Logistics management of pharmaceutical products with bar codes and RFID tags TBC Tokyo, Toho Pharmaceutical Co., Ltd.

ABSTRACT

Toho Pharmaceutical Co., Ltd. (Toho Pharmaceutical) is a wholesaler of pharmaceutical products, which was established in 1948. Toho Pharmaceutical has nine subsidiaries and three affiliated companies. These companies all belong to the Kyoso Mirai Group and work in cooperation to provide services in areas across Japan.

The Kyoso Mirai Group, which is currently a holding company, has total group sales exceeding 1 trillion (¥) Yen and serves about 100,000 clients including; hospitals, clinics and dispensing pharmacies.

The group's nationwide logistics network is supported by logistics centres located in six areas in Japan. In this article, we report on TBC Tokyo, the largest of these centres.

By **Ryuta Suzuki,**
TOHO Pharmaceutical Co., Ltd

Background

Before explaining TBC Tokyo, we would like to briefly discuss its historical background along with the Japanese pharmaceutical product supply chain. In Japan, wholesalers provide all the services that connect pharmaceutical manufacturers and medical institutions including; securing product stocks, providing information on pharmaceutical products, determining prices and delivering goods. Since trusted wholesalers deliver products produced by trusted manufacturers to medical institutions, problems with fake medicines do not exist in present-day Japan.

Toho Pharmaceutical created its first large logistics centre in 1988. At that time there were already standardised pharmaceutical product codes compliant to EAN specifications and attempts were being made to print JAN codes (EAN-13 in Japan) on sales packages. JAN codes (present-day GS1 codes) were put to full use for automatic product checking together with the original company bar codes attached to transportation equipment (such as folding containers) for automatic transportation within the storehouse. We at Toho Pharmaceutical not only improve economic performance and efficiency through a concentration of products, but we also strictly control the amount of supply for each product item and provide a steady supply of products.

In 2002, the Ministry of Health, Labour and Welfare issued the Revised Pharmaceutical Affairs Law, which was aimed at ensuring the post-marketing safety of pharmaceutical products of biological origin (products made from materials of human or animal origin, such as blood). This revision of the law, which obligated companies to keep records of the LOT numbers of such pharmaceutical products sold or dispensed, served to raise awareness of the importance of LOT management in the pharmaceutical industry. There was also an increasing interest among medical institutions in obtaining information on the LOTs and expiration dates of delivered products, which created the need to manage products by LOT rather than by item.

We subsequently created a series of centres to implement stock management by LOT, and in November 2006, TBC Tokyo started operations as a replacement for our first logistics centre.

Operations at TBC Tokyo

Overview and specifications

TBC Tokyo was created to realise a high level of accuracy, efficiency and automation in the distribution of pharmaceutical products based on the knowledge and experience accumulated over many years. Although bar code checking at each process had been conducted, even in the previous logistics centre, TBC Tokyo introduced a 100% paperless environment, which pursues the integration of human and machine processes to attain higher automation and accuracy of the operation. Flashing RFID tags are also adopted to prevent errors in picking areas.

