



HYTROL CONVEYOR CO.

SORTATION TECHNOLOGY

**A GUIDE TO SELECTING THE RIGHT
SORTATION SYSTEM FOR YOUR NEEDS**

INTRODUCTION

Sortation in material handling is crucial and requires precise and reliable hardware. The right sortation reduces the manual labor needed to prepare for palletizing, packing, shipping, and other industrial operations. Sortation systems can increase efficiency, provide more accurate fill rates, and lower return rates and operating costs. The result—lower prices and faster delivery to the consumer.

The exponential rise in the online and retail market has moved sortation from being a "relevant" to a "critical" subsystem for optimized operations. The wrong selection can cost your business millions. Leaps in sortation technology for different items and product types can also make it difficult to choose an ideal sortation system to capture all critical business requirements. This white paper aims to simplify the selection process by highlighting essential criteria for selecting a sortation system.

The following topics will be covered:

- *Types of sortation*
- *Typical elements of a sortation system*
- *How to select the right sortation system for your application*
- *Economics of choosing a sortation system*
- *Hytrol and its sortation portfolio*

2 — TYPES OF SORTATION

Sortation is the process of identifying products on a conveyor system and diverting/sorting the products to a specific destination using a variety of categories and system methods. Various sorting methods apply to different applications, depending upon product type and required sorting rate; however, sortation is generally divided based on the sorter's arrangement or throughput.



Based on Arrangement:

1. LINEAR OR LINE SORTATION SYSTEM

A straight-line configuration is called a “line sorter” where items enter the sorter at only one location. As a result, they typically need separate recirculation conveyors to sort products missed on the first pass.

Line sortation further divides into two types based on the orientation of the product at the destination after sorting.

- MAINTAINED ORIENTATION LINE SORTATION
- RIGHT-ANGLE LINE SORTATION

2. LOOP SORTATION SYSTEM

An endless loop-based configuration is called a “loop sorter,” often with more than one entry point. In addition, the loop-based has a built-in recirculation system, which can help divert confirmation signals from the control system.

2 — TYPES OF SORTATION

Based on Throughput and Speed:

Classification of the sorters can be done under the following headings based on the throughput. The division based on throughput has clear markers in terms of the range; however, certain sorter technologies act under multiple divisions. For example, a shoe sorter operates between the range medium to high depending on the application and the requirement.

TYPE	RANGE OF THROUGHPUT [PPM*]	RANGE OF THROUGHPUT [PPH*]
SLOW	0-30	0-1800
MEDIUM	30-120	1800 - 7200
HIGH	120-500+	7200 - 30000+

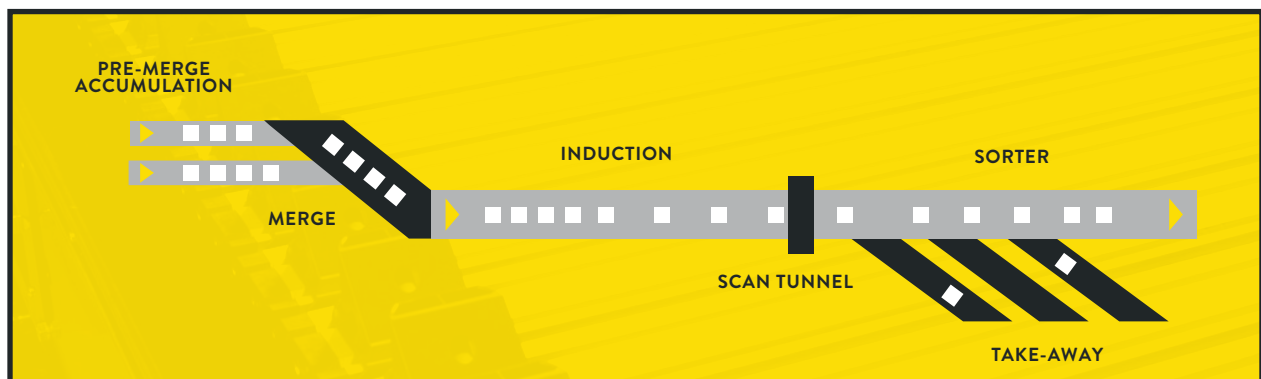
PPM - PIECES PER MINUTES | PPH - PIECES PER HOUR

3 — TYPICAL ELEMENTS OF SORTATION

Line Sortation System:

THE COMMON ELEMENTS FOR A TYPICAL LINE SORTATION SYSTEM ARE AS FOLLOWS:

- **PRE-MERGE ACCUMULATION:** ACCUMULATES PRIOR ENTRY INTO A SINGLE LINE
- **MERGE:** ENSURES A STEADY FLOW OF LOADS
- **INDUCTION:** CREATES MINIMUM GAPS BETWEEN PRODUCTS BEFORE ENTRY INTO THE SORTER
- **IDENTIFICATION SYSTEM:** RECOGNIZES AND DEFINES DESTINATIONS FOR LOADS
- **SORTER:** DIVERTS ITEMS TO EITHER OF THE TWO SIDES
- **RECIRCULATION SYSTEM:** ROUTES REJECT OR MISREAD PRODUCTS BACK INTO THE INDUCTION LINE

