



Introduction to Warehouse Management

郭幸民
國立高雄科技大學運籌系

Warehouse Management

介紹各類型倉儲設施的功能

介紹倉儲所使用的硬體設備，分析其用途與效益

介紹倉儲的各項作業內容，分析如何減少錯誤並提高效率

介紹倉儲管理者的職責，包括績效、工安、環保

不同於存貨管理，不討論如何決定適當的存貨量，不討論如何以更低的存貨達到更高的服務水準

不同於物流管理，不討論企業策略，不涉及運輸配送

教科書



Gwynne Richards

Warehouse Management, 2nd Edition



www2.nkust.edu.tw/~smguo/teaching/warehousing.htm

參考書籍

Edward Frazelle 高效能倉儲物流管理

出版社：麥格羅·希爾 McGraw-Hill



3

授課大綱

Week 1	Chapter 1	課程簡介 倉儲功能
Week 2	Chapter 3	進貨與入庫
Week 3	Chapter 10	儲存與搬運設備
Week 4	Chapter 4	揀貨作業介紹
Week 6	Chapter 5	揀貨方法與設備
Week 7	Chapter 6	揀貨作業改善
Week 8	Chapter 7	補貨與出貨
Week 9	Midterm	

4

授課大綱

Week 10	Chapter 8 WMS與資訊應用
Week 11~12	Chapter 9 動線與空間規劃
Week 13	Chapter 12 倉儲成本與營收
Week 14	Chapter 13 績效衡量
Week 15	Chapter 15 倉儲作業安全
Week 16	Chapter 16 倉儲與環保
Week 17	Chapter 2 經理人的角色
Week 18	Final Exam

5

成績計算

Test	15%
Midterm	35%
Report	15%
Final Exam	35%



報告分全組成績與個人成績
 考試作弊者依學務規章處理，學期成績並以壹分記錄

6

Chapter 1 The Role of the Warehouse

- To better match supply with demand

住家也需要儲存日常需求用品。

- **To consolidate product**

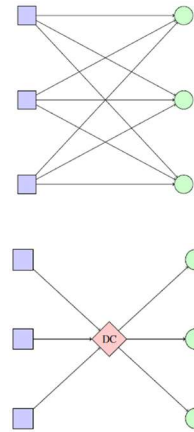
集散貨物以節省運費。

- To postpone product differentiation

工廠與夜市小吃都需要延遲生產。

- Labeling and Repackaging (imports)

進口大宗貨物需要分裝與貼標。



7

歷史小典故

- 舊約聖經記載埃及王接受約瑟夫的建議而興建糧倉，儲放連續七年豐收的過剩糧食，安然度過緊接而來的七年歉收。
- 洛陽的含嘉倉，歷經隋、唐、北宋，沿用500多年。倉城東西長612米，南北寬710米，已探出倉窖287座。隋朝選擇在洛陽儲備大量的糧食，取決於地理位置和交通便利。
- 倉窖為大口小底缸形窖，口徑10至18米，深7至12米，窖底用火烘乾，周壁和窖底鋪設草、木板、糠、席等，然後儲糧，糧上面鋪席，堆糠和墊草，最後用土密封。以刻字磚記載倉窖位置、儲糧來源、入窖年月以及授領官員的職務、姓名等。



Introduction—過去 vs. 現在

過去

1. Cost centres and rarely adding value.
沒有產值

過去

2. As land and buildings were relatively cheap, the cost of holding significant quantities of raw materials and finished stock was seen as the norm and totally acceptable.
倉儲是次要成本

過去

3. Logistics was blamed by other functions for stockouts and poor delivery performance.
採購與營業的代罪羔羊



9

Introduction—過去 vs. 現在(續)

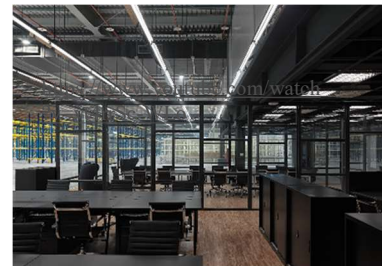
現在

1. A vital link within today's supply chains. 連結供應鏈各環節
2. Expensive land, buildings, labour and energy costs. 營運成本上升
3. Competitive differentiation, profitable growth (greater volatility, ..., major shifts in customer demographics and buying patterns, and ...)
4. Delivering the right product in the right quantity. 就近供應市場
Delivering to the right customer at the right place, on time
5. just in time (JIT), efficient consumer response (ECR) and quick response (QR) 供應商快速反應
6. retailers took control of their supply chains. 經銷商主導 →
warehouses moving towards larger, multi-temperature sites

