Warehouse Revitalization: Eliminate Fragmentation for Improved Picking

How Infusing Defragmentation Processes into Warehouse Operations Boosts Productivity and Reduces Cost

Executive Summary

As technological advances continue to grow and take shape, companies around the world are looking to adapt and adopt new approaches to deliver unique experiences and quality products to make a lasting impression. The supply chain is an integral piece to the puzzle in ensuring that companies' visions for the customer experience are met, and, specifically, within the four walls of the warehouse, operations are evolving.

With the rate of change, it is easy to get caught up within the hype of the latest trend, but warehousing operations must not lose sight of the essential storage and retrieval elements that, when recharged, can boost productivity. Much like computer hardware, the warehouse works as an intricate system, with storage and retrieval actions similar to that of a magnetic disk drive: both systems require activation and process rejuvenation to run in sustainment mode. You may understand the reasoning behind defragmenting your hard drive, but why should you defragment your warehouse? Proper space utilization, shortened order fulfilment routes throughout the warehouse as well as replenishment reductions, are just a few examples of what can be reactivated for improvement through regular attention to the defragmentation process performed in the warehouse.

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1.0 Introduction

In the warehousing environment, efficient product storage and retrieval is essential to performing with the operational precision necessary to meet or exceed internal expectations (e.g. key performance indicators, company-wide goals, etc.) and external client expectations (e.g. deliver products of quality, on time, as-defined, etc.).

Think about the attributes of a conventional warehouse: It is generally a large building, with defined capacity levels, where people execute the organization, storage and retrieval operations as directed by a warehouse management system (WMS). When thinking about the warehouse operations in these terms, it becomes clear that the way product is organized, or disorganized, can make or break the efficiency of an operation.

The way technology performs functions is often mirrored and designed to perform similarly to systems that occur in nature. As modern computers are often compared to reverse-engineered human minds, magnetic disk drives were similarly designed to be a high-functioning memory for computers. As with human memory, over time data held by a disk drive can often become disorganized and hard to access. To ensure hard disk storage remains accessible and retrievable, defragmentation or rejuvenation processes must be performed; the same conclusion can be drawn within the warehouse as fragmentation of product can be just a detrimental as losing key information needed to run quickly and efficiently.

2.0 Storage and Retrieval Systems

Thinking of the warehouse environment as a unique storage and retrieval system, infused with a combination of advanced systems and people who specialize in the performance of certain tasks to ensure orders are retrieved quickly, efficiently and accurately to satisfy orders and ancillary expectations, the placement of product in pick zones becomes essential.

Noting the importance of product placement within pick zones, how does one define which products belong where to achieve the most efficiency? While goals and objectives for each warehouse may vary, the first step in defining best product placement in the forward pick begins with data collection. In addition to accurate product dimensions and weights for each pick unit, order history, including cube movement history, as well as forecasts (where applicable) become essential components to the analysis and placement of product to support the desired benefits.

2.1 Magnetic Disk Drive Example

Let's compare the fragmentation and defragmentation of a computer disk drive. A traditional magnetic disk drive is a storage and retrieval system for digital data. However, it is actually a mechanical device (see Figure 1 below), and it takes time to move the read/write head to a specific place on the disk in order to read data stored there.

