

# The Big Chill - Efficient Solutions for Deep-Freeze Warehouse Operations

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**SSI SCHÄFER**

*Think Tomorrow.*



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# SSI SCHAEFER at a Glance

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# EVERYWHERE Worldwide

With locations across six continents, SSI SCHAEFER provides innovative concepts and solutions for its customers and combines both global and local strengths.

- 7 production sites
- Over 70 subsidiaries
- More than 10,000 associates



## Europe

Germany\* • Austria\* • Belgium • Czech Republic\* • Denmark • Finland • France • Hungary • Italy • Latvia • Norway • Poland • Romania • Russia • Slovakia • Slovenia • Spain • Sweden • Switzerland • The Netherlands • The UK • Turkey • Ukraine

## North America

USA\* • Canada • Mexico\*

## Asia

Singapore • China • Hong Kong • India • Indonesia • Malaysia\* • The Philippines • South Korea • Thailand • Taiwan • Vietnam

## Middle East

United Arab Emirates • Saudi Arabia

## Africa

South Africa

## Latin America

Brazil • Argentina • Chile • Colombia • Peru

## Australia

\* Production sites

# Extensive Expertise in many Industries

SSI SCHAEFER specializes in **six market sectors**. Sector specific expertise can be found within our experienced worldwide teams. The market-sector experts speak the customers' language, know and understand their challenges and work with them to develop **individually tailored solutions**.



