Industrial and Manufacturing Systems Engineering
The University of Hong Kong

基于RFID的 实时智能仓储管理系统

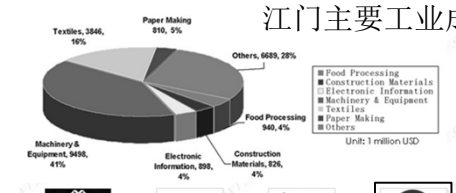
RFID Enabled Real-time Warehouse Management System (RT-WMS)

公共外库及流通加工应用案例分析

A case study of ***Public Warehouse*** and ***Distribution Processing***

Dr. Hao Luo
黄国全博士 教授

Major Industry of Jiangmen
江门主要工业成分



Agenda

- ✔ 1. Background of the Case Study
- 2. Business Process Analysis
- 3. System Design
- 4. Conclusions and Future Work

Companies Involved in this Case Study
案例所涉及企业简介

Haojue

- China's Top & Famous Motorcycle Brand
- The largest partner and export base of Suzuki (Japen)
- "Top 500 Enterprises of China"
- The volume of sales has been ranked No. 1 of China since 2003

JINLING 金羚

- Large company of the production of household appliance
- Produce 1.6 million washing machines annually
- Gross output value of over RMB600 million
- Export of over USD20 million

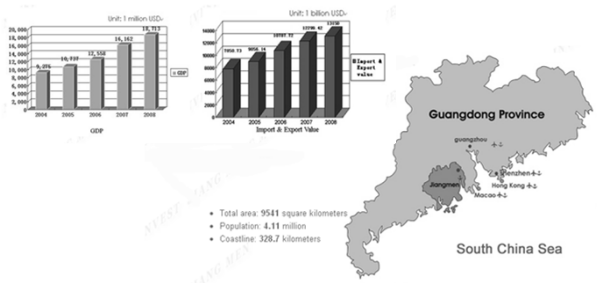
LEE KUM KEE

- Lee Kum Kee was established in 1888
- The Corporate Support Centre is in Hong Kong
- 5 production bases in China, Malaysia and Los Angeles
- The Jiangmen factory is the largest operation occupying 1,700 acres.

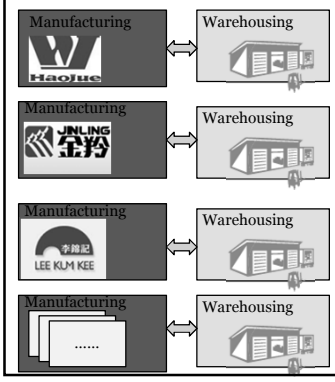
.....

- Food Industry
- Chemical Industry
- .....

Guangdong Jiangmen
广东 江门



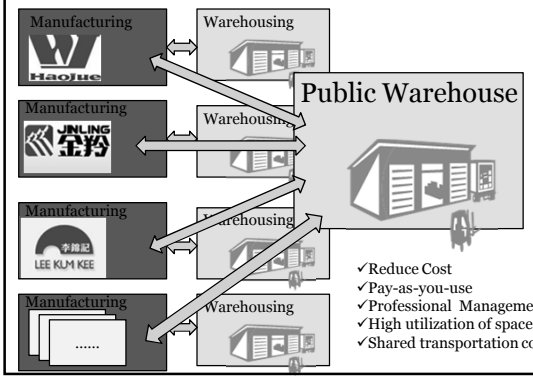
Company-owned Warehouse VS. Public Warehouse
企业自有仓库Vs. 公共仓库



COST

- Warehouse facility
- Warehouse Management
- Warehouse software
- Warehouse staff
- Internal Transportation
- Low utilization in offseason
- High inventory pressure in peak season

Company-owned Warehouse VS. Public Warehouse
企业自有仓库Vs. 公共仓库



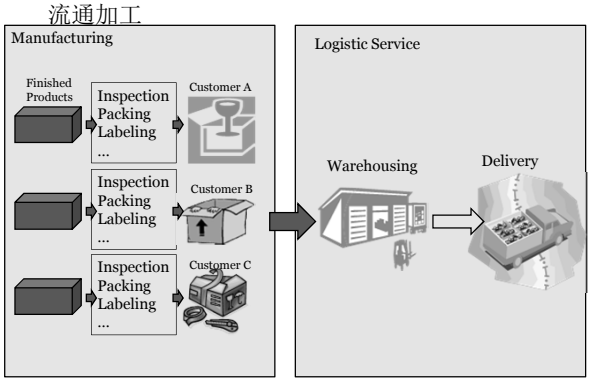
- ✓Reduce Cost
- ✓Pay-as-you-use
- ✓Professional Management
- ✓High utilization of space and
- ✓Shared transportation cost