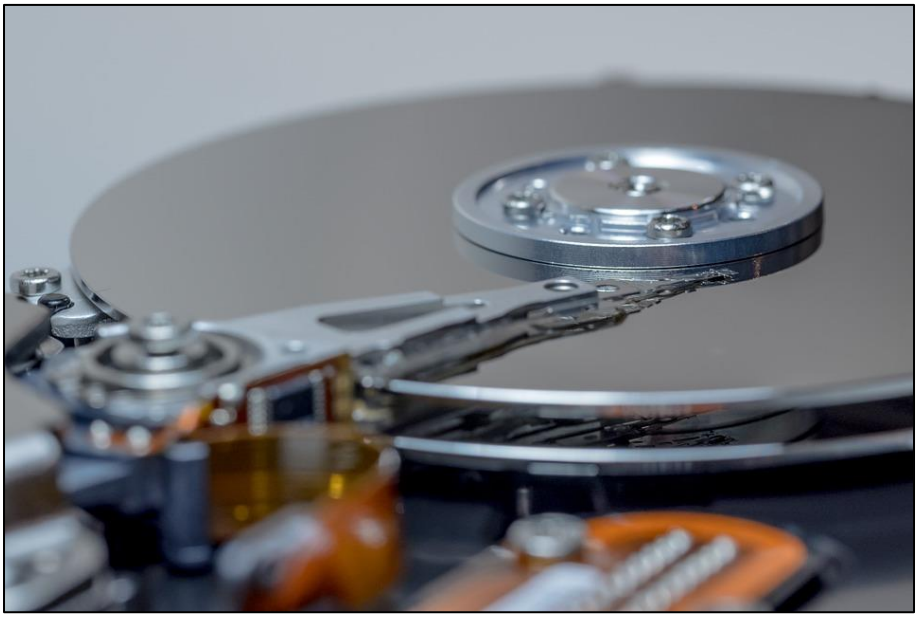

Figure 1

Files are stored on the disk by dividing them into segments and writing the segments into various places on the disk. In order to read the original file, the read head must visit all of the locations where the segments of the file are stored. This can add significantly to the time it takes to read a file. If the file is large or read often, then it makes sense to use one of the many defragmentation tools to reorganize the data segments on the disk so that they are contiguous, enabling the read head to minimize movement when reading the data.

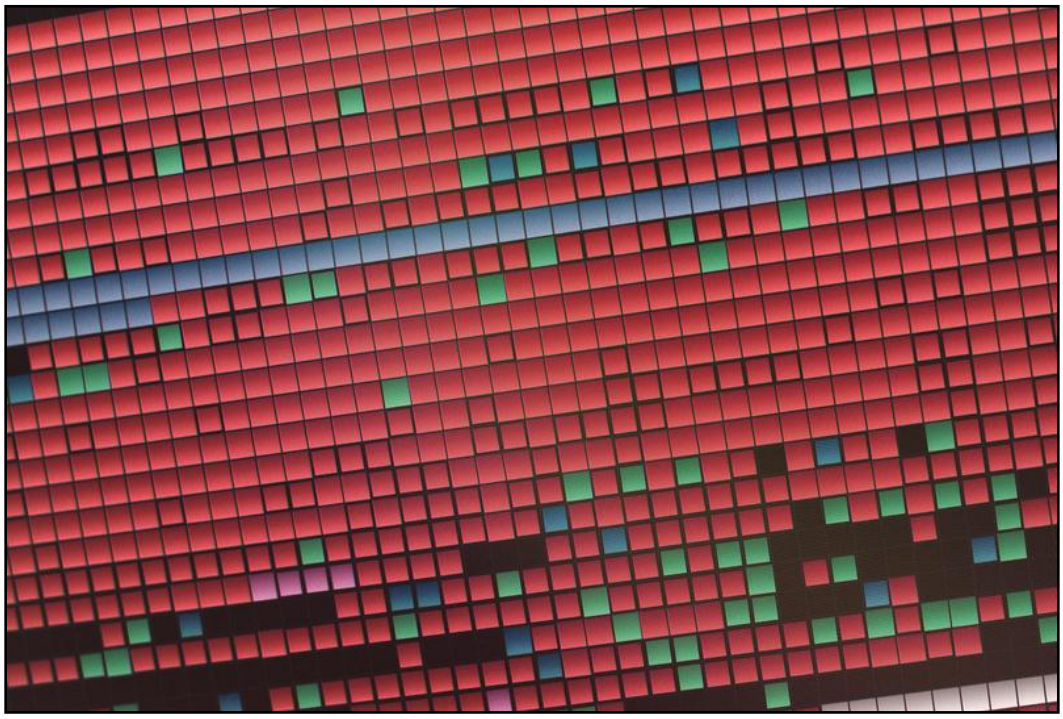

Figure 2

2.2 Forward Pick Area Example

Similarly, in the forward pick area of a warehouse, items are stored in slots or bins along a pick path, usually arranged in some sort of aisle configuration. When items are picked to fulfill an outbound order, the picker travels from slot to slot to retrieve the items, not unlike the read head on a disk drive.