FASHION



HEALTHCARE & COSMETICS



INDUSTRY



RETAIL & WHOLESALE



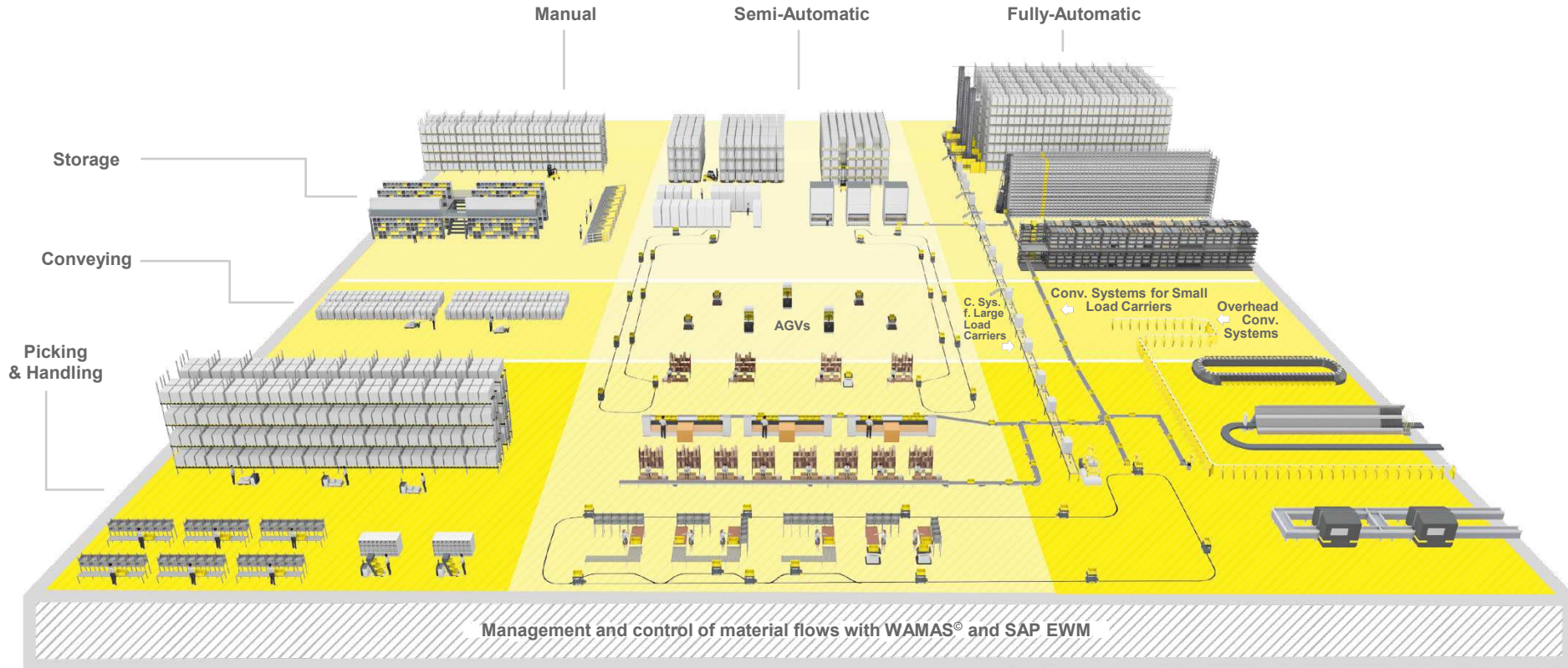
FOOD & BEVERAGE



FOOD RETAIL



# Our Logistics Solutions



# Cold Chain Challenges

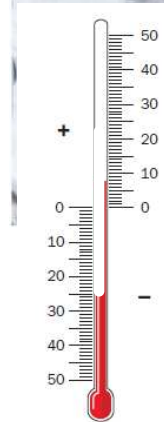
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# Challenge: Temperature-Controlled Logistics

The worldwide Cold Chain for Food contributes to the Quality of our Lives

- We have gotten used to a supply that is independent of seasons and climatic zones
- Green products of temperature-controlled logistics require prompt handling and direct transports
- Solutions are required to ensure and optimized handling in the supply chains from the farmer to the refrigerated shelf
- This includes concepts for storage and picking, buffering and x-dock, hardware, components of automation and software
- Products are stored long or short terms and are complete cooled
- “best before” dates, hygiene standards and traceability must be ensured





# Logistics in the Eternal Ice

## Continuous Growth in Demand

- In recent years, the market of Cold Chain storage has increased to more than 20-folds than its value in 2015
- Even before Covid-19 cold storage has been in high demand
- Continuous shift in Consumer behavior creates a skyrocketing demand
- Pre-Covid “just-in-time” inventory methodologies were hailed as the way to run a profitable supply-chain
- Increasing demand in warehousing space, driven by need for security
- Localization to meet the need for fast deliveries driven by e-commerce
- Other factors to consider
  - rising energy cost & sustainability goals
  - workplace safety
  - track-and-trace requirements
  - labor shortages
  - growing consumer demand for e-commerce
  - future expansion to meet growing business

# Challenges specific to a Cold Store

## Building for Cold Storage

### ▪ Workforce

- Limited labor pool
- Increasing regulations on employee work time in cold temperature zones

### ▪ Construction

- Limit unnecessary volume to save on energy for cooling
- Efficient and cost-effective HVAC design
- Building designed for deep-freeze

### ▪ Material handling equipment

- Material handling and racking equipment designed to handle deep freeze temperatures
- Efficient material flow through temperature zones



# Factors that influence a Cold Store Design and Efficiency

- General Considerations when planning a Cold Store
  - Low build-up volume – high storage density
  - Limited wall penetration / traffic
  - Minimal human activity
- Technical Design Considerations
  - Capacity                      Pallet, Case, Piece capacities
  - Load Unit                      Stock Keeping Units / Stock Line
  - SKU Range                      Product Range by SKU and BBD
  - Throughput                      Throughput / Stock Turn Over / Shelf Life
  - Retrieval                      Stock'n'Go / Order Picking (Case/Piece Picking)
  - Storage Strategy              FIFO / FILO
  - Leadtime                      Greenfield / Brownfield - Readiness and Freeze
  - Availability of Labor          labor requirements of different solutions
  - Energy Cost                      power consumption

# Proper Planning

## In-depth deep-freeze Knowledge

- Using air-locks between different temperature zones
- Labor intensive working areas placed in non-freezing environments
- Limited product exposure in non-chilled areas
- Saving space by customizing the rack design to each customer's needs
- Make use of data analysis and simulation to come up with the most efficient material flow design

-25 °C



+4 °C

# Planning a Cold Store Operation

## ▪ Greenfield

### BENEFITS

- Flexibly design for meeting present and future business requirements
- Future expansions
- Lease or own options
- Optimal integration of automation equipment
- Usually more energy efficient

