FOOD & DRINK STORAGE BRIEFING

CONVENTIONAL, SEMI-AUTOMATED OR FULLY AUTOMATED?

Choosing the right warehouse storage strategy for food & drink operations

A practical guide to balancing usable capacity, SKU complexity, stock rotation, peak throughput and future growth in food & drink warehouses.

THE PRINCIPLE

There is no hierarchy from conventional racking to automated storage. There are simply different operating models for different stock and throughput profiles.

The right answer may be conventional racking, semi-automated shuttle storage, fully automated pallet handling or a combination of approaches. Start with the operation. Understand the stock and the data. Then determine which route genuinely improves it.

The storage decision has changed

Food and drink warehouses rarely face a simple capacity problem. The challenge is balancing pallet capacity with SKU complexity, stock rotation, accessibility and throughput, particularly as occupancy rises. Seasonal and promotional inventory, retailer-specific ranges, changing pack formats and batch or shelf-life requirements can all restrict where stock can actually be stored. An empty pallet location is not necessarily the right pallet location.

As occupancy and throughput rises, the operation begins to compensate: pallets are relocated to release suitable positions, temporary floor storage appears, forklift travel increases and third-party warehousing becomes part of the peak-season response. A warehouse can therefore reach its practical operating limit before every pallet position is occupied.

This is why the storage decision should not begin with technology. It should begin with the stock and throughput profile the operation needs to support.

THE DECISION TO MAKE

Which storage model best fits the stock we need to hold, the access rules we must protect and the throughput we need to sustain?

What should drive the choice?

- Peak pallet holding and the shape of demand, not average occupancy alone.
- SKU profile, including pallets per SKU, product families, pallet formats and dwell time.
- Shelf life, batch, date-code, FIFO/FEFO, product compatibility and customer-allocation requirements.
- Inbound, production supply, replenishment, full-pallet and case-pick demand, and dispatch throughput during the busiest operating windows.
- Movement, reshuffling and forklift travel required to keep stock accessible.
- Building constraints, investment available, and the level of operational change the business can support.

Good storage design begins by defining the operating requirement. Only then should conventional, semi-automated and fully automated options be compared.

Three operating models, not three levels of improvement

Conventional, semi-automated and fully automated storage should not be treated as good, better and best. Each represents a different balance of accessibility, density, movement, control, complexity and investment.

	CONVENTIONAL	SEMI-AUTOMATED	FULLY AUTOMATED
Movement model	Forklift and driver travel to the pallet.	Forklift works at the lane entrance; shuttle moves pallets within the lane.	Four-way shuttles, lifts and conveyors move pallets within the storage structure.
Space model	Access aisles remain part of the design. Density varies by racking format.	Deep lanes reduce aisle requirements where pallet quantities support lane depth.	No forklift aisles inside the automated racking; the available cube can be used at high density.
Best question	How much direct access and flexibility does the stock require?	Can sufficient pallets per SKU be grouped into deep lanes productively?	Do capacity, throughput, movement and control justify a system-directed model?

Selectivity vs density

Most storage formats sit somewhere on the same trade-off. Greater density usually means fewer aisles and less direct access, while greater selectivity requires more space for movement. Automation changes that relationship because system-directed equipment retrieves pallets within the racking superstructure, allowing high density without relying on forklift access to every location.

The appropriate point on this spectrum depends on the SKU profile, pallets per SKU, stock rotation requirements and throughput, not on density alone.

01 Conventional storage

Conventional storage is not simply the option used before automation becomes viable. For the right stock profile, it can be the most operationally and commercially appropriate solution. For food and drink operations with a broad SKU mix, retailer-specific inventory, variable pallet quantities or frequent batch selection, direct access can be more valuable than maximum physical density.

Where conventional storage earns its place

- Selective pallet racking where direct access, broad SKU ranges and frequent batch selection matter
- Push Back where suitable product families can trade some selectivity for greater density
- Drive-In where larger quantities of similar or slower-moving stock can use deep lanes effectively
- Pallet Live where controlled FIFO movement supports the product and throughput profile
- Mobile Racking where selective access is required but reducing permanently open aisles creates worthwhile capacity

What the design needs to get right

Conventional storage performs best when the layout is designed around the behaviour of the stock rather than simply the maximum number of pallet positions. That means understanding which SKUs need immediate access, which can be grouped into deeper storage, how frequently batches change and where replenishment or production demand creates the greatest movement.

Where conventional storage can go wrong

The design risk is focusing on pallet positions rather than usable pallet positions. A denser layout creates limited value if it increases forklift travel, restricts access to the right batch or creates partially occupied lanes that cannot be used effectively.