If the items are dispersed in such a way that those that are often picked are in slots far from the outbound delivery point, or arranged in another inopportune manner, then the time it takes to pick the order is extended, and, over time selectors lose steam, further draining on overall productivity. This increase costs. It is generally accepted by the warehousing industry that 50-60% of warehouse labor is used for outbound order picking, so a fragmented warehouse can be a significant source of unnecessary operational cost.

3.0 Defragmenting the Warehouse

While defragging a disk drive organizes data to read more efficiently, within the warehouse, organizing the placement of items to take advantage of convenient locations or to present the picker with a carefully planned sequence of items to achieve other specified goals can save from 5% to 50% of the labor needed to fulfill orders, according to industry case studies. Without taking the time to defragment one's warehouse, many efficiencies and cost savings will be missed.

4.0 Types of Warehouse Fragmentation

A warehouse is more complex than a disk drive as many goals, objectives and constraints must be taken into account for an operation to be effective. With these goals, objectives and constraints in mind, as well as the various other elements that can affect an operation (e.g. seasonality, promotions, the introduction or retirement of SKUs, etc.) the warehousing environment can easily become fragmented in multiple ways simultaneously.

Examples of item location fragmentation include:

- Empty space in numerous locations, highlighting potential need for improved space utilization
- Prime locations with dust on the items, signifying items currently located within the slots are no longer high velocity items in need of a prime location and are in need of new placement
- Selectors waiting on product, signifying that items may be in slots too small for the quantities typically needed
- Selectors congested in certain pick areas, highlighting the need for pick path optimization to stagger fast moving product along the pick path
- Poorly built pallets, pallets being rebuilt or consolidated on the shipping dock, and/or damaged products, signifying the need to refine the placement of goods along the pick path to achieve proper weight sequencing (e.g. heavier items in the beginning of the pick path, lighter or fragile items later in the pick path, etc.)
- Identical SKUs placed side by side, highlighting the need to separate certain items that, when placed together, could often could lead to mis-picks
- Selectors consistently picking above the head or below the knees, visually highlights the need for improved ergonomic placement of items
- Items placed in the wrong zone or family group, leading to slower picks, or depending on the nature of the item, regulatory fines

Often, warehouse operators recognize these sorts of reorganization opportunities, but the sheer magnitude of a large warehouse can be overwhelming, resulting in relatively ineffective incremental improvements, driven by familiarity with the operation, or maybe a spreadsheet tool.

Defragmenting and revitalizing the warehouse involves reslotting the items with a global strategy to improve efficiency. Like a defragmentation program for a disk drive, slotting

software can help defragment the warehouse, using slotting rules that capture the organizational strategy that best matches the particular goals and constraints of an operation.

Let's look at an example of a poorly organized (fragmented) warehouse, and how slotting software can help reorganize and reactivate significant operating costs.

5.0 Warehouses Present Simultaneous Fragmentation Challenges

Below (Figure 3) is an example of an overhead drawing of a warehouse that is fragmented. The bays of pallet racking are color-coded in such that the red bays house items with high activity, and cooler colors represent lower activity. The shipping dock is on the right, and a typical path followed by a picker selecting cases to build an outbound pallet is shown with red arrows. As one can see, since active items are in the back section of the warehouse, the typical pick path is longer than necessary.

