**Design and Optimization of Automated Warehouse Processes**

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Products are often stacked on shelves, picked and packed according to customer orders in a warehouse. Most high-volume warehouses have been using robotic handling systems to carry out these operations. However, traditional automation approaches for a warehouse have some drawbacks, namely, the inflexibility of inventory locations, high set up cost and manual slotting. In the recent years, innovative warehouse automation systems are integrating picking robots and automated storage retrieval systems (AS/RS) to enable spatial flexibility and scalability. These automated systems used at pick-pack-and-ship warehouses where the robots pick the products from the shelves and pack them into the customer order boxes, ready for shipping. Additionally, they can rearrange the shelves, handle incomplete orders and buffer storage systems.

Recent application of fully automated order fulfilments systems is in the retail sector where the demand requirements represent the orders that need to be stored or retrieved to meet the distribution schedule. Customers expect same-day or next-day deliveries which results in tight deliver schedules and uncertainties in order arrivals. In this research, such an e-commerce environment is considered to focus on the following operational and tactical aspects.

1. Static and dynamic retrieval patterns and the related processes such as sequencing and batching of orders
2. Forward-reserve storage assignment decision
3. Picking sequence in the presence of packing constraints
4. Inventory allocation and replenishment policy