

Order Fulfillment Technologies For Expanding Markets 快速发展市场中的订单拣选技术

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Session Objectives 目的

- Review of order picking technologies and techniques being employed in high-volume distribution centers
介绍在大容量物流配送中心环境下采用的订单拣选技术和方法
- Discuss benefits and challenges associated with employing these technologies and techniques
讨论这些技术和方法在使用中的优势与挑战
- Appreciate the steps involved in justifying, acquiring and implementing these technologies and techniques
了解采用这些技术和方法所需要考虑的方方面面

China's DC Landscape 中国物流配送中心现状

IT Systems

IT 系统

- Legacy/ERP based Warehouse/DC control systems still prevalent
主要采用传统ERP系统下的仓储管理系统
- Manual data entry common
普遍采用手工数据输入方式
- Lack of directed task management
缺少作业分配管理功能

Storage Systems

存储系统

- Wide range of technology utilized, often industry driven
大量使用各种存储技术，通常是由行业驱动
- In general, good application of the correct storage medium
通常所采用的存储方法还是适中的
- Mis-match between storage medium and industrial trucks common
普遍存在存储方法与工业叉车不配套的状况

Order Fulfillment

订单拣选

- *Most significant opportunity for improvement*
改善空间最大
- *Paper-based picking solutions widely utilized*
普遍采用纸张拣选
- *Stratification of product by velocity (Pareto) not well understood*
按产品进出库速率（柏拉图二八开原理）进行分别管理的认识不够
- *Discrete order picking prevalent*
普遍采用摘果式订单拣选方式
- *Excessive touches of product*
产品被发发复复捡起、放下，碰动过多

Use of 3PL's

第三方物流

- *Contract terms typically include short durations*
合同期限通常较短
- *Application of advanced technologies financially prohibitive*
投资先进的技术成本受限

Typical DC Labor Breakdown

典型物流配送中心成本构成

- Picking/replenishment or order fulfillment labor is the largest component of the labor expense.
拣选、补货或者说订单拣选占成本构成的主要部分
 - Over 30% of total DC labor
占配送中心总工时的30%
 - 70% of an order fulfillment operator's time in a typical DC is travel
在典型物流配送中心中，订单拣选人员花在“行走”上的时间占70%

Job Function 工作内容	
Management labor costs 管理人工时	7.6%
Administrative labor costs 后勤人工时	7.0%
<i>Indirect sub-total</i> 间接工时合计	14.6%
Receiving/putaway 入库收货、放置	18.8%
Quality inspection 质量检查	1.8%
Picking/replenishment 拣选、补货	30.7%
Packing 包装	9.6%
Value added activities 增值服务	7.6%
Shipping 发货	14.9%
Cycle counting 循环盘点	2.1%
<i>Direct sub-total</i> 直接工时合计	85.5%
Total 总计	100%

General Order Picking Best Practices

比较普遍采用的订单拣选最佳方式

- **Separate broken case picks into dedicated zone**
在指定的区域拆零拣选作业
- **Focus on replenishment to minimize stock-outs**
及时补货，避免出现缺货
- **Minimize travel and touches** 缩短行走路线，减少碰动次数
 - Apply Pareto's law for slotting product 采柏拉图方式对储位合理安排
 - Require pick confirmation 要求拣选确认
 - Conduct outbound quality audits versus checking all orders 采用出库质量抽查或订单全部核实
- **Minimize/eliminate paperwork for pickers, improve legibility of order instruction** 减少/消除拣选工纸张工作，提高订单的可识别性
- **Select appropriate fulfillment process**
 - Picker to material 人到物品
 - Material to picker 物品到人
 - Batch picking and sortation 集单拣选及播种

Picker to Material

人到物品



Radio Frequency (RF) Terminals

无线射频终端

- **Pick using wireless handheld, wearable and vehicle mounted terminals directed by server application scanning bar codes**

采用无线手持、可带在手上的或装在车上的与服务器连接的条码扫描终端

- **Supports all picking types**

支持所有的拣选类型

- **Employed in all types of warehouses**

用在所有类型的仓库中

- **Numerous variations (e.g. RF cart picking)**

多种形式 (如： 带RF的拣货小车)

