Optimization of the value chain using Load Forming Logic

Optimization of the value chain using Load Forming Logic

Food retailers are finding themselves with a conflict between local store processes and distribution center processes with respect to the value chain. Optimization of the value chain in the local store is often to the detriment of the value chain in the distribution center, and vice versa. Additionally the transport component needs to be considered since shipping half-empty pallets or roll containers not only costs money, but also negatively impacts the company's CO_2 footprint and thus the overall image of the company. Vanderlande's Load Forming Logic, part of the Automated Case Picking concept, solves this conflict by calculating the optimal balance between the contradictory parameters, and so helps food retailers excel in customer experience, CO_2 reduction and ergonomics whilst saving money.

With Load Forming Logic:

› Improved customer experience with store-friendly deliveries
› Reduced CO_2 footprint
› Improved ergonomics

Conventional order picking

Although often invisible to consumers and even store managers, the really heavy work takes place in distribution centers (DC) with manual operations. Pallet trucks or roll container trains travel through the distribution center following a one-way track and stopping at each pick location (Figure 1). Cases (boxes containing the products we all buy at stores) are manually loaded onto pallets or containers. With an average of 150 picks/hour/operator, this process is not only labor intensive, but also ergonomically unsafe (operators lift heavy cases above their heads), prone to errors and potentially dangerous, e.g. fork-lift truck traffic for replenishing operating together with the picking process in the same aisle (Figure 2).

Due to the fixed slotting (the positions of the SKUs) in the distribution centers, the picking sequence is predetermined and inflexible. However, local stores are not all the same! Therefore, local stores may need to use a back-store process to redistribute the cases over the pallets or containers before they can go to the shop floor. This is, once again, labor intensive and ergonomically unsafe. If the back-store process is omitted, the pallets or containers have to travel miles on the shop floor. And if replenishment in the local store takes place during opening hours – which is very often the case – this lack of pre-sortation results in a degraded customer experience.

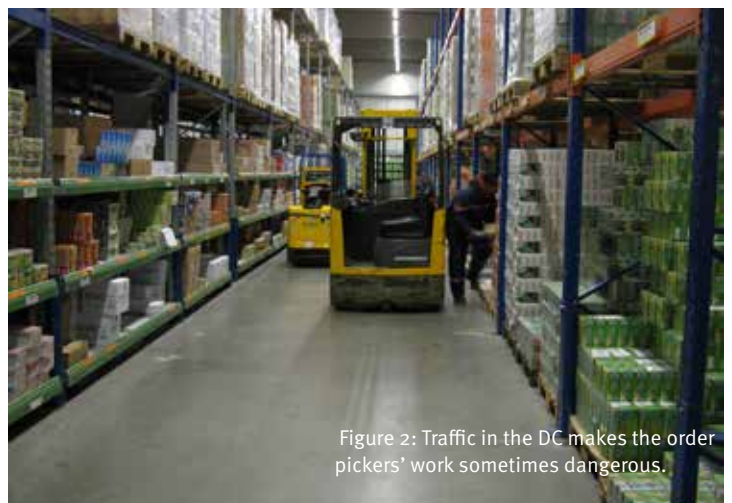Figure 1: Manual order picking in a distribution centre is heavy work.

Figure 2: Traffic in the DC makes the order pickers' work sometimes dangerous.

Automated Case Picking

Vanderlande's Automated Case Picking concept (ACP) is a fully automated replenishment (inbound), storage and order picking (outbound) system for distribution centres. Manufacturers' pallets are de-stacked automatically, then checked, scanned and stored in an automated storage and retrieval system (AS/RS) in which specialised shuttles are used for both storage and retrieval. Picked cases travel to the palletizer where a robot places them on a pallet or roll container. The finished carriers are shrink-wrapped and are then ready to be shipped to the store. Several times faster than an operator, the stacking robot is capable of creating stable loads without the risk of a case being placed on the wrong carrier.