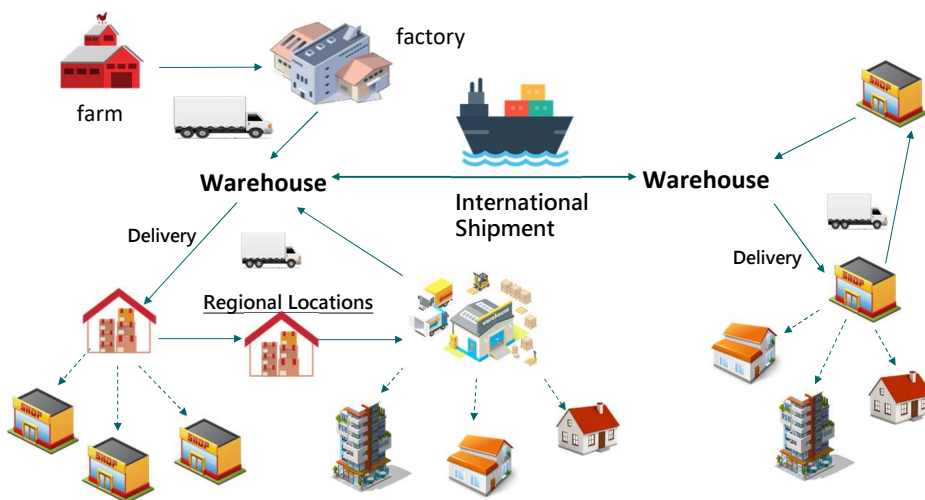


10

不再是陰暗封閉的鐵皮倉庫



Warehouse Logistics



Types of Warehouse Operation

1. Raw materials storage

Ex. plastics, precious metals, sand...
for continuous production



2. Finished goods storage

⇒ ready for sale, they provide a buffer or safety stock for companies, enabling them to build up stock in preparation for new product launches, expected increases in demand and to deal with seasonality.

13



Types of Warehouse Operation(續)

3. Intermediate, postponement, or sub-assembly facilities

- store products temporarily at different stages in production. 在製品
- customize products before final delivery to the customer. 待客製化
- specific packaging or labelling being changed or added. 需包裝或貼標
- country-specific items being added such as electrical plugs. 地域化

4. Consolidation centres and transit warehouses

⇒ These differ from cross-dock centres in that product can remain in the centre for a period of time awaiting call-off from the final destination. 轉運

5. Transshipment or break-bulk centres

large quantities → manageable quantities 進口大宗貨物分裝

14



Types of Warehouse Operation(續)

6. Cross-dock centres 越庫作業

- 作業方式 Cross docking requires deliveries to be already labelled and ready for onward delivery. Items are identified and consolidated with other deliveries, ready for despatch.
- 適用商品 perishable items, fruit and vegetables, meat and fish, which need to be moved quickly through the supply chain.
- 目標 Items should remain in the warehouse for as short a time as possible. Same-day receipt and despatch is the target.

15



Types of Warehouse Operation(續)

7. <u>Sortation centres</u> letter, parcel and pallet distribution companies 分類、轉運*	8. <u>Fulfilment centres</u> 服務個別消費者的訂單履行中心 https://www.youtube.com/watch?v=vXKiFEFaJQo&t=193s
9. <u>Reverse logistics centres</u> Either repaired, recycled, repackaged or disposed of. 逆物流	10. <u>Public sector warehousing</u> 公共倉

16



倉儲基層作業項目 物流中心、訂單履行中心

- 進貨(receiving)：驗收規格、品質、數量 (退貨作業)
- 預先包裝(kitting)：重新分裝組合以利儲存或後續使用
- 入庫(putaway)：儲位確認、物料搬運

- 儲存(storage)：庫存盤點(counting) Movie: lativ
- 揀貨(picking)：儲位確認、物料搬運

- 重新包裝(repackaging)與定價：附加價值服務倉庫
- 分類(sortation)與集中(組合assembly)：
 - 合併揀取的品項依訂單分類、分區揀取的品項依訂單集中

- 單位包裝與出貨(shipping)：以個別客戶為單位進行包裝以免散落、確認出貨清單與相關文件。

17

Logistics is very much about trade-offs

Trade-offs will affect how warehouse and logistics managers approach their jobs and the decisions they take.

- cost versus service;
- storage capacity versus speed of retrieval;
- speed versus accuracy;
- lower inventory versus availability;
- efficiency versus responsiveness; and
- volume purchases versus storage cost and availability.



Supply chain trends affecting warehouses

1. 電子商務B2B與B2C蓬勃發展
2. 在競爭環境中，零售商與製造商尋找降低成本，倉儲作業往高效能與高成本效益目標前進
3. 零庫存倉庫(不以倉庫儲存的形式存在，而是處於周轉狀態)、轉運中心、集貨中心、越庫作業 增加
4. 為了更靠近進出貨港口，而增加以港口為中心的倉庫
5. 手機、DVD撥放器、電腦的體積縮小，由網路來獲取影音商品的蓬勃發展，減少了對上述商品的儲存空間需求
6. 環保意識與法規，倉庫使用再生能源 (如：太陽能或風力發電)