- **Out of the box support with many WMS packages**

许多WMS系统均支持

- **Deployment cost is low to moderate (\$\$)**

实施成本较低

- **Strengths – Supports best pick path and batching, real time verification of pick**

优点： 支持最佳拣选路径、集单拣选， 拣选实时校验

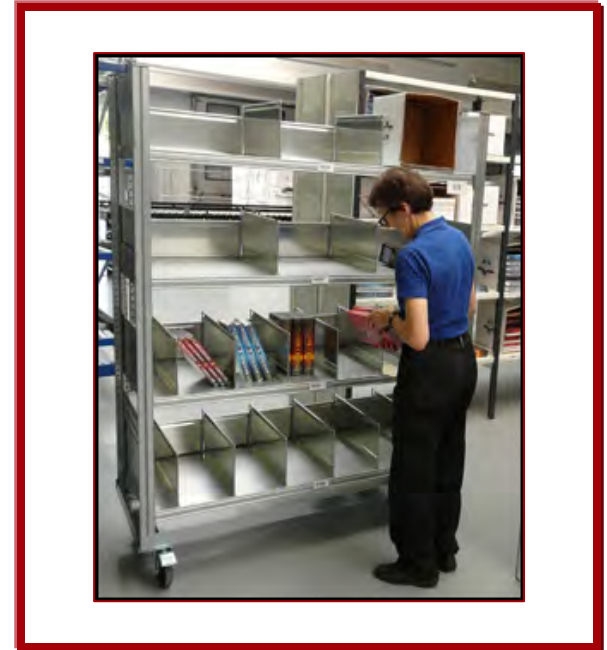
- **Challenges – Picker must interact with screen, keyboard and scanner. May required WMS modifications to meet operational objectives**

挑战： 拣选员必须使用屏幕、键盘和终端扫描仪。不同的业务流程可能要求WMS系统做些调整



RF Cart Picking 带RF的拣选小车

- **Multiple order or cluster picking with each cart slot representing order or carton.**
多订单或聚合拣选，每个小车小槽代表一个订单或一个纸箱
- **RF terminal directs picker in best pick path sequence based on aggregate cart demand.**
RF终端告诉拣选员最佳拣选路径顺序，根据累计的小车需求
- **Operator confirms location pick and put into slot**
拣选员确认位置拣选，放到拣选小槽中
- **Good fit for multi-unit orders where cart travel path is reasonable. For singles consider batch picking instead**
对多订单且对小车行走路线合理的情况非常适合。对单一订单考虑集单拣选
- **Voice and 'smart cart' (PTL) variations**
语音和“智能小车按灯”变形
- **Requires specific WMS or server functionality**
要求具体的WMS或服务器功能
- **Deployment cost is moderate (\$\$) depending on WMS support**
实施成本中等，取决于WMS系统支持情况
- **Consideration – total travel path per cart**
考虑重点 - 每辆小车的总行走路线



Voice 语言拣选

- **Pick using voice-enabled, wireless terminal directed by host application.**
采用由主机系统支持的声音控制的、无线终端
- **Supports all picking types including cart/cluster**
支持所用的拣选方式，包括小车拣选及集单拣选
- **Works best where dialogue is limited (verify pick by speaking location check digit)**
在沟通要求较少的环境中使用最好（通过口述拣选位确认拣选）
- **System variations: direct WMS interface, standalone application server, terminal mapping**
不同的系统：直接WMS接口，单独应用服务器，终端映射
- **Voice-only only versus multi-modal terminals, speaker dependent versus speaker independent**
单一语音模式与多种模式，耳机模式与扬声器模式
- **Deployment cost is moderate (\$\$)**
实施成本中等
- **Strengths – All that RF provides plus significant productivity boost due to heads up & hands free operation, safety & job satisfaction, flexible when requirements change**
优点：除了具有所用RF终端的优点外，由于拣选工不再低头看终端及双手不必拿终端，通常生产率会大大提高，安全与工作满意度提高，当有变化时改变灵活
- **Challenges – Selecting the right solution**
挑战：选择合适的解决方案