A schematic overview of the ACP concept is presented in Figure 3. Since the picking sequence is no longer fixed, any store – from local kiosk to megastore – receives its ordered goods delivered on carriers specifically tailored to its requirements. The secret behind this is Load Forming Logic, software which creates stable and store-friendly loaded pallets or roll containers.

Vanderlande ACP highlights:

› Automated depalletizing
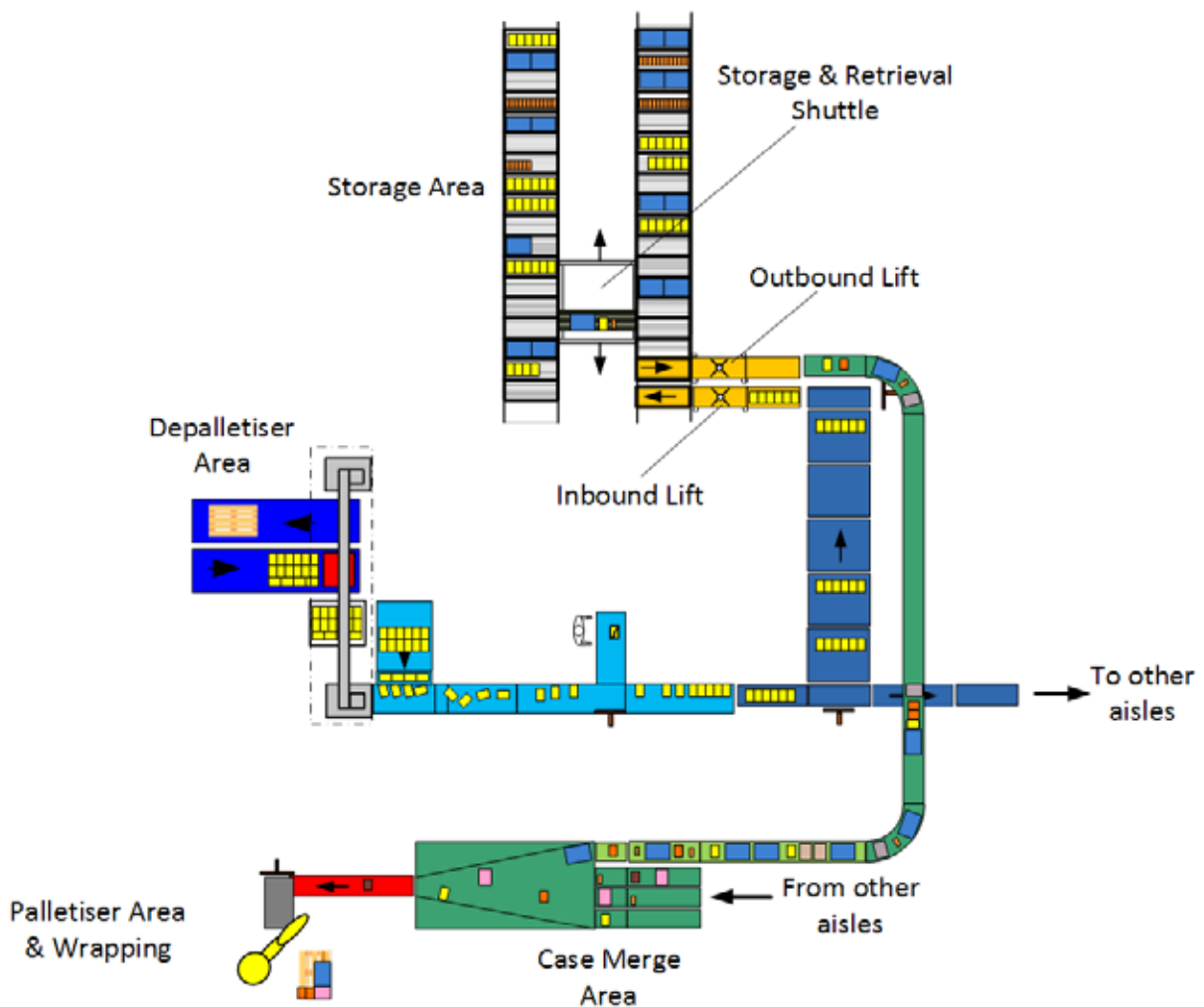› Automated palletizing
› Ergonomically safe

Figure 3: Top overview of Automated Case Picking (ACP) concept.

