# Development of New Technologies

Needs relating to good eating habits have been growing and diversifying among customers and within society at large. In the drive to further strengthen its core competencies and proactively resolve social issues, Nichirei will leverage its production technologies and expertise, while drawing on new developments including those in AI, IoT, autonomous driving, and robotics.

■Harnessing AI to Automate and Optimize Production and Personnel Planning

🌐 https://www.nichireifoods.co.jp/news/2020/info_id8338/ (Japanese only)

Nichirei Foods has collaborated with Hitachi, Ltd. in creating a system that uses AI to automate and optimize production and personnel planning. In FY2021, the system was introduced at two model factories in Japan. It uses sophisticated AI technology to reproduce and refine plans previously formulated by experts based on complex constraints. In addition to legal and regulatory requirements involved in personnel planning, a variety of other conditions must also be considered, including individual ability, overtime, and paid leave. Until now, experts formulated plans based on such preconditions, often relying on experience-based intuition. The new system uses AI to automate planning and identify optimal solutions from among the various permutations, while also quantifying and incorporating intuition-based criteria. As a result, planning requires one-tenth of the time and can be conducted by non-expert employees. The system is expected to contribute to work style reforms such as by reducing the number of hours worked and encouraging more employees to use paid leave. Given that in recent years food manufacturers have been called upon to make and supply products while responding to fluctuations in demand, the system is contributing to improved customer satisfaction due to its application of advanced digital technologies and the creation of efficient production systems. Nichirei Foods will continue to harness digital technologies to promote further improvements in productivity, reductions in lead time and inventories, as well as work style reforms.

Production Planning Concept Diagram
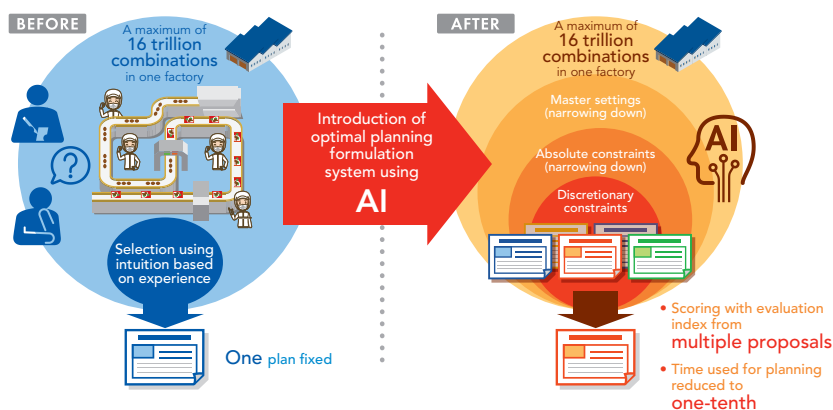
From a maximum of 16 trillion combinations in one factory, production plans encompassing daily production of products and volumes for each line and personnel plans involving shift schedules are formulated automatically.

■Joint Development of AI-Based Foreign Matter Detection and Elimination Technologies with Kindai University

🌐 https://www.nichireifoods.co.jp/news/2018/info_id5715/ (Japanese only)

In the process of receiving ingredients for processed chicken products, we control and maintain the quality of those ingredients using sorting technologies that include metal detection and X-ray, near-infrared, optical, and color analysis. However, additional manual or visual inspection is often required, since the accuracy of these methods in distinguishing the quality of ingredients decreases depending on the regularity of the shape of the ingredient, and the position and angle of foreign matter or impurities.* In selecting ingredients for chicken products, three major impurities in particular must be eliminated: bones, feathers and blood spots. In February 2018, in partnership with Kindai University, Nichirei Foods developed sorting technologies powered by AI. With the ability to locate impurities with pinpoint accuracy, AI-powered technology prevents rejection of impurity-free meat, leading to reduced food waste.
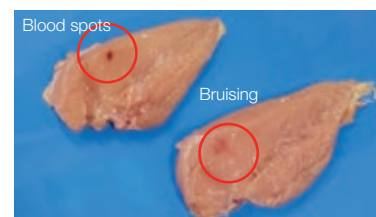
* Impurities include parts of food normally considered to be inedible, such as bones and feathers in the case of chicken.

Management Strategy

Value Creation Story

Financial Strategy

Business Strategy

Initiatives for Achieving a Sustainable Society

Data

■Expiration Date Reader AI Solution for Tablet Inspections*

🌐 https://www.nichirei-logi.co.jp/news/2020/20200713.html (Japanese only)

Following field tests, Nichirei Logistics Group began introducing an AI solution for automatically reading expiration dates from image data at 50 bases nationwide in FY2021. As part of its efforts to fully digitize warehouse operations, the Group is adopting tablet devices and AI solutions to expand functionality. Previously performed manually, expiration date input can now be completed using AI, enabling highly accurate readings of 93% or higher and fast processing speeds of about two seconds. This has led to improved quality control enabling anyone to capture expiration date images, simplifying overall operations, and facilitating stress-free work.

* Automated expiration date reader AI solution: Preprocessing technologies that use AI-OCR (Optical Character Recognition/Reader) and image recognition to identify the characters of the expiration date from the image and cross-reference the recognized expiration date with information in the cloud, thereby achieving higher reading accuracy.

■Autonomous Driving Forklifts

Nichirei Logistics Group began conducting field tests of autonomous driving forklifts at refrigerated warehouses in January 2018. In 2021, they were introduced at the Daikoku Distribution Center of Group company Kyokurei.

A distinctive characteristic of autonomous driving forklifts is that they can be given instructions using a tablet device, thereby making safe use possible for employees who might otherwise lack the physical strength or operating skills to manually operate a forklift. Going forward, we will steadily increase the number of facilities with autonomous driving forklifts and tie that into reducing working hours, economizing on manpower for on-site work, and improving occupational health and safety at our warehouses.

An autonomous driving forklift at the Daikoku DC

■Automated Guided Vehicles (AGVs)

In 2021, Nichirei Logistics Group introduced automated guided vehicles (AGVs) for transporting pallets supplied by Phoxter Corporation (Headquarters: Toyonaka City, Osaka; President & CEO: Junichi Sonoda), which develops image processing technology and automated guided vehicles, at the Sendai Distribution Center of Nichirei Logistics Tohoku. AGVs for transporting roll pallets have also been introduced at five transfer centers.

The Group is focused on process innovation to address labor shortages, reduce the load on workers, and change on-site work so that anyone can do it. We will continue to work on building an optimal labor environment and system leveraging the characteristics of both humans and machines.

AGV for transporting pallets

AGV for transporting roll pallets

■Truck Loading Dock Reservation System

🌐 https://www.nichirei.co.jp/news/2017/298.html (Japanese only)

At distribution centers, truck deliveries are concentrated at certain times, and without knowing each truck's cargo, smooth loading and unloading can be difficult, which has led to long wait times for truck drivers becoming a social issue.

Aiming to alleviate and eliminate the problem of trucks having to wait, in October 2017 Nichirei Logistics Group began operating a truck reservation system. As of FY2021, the system has been introduced at 30 facilities nationwide. The system allows truck operators (the shipper or shipping company) to reserve a desired time for loading or unloading trucks, in line with the loading and unloading time slot

framework at each distribution center. It also improves efficiency with regard to post-arrival administrative procedures by enabling truck operators to inform distribution centers of cargo details ahead of time. The introduction of the system has led to reductions in the time required for unloading and loading, truck operations, and truck exhaust gas emissions (CO_2 reductions).