### DISADVANTAGES

- Further away from urban areas with more transit time
- Harder to find skilled labor
- Perceived as negative impact to environment

## ▪ Retrofitting

### BENEFITS

- Reduces environmental impact
- Helps revitalize urban areas
- Grants are sometimes available for improvements
- Labor is typically easier to find

### DISADVANTAGES

- Longer construction and installation time
- Higher labor requirements
- Upfitting to meet building codes
- Space constraints may limit throughput
- Usually higher energy costs
- Possible issues with slab usability

# Manual or (semi-) Automated ?

Manual Operation are typically considered more economical

- Challenges of Manual Cold Store Operations
  - condensation due to manual and MHE movements between temperature zones
  - human mistakes may lead to damages resulting in spills, mold and uncleanliness
  - product, process, FIFO tracking
  - labor availability, cost and safety, particularly for coldroom operations
- Semi-Automated Cold Store Operations
  - reap some benefits of automation without capital justification for full automation
  - manpower savings
  - typical for 3PL due to short term contracts with their clients
  - high density storage solutions using AGV, pallet satellite, mobile rack
- Automated Cold Store Operations
  - long-term strategies and available capital
  - energy savings: less footprint, less build-up volume, less footprint, better airlocking, environmentally friendly
  - labor savings: cost, but also attractiveness of workplace, higher retention
  - safety: food safety, staff safety

# Intralogistic Cold-Chain Solutions

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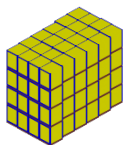
# Conventional Storage Solutions

- **Block Stack**

high density bulk storage



- **Stackable Pallet Converters**



## PRO's

zero capital investment  
high density  
volumetric utilization up to 70%

## CON's

poor stock rotation  
only for homogeneous products  
poor air circulation  
risk of damage to products  
unsafe product stacking  
limited use of height  
does not support case picking  
FILO

high density  
flexible layout  
suits full pallets in/out  
safe stacking up to 5 high  
Volumetric utilization ~ 60%

higher Capex investment  
addl. storage area for empty units  
First In Last Out  
labor intensive to retrieve pallets  
operation risk in stacking  
does not support case picking



# Conventional Storage Solutions

- **Selective Pallet Rack**

economical, quick solution for limited pallet count

1,940



## PRO's

- 100% selectivity
- flexible layout
- low level order picking
- low cost per pallet location
- good stock rotation
- fast installation
- up to 95% pallet utilization
- FIFO (&FILO)

## CON's

- poor utilization floor area
- lowest storage density
- high storage cost as business grows
- limited storage height up to 12m
- volumetric utilization about 35%

- **VNA Pallet Rack**

higher storage capacity thanks to narrow aisles

2,450



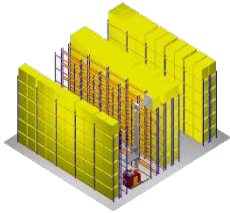
- higher volume utilization
- height up to 16m
- 100% selectivity
- low level order picking
- good stock rotation
- fast installation
- up to 95% pallet utilization
- FIFO (&FILO)

- requires super flat floor
- mechanical or wire guided VNA
- volumetric utilization about 50%

# Conventional Storage Solutions

## ▪ Double Deep Pallet Rack

increased storage capacity for low SKU range



## ▪ Drive-In Pallet Rack

max storage capacity for large quantities, few SKUs

3,130



## PRO's

high density storage capability  
low Capex investment  
when more pallets per SKU  
up to 85-90% pallet utilization  
good for fast moving SKUs  
good for lower SKU range  
FIFO

high density  
virtually unlimited depth  
cost effective  
good for low SKU range  
volumetric utilization about 65%

## CON's

slow operation to access rear pallet  
requires special fork-lift truck  
use bull nose protector for lower leg  
some MHE require lower beams  
not ideal for items with expiry dates  
limited storage height up to 12m  
volumetric utilization about 50%  
limited FILO occasions

fixed layout, lacks flexibility  
high operative risk entering rack  
limited selectivity  
limited storage height  
does not support case picking  
slow material handling cycle time  
up to 70% pallet utilization  
limited access to upper levels  
strictly FILO per bay