FOOD & DRINK DECISION LENS

Direct access can be operationally stronger where SKU variety, batch selection, promotional ranges or retailer-specific stock create frequent exceptions. The test is whether the layout gives the operation usable positions and reliable access at peak, not simply the highest theoretical pallet count.

02 Semi-automated shuttle storage

Semi-automated shuttle storage changes who performs movement within a deep storage lane. The forklift deliver retrieves pallets at the lane entrance, while the shuttle carries each pallet to or from its storage position. This can remove substantial forklift travel from within the storage lanes and enable significantly deeper storage where the SKU profile supports it.

The question is not simply whether shuttle storage can increase density. It is whether pallets per SKU, throughput and stock-rotation requirements allow the lanes to be used effectively.

Where shuttle storage is strongest

- Sufficient pallet quantities per SKU keep deep lanes productively occupied
- Higher density is required without moving to a fully automated operating model
- Reducing forklift travel and repeated pallet repositioning is commercially meaningful
- FIFO or FILO lane strategies can be planned around the stock profile and date-control requirement

What changes operationally

The forklift remains part of the wider operating model, but no longer travels within the deep lane. The benefit is not only density. It is the combination of deeper storage, reduced forklift travel and a more structured method of moving pallets within the lane.

Food & drink considerations

Pallets per SKU	Deep lanes need sufficient compatible stock to remain productively occupied.
Stock rotation	FIFO or FILO logic must reflect shelf life, batch control and the required retrieval sequence.
Pallet condition	Loads must be suitable for the racking, shuttle interface and clearances used in the design.
Peak throughput	Lane demand, shuttle availability and forklift transfer capacity should be tested against the busiest operating period.
SKU change	Seasonal, promotional and new product lines should be considered so lane utilisation remains practical as the range changes.

03 Fully automated pallet storage

With full automation, storage and pallet movement become part of the same operating model. In AutoCube®, four-way shuttles move pallets within the storage structure, while lifts connect levels and MAxIQ® coordinates inventory locations, movement priorities and system workflows.

Instead of forklift operators travelling through storage aisles to locate and retrieve stock, routine movements within the automated storage block are system directed. For food and drink operations, this changes the relationship between inventory growth and internal movement. Higher stockholding does not automatically have to create the same increase in forklift travel, congestion and manual pallet handling.

When full automation becomes worth investigating

Usable capacity	Suitable locations become difficult to find even though nominal pallet positions remain.
Movement	Higher stockholding is creating more forklift travel, relocation or congestion.
Peak flow	More predictable storage and retrieval is needed as inbound, production and dispatch demand increase.
Control	Batch, shelf-life, FIFO/FEFO or dispatch priorities are becoming harder to maintain at high occupancy.
Growth	The current movement model is unlikely to scale with the future stock and throughput requirement.

Automation should earn its place

Full automation should solve a defined operational problem and build a commercial case against the credible alternatives.

- The pallet and load profile is sufficiently consistent for the proposed system
- Peak inbound, production-facing and outbound demand can be supported at the required operating rate
- Batch, shelf-life, FIFO/FEFO and dispatch-priority requirements can be supported within the proposed control logic
- Building, fire, maintenance, interfaces and supporting infrastructure suit the proposed design
- The whole-life case is stronger than credible conventional, semi-automated, external-storage or expansion alternatives

04 The hybrid warehouse

Food and drink inventory rarely behaves as one uniform stockholding. High-volume production lines, seasonal ranges, promotional inventory, slow movers, packaging, bulk pallet storage and case-pick stock can each create very different storage and access requirements.

A hybrid design recognises those differences rather than forcing every product family into the same storage method. One area may prioritise density, another immediate pallet access, another efficient case picking and another repeatable, system-led movement.

The most sophisticated solution is not necessarily the most automated. It is the one that applies the right storage method to the right stock.

The design challenge is not to decide which single technology wins. It is to determine which stock belongs in which storage model, and how those areas work together as one operation.

BULK PALLET STORAGE	High-density storage selected around pallet volume, dwell time and throughput.
DEEP-LANE STOCK	Semi-automated shuttle where pallets per SKU support productive lane depth.
CASE PICKING	Pallet Live, mezzanine or picking-tower solutions that support replenishment and the pick face.
SELECTIVE / SLOW MOVERS	Direct-access racking where flexibility matters more than maximum density.
AUTOMATED FLOW	AutoCube® where capacity, movement, control and throughput justify system-led storage and retrieval.

The test: does the storage model still work under pressure?

A food and drink storage strategy should not only work at average occupancy. It should continue to work when seasonal inventory arrives, production increases and the product mix becomes more complex.