Load Forming Logic

Placement of store order to back-door delivery usually takes less than 24 hours, with a trend towards multiple deliveries per day. The whole chain of actions between ordering and delivery needs to be fast and flawless. Out-of-stock is one of most annoying customer experiences and it leads to a decrease in turnover and eventually loss of customers. Recent studies have shown that on-shelf availability is not the same as store availability. Products are often in the back-store, waiting for in-house sortation so, despite on-time order delivery, the products themselves do not reach the shelves in time. What if this back-store process could be omitted completely?

Vanderlande has been developing Load Forming Logic (LFL) since 2011. The LFL software converts DC orders (from local stores) into a set of stacking patterns for the automatic palletizers. Stacks can be tailored to meet the needs of the local store without affecting DC processes.

LFL basically answers three questions, each addressed separately in the process flow as depicted in Figure 4:
› Which cases go on which carrier (pallet/roll container)?
› How are the cases to be stacked on each carrier?
› What is the best arrival sequence of the cases to the palletising station?

The first process step of LFL is where most value is added for the customer. Cases are distributed over carriers taking into account the ordering store's floor layout. This ensures products that are close to each other in the actual store are kept together, as well as products from the same family. The secondary objective is to have as few carriers as possible in the shop's aisles. This requires high carrier fill rates and clever selection of products for each stack. In addition, LFL distributes the volume (and/or weight) of the order evenly over the carriers to ensure a stable payload for the truck drivers.

An example of this is shown in Figure 5. This top view shows the aisles in the store and how the ordered products have been distributed over nine carriers. The ergonomically-unsafe back-store sortation process has been eliminated completely meaning that pallets or roll containers can be sent to the correct aisle directly from the truck.
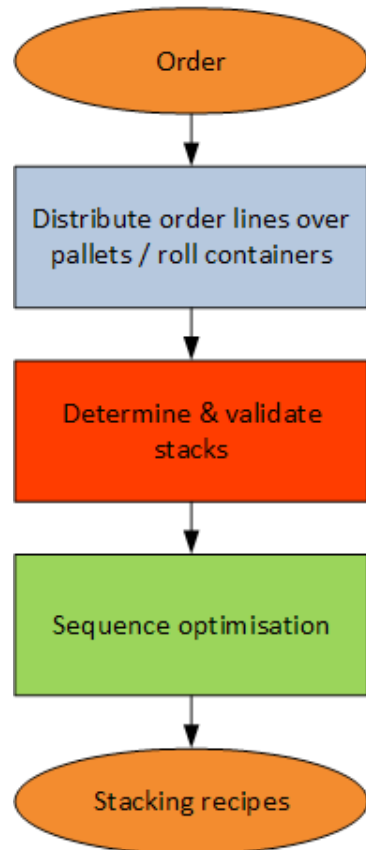

