



Success Story

IoT-based production management platform development for a Japanese multinational company

Customer

Japanese Multinational Company

Country

Japan

Industry

Manufacturing

About the Client

The client is a Japanese multinational company that specializes in air conditioning, refrigeration, and chemical solutions. They operate across various sectors including residential and commercial air conditioning, industrial oil hydraulics, and fluorochemicals. With operations in more than 170 countries and over 110 production bases, the company has a strong local presence in Europe, Latin America and Asia which caters to diverse regional needs.

Tech Stack

 PostgreSQL

 ANGULAR

 .NET
Core

Business Situation:

The client's production plant in India depended on manual processes such as real-time tracking of equipment performance, production planning & control as well as inventory management. This reliance resulted in data silos where each production line operated independently which made it difficult to consolidate and analyze performance metrics across the plant. Machine downtimes were often addressed reactively which caused unexpected delays while inventory levels were inconsistently managed. The absence of automated workflows meant that production schedules were frequently disrupted, thus compounding inefficiencies and increasing operational costs.

The client recognized the need for a solution that could provide real-time visibility into their production processes. They envisioned a centralized production management platform that would not only automate routine tasks but also enable predictive maintenance to reduce unexpected machine breakdowns.

Their goal was to achieve a fully integrated, smart production platform capable of scaling with their growing operations while maintaining efficiency, agility, and cost-effectiveness.

For this, they required technical expertise in developing advanced production management systems with real-time monitoring and predictive analytics. After assessing various providers, the client chose Unthinkable Solutions because of our proven track record in delivering scalable, custom solutions that seamlessly integrate with existing infrastructure.

Through collaborative brainstorming sessions, Unthinkable Solutions and the client outlined a comprehensive set of requirements, which included:

- ✔ Strategize the overall development lifecycle - recommending the optimal software architecture and technology stack suited for an IoT-based production management platform.
- ✔ Design a dashboard that gathers real-time data from all production lines - highlighting performance metrics, machine health and inventory levels.
- ✔ Integrate role-based access control for the platform to make sure that different levels of access are provided to various user groups based on their roles and responsibilities.
- ✔ Implement a reporting & analytics feature that provides real-time insights into the performance of the entire production plant to generate detailed reports on machine health, production efficiency downtime trends and other KPIs.
- ✔ Enable mobile access to the platform so that plant managers and operators can monitor production performance, receive maintenance alerts and access key metrics.

The Solution

The development of the IoT-based production management platform consisted of multiple stages that were tailored to handle specific challenges. We integrated IoT sensors to collect critical real-time data from equipment to enhance the platform's reliability and improve fault detection capabilities. The data collected from these sensors was visualized on an interactive dashboard, allowing users to monitor the status of machinery and inventory effectively.

For the backend, we implemented .NET Core, which provided the modular architecture and performance optimizations necessary to manage the real-time data generated by IoT sensors on the production lines. To improve efficiency & manage growing data complexities, we recommended migrating data from OracleDB to PostgreSQL to ensure a smooth transition through a structured data migration process that preserved data integrity.

For the front end, we chose AngularJS for its two-way data binding and component-based architecture, enabling the creation of an interactive dashboard that aggregates real-time data for monitoring key performance metrics, machine health and inventory levels. To ensure accessibility across various devices, we employed responsive web design principles. This allowed users to access the platform from desktops and smartphones.

Here's how we helped the client enhance their product's capabilities and features:

User Portal

Weekly/ Daily/ Monthly Production Report: In order to enhance production tracking, we developed a reporting module featuring a visual dashboard. Users were able to monitor daily/weekly/monthly progress across all production lines with color-coded bars such as grey for planned production, violet for current targets, blue for actual production and others. The module included filters for customizable views such as plan vs. actual, target vs. actual or a combined view of all metrics. This functionality ensured accurate monitoring and streamlined decision-making for achieving production goals.

Predictive Anomaly Detection: We integrated this feature to help users analyze equipment failures & production data with tools such as scatterplots, Pareto charts and abnormal content tables. These tools provided detailed insights into performance metrics that enabled users to identify the root causes of failures, monitor production efficiency as well as maintain quality standards with real-time data integration, users visualize trends, anomalies, and areas for improvement. By addressing issues proactively, this module supported streamlined operations and ensured optimal equipment performance.

Equipment Failure Downtime: To minimize disruptions, we incorporated the equipment failure downtime feature that provided a detailed table with key failure information such as date & time, machine, alarm code, and alarm description sourced from IoT devices. The sensors track metrics such as temperature and vibration, enabling predictive analytics to identify potential failures early. This proactive approach allows for quick diagnosis and prioritization of maintenance tasks, significantly reducing unplanned downtime and improving productivity while ensuring consistent output quality.

