Today's Class: Energy Efficiency in Cold Chain
Today’s Speakers

Thomas Goldsby
Professor
James A. Haslam, II Chair of Logistics
The University of Tennessee Knoxville

Mark Vogt
Head of International Sales & Automation
Körber Supply Chain
Why are we here? What are we trying to accomplish?

Class Schedule:
Tuesday, February 16:  Dark Warehouse Efficiencies:  How Close Are We?

Master Class Series – On-Demand
• Addressing Labor Challenges
• Cold Storage Trends
• Warehouse Technology Excellence
• Workplace Efficiencies & Safety
• SAP Supply Chain Excellence
• Disruption Mitigation
Housekeeping

All phone lines are muted

Recording of today’s class and slides will be emailed to you within 48 hours

Questions:
- Ask questions during today’s class in the GoToWebinar Questions window
- Questions will be addressed at the end of today’s class or we will follow up via email after class

Handout: Körber Sustainable Supply Chain Infographic

Poll Question: What steps are you taking to improve energy efficiency in the cold chain?
Warehouse Count and Floorspace

Percentage of commercial U.S. buildings and floorspace by principal building activity

**Building Count**

- **5.9 million** number of buildings
  - warehouse and storage, 17%
  - office, 16%
  - service, 15%
  - mercantile, 9%
  - food service, 5%
  - education, 7%
  - religious worship, 7%
  - public assembly, 8%
  - all other buildings, 15%

**Building Floorspace**

- **97.0 billion** total floorspace in square feet
  - warehouse and storage, 18%
  - office, 17%
  - service, 7%
  - mercantile, 11%
  - public assembly, 8%
  - religious worship, 6%
  - education, 14%
  - lodging, 7%
  - all other buildings, 12%

Warehouse and storage account for 17% of all commercial buildings and 18% of total commercial building floorspace.

Source: U.S. Energy Information Administration (www.eia.gov/consumption/commercial)
Number of commercial buildings (in thousands) by principal building activity

- Warehouse and storage
- Office
- Service
- Public assembly
- Mercantile
- Religious worship
- Education
- Food service
- Lodging
- Vacant
- Food sales
- Health care
- Other
- Public order and safety

Warehouse and storage space grew 26% from 2012 to 2018

Source: U.S. Energy Information Administration (www.eia.gov/consumption/commercial)
Refrigerated space accounts for just over 10% of all warehouse space but almost 16% of energy consumption.

Refrigerated space is 5X more energy intensive per square foot (28.8 kWh vs. 5.8 kWh per sq. foot).
Pressure Towards Green Logistics grows beyond being eco-friendly

Companies’ value is ever more dependent on their behavior and practices.

1. Over 50% of the value top 50 CPG* companies have today is made of expected growth in cash flows.

2. Sustainability factors (e.g. carbon emissions, resources consumption) can seriously affect growth projections of CPG companies’.

3. Consumers and investors are watching and acting based on sustainability practices of the companies.

Supply Chains became a central aspect being closely monitored by Customers

Warehouses turned to be one of the major causes of industrial emissions and the progressing environmental pollution.

University of London Study

THE NEXT BIG ITEM ON THE AGENDA:

ENERGY-EFFICIENT BUILDINGS AND WAREHOUSES

Companies now have to care about sustainability because their customers care about it.

Note: *Consumer Products Good
Source: Körber Supply Chain Automation
The Case for Sustainable Warehouses

There is big money to be saved in the sustainability revolution

1. Warehousing costs can represent as much as 10% of company’s revenue

In UK alone, energy-efficient equipment investments can save more than US$260mi only in warehouses.

2. Warehouses account for 18% of all total floor space in US, adding up to 16,4 bi square feet.

With utilities costs at US$2,10 per square foot* and sustainable practices estimated to reduce amid 9% to 16% cost**, warehouses can cut between $3 and $5,5bi expenditure only in US.

Efficiency practices can save in total up to 22% of energy expenditure.

Note: *Data from US Dep. of Energy 2018 / **World Economic Forum 2019
Source: Körber Supply Chain Automation
Look Below the Surface
An individualized approach is needed

Average Non-refrigerated Warehouses energy consumption distribution by end use:
(Source: US Energy Information Administration 2018)

- Lighting 34%
- Material Handling 33%
- Cooling 10%
- Refrigeration 6%
- Computing 6%
- Ventilation 6%
- Other 4%

Energy efficiency Case Study on One Warehouse using WMS:
(Körber Supply Chain Automation)

- Lighting 65%
- Material Handling 15%
- Cooling 3%
- Refrigeration 5%
- Computing 3%
- Ventilation 3%
- Other 6%

Each individual Warehouse presents unique processes, technology and systems that significantly impact its energy consumption behavior and energy-saving strategy.