Outline of TBC Tokyo

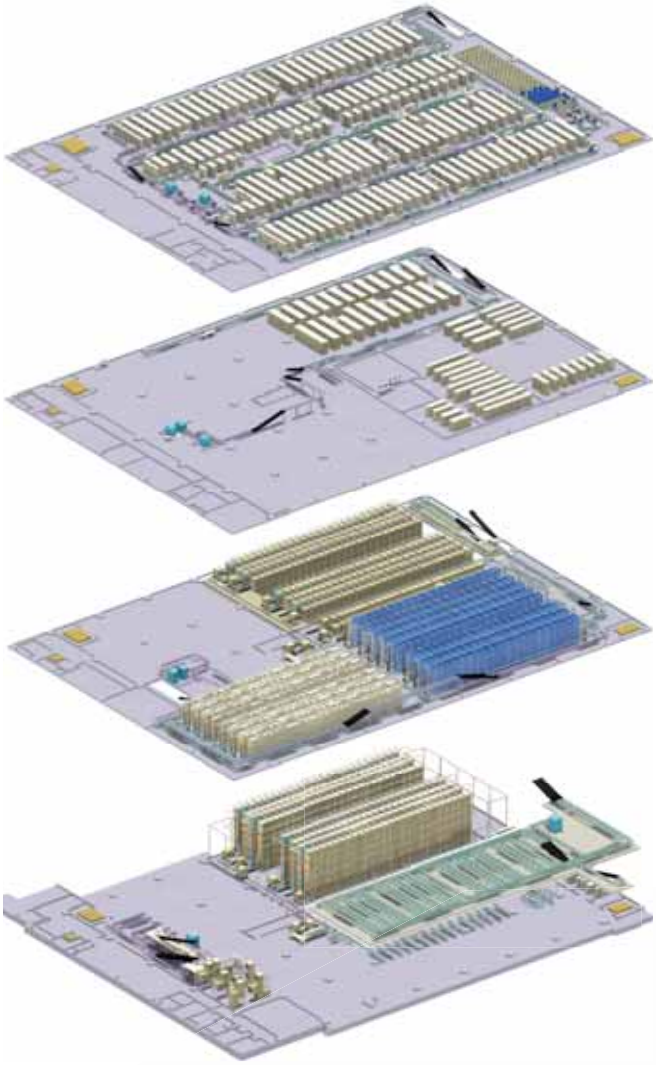
Established: November 2006 (Shinagawa-ku, Tokyo)
Site area: Approx. 10,000 m²
Total floor area: Approx. 20,000 m² (4 floors)
Stock items: 22,000 items (98% of which are prescription drugs)
Amount of Supply: 25 billion (¥) Yen per month
Suppliers: 300 companies
Sales offices: 75 (These sales offices provide products to a total of 35,000 medical institutions.)

4F: Sales package digital picking area
Combination of digital picking and handy terminals; simple transportation lines; flashing RFID tags

3F: Area for refrigerated products and psychotropic drugs; area for products of irregular shapes
Fingerprint identification lock

2F: Automatic packing and storage area
100% automated area with a location-free system

1F: Receiving and shipping area; storage with automatic pallets
Receipt and shipment of products and buffer lines



Receipt of products (manufacturers' original packs and sales packages)

TBC Tokyo receives 10,000 cases of manufacturers' original packs and 10,000 boxes of sales packages per day on average. Although we are working to check all these products using bar codes, about 30% of original packs do not have bar codes. (At present manufacturers are required to print bar codes (GS1 GTIN) on sales packages, but have no obligation to mark bar codes on original packs except for biological products).

Since stocks are managed by LOT at TBC Tokyo, information on the LOT and expiration dates of products need to be entered into the computer system when they are delivered to the centre. To this end, we obtain, in advance, the data on products scheduled for delivery from manufacturers and check delivered products by comparing them against the obtained information. At present, bar coding of information on LOT and expiration dates has not been fully implemented, except for biological products, but we do hope this could be achieved in the near future.

Automatic transportation

Conveyor lines with a total length of 3,000 meters are installed in the logistics centre, where storage control labels are attached to original packs and handling containers, as they are transported by conveyors. These originally designed control labels have bar codes to be read by bar code readers at the side of the conveyors. The bar code readers determine transportation routes and automatically transport products to their assigned destination. The control labels are automatically attached by pneumatic machines and transportation is performed entirely without manual operation.

Automatic labelling

Handling containers transported by conveyors

Automated storage

Upon receipt, original packs are automatically transported to automated storage devices.

There are a total of 14 automated storage devices with either rotary racks or shelves, and 22,300 stacks of products are managed using a free location system. Products are controlled with the storage control labels linked with storage locations and are stored in stacks on a 100% first-in-first-out basis.

Products to be delivered to sales offices, in original packs, are automatically transported out of the automated storage area to the shipping area, entirely without manual operation. The supply of sales packs for picking is also done automatically from the storage area to the shipping floor.