The Key Company of the Case Study
江门安捷物流有限公司

Jiangmen Anjie Logistic Co., LTD
- Third-party Logistic Service Provider
- Public warehouse + Distribution Processing

Challenges
- Mixed products with different storage requirements
- Dynamic space planning
- Distribution Processing Scheduling
- High throughput
- High punctuality requirement
- Lack of an efficient warehouse management system

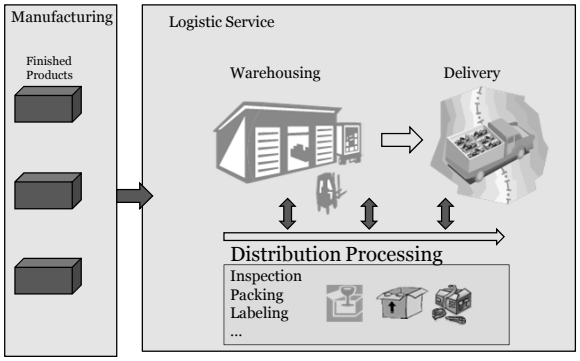
Distribution Processing
流通加工



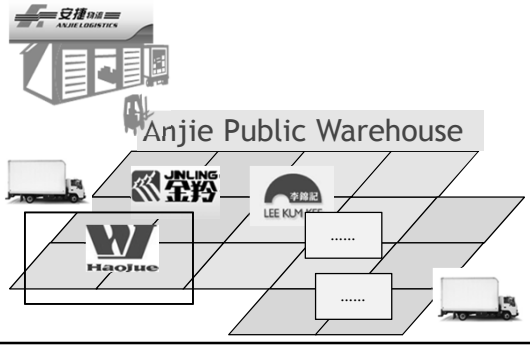
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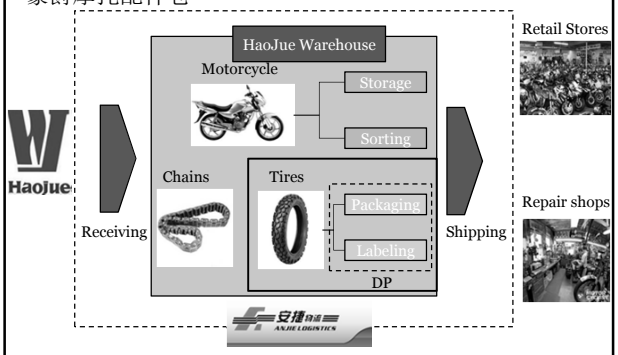
Distribution Processing
流通加工



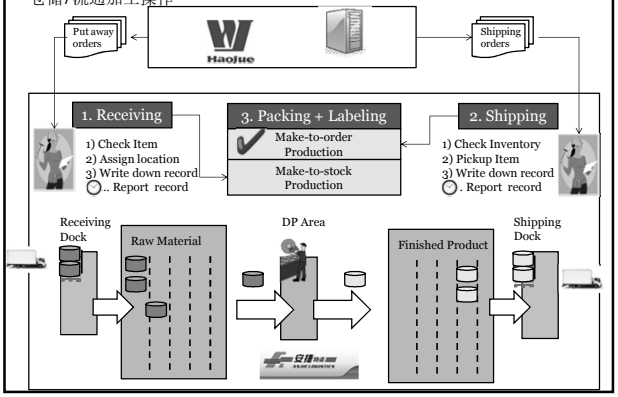
Scope of the Project
试点项目实施范围



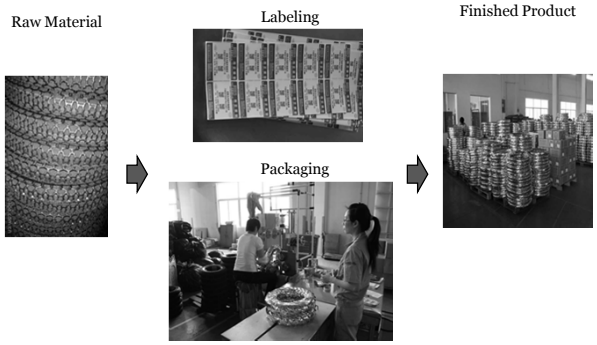
HaoJue Warehouse in Anjie Logsitic
豪爵摩托配件仓



