# LECTURE 09 CROSSDOCK: JUST IN TIME WAREHOUSE

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### OUTLINE

- **1** INTRODUCTION TO CROSSDOCK
- 2 Congestions in Crossdock
- 3 Shape of Crossdock & Number of Dock Door
- 4 Truck Scheduling in Crossdock

source: General references [BH09, Mul94, Fra02, ?]

Shape & Dock

Scheduling

## What is a crossdock?



source: http://www.saddlecrk.com/CMFiles/Images/villaRica.jpg'

Basics

• Ideas: hub with little inventory ( $\leq$  48 hours)

**Pro:** high shipping frequency & little inventory  $\rightarrow$  service level Warehouse v2.0: Crossdock

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### FLOW PROCESS



source: http://gowalbert.com/services2.html

### MANAGING CROSSDOCK

- Candidate SKUs: high & constant demand, perishable, low value
- Candidate Supplier: strategic, large qtys for every outlet, good IT
- Avoid SKUs: SKU with VAL, initial lunch, promotion
- **Requirement:** good relationship, better decision making, perfect quality, cost saving
- Implementation: pilot site, few large supplier, small transaction,

source: Ertek, G (2005). "A Tutorial on Crossdocking" [Ert05]

### FEATURES COMMON IN CROSSDOCKS

- Layout: proximity of receiving & shipping, floor stack storage, multiple # of docks
- Workers: forklift drivers (moving & sorting)  $\rightarrow$  high volume of shipments
- Products: perishable items, no inspection, everyday product, unit load
- Owner/Business: 3PL, chain outlet/store, large company

Issues in crossdock

- Congestion: floor space, forklift, 'dragline',  $\rightarrow$  dock assignment
- Layout: shape of crossdock VS # of docks
- Scheduling: order of trailers  $\rightarrow$  yard management [GK01]

Shape & Dock

Scheduling

### FLOOR SPACE CONGESTION



source: Bartholdi, J. & Hackman, S. 2009. [BG00]

Shape & Dock

### FLOOR SPACE CONGESTION



source: Bartholdi, J. & Hackman, S. 2009. [BH09]

#### minimal stacking areas on both ends of facility

Shape & Dock

Scheduling

## FORKLIFT INTERFERENCE



source: Tours of warehouses, distribution centers, crossdocks. http://www2.isye.gatech.edu/jjb/wh/sites/sites.html

#### Issues

- Forklift-Forklift: lane width, driving VS lifting
- Forklift-Stacking area: overflow, staging queue, house keeping
- Forklift-Picker: sharing lanes, speed difference

## ORIGINAL DOCK DOORS ASSIGNMENT



source: Gue, K. http://web.mac.com/krgue/Kevin\_Gue/Crossdocking.html

Scheduling

### SUGGESTED DOCK DOORS ASSIGNMENT



source: Gue, K. http://web.mac.com/krgue/Kevin\_Gue/Crossdocking.html

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## GEOMETRY OF CROSSDOCK



source: Gue, K. http://web.mac.com/krgue/Kevin\_Gue/Crossdocking.html

## INTERNAL & EXTERNAL CORNERS



- Internal corner: stacking area,
- External corner: parking area

## GEOMETRY & CORNERS

	Number of corners	
Shape	Internal	External
'l'	4	_
'L'	5	1
'T'	6	2
'⊏'	6	2
'+'	8	4
'H'	8	4

- Dominated: 'I'  $\gg$  'L', 'T'  $\gg$  ' $\sqsubset$ ', '+'  $\gg$  'H' [BG04]
- Suggest: 'I', 'T', '+' depending on # dock doors

## MATCHING TRAILERS



source: http://www.lean.org/Common/LexiconTerm.aspx?termid=195&height=550&width=700

## QUESTIONS

- 1. Explain similarities and differences between a warehouse and a crossdock?
- $2.\,$  Given the same number of dock doors, explain why a 'T'-shape crossdock is superior than an 'L'-shape crossdock
- 3. Despite the practical application, some researchers argument that a *promotion product* is a poor candidate for crossdock. Answer the following quesitons:
  - Elaborate rational of this argument
  - Give an exception of this argument

### REFERENCE

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