Line Status: To optimize production line monitoring, we implemented a line status feature that tracks the real-time status of each production line using IoT sensors. Accessible through the side menu, the module initially displayed the status of all machines for the selected line, offering a clear operational overview. A time-based graph illustrated machine statuses and users were able to log reasons for any halts directly from the interface. This functionality ensured that production interruptions were documented and resolved efficiently, contributing to continuous improvement in operational workflows.

Safety Security Details: To improve incident tracking and safety management, we introduced the safety security details feature, which enabled users to log and update incident causes with ease. The page featured a comprehensive table displaying columns such as date, time, type of incident, reason, and actions (edit/delete). Users could seamlessly update incident details, ensuring accurate and up-to-date records. This functionality helped foster a safer work environment by tracking the root causes of incidents, allowing teams to implement corrective actions and effectively prevent recurrence.

Admin Portal

Line Management: The Line Management page enabled admins to oversee and modify line-related information effortlessly. Admins could view the current list of production lines, add new ones, or update existing details. This feature ensured that all production lines were well-documented and up-to-date, supporting better operational control and offering flexibility to adapt to changing production requirements.

NG Code Definitions: We implemented the NG Code Definitions feature to help admins manage production defect codes efficiently. This feature provided tools to view, analyze, and update a list of defect codes, including their Line, Station, NG Code, and Description. Charts and insights helped identify common defect causes, improving quality control and process optimization. Admins could also add new defect codes to the system for accurate defect tracking, ensuring streamlined production processes and minimizing errors.

Configuration

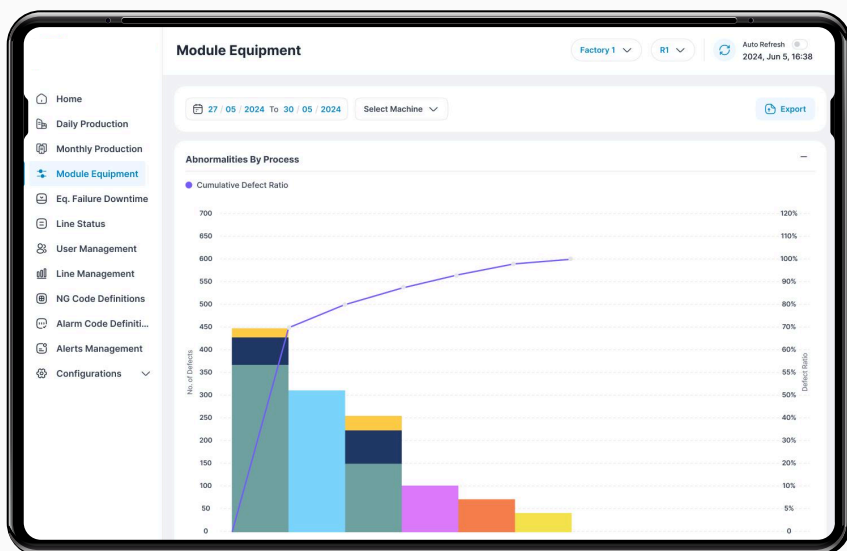
Production Loss Reason Master: To enhance production loss tracking, we introduced this feature to allow admins to register, update, and delete production loss reason codes. These codes were reflected on the line status page to offer valuable insights into potential production inefficiencies. This functionality ensured accurate tracking of production losses, empowering admins to implement corrective actions and optimize overall productivity.

Manage Plants: The manage plants feature enabled admins to oversee plant-related data with ease. Admins could update or modify plant details to ensure the system remained current and accurate. This functionality facilitated smooth operations and allowed for easy scalability by maintaining a centralized repository of plant information, supporting long-term growth and operational flexibility.

The Impact

The IoT-based production management platform greatly improved the client's operations at its production plant in India. The business gained clear visibility into its production activities by automating the manual process & adopting real-time data tracking. This lets them identify potential equipment performance issues that result in proactive maintenance and a considerable reduction in unexpected downtimes. Features such as the detailed reporting module & tools for analyzing equipment failures enabled the client to collect performance metrics from all production lines in one place. This consolidation made it easier for decision-makers to analyze data and plan strategically. Additionally, mobile access to the platform empowered plant managers & operators to supervise important metrics and respond quickly to any problems, enhancing the overall efficiency of operations.

Product Snapshots



Module equipment feature provided a detailed table with key failure information

The 'User Management' dashboard shows a table of users. The table has columns for Employee ID, Employee Name, Role, Update Date, Updated By, and Status. The data includes users like Aakanksha Meena, Ravi Kumar, Anukriti Karn, Sudarshan Singh, Deepsikha Das, Ravin Singh, Kartike Shukla, Raksha Gosh, Rahul Bhatt, Nitin Kumar, Rishabh Mishra, and Kankana Singh.