Operations in HaoJue Warehouse
仓储/流通加工操作



Distribution Processing of Motorcycle Tires
摩托车轮胎流通加工



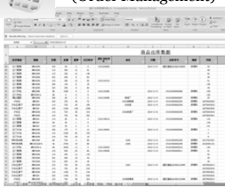
Reader Selection
ＲＦＩＤ硬件选型



Frequency	HF	HF	UHF	UHF
Distance	<10 cm	<10 cm	1 m-3 m	1 m-3 m
Multi tag?	1 tag	1 tag	Multi tags	Multi tags
Connection	USB	TCP-IP (Network Cable)	TCP-IP (Network Cable)	802.11 (WIFI)
Operation system	None (connect to PC)	Embedded Windows XP	None (connect to PC)	Embedded Windows Mobile
Portability	Fixed/Portable	Fixed	Fixed	Portable
Price	HKD 120	HKD 8,000	HKD 4,000	HKD 13,000

Before RFID WMS System…
手工仓储/流通加工管理

Excel spreadsheet (Order Management)



Blackboard (Production Scheduling)



- The inventory record is not accurate.
- Difficult to conduct the planning and scheduling of the DP.
- Cannot control the progress of production.
- Difficult to find the specific products for the specific customers.
- The delivery of product is always delay.

Our RFID Reader Solution
安捷ＲＦＩＤ硬件选型方案



	PC Server	Handhold RFID Device
User	Warehouse Manager	Warehouse Coordinator
Function	•Warehouse Information •Order Management •Production Planning & Scheduling •Process monitoring & control	•Download Orders •Get Real time data •Process Execution •Upload process result

Tag Deployment
电子标签部署

×N o shelves, plane warehouse

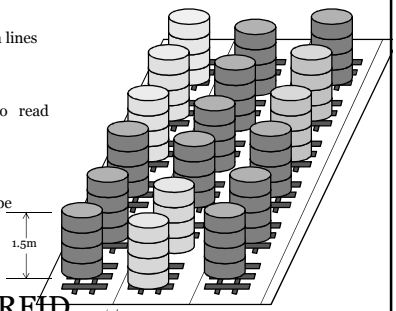
×No grid, pallets are stocked in lines

×No space to walk in

×Tires are staked up, difficult to read the pallet

×No barcode on tires

×One pallet for one product type

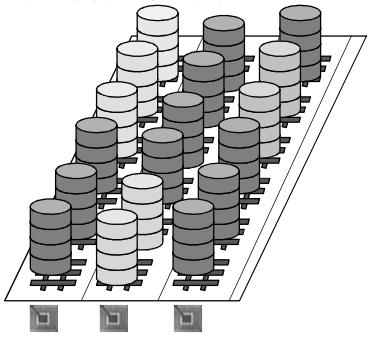


How to deploy RFID Tags ????

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Our RFID Tag Deployment Solution
安捷电子标签部署方案

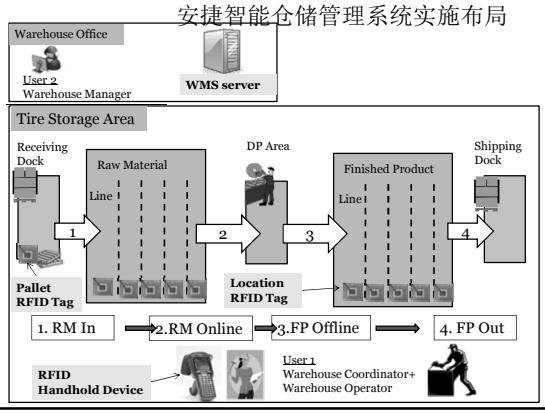


Location Tags

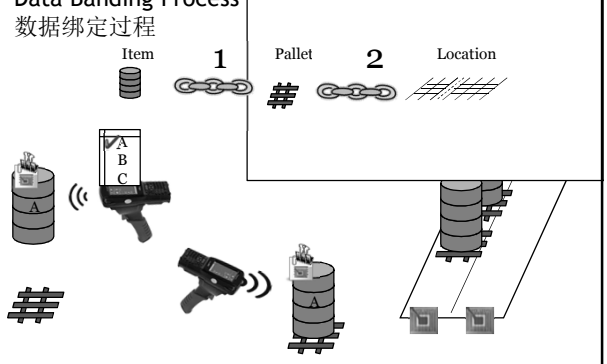


Pallet Tags

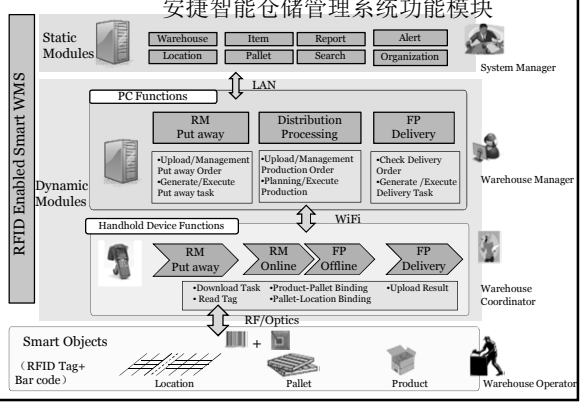
RFID WMS Implementation Layout
安捷智能仓储管理系统实施布局



