Value creation initiative

Value Creation Feature Utilization of digital technology in automobile painting facilities

Towards Realization of Smart Factories

Optimization of production conditions and provision of stable product quality using IoT/AI technology

The manufacturing industry is required to address various issues including technological innovation associated with digitization, the decreasing labor force, and the shift to a carbon-neutral society. In order to address such issues, "smart factories," which improve productivity and quality utilizing IoT and AI, are gaining attention.

Smart factories collect and analyze data from production lines and, with its self-learning system, improve production line, optimize operations and improve product quality.



Increased demand for smart factories

Smart factories are facilities that enable improvement of the production process and streamlining of operations utilizing and analyzing data with latest technologies such as IoT and AI.

Since the German government advocated the project "Industry 4.0" aiming for transformation in manufacturing in 2011, smart factories have gained increased attention globally.

Japan was not an exception. More companies are taking initiatives in smart factories to address issues such as the decreasing population, aging population, and realization of a carbon-neutral society. Also, in recent years, as a prevention measure under the COVID-19 pandemic, companies are introducing remote communication and automation of operations utilizing digital technologies to continue operation while avoiding contact and crowding among people.

Issues in the manufacturing industry

Technological innovation using IoT and AI

Decreasing working population

Shift to carbon-neutral society

Smart factories

- Optimization of production operation
- Realization of digital transformation
- Enabling fast production and uniform quality in any environment

Solving issues at production sites with development of i-Navistar

Taikisha has long been engaged in the design and installation of large-scale painting facilities for automobile manufacturers in Japan and around the world since its foray into the industry in the 1950s, and has achieved high-quality painting. Extended knowledge and know-how regarding the entire painting process gained through provision of plant engineering has become the company's strength.

"i-Navistar" is a system enabling predictive maintenance of equipment and cause analysis of quality issues based on our knowledge and know-how and by utilizing IoT and AI.

i-Navistar tracks various types of time series data, such as facility/equipment operations information and process environment conditions, for each product according to vehicle type production information on automotive paint lines, and identifies the operating status of an entire production line on a real-time basis. In addition, the system detects signs of operational anomalies and analyzes the causes of defects by linking and analyzing inspection and quality data on various products produced.

Thanks to the introduction of i-Navistar, the holistic optimization of conditions in product lines and further stabilization of product quality have been achieved efficiently and in a short time. We believe that it not only dramatically improves productivity, but will address issues regarding lack of experts at production sites.





Functions of i-Navistar

1) Operations analytics system

Examples of prediction of motor failure

Automobile paint finishing lines are composed of various equipment. When equipment fails, the production line could be stopped for a long time, causing a huge loss.

Using sensing, analysis software, output tools, and network, the operations analytics system predicts the timing of these failures and give alerts before abnormality occurs.

By predicting failures, the system helps prevent operational stoppages and achieve stability.

Vibration acceleration (m/s²) Resultant acceleration A Resultant acceleration B --- Alert Anomalies 50 Predicted anomalies level 40 Prediction of anomalies 6/13 8:00 30 Alarm 20 activated 10 Alarm March March March March 20XX/5/27 20XX/5/29 20XX/5/31 20XX/6/2 16:00 18:00 20:00 22:00 20XX/6/5 0:00 20XX/6/9 20XX/6/11 20XX/6/13 4:00 6:00 8:00 20XX/6/7 2:00

2) Quality analytics system

When a quality defect occurs in a product, engineers would previously analyze data and carry out repeated testing to locate the cause, which is time-consuming.

The quality analytics system enables visualization of the production history by linking vehicle type production information and painting quality at the time of production (painting material and equipment conditions) and storing the data as production history for each product painted. Furthermore, by utilizing AI, the cause of quality defects can be predicted and attributing factors are output.

Α В С D А В C Н D F F 0.00 0.05 0.10 0.15

Example of cause analysis when a product defect occurs





Development of the system for the future

Regarding i-Navistar, the cause analysis system for equipment operation has started to be deployed domestically and internationally. In order to realize smart factories and to promote application of i-Navistar, the Company is engaged in development of an energy management system and digital twin application.

In particular, we are aiming to build a system that can monitor and manage operation status and quality information in a virtual space by applying digital twin technology. This system will collect product information from factories, linking it to the virtual space, and virtually simulating the factory facilities.

The features of this system not only improve management accuracy by enabling real-time monitoring of production status, but also enable detection of signs of abnormalities before they occur using information from sensors, management of abnormalities when they occur, and simulation of changes in production status.

The system can be used to supervise operations from remote locations and improve production operations.