# Conventional Storage Solutions

- **Pallet Live Storage System**

high density storage for First in First Out

2,400



## PRO's

- high density
- more capacity vs selective
- separate storage/retrieval ops
- fast picking and replenishment
- hand pallet trucks can be used
- volumetric utilization about 50%
- FIFO

## CON's

- pallets can get stuck in channel
- lubricant required for gravity rollers
- case/pallet pick req separate face

- **Push-Back Racking System**

high density Storage for First In Last Out

3,130



- for products stored in high qty
- fast, MHE does not enter
- safe, MHE does not enter
- high density
- good for fast moving SKUs
- about 80-85% pallet utilization
- volumetric utilization about 65%

- limited selectivity
- limited depth vs drive-in
- not suitable for case picking
- one SKU per track
- FILO per channel

# Semi-Automated Solutions for ColdStore Operations

## ▪ Channel Storage System

further increase of capacity due to no aisles

4200



## ▪ Mobile Pallet Racking

increase in capacity due to only one operating aisle

3,798



### PRO's

for products stored in high qty  
 FIFO or FILO operation possible  
 safety with cart and docking  
 highest density, up to 50m deep  
 less MHE loading and unloading  
 low investment  
 great for low SKU counts  
 volumetric utilization approx 85%

### CON's

Case picking not possible  
 Batteries require charging  
 Batteries require replacing  
 requires adequate training  
 not suitable for high SKU counts

100% selectivity  
 utilization up to 70%  
 conveyors increase pallet cycles  
 "case/piece picking mode"  
 up to 95% pallet utilization  
 volumetric utilization about 80%

High Capex cost  
 Only 1 aisle = 1 MHE per block  
 Electrical failure?  
 Potential breakdown?  
 best suited for Greenfield projects  
 due to floor leveling requirements  
 works in small to medium sized areas

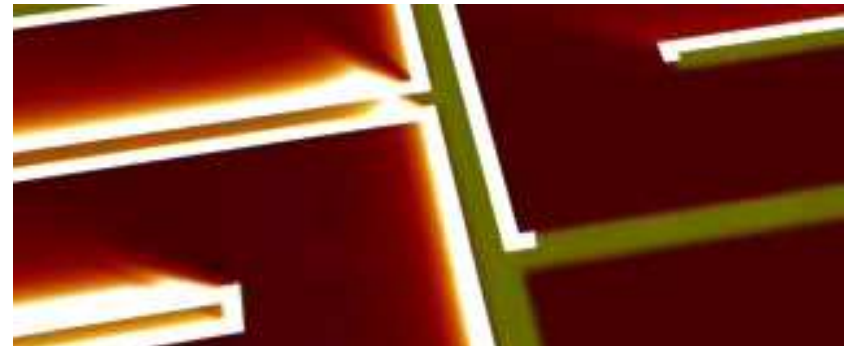
# Channel Storage Systems

- On the market for approx. 20+ years
- Highly compressed storage system with appropriate access and high throughput
- “Automation“ of a drive-in racking system
- Advantages:
  - Higher filling ratio than a drive-in racking system
  - Higher throughput than a drive-in racking system
  - More or less stress-free work for forklift driver
- Perceived “Disadvantages”:
  - No direct access to the pallet
  - Difficult handling + 8 Meter
  - Battery operation in cold stores



# Mobile Racking Systems

- Increase of storage capacity by 100% compared to conventional static pallet racks without loss of selectivity
- Good floor space utilization, very popular in high-cost environments i.e. Cold Stores due to increased capacity
- Mechanical Handling Equipment: counter balanced truck, reach truck or very narrow aisle truck
- Higher cost can easily be justified by the increased capacity of pallets in a high-cost environment
- Mobile bases operated by remote handheld or forklift mounted controller
- 80 % of coldstores are equipped with mobile racking systems
- Excellent product for third party logistic providers
- Direct access to all the pallets



# Deep-Freeze MHE

## Upgraded Components for the Cold Chain

- Special high-quality steel for long-lasting durability
- Extend the driver period in cold room by using “Driver Cabin”
- Heated cabinets
- Energy recovery solutions
- Counter-balance weight for pallet cranes
- Intelligent drive controls for cranes
  - Warm-up phase after longer stops
  - Speed on demand