Pick-to-Light (PTL) 按灯拣选技术

- **Pick directed by fixed location and zone displays.**
在固定的位置或区域显示区拣选
- **Bay display, location display (beacon or quantity), confirmation and increment buttons**
货格显示，储位显示（信标或数量），确认按钮及调整按钮
- **Typically deployed in zone configuration with conveyor routing totes/cartons between zones.**
通常用于采用传送带传送拣选箱的各工作区域中
- **Works best for high velocity SKUs in relatively dense pick modules. Moderate to high number of lines per order**
适用于拣选量相对高、SKU流动率高的拣选模块中。每个订单的订单行较多
- **Variations: Confirmation barriers, smart carts**
变形：确认按灯，智能小车
- **PTL software may also support Voice & RF**
按灯拣选技术也许支持语音拣选及无线射频技术
- **Deployment cost is moderately high (\$\$\$) to high (\$\$\$\$)**
实施成本中到高
- **Strengths – Productivity, easy to use**
优点：生产率提高，使用方便
- **Challenges – Fit, host integration, inflexible when requirements change**
挑战：适用与否，主机系统集成，当要求变化时调整不够灵活



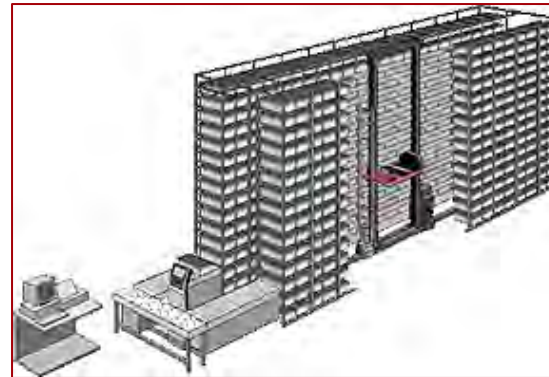
Material to Picker

物品到人

Carousels & AS/RS 旋转式货架与AS/RS

- **Material to picker. Typically light directed – pick to light & put to tote/carton**
物品到人。通常是按灯指示，按灯拣选，播种到拣选箱
- **Batches multiple cartons/totes in put locations**
分批把多个拣选箱放到播种位置
- **Pods, carriers, shelving, shuttles, carriages and cranes.**
工作台，搬运器，货架，往返车，车架和堆垛机
- **Typically deployed in zone configuration with conveyor routing totes/cartons between pods/zones.**
通常用于采用传送带传送拣选箱到各个工作台/区域内
- **Horizontal carousels - Works best for low to medium velocity small items**
水平式旋转货架 – 通常用于物品较小，流动量小的环境
- **Mini-load AS/RS – Typically used for higher velocity SKUs**
箱式AS/RS – 通常用于SKU流动性高的环境
- **Variations: Vertical carousel, AS/RS (pallet or unit load)**
变形：立体旋转货架，AS/RS (托盘或单件)
- **High deployment cost**
实施成本高
- **Strengths – Productivity and space utilization, security, controlled environment fit, minimizes re-slotting (mini-load and vertical carousel)**
优点：生产率与空间利用率，安全，受控制的环境，减少重新调整存储位（箱式及立体旋转货架）
- **Challenges – Fit, host integration, SKU balancing (horizontal carousels)**
挑战：产品适合否，主机系统集成，SKU平衡（水平式旋转货架）

Carousels & AS/RS 旋转式货架与AS/RS



Mini-Load AS/RS
箱式AS/RS

Mobile Robotic Systems 移动式机器人拣选系统

- **Material to picker. Light directed – pick to light & put to tote/carton**
物品到人。信号灯指示 – 按灯拣货，播种到拣货箱中
- **Mobile carriers / pods, AGV**
移动式平台/工作台，AGV
- **Relatively new technology**
技术相对较新
- **Works best 最佳应用环境**
 - Smaller items 物品较小
 - Moderately high lines per day 每天的订单行较多
 - Moderate to high inventory turns 库存周转较高
 - Moderate to high SKU base SKU数量较大
- **High deployment cost**
实施成本高
- **Strengths – Productivity, easy to use, dynamic storage (no re-slotting), less auxiliary MHE required**
优点：效率高，使用方便，动态存储（无需重新做储位规划），对辅助物流搬运设备要求少
- **Challenges – Fit, clear height utilization, peak periods, integration**
挑战：实用，净高使用率，峰值处理，集成