Note: WMS – Warehouse Management System
Source: Körber Supply Chain Automation
How to Harvest the Opportunity
The 3 Pillars of Warehouse Management Sustainability

- Drive energy consumption to reduce production costs and increase bottom line
- Warehouses designed for improving efficiency and profitability
- Sustainable Warehouse Design
- Warehouse Process Automation
- Achieve fully sustainable warehouse system by automating labor-intensive tasks

OPERATORS MUST TAKE A HOLISTIC AND INDIVIDUALIZED APPROACH

Source: Körber Supply Chain Automation
Building the Sustainable Warehouse
Approaches for Harvesting the Opportunity

Energy Efficiency Through the Warehouse
Drive energy consumption to reduce production costs and increase bottom line

- Sunlight maximization
- LED lighting
- IoT goods tracking
- Solar Energy
- Cool Roof
- Temperature zones
- Yard Traffic Management
- Sustainable packaging
- LEED Certification
- Blast Cooling
- Equipment performance monitoring

NewLogic III – One of World’s greenest warehouses according to WEF

Note: WFE – World Economic Forum
Source: Körber Supply Chain Automation
Building the Sustainable Warehouse
Approaches for Harvesting the Opportunity

Sustainable Warehouse Design
Warehouses designed for improving efficiency and profitability through Automated Material Handling Technology

Implement energy efficient technology and systems can reduce up to 29% of energy expenditure

On Deep Freeze Warehouses energy efficient technology can:
- improve work conditions
- increase system performance
- reduce up to 40% energy costs

Regenerative Power
Reuse waste equipment kinetic energy

Automated Storage & Retrieval System
Reduce up to 60% footprint, optimize stock movements and increase efficiency

Robotic Automation
Smooth product handling, cut wastes & maximize efficiency

Wearables (e.g. Voice-directed)
Increase efficiency, reduce errors and injuries

Autonomous Mobile Robots
Flexibility & reduce manual labor

Automated Guided Vehicles
Reduce accidents and increase efficiency

Source: Körber Supply Chain Automation
MotionControl MOVİ PLC Intelligent control of the two axes ensures:

- the energy released by one axis is used as efficiently as possible by the other axis through intelligent movement planning.
- travel and lifting axes operate in energy-optimized manner without increasing cycle time.

TOTAL ENERGY CONSUMPTION REDUCED UP TO 25%
WITH MAXIMUM PERFORMANCE AND OPTIMUM UTILIZATION OF DEVICE DYNAMIC

Next Stage: Regenerative Energy

Hoist and trolleys' downwards and backwards movement energy is fed to a Regenerative Power Supply Module that stores energy and inputs it back in the system when needed.
Building the Sustainable Warehouse

Approaches for Harvesting the Opportunity

Warehouse Process Automation
Achieve fully sustainable warehouse system by automating labor-intensive tasks

Warehouse Management System
• Minimize movements of goods, equipment and people.
• Maximize cube-wise space to increase capacity.
• Optimize stock and reduce inventory turnover.
• Facilitate integration of new technology and equipment.
• Improve warehouse visibility and management.

Energy Management System
• Monitor energy usage in the entire system
• Visibility of energy consumption behavior
• Building energy management (e.g. lighting and HVAC*)
• Identify wastes and improvement opportunities
• Control building and devices to optimize energy efficiency

CAPABILITIES OF COMBINED WMS AND EMS
• Smarter control of equipment (e.g. “deep sleep”, “off-peak” mode)
• Adjust system speed and acceleration according to the demand.
• Optimized stock transfer strategy (e.g. night inventory relocation)
• Use case adapted energy storage strategy (e.g. ad hoc, production supply, batch)
• Machine learning energy management strategy (e.g. anticipate zone cooling, predict peak demand)

Note: *HVAC – Heating, Ventilating and Air Conditioning.
Source: Körber Supply Chain Automation
Efficient Storage Strategies
Körber Supply Chain Automation Case Study

ANALYSIS OF STORAGE SYSTEM EFFICIENCY
WITH REAL STOCK ORDER DATA

BEFORE

STORAGE OPTIMIZATION

AFTER

FINDINGS
• Substantial reduction of travel distances
• Meaningful efficiency gains are observed

ADJUSTING STORAGE STRATEGY
OR MASTER DATA SIGNIFICANTLY
IMPROVES PERFORMANCE WHILE REDUCING ENERGY CONSUMPTION

Source: Körber Supply Chain Automation
Warehouse Sustainability Takeaways

Good business for the environment and for the bottom line

**ENERGY CONTROL CENTER RELATIONSHIP MODEL**

“CUT ENERGY WHERE IT’S NO LONGER NECESSARY AND DIRECT IT TO WHERE IT IS NEEDED”

**Processes**

**Energy Efficiency**

**Intralogistics, Production**

**Building**

**Energy Efficiency**

**KEYNOTES**

1. Choosing the right drive technology and associated intelligent control system lead to a reduction up to 22% of energy demand for RBG.

2. Further measures with software optimization can save at least 20% of total consumption in the plant.

3. In connection with building management, further optimizations can achieved 10-15% energy savings.

4. Future tax reduction possible made possible through connection to energy management system.

5. Demonstrable energy or cost savings are achievable over 40%.

Determine the optimum of available technology, installed building and available orders, and then to manage processes as a command variable in distribution centers accordingly.

Source: Körber Supply Chain Automation
Questions & Discussion
Dark Warehouses Efficiencies: How Close are We?

February 16th – 12:00-12:30pm EST

Dark warehouses, or warehouses without lights or people, are a hot topic in today's supply chain. But are they truly feasible? Join John Santagate on February 16 to learn how close we are, and what technology is helping us get there.

John Santagate
Vice President, Robotics
Körber Supply Chain