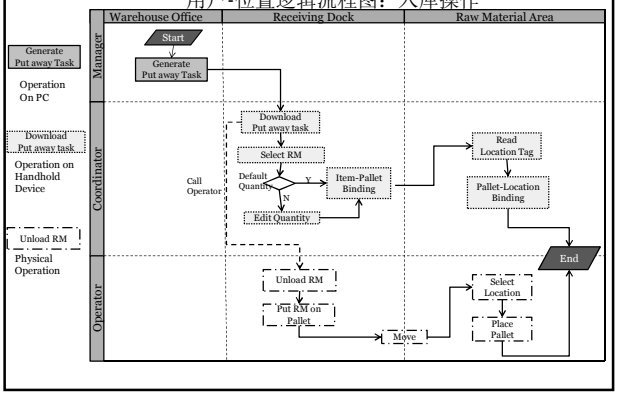
Data Banding Process
数据绑定过程



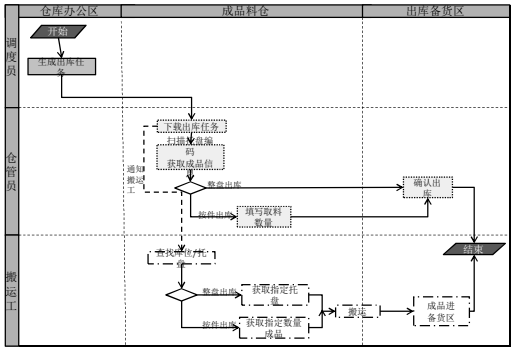
RFID WMS Function Module Structure
安捷智能仓储管理系统功能模块



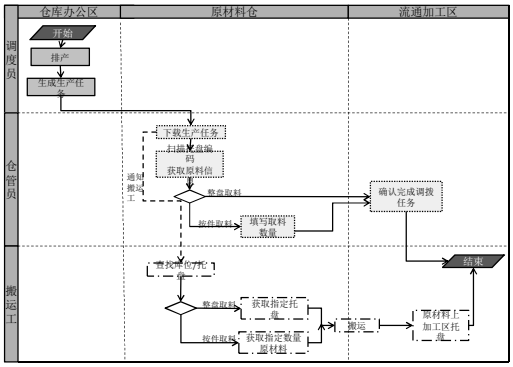
User-Location Flowchart: RM Put away
用户-位置逻辑流程图：入库操作



User-Location Flowchart: FP Delivery
用户-位置逻辑流程图：成品出库



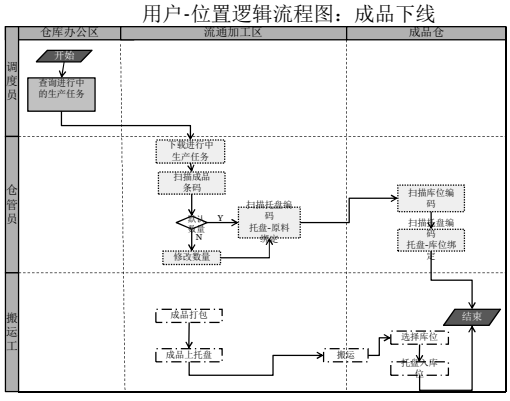
User-Location Flowchart: RM Online
用户-位置逻辑流程图：原料上线



Screen Copy of PC System
PC端操作界面



User-Location Flowchart: FP offline
用户-位置逻辑流程图：成品下线



Screen Copy of Handhold Device
RFID手持设备操作界面



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What can be improved in current solution
项目后期改进方案



Smart Phone + Mini RFID Reader

Price: 1,000-3,000 (Smart Phone)+ 500-2,000 (Reader)
OS: Android
UI: Multi touch, easy control
Size: 3.5 inch/5.3 inch/9.7inch

What we achieved in this project
项目评估

- ✓ Accurate inventory record
- ✓ Flexible and dynamic planning and scheduling
- ✓ Real time process monitor and control
- ✓ Paperless warehouse and production management
- ✓ Fast product location in warehouse
- ✓ Increased on time delivery rate
- ✓ Simplified operations

What can be improved in current solution
项目后期改进方案



NFC (near field communication)

Integrate the smart phone with RFID Reader

Price: 1,000-3,000 Smart Phone

OS: Android
UI: Multi touch, easy control
Size: 3.5 inch/5.3 inch/9.7inch

What can be improved in current solution
项目后期改进方案



Handhold Device

Price: 17,000 HKD
OS: Windows Mobile
UI: Not friendly
Size: Small Screen , Large Body



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