ACCESS	Can the right product, batch or date be retrieved without unnecessary reshuffling?
ROTATION	Can FIFO,FILO, FEFO and other stock-rotation requirements still be maintained?
MOVEMENT	Does higher occupancy create a disproportionate increase in forklift travel or pallet touches?
THROUGHPUT	Can production, picking and dispatch still be supplied at the required rate?
OVERFLOW	Does the storage model continue to work without routinely creating temporary floor storage or external overflow?

If more inventory creates more movement, more intervention and more workarounds, headline pallet capacity is only telling part of the story.

A decision framework for food & drink warehouses

Before comparing storage systems, establish how the food and drink operation needs to perform. The six questions below turn broad aims such as “increase capacity” or “reduce labour” into requirements that can be tested.

01 What must be stored at peak, and why?	Peak pallets, seasonal build, promotional inventory, packaging, buffers and retailer-specific stock.
02 How is that stock distributed?	SKUs, pallets per SKU, pallet formats, product families and dwell time.
03 What access rules apply?	FIFO, FEFO, batch, date code, compatibility, customer allocation and quality status.
04 What must move?	Inbound, replenishment, production demand, full-pallet dispatch and case-pick activity.
05 Where is effort being consumed?	Relocations, forklift travel, temporary storage, external warehousing and additional labour.
06 What must the future operation support?	Growth, new ranges, service expectations, building constraints and acceptable operational change.

Compare the operating model, not just the equipment

A credible business case compares what the warehouse will look like under each route. Capital cost matters, but it is only one part of the decision.

	CONVENTIONAL	SEMI-AUTOMATED	FULLY AUTOMATED
Access	Ranges from direct to restricted deep-lane access.	Forklift accesses the lane entrance; shuttle moves pallets within the lane.	System-directed through defined interfaces.
Use of cube	Depends on aisles, lane depth and actual utilisation.	Supports deep-lane density without routine forklift lane entry.	Reduces internal forklift-access requirements within the storage structure.
SKU fit	Strong where broad SKU ranges or lower pallet quantities favour selectivity.	Strong where pallet quantities per SKU allow productive lane utilisation.	Assessed against pallet, stock, movement, throughput and control requirements.
Peak performance	Depends on people, trucks, routes and staging.	Depends on shuttle availability, forklift transfer capacity and lane demand.	Depends on engineered carriers, lifts, interfaces, buffers and control logic.
Exceptions	Often managed through operating procedures.	Requires plans for pallet issues, blocked lanes and shuttle recovery.	Requires load-acceptance criteria and designed exception and recovery routes.
Operational change	Closest to an established forklift-led model.	Introduces shuttle management, charging and recovery requirements.	Introduces system-led movement, controlled interfaces and integrated support.
Investment profile	Typically lower initial investment; project-specific.	Depends on lane configuration, shuttle quantity and operating requirement.	Higher-infrastructure route requiring a whole-life operational and commercial case.

What the business case should include

- Usable pallet capacity, not theoretical slots.
- External or overflow storage cost, transport and additional handling.
- Forklift fleet, travel, pallet touches and congestion.
- Peak labour, overtime and additional MHE required to maintain service.
- Production supply and dispatch performance at high occupancy.
- Stock rotation, date control and retrieval performance.
- Temporary storage, staging and marshalling space.
- Maintenance, controls, software, integration and recovery requirements.
- Implementation disruption and future capacity and throughput headroom.

Don’t choose the technology first. Prove the operating model.

A storage system should earn its place in the warehouse.

The answer may be conventional racking, semi-automated shuttle, AutoCube® or a combination of approaches. What matters is whether it solves the constraint the food & drink operation actually has.

START WITH THE STOCK	What must be held, for how long and under which shelf-life, batch and access rules?
UNDERSTAND THE MOVEMENT	Where are travel, handling, congestion and workarounds increasing?
DEFINE THE CONSTRAINT	Is the business short of physical space, or is usable capacity being lost through the way stock is stored and accessed?
TEST THE CREDIBLE ROUTES	Compare each route against the same capacity, throughput, access and commercial requirements.

FOOD & DRINK WAREHOUSE STORAGE REVIEW

Compare the credible options against your actual stock and movement data.

Thistle Systems begins with the operation rather than the solution: peak stock, SKU profile, throughput, pallet movements, access requirements and building constraints.

About Thistle Systems

Thistle Systems is a data-led warehouse storage specialist. The Max the Cube® approach compares storage options around the client’s capacity, throughput, safety and available-space requirements rather than starting with a preferred technology.