19



The growth of e-fulfilment and its effect

- According to Forrester (2013) online retail sales in the United States in 2013 will reach \$262 billion –representing 8 % of the total retail market and will reach \$370 billion by 2017.
- 網路訂單履行中心(e-fulfilment warehouse)所面臨的挑戰：
 1. 訂單類型與數量易受季節性影響
 2. 經常性處理低價值或單一品項的訂單內容，但須付出與處理高價值品項相同的人力成本與設備，在處理低價值品項所得到的邊際效益遠低於高價值品項。
 3. 須滿足顧客對於訂單的準確性與準時性
 4. 商品種類增加造成揀貨空間不足，尤其是流通性低的商品
 5. 處理逆物流

20



Warehouse Location

Factors that need to be taken into account :

- | | |
|--|---|
| <input type="checkbox"/> cost of land, rent and rates
土地成本 | <input type="checkbox"/> availability and cost of utilities including
telecoms 水電 |
| <input type="checkbox"/> access to transport networks
運輸 | <input type="checkbox"/> availability of finance and resources 資金 |
| <input type="checkbox"/> availability of affordable
skilled labour 人力 | <input type="checkbox"/> goods traffic flows 交通狀況 |
| <input type="checkbox"/> transport links for staff 交通 | <input type="checkbox"/> proximity to ports and airports 機場、海港 |
| <input type="checkbox"/> availability of funding, grants,
etc 貸款、優惠 | <input type="checkbox"/> location of suppliers and manufacturing
points 供應商地點 |
| <input type="checkbox"/> availability of existing
buildings 現成設施 | <input type="checkbox"/> the potential neighbours (eg proximity to
oil storage depots can be a negative factor).
周圍環境 |

21



Number of Warehouses

- The increasing cost of fuel, a move towards near-shoring and a requirement to be nearer the customer could see the number of warehouses and DCs increasing with cross-dock operations being favoured by more companies. 成本與服務的取捨

Criteria	Many warehouses	Fewer warehouses
Inventory costs	Higher	Lower
Customer reaction time	Quicker	Slower
Facility costs	Higher	Lower
Inbound transport cost	Higher	Lower
Outbound transport cost	Lower	Higher
Systems cost	Higher	Lower

22





亞馬遜(Amazon)正加速興建倉庫，把產品更快交到顧客手上的迫切性。亞馬遜2010年起已砸下近139億美元在美國興建50座新倉庫，金額比該公司成立至今花在倉庫的費用總和還高。截至去年底亞馬遜在美國已有89座倉庫，今年將再蓋五座。

eBay和沃爾瑪等業者正設法讓產品**以最快的速度交貨**，使亞馬遜執行長貝佐斯承受巨大壓力。亞馬遜興建倉庫的策略有推升成本、壓縮利潤的風險，配送支出已成為亞馬遜最大的營運支出，每年以逾40%的速度增加。(2013)



2016: 全美165，全球298

23

Specialized Warehousing

1. Customs warehousing

- 同保稅倉庫(bonded warehouse)，為海關核准存放保稅貨物的專用倉庫。根據國際通行的保稅制度，入境存保稅倉的貨物可暫時免納進口稅。

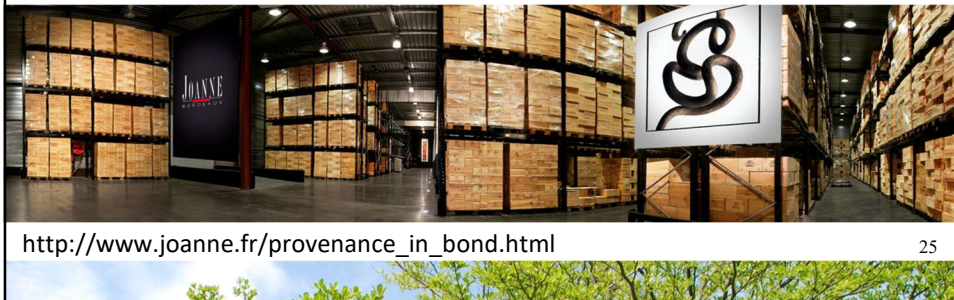
2. Refrigerated warehouses

- 為延長食品的新鮮度與保存期限，對低溫倉庫的需求大增
- 使產品穩定維持在一定低溫環境下是關鍵因素
- 高密度的自動倉儲設備
- 防災與災害復原計畫為冷鏈核心要求

24



- 法國Provenance in Bond保稅倉佔地14,500平方公尺，可儲存600萬瓶葡萄酒。
- 提供從溫度、濕度、紫外線、防震的存放管理，以至於紅外線保全、保險、存取運送、轉售服務。
- 客戶可透過網路查看存貨清單、溫濕度報表、發送存取貨指令，運送全程的溫度變化狀況。



http://www.joanne.fr/provenance_in_bond.html

25

Summary and Conclusion

1. 倉庫不再只是單純用來儲存，更是用來進行轉運、越庫作業、執行延遲策略的場所。
2. 控制供應鏈的權力從原本的製造商轉移到零售商，零售商趨向將庫存管理的責任推給上游的供應商，增加供應商對於預測準確性與獲取即時資訊能力的要求。
3. 電子商務與低溫生鮮明顯改變了原本倉儲管理的作業形式。
4. 高科技的倉儲作業與管理

26