# Airtight HBW

## Engineered for efficient cooling and airtight Design

- Reduce the Air Change Load
- Minimise the door opening by using “Conveyor Transportation Mode”
- Extend the driver period in cold room by using “Driver Cabin”
- Data transferring with WMS for optimisation of the put-away & retrieving

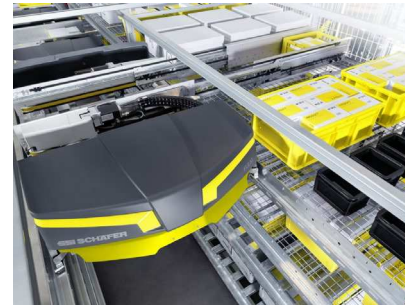




# Automated Systems

## Semi- or fully automated

- Lowest labor and operational costs
- Virtually zero errors and reduced product waste
- Easily follow FIFO requirements
- Highest throughput
- Reduced time of employees in harsh temperature zones and improved ergonomics in work spaces
- Guarantee continuity of the cold chain
- Highest investment on material handling equipment
- Smaller footprint resulting in lower building and overall project costs



# Storage Concepts

## Solutions for all Handling Units

- **Storage & Retrieval Machines for Pallet Loads**
  - single-deep, double-deep and satellites
  - work with large number of SKUs
  - dense storage through use of vertical up to 45m high
  - sustainable energy savings for cold chain applications
- **Shuttle Solutions for Pallet and Layer-Trays**
  - work with medium to large number of SKUs
  - high throughput supports automatic or GTP case pick
  - limit human exposure
- **Shuttle Solutions for Container, Bin and Carton Loads**
  - scalable shuttle systems
  - capable of handling loads of varying dimensions
  - high throughput supporting goods-to-person pick
  - multiple deep storage capability, maximizing storage density



# Picking Concepts

## Utilizing Workforces efficiently

- **Semi-automated workstations**
  - Ergonomic design
  - Goods-to-person, high throughput workstations
    - Up to 4 times higher efficiency compared to conventional person-to-goods approach
- **Robotics**
  - Fully-automated solutions for case and layer picking
  - Available 24/7
  - Can be safely placed in harsh temperature zones
- **Pallet Picking**
- **Layer Picking**
- **Case Picking**



# Applications

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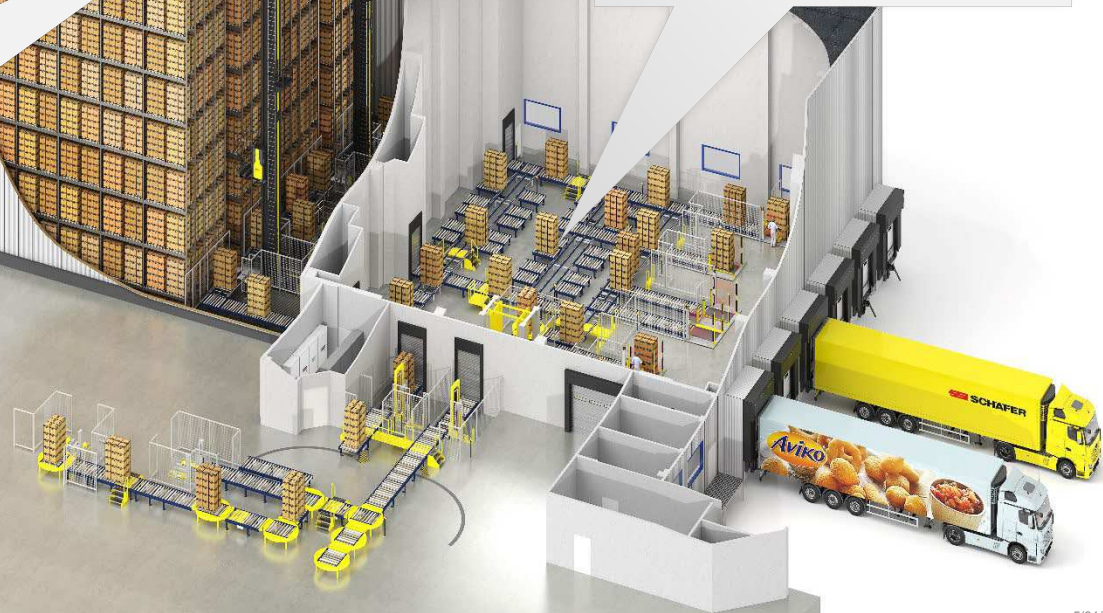