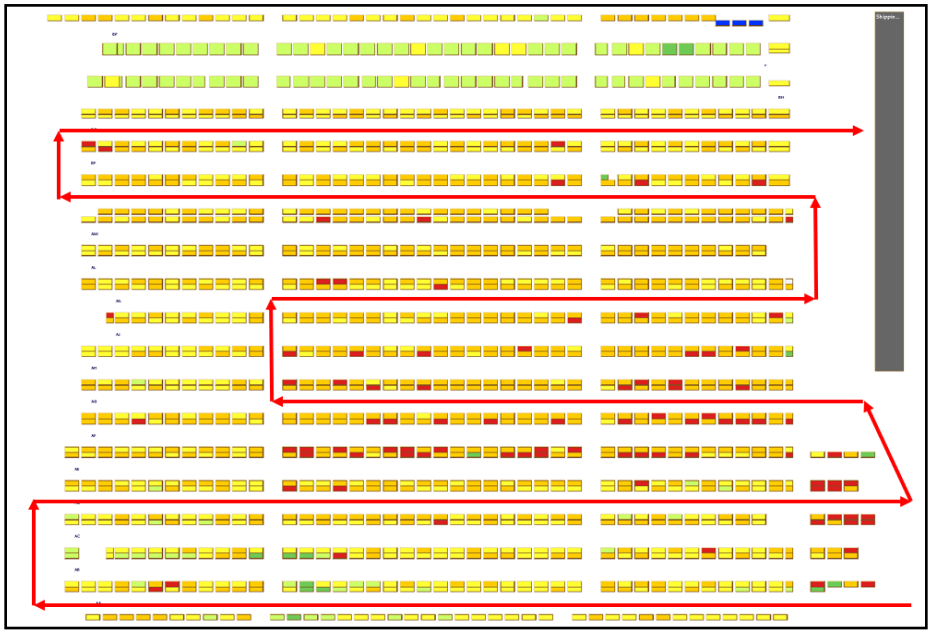

Figure 3

As a matter of fact, this warehouse is fragmented three different ways, simultaneously. Figure 4 shows the same example, this time color coded so that red colored bays house heavier, more dense items. In this image, one can see that the picker must constantly shuffle the selected cases on outbound pallet being built so that heavier items are on the lower layers.