Mobile Robotic Systems 移动式机器人拣选系统



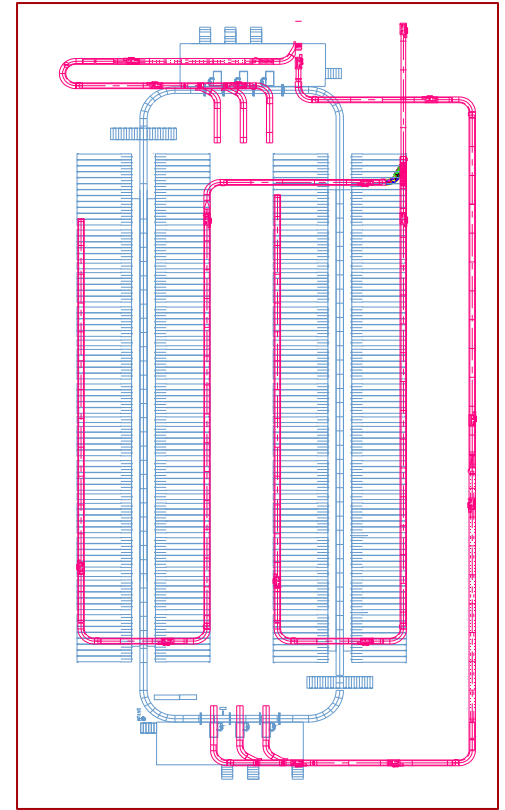
Batch Picking and Sortation

集单拣选与播种

Batch Picking and Sortation 集单拣选与播种

- **Pick aggregate demand via paper/label, RF, or voice. Sort to order manually or through automation (unit sorters)**
通过纸张/标签, RF, 或语音拣选。手工或自动播种 (单件分拣系统)
- **Unit sorters – cross belt, tilt tray, others...**
单件分拣系统 - 平移式输送带, 倾斜式托盘, 其它...
 - High volume operations 适于订单量高的环境
 - High deployment costs 实施成本高
 - Strengths – Throughput and productivity 特点: 高吞吐量与生产率
 - Challenges – Complexity, integration, wave/capacity balancing, item fit 挑战: 复杂, 集成, 波次/能力平衡, 分拣物品与系统配套问题
- **Manual sortation – paper/label, RF, voice, or PTL**
手工播种 – 纸/标签, RF, 语音, 或按灯
 - Put to carton/order 按拣选箱/订单播种
 - Sort singles at packing 对单一订单在包装区分拣
 - Low to moderate deployment costs 实施成本较低
 - Strengths – Relative simplicity 优点: 相当简单
 - Challenges – Extra touches 挑战: 过多的碰动