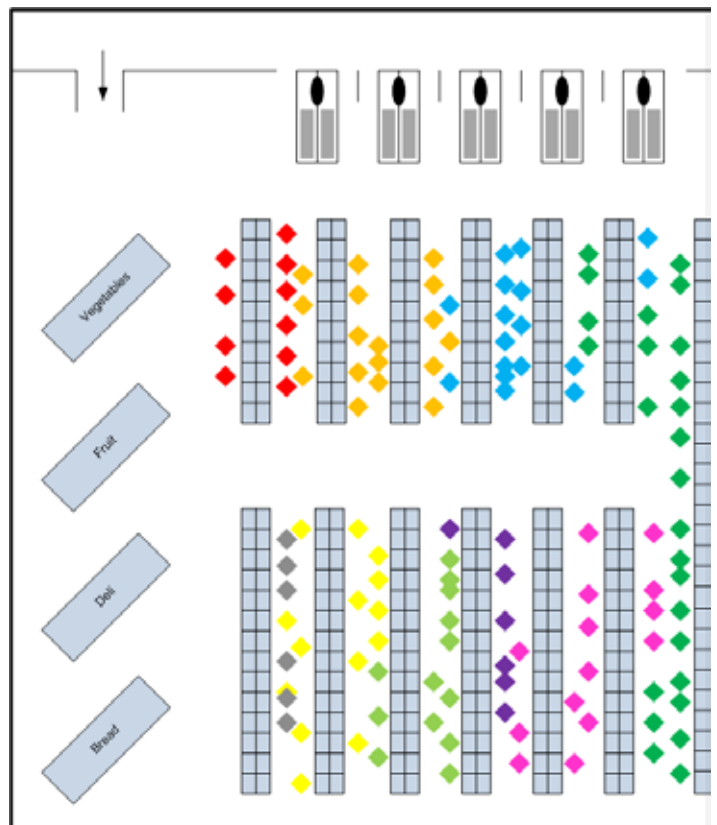Figure 4: Process flow Load Forming Logic.

Figure 5: Figure 5: Store-friendly delivery can be achieved for each store layout (example top view) specifically. Diamonds of same colour represent cases that are stacked together on one carrier.

Once the cases have been allocated to a pallet or roll container – LFL is capable of handling multiple carrier types per order – the stacks are calculated using a sophisticated stacking engine. This component makes sure that products are not damaged by taking into account the maximum weight that can be placed on top of each product (e.g. wine boxes on the bottom of the pallet and coffee pads in the upper region of a stack).

In addition, different top-surface shapes can be distinguished and utilized in the stack calculations. The current trend towards more shelf-ready packaging means that more and more products are unable to provide support over the full top surface; sometimes only the edges or the corners of a pack are capable of providing support. LFL takes this information into account when determining the best stack arrangement. An example of a calculated stack pattern is shown in Figure 6.

The final step in the LFL process flow is sequence optimization; given the stacks from the previous step, possible arrival sequences of the cases at the palletizer are determined. These sequences are calculated so that the stack remains stable after the placement of each case. To increase the capacity of the DC ACP supply chain, cases of the same SKU are sequenced consecutively when possible.

Improving the triple bottom line
Triple bottom line incorporates the notion of sustainability into business decisions. The triple bottom line is an accounting framework with three dimensions: social, environmental (or ecological) and financial. Load Forming Logic (in combination with ACP) enables a reduction in logistical costs per case while improving the people and planet dimensions at the same time.

› People: Load Forming Logic improves working conditions in food retail distribution centres and local stores by reducing or even eliminating heavy labour while improving customer experience in the stores.
› Planet: Load Forming Logic reduces the number of carriers (pallets / roll containers) and thereby the number of transport kilometres and the CO_2 footprint. This is achieved mainly through the optimization of fill rates (volume and/or weight fill).
› Profit: Load Forming Logic reduces the logistical costs per case by improving the efficiency of the supply chain processes. Additionally, there is the opportunity to increase turnover through improved shelf availability.

New opportunities for the future
The compact distribution center enables food retailers to locate their DC close to (main) cities further improving their supply chain and reducing transportation miles.