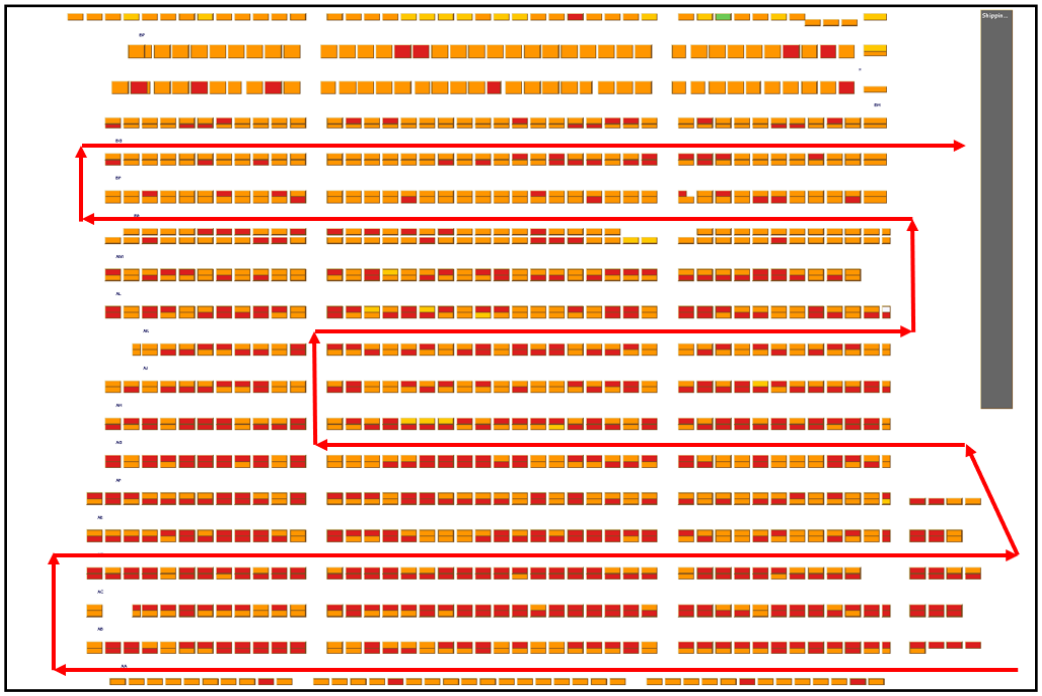

Figure 4

5.0 Warehouse Defrag Benefits

Now, after using slotting software to defragment, reactivating essential elements needed to sustain a healthy warehouse environment, one can see a marked visual improvement. First, color-coded by activity again, Figure 5 shows more active items located nearer the shipping dock, resulting in a reduced pick path.

Figure 5

The slotting software also simultaneously arranged the items along the pick path such that heavier, denser items are earlier in the pick path, so the picker has much less shuffling to do to build a stable outbound pallet (see Figure 6, the same example, now color coded so that denser items are housed in bays colored red).

Figure 6

For the third fragmentation issue, the slotting software was able to determine the ideal holding quantity in the forward pick area for each item and use that result to assign the item to slots that more closely matched the space needed for that required holding quantity. This reduced the replenishment tasks to under 2500 per week, another source of significant savings.

In warehouses that pick from multilevel racking or shelving, the fragmentation can occur in three dimensions. Not only is horizontal travel distance important, but the vertical bend and reach can add critical picking time if this is not addressed.

6.0 Automated Storage and Retrieval System Fragmentation

With recent advances in automation and robotics, Automated Storage and Retrieval Systems (ASRS) are becoming more popular in warehouses. These giant machines are even more similar to a disk drive, since they have a mechanism that stores and retrieves

stock in internal storage locations. Fragmentation can be a problem for these systems, too. Many ASRS use a form of dynamic slotting, which is intended to alleviate slow retrieval, but the standard form of dynamic slotting often does a poor job of preventing crippling fragmentation. This is often because stale (inactive) stock can land in better locations (in terms of storage/retrieval time) and occupy those locations for long periods of time. ASRS present a great opportunity for global slotting strategies implemented by specialized slotting optimization software, which defragment and revitalize these storage systems much like a disk drive.

7.0 Conclusion: Sustain, Automate and Self Heal

As with a hard drive, in order for a warehouse to consistently realize the benefits of an organized environment, defragmentation, synonymous with reslotting, must take place at frequent intervals. To best facilitate operational health, scheduling and automating the defragmentation process becomes key to accelerating intelligent movement and working towards a warehouse that self heals.

Optricity Profile

Optricity offers a platform of warehousing optimization, design and analysis software solutions to enhance operational precision within the workplace. By utilizing a unique blend of domain expertise, advanced mathematics and software engineering skills, Optricity has developed innovative technologies to support warehousing professionals and improve operational clarity in distribution centers around the world.

Capitalizing on powerful computing algorithms and patented processes, Optricity's solutions drive productivity and efficiency and offer software users the ability to master warehousing operations, from gain to maintenance. Continuous software enhancement exemplifies Optricity's commitment to its users addressing both dynamic operations and ever-changing industry conditions. Responding to business-specific requirements, Optricity systems modify advanced mathematics to serve real operating environments, ensuring results are optimal according to defined rules.

Optricity software-supported warehouses are more efficient at accomplishing true objectives – receiving, storing, and shipping goods with efficiency to achieve customer satisfaction, both internally and externally. Mirroring the values of Optricity's leadership team and the rigorous demands of the marketplace, the software development team delivers:

- solution speed, quality, and ease of use,
- system integration simplicity,
- high quality user training, dedication to innovation,
- extreme customer support,
- and industry-advancing, thought leadership, to produce software that serves as a global leader in its class.

For questions contact:
Lindsay Olla
Vice President, Market & Client Relations
lolla@optricity.com | www.optricity.com
+1 (919) 237-4846