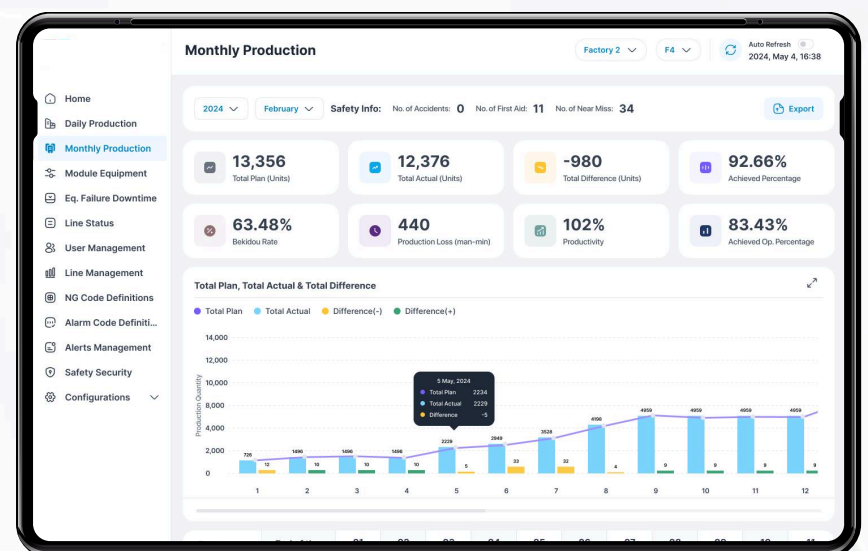
Employee ID	Employee Name	Role	Update Date	Updated By	Status
24598	Aakanksha Meena	Admin	-	-	Active
21389	Ravi Kumar	User	03/ 01/ 2024	24598	Inactive
24534	Anukriti Karn	User	15/ 02/ 2024	24598	Active
26783	Sudarshan Singh	Admin	16/ 02/ 2024	24598	Active
25468	Deepsikha Das	User	20/ 02/ 2024	24598	Inactive
23245	Ravin Singh	Admin	20/ 02/ 2024	24598	Active
22535	Kartike Shukla	Admin	21/ 02/ 2024	24598	Active
24353	Raksha Gosh	User	02/ 03/ 2024	26783	Inactive
25476	Rahul Bhatt	User	23/ 03/ 2024	22535	Active
27456	Nitin Kumar	User	23/ 03/ 2024	24598	Active
29895	Rishabh Mishra	User	29/ 03/ 2024	24598	Active
26573	Kankana Singh	User	05/ 04/ 2024	23245	Active

Detailed list of users for admin to monitor the activities and manage the access

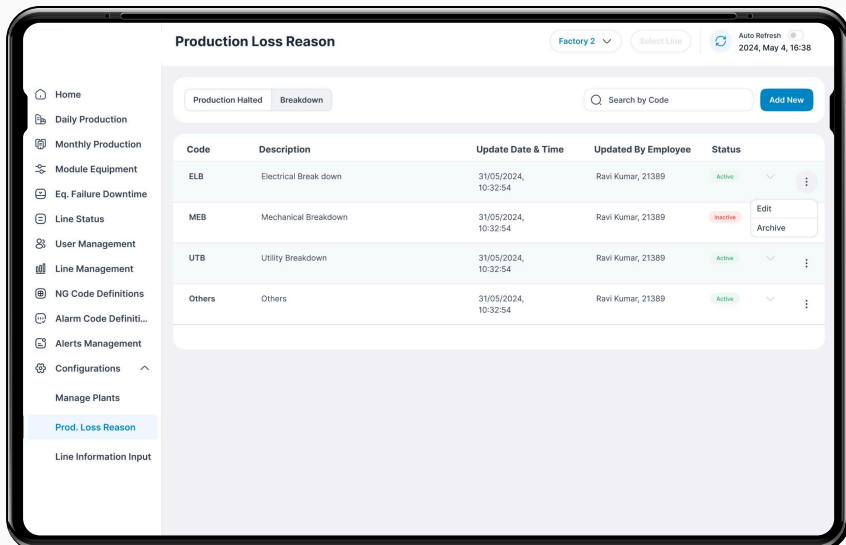
The 'Line Management' dashboard displays a table of production lines. The table has columns for Process ID, Line Model Name, UIL, LIL, UWL, LWL, UCL, LCL, Average Value, UPL, and LI. The data shows multiple entries for 'Secondary Charging Pressure' with various sensor readings.

Process ID	Line Model Name	UIL	LIL	UWL	LWL	UCL	LCL	Average Value	UPL	LI
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N
C199302R	Secondary Charging Pressure	4400	4400	4400	4400	4400	4400	22594656	NG	N

Line management feature to track the real-time status of each production line using IoT sensors



A reporting module featuring a visual dashboard



Production loss reason feature for admins to register, update, and delete production loss reason codes

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