High-efficiency cooling concept



Shipping buffer with sequencer

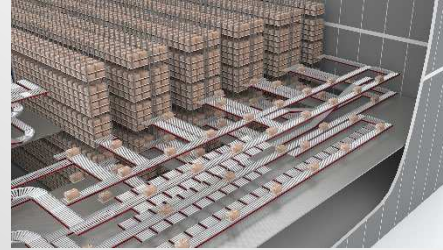




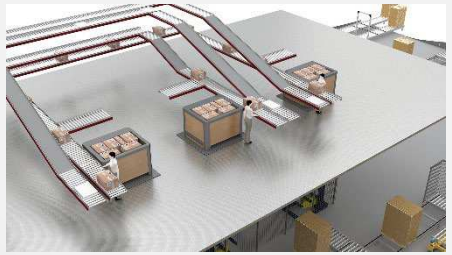
Deep-freeze shipping buffer



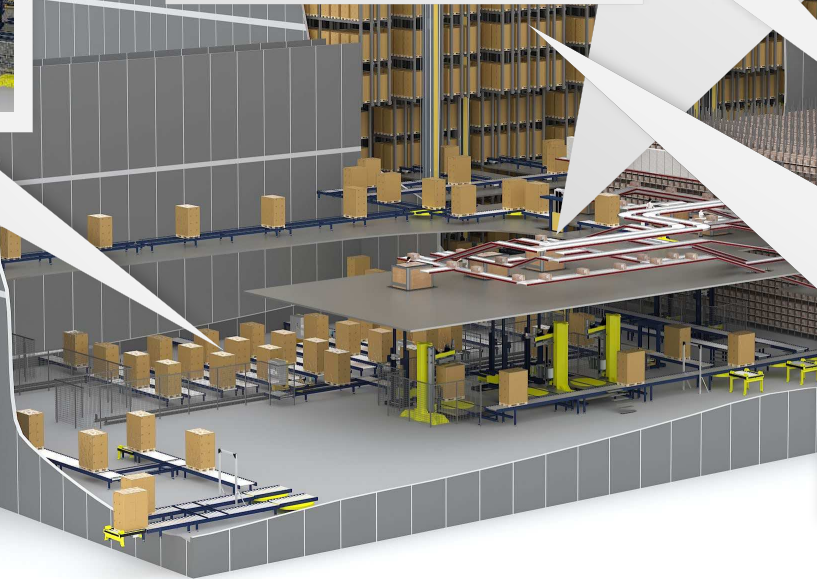
High density case buffer



Manual de-palletizing & palletizing in deep-freeze environment



Double-deep deep-freeze HBW



Two-way  
floor level outfeed



Channel storage  
deep-freeze HBW



Slaving  
and de-slaving unit



Deep-freeze HBW with  
~20,000 pallet locations



Earthquake and typhoon  
resistant rack-clad  
technology



ergonomic goods-to-  
person get-and-pick  
workstations



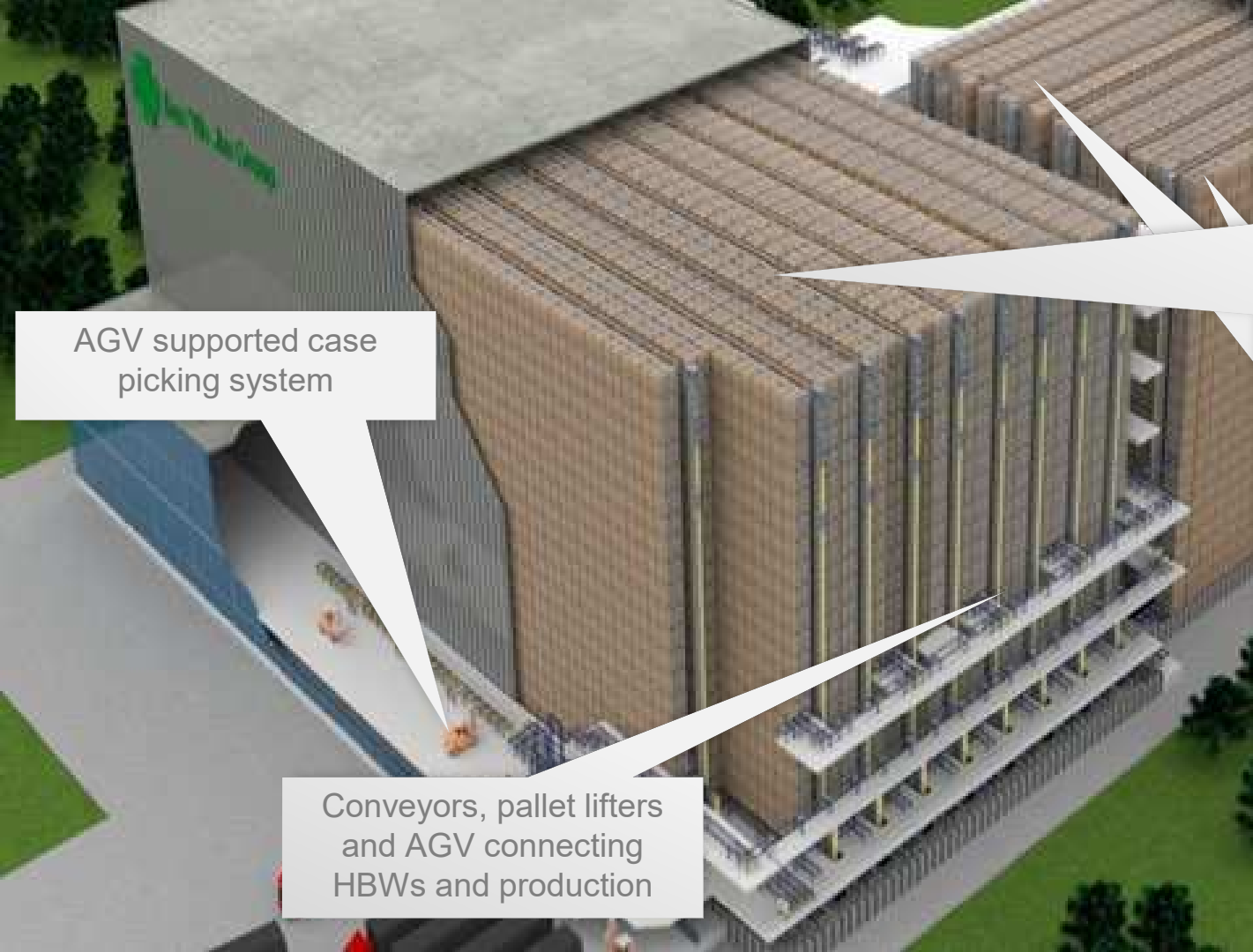
Manual pallet feed, automatic  
checking, wrapping and  
tagging



Food products are carried by forklifts to the infeed conveyor







AGV supported case picking system

Conveyors, pallet lifters and AGV connecting HBWs and production

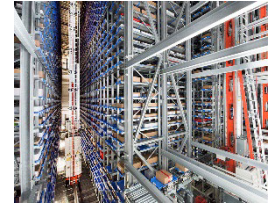
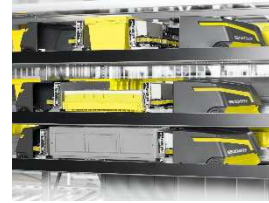
9-aisle double-deep deep-freeze HBW with ~63,000 pallet locations



# Summary

## What to expect from your MHE vendor

- In-depth knowledge of the processes and requirements of the food industry
- Broad product portfolio to create optimal concepts based on individual customer requirements
- Equipment proven to reliably operate in frozen conditions
- Long and successful track record of designing and implementing deep-freeze projects
- Knowledge from numerous deep-freeze projects with a broad range of customers
- Highly professional service organization to support the entire lifecycle of a system



**SSI Schaefer covers all your needs to realize your deep-freeze solution successfully**



# Thank you!

*Think Tomorrow.*

Carsten Spiegelberg

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