Unit Sorters 单件分拣系统

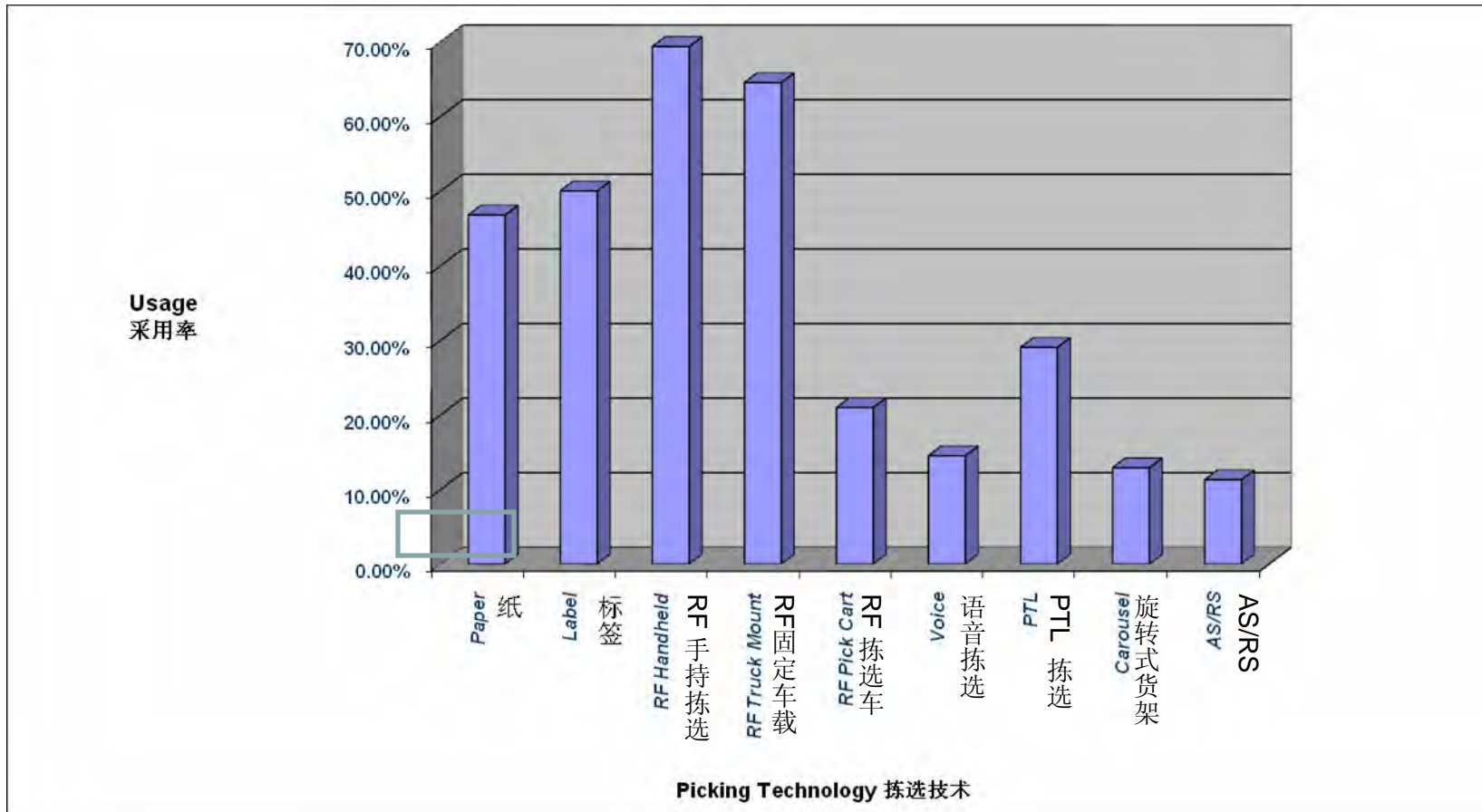


Moving Forward

未 来



Picking Technologies – Across Industries/Channels 拣选技术 – 全行业平均



Source: Supply Chain Consortium (www.supplychainconsortium.com)

来源：供应链联盟

Just The Facts 一些事实

- **There are no easy answers or simple formulas to determine what works best for your operation** 对贵公司的业务，该采用何种技术，没有一个简单的答案或计算公式
- **The most important step is identifying the long-range requirements of the operation**
最重要的是要明确未来业务的需求
 - Order volumes 订单量
 - Growth 增长率
 - Discrete work flows 分析不同的工作流状态
 - Customer requirements 客户需求
- **Don't look at picking technologies within vacuum** 不要孤立地寻找拣选技术
 - Layout, replenishment, packing, shipping, upstream/downstream automation, and systems all significant impact on picking performance
仓库平面布局，补货，包装，发货，上端/下端自动化及自动化程度均对拣选绩效都有影响
- **Technologies aren't mutually exclusive** 技术不是相互排斥的

Thank You

谢谢

Please feel free to contact me with additional questions

如有问题，请随时与我联系

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