Flexibility
Vanderlande's Load Forming Logic software enables food retailers to optimize the supply chain according to their own strategy and (environmental) targets. LFL is configured to find the optimal balance between the number of carriers and store friendliness.
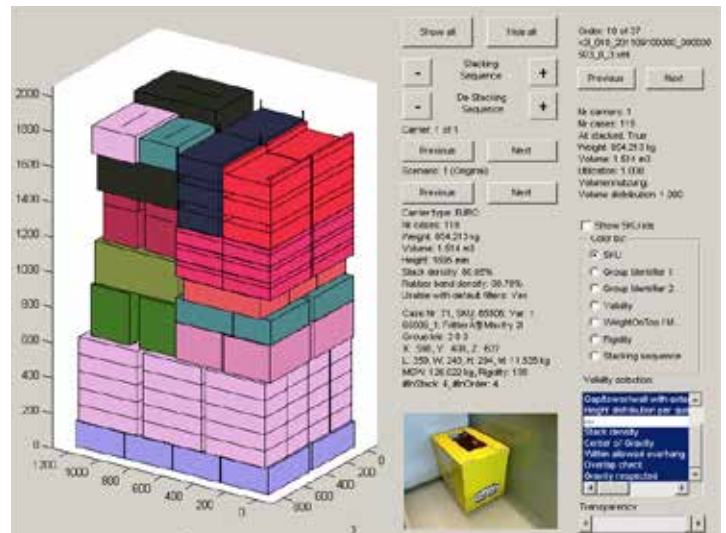

Figure 6: Load Forming Logic automatically calculates stable stacks, and ensures damage-free delivery of products to the stores.

Future changes in either supply chain optimization or store layout (the positions of products) can be incorporated into the software. This flexibility enables food retailers to continuously create a positive balance between people, planet and profit.

Conclusion
Vanderlande's Automated Case Picking concept facilitates food retailers in the optimization of the entire logistics value chain. Eliminating the fixed slotting and picking sequence in distribution centres allows food retailers to focus on store-friendly delivery which in turn contributes to an improved customer experience in local stores. Fully automated material handling in distribution centres improves ergonomics, not only in the warehouse but also in local stores. Back-store sortation can be eliminated from the replenishment process, improving ergonomics and reducing labour costs.

Load Forming Logic (the computational heart of ACP) optimizes the set of loaded carriers that together fulfil a store's order, in terms of fill rate, family grouping and store friendliness. Increased fill rates result in fewer pallets or roll containers being shipped which provides an immediate pay off in terms of reduced transport costs and lower CO_2 emissions. By reducing the logistical costs per case and (potentially) increasing turnover as a result of better shelf availability, the financial benefits of LFL are substantial. Through Load Forming Logic, Vanderlande is actively developing solutions in accordance with its declared triple bottom line sustainability strategy: people, planet, profit.

LFL for a Triple Bottom Line:

› People: improved working conditions and customer experience
› Planet: improved CO_2 footprint
› Profit: lower costs per case

Innovation Center

Reliable partner for value-added automated material handling solutions

Vanderlande is the global market leader in baggage handling systems for airports, and sorting systems for parcel and postal services. The company is also a leading supplier of warehouse automation solutions.

The company focuses on the optimisation of its customers' business processes and competitive positions. Through close cooperation, it strives for the improvement of their operational activities and the expansion of their logistical achievements. Vanderlande's extensive portfolio of integrated solutions – innovative systems, intelligent software and life-cycle support – results in the realisation of fast, reliable and efficient automation technology.

Established in 1949, Vanderlande has more than 3,300 employees, all committed to moving its customers' businesses forward at diverse locations on every continent. With a consistently increasing turnover of more than one billion euros, it has established a global reputation over the past six decades as a highly reliable partner for value-added automated material handling solutions.

For more information about the company, its products and technology, as well as career opportunities, please visit www. vanderlande.com.

VANDERLANDE

Authors:
Joost van Eekelen, PhD
Esther Kersten, MSc

For more information, please contact Vanderlande:
Vanderlande Industries B.V.
Remko van Gils, Market Director Food Retail

Vanderlande Industries
Vanderlandelaan 2
5466 RB Veghel
The Netherlands
Fax: +31 (0)413 36 29 10
Phone: +31 (0)413 49 49 49
Internet: www.vanderlande.com
E-mail: info@vanderlande.com

› **vanderlande.com**

MOVING YOUR BUSINESS FORWARD