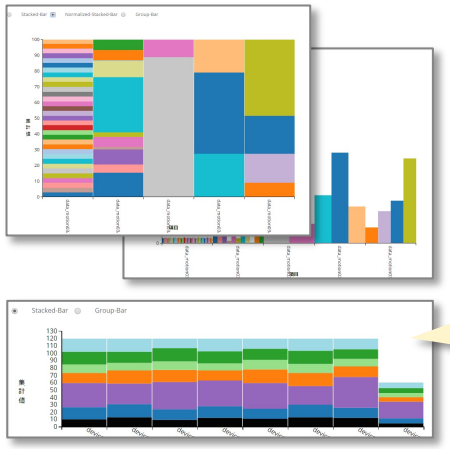
Heat Map



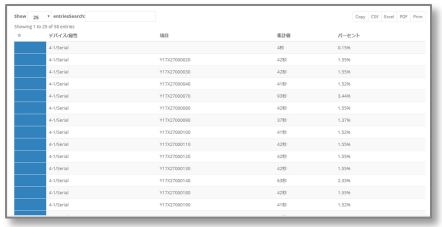
Scatter Plot



Stacked Bar Graph



Output of Summary Sheet and CSV

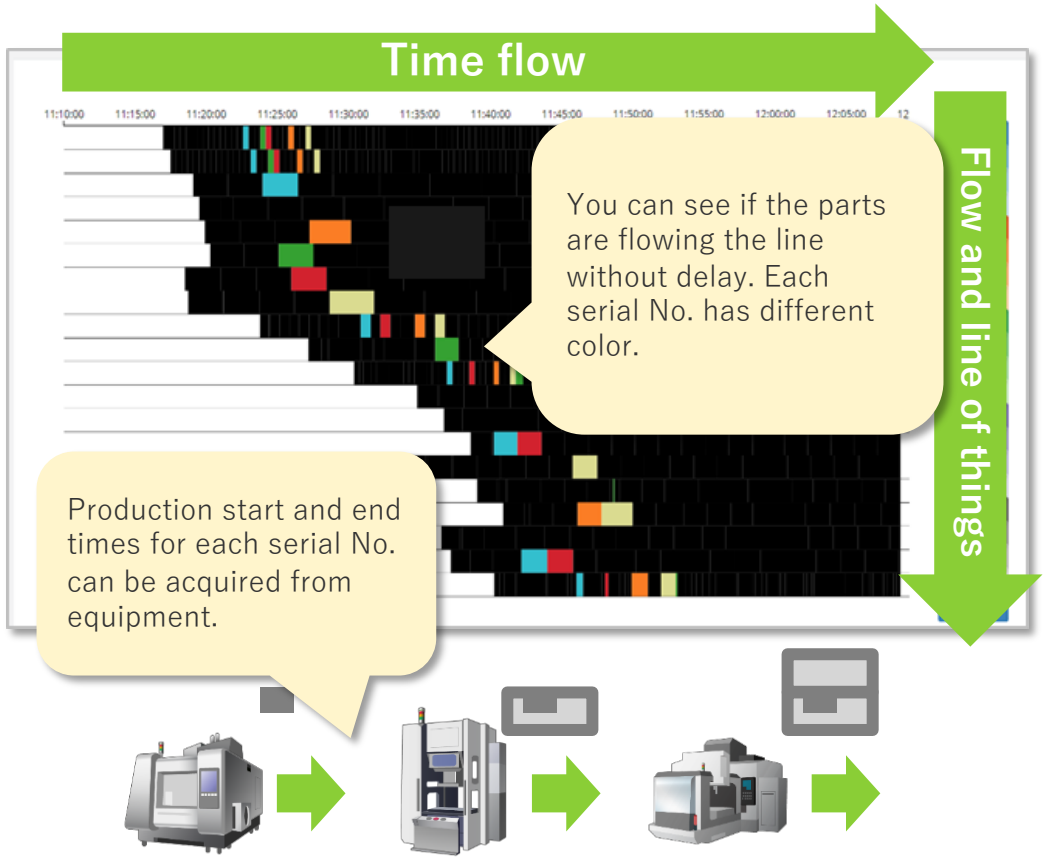


Can be aggregated by shift and by time

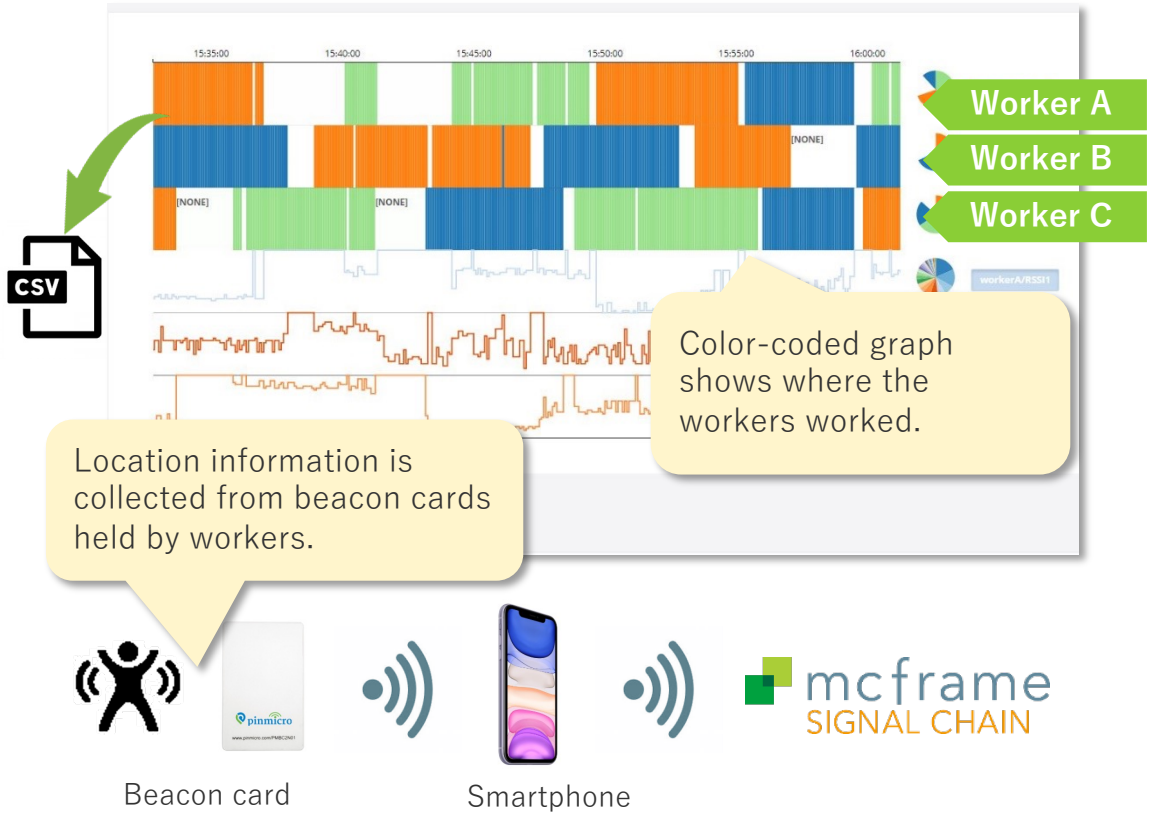
Utilization example 1.

Scenario: Collect and analyze information on things and people as well as equipment.

See the delay status of parts flowing through a line.

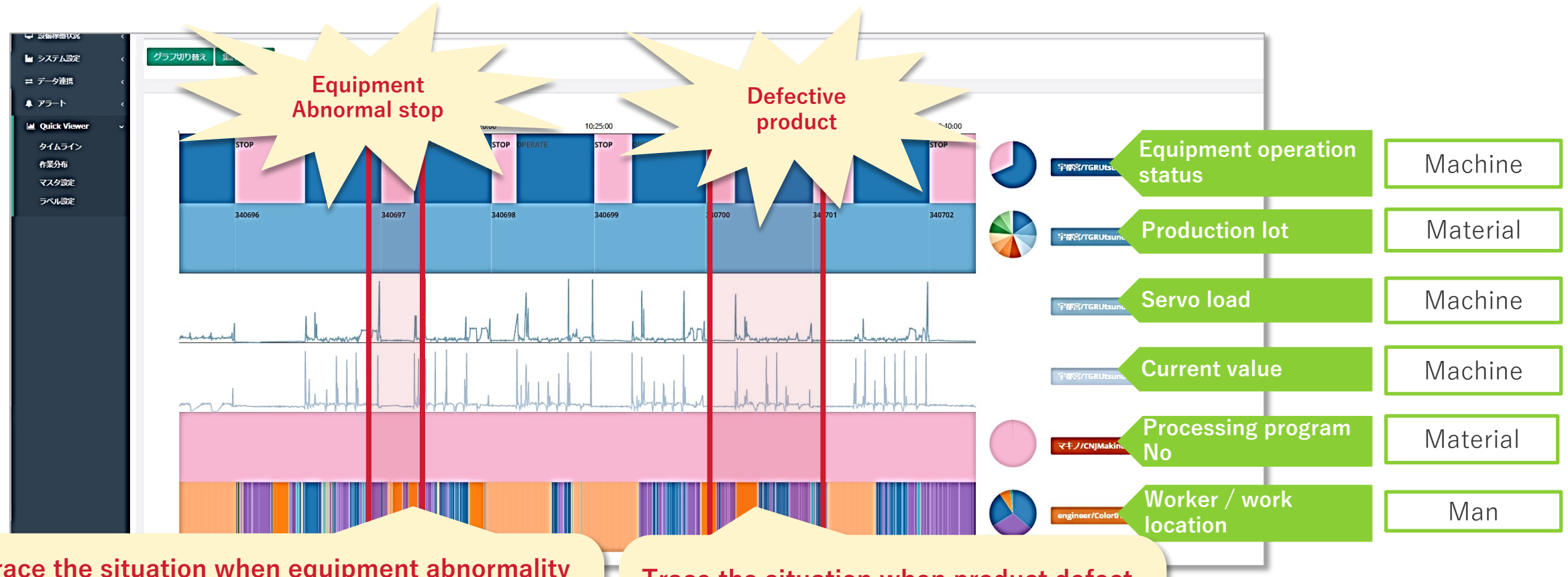


See how people move



Utilization example 2.

Scenario: When a trouble occurs, associate 3M with the trouble and trace the situation.



Trace the situation when equipment abnormality occurs

When an abnormality occurs in equipment, you can look back on the situation of the equipment before and after the abnormality.

Trace the situation when product defect occurs

When a product defect occurs, you can look back on the operating status, manufacturing conditions, and worker's location.

Exhibitor: IVI Symposium 2018-Spring
Business scenario session

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