

# Handled (automatically) with care

JA citrus facility, Kumamoto, Japan

Japanese consumers are famously demanding when it comes to the quality of fresh foods. Although it's not easy to meet their standards, Kumamoto-City Agricultural Cooperative (JA Kumamoto) discovered the key: specially designed equipment by Daifuku Co. Ltd. that handles each orange processed at the facility with care. The system has also helped to enhance quality control, cut labor costs, and improve ergonomics.



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► Located in southern Japan, JA Kumamoto's processing and distribution center ships some 220 million pieces of fruit throughout Japan each year. During peak season, the facility processes up to 2.6 million *unshu mikan* (satsuma oranges) daily.



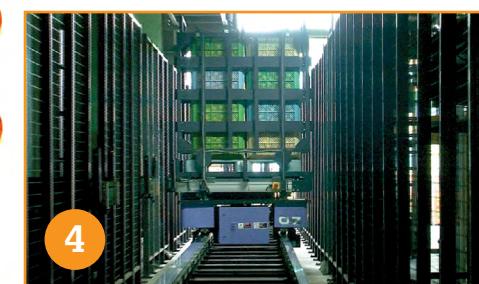
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► Forklifts deliver the pallets to an automated storage and retrieval system (AS/RS). Automation allowed JA Kumamoto to reduce the number of input stations and forklift operators required for this part of the process.



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► Farmers deliver oranges in crates supplied by JA Kumamoto. On arrival, they receive a bar-code label that will link the crates to bar-coded plastic pallets.



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► Sorting transfer vehicles shuttle the pallets to temporary storage in the AS/RS. Pallets are assigned to storage locations based on the grower and the field where the fruit was harvested.



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► When oranges are released for processing, the pallets are conveyed to a robotic depalletizer. The robot places the crates on a belt, which takes them to vertical lifters for delivery to the third floor for sorting. Each lifter can handle about 1,000 crates per hour.



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► In the sorting area, workers sort the oranges manually, separating out those that are damaged to be used for juice. The remaining oranges are waxed and dried, then sorted a second time.

► As the oranges pass through these tunnels, cameras take photos from all sides. Sensors match the photos to the individual piece of fruit and analyze the images for shape, size, scratches, and color. Next, light sensors measure internal qualities such as sweetness and acidity. The system typically processes four oranges per second.



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► Based on a lightning-fast analysis of the photos and data, the system assigns each piece of fruit one of 30 grades. The oranges then enter a "finger domino sorter," with 28 lines. Articulated "fingers" in the belts gently drop individual oranges into chutes based on their grade.

► Workers make one last check to remove any oranges that may have been damaged during sorting.



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► During filling, cases start out at a tilt, so the *unshu mikan* gently roll rather than drop to the bottom. As the case fills, the angle is gradually reduced until the case is upright. Once filled to a set weight, the cases receive a gentle shake to level the contents.



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► Sealed and labeled cases travel to the first floor, where a "surfing" (sliding shoe) sorter sorts them for customer orders. Most finished product goes into a unit load AS/RS (shown here) or to a miniload, depending on the order size and whether or not it is palletized.



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► Both the unit load AS/RS and the miniload include sorting transfer vehicles that move the pallets or cases to transfer platforms. From there, orders are taken to the shipping area by forklift.



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► Workers floor-load the cases—between 25,000 and 30,000 each day during peak season—into trucks. The side-opening doors are typical of the vehicles used in the operation.