Automated storage for original packs (with rotary racks)

Automated storage for original packs (with shelves)

Automatic folding machines for the handling containers

Sales package picking

On the sales package shipping floor, products are stocked on dedicated shelves, from which packages are picked by using instructions given from lights built into the shelves (DPS: Digital Picking System) or by using 'handy' terminals. Products are managed using a free location system on this floor as well, with stock on each stack linked with a particular LOT and expiration date. Operators pick packages from designated stacks without having to paying attention to LOT numbers or expiration dates.

In order to double-check shipping errors, GS1 codes are read with scanners to inspect all items that have been picked from shelves.

Picking

Flashing tags

The shipping floor, where sales packages are processed, is divided into a total of 16 areas. TBC Tokyo's shipping system is known as the relay system, in which handling containers, which are automatically assembled further up the line, are delivered to individual areas as needed. Picking starts in individual areas without waiting for containers (advance picking system). This system eliminates operators' waiting time but creates the need to match baskets containing products that have been picked to appropriate handling containers.

With a view to overcoming an identification difficulty, we developed a flashing tag (jointly developed with the Ubiquitous Networking Laboratory; a patent application has been filed). This flashing tag is attached to a basket before products are picked and flashes when the matching container arrives at this area, and the bar code on its control label is read. This flashing tag, designed to enable operators to accurately perform their jobs without stress, was developed in order to avoid errors in these operations, which can result in a large number of erroneous shipments.

Flushing Tag Specifications

Conform with : ARIB STD-T67
Communication frequency: 429 MHz band
Modulation rate: 14.4 kbps
Battery: Lithium ion

Shipment

Handling containers, filled with products in the sales package shipping floor and original packages transferred out of the automated storage area, are transported to the shipping area and are stacked in the buffer area to be sorted according to destination before final shipment. Operators check how packages are being processed, using their terminals, and give instructions to send correctly identified sets of products to relevant shipping lines.

Containers and original packs with the same destination are subsequently sent to the designated line in batches. The package at the head of each batch is examined with a 'handy' terminal to check its control label against the cargo destination bar code.

Summary

Thanks to the above operations, TBC Tokyo has achieved a shipping accuracy of 99.9999%. In fact, only several times a year where shipping errors have occurred it is mostly with products without bar codes, such as hygiene products. These results prove the importance of carefully checking products using the GS1 code as a means of preventing shipping errors.

At Toho Pharmaceutical's logistics centres, we are working to create a system designed to achieve seamless integration between manual and machine operations, and we believe that we have achieved a certain level of perfection for our system at TBC Tokyo. Transportation within the logistics centre is automated using bar codes, and all operations, including

labelling, are automated. Our system, which enables even inexperienced operators to perform jobs without errors by following instructions from machines, is designed to ensure accuracy in the final outcome.

There are many operations left unmentioned in this report, which all make use of variations of automation technology using bar codes, some in combination with attempts at developing new technologies.

Although at TBC Tokyo, staff still perform the main roles, with the support of machines but in a fully automated system, of the future, this maybe reversed with machines performing the main roles, with staff providing the support.

We receive as many as 20,000 products from about 300 companies, which vary in packaging and shape. There is also no unified standard about where to place source-marked bar codes, which will create difficulties in further promoting automation. Accordingly, apart from various standardisation efforts, the development of automatic identification technologies, such as RFID and image recognition, that meet our needs is likely to be an important key to the future.

ABOUT THE AUTHOR

Ryuta Suzuki, Deputy Director, Information Systems Planning Office, Development Division TOHO Pharmaceutical Co., Ltd

After joining TOHO Pharmaceutical Co., Ltd.(TOHO Pharma) in 1987, he had been engaged in the development of electronic ordering system between medical institutions and the company as the staff of TOHO System Service Co., Ltd. (a subsidiary of TOHO Pharma) since 1988. Returning to TOHO Pharma in 1995, He has been in charge of various system developments such as in-company network system and barcode system for supply chain.

He has been involved in the establishment of bar code indication rules for drugs in Japan since 2004 when he joined a working group of JPWA (Japan Pharmaceutical Wholesalers Association) and was concurrently appointed as a member of the code system study working group of the Ministry of Health, Labour and Welfare.