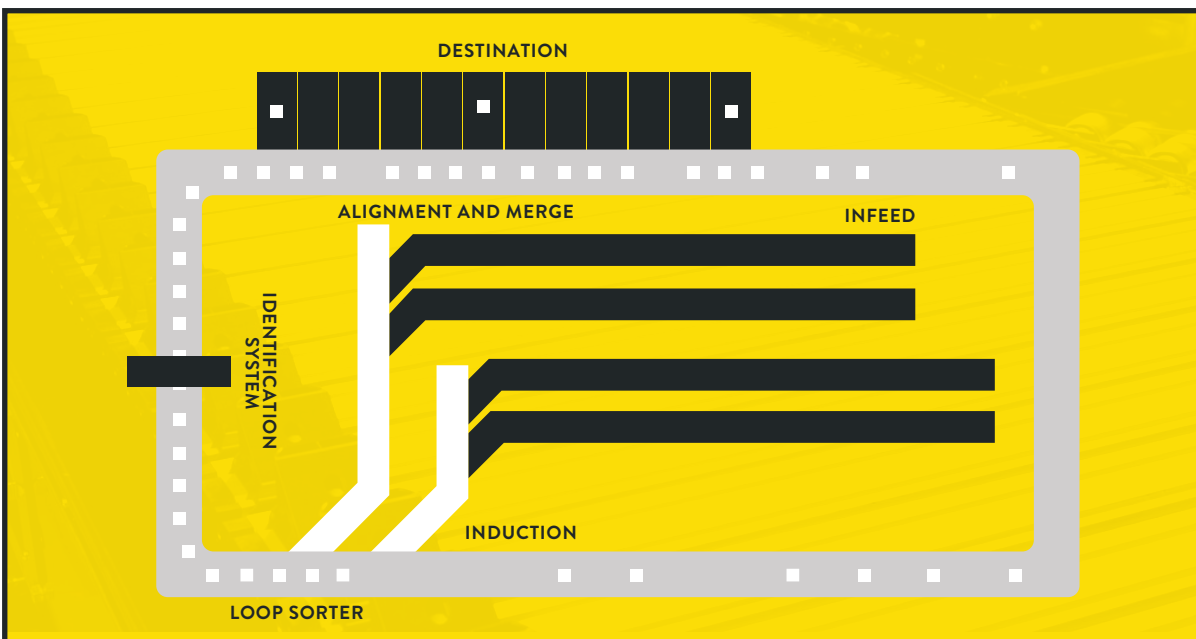


3 — TYPICAL ELEMENTS OF SORTATION

Loop Sortation System:

THE COMMON ELEMENTS FOR A TYPICAL **LOOP** SORTATION SYSTEM ARE AS FOLLOWS:

- **INFEED SYSTEM:** CONSISTS OF CONVEYORS FROM MULTIPLE SOURCES
- **ALIGNMENT AND MERGE:** FACILITATES ALIGNED AND MERGED LOADS FOR A STEADY FLOW
- **INDUCTION:** ENSURES EVERY CARRIER IS LOADED WITH A PRODUCT
- **IDENTIFICATION SYSTEM:** RECOGNIZES AND DEFINES DESTINATION LOADS
- **SORTATION:** DISCHARGES THE ITEMS BASED ON THE FEEDBACK FROM THE IDENTIFICATION SYSTEM
- **DESTINATION:** COLLECTION POINTS IN A LOOP SORTER LIKE BUFFERS, CHUTES, ETC.



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SORTATION SYSTEM SELECTION

Selection of the right sorter is the key to an efficient support system for your business. A poor choice can be disastrous and bleed your business in labor and non-value-added processes.

When selecting any sortation system and subsequent technology, it is essential to identify the required specifications. The most critical information typically involves these three basic questions:

1. WHAT IS THE PRODUCT OR THE PRODUCT RANGE YOU ARE SORTING?
[PRODUCT TYPE]
2. HOW MANY SAID PRODUCTS ARE TO BE SORTED PER MIN OR HOUR?
[THROUGHPUT]
3. WHAT IS THE SPACE AVAILABLE, AND TO HOW MANY DESTINATIONS?
[FOOTPRINT AND DESTINATIONS]

In addition to these essential criteria, other aspects pertinent to system selection include: maintenance requirements, noise levels, energy usage, investment levels and flexibility for future expansion. These will vary from business to business

Product Type:

Product type is a key priority for selecting a sortation system. Product type covers the dimension, weight, shape, fragility, packaging, surface, and materials. The product characteristics will influence the selection of the sorter and the design of the destinations. With the growth in technology, even irregulars—a pain point for most operations, can be managed with new-age sorting solutions.

4 — SORTATION SYSTEM SELECTION

Most applications do not handle a single item type, so evaluating the range of products against the system selected is essential. The more variety of products the system can handle, the fewer products need to be operated manually, which increases operational efficiency. Therefore, consider your entire product mix for present and future needs when making your selection.

Consider your products and ask the following questions:

1. WHAT ARE THE TYPES OF PRODUCTS TO BE SORTED? (E.G., CORRUGATED CARTON, TOTE, FLATS, STRAP, LOOSE ITEMS, STRINGS, IRREGULARS.)
2. WHAT TYPE OF PACKAGING HAS THE PRODUCT UNDERGONE? (E.G., CORRUGATE, SHRINK WRAP CASE, BAGGED APPAREL, APPAREL ON HANGERS)
3. WHAT IS THE DIVISION OF PRODUCT VARIETY? (E.G., 50 PERCENT CORRUGATED CARTON, 25 PERCENT BAGGED APPAREL)
4. WHAT IS THE STRUCTURAL INTEGRITY OF THE PRODUCT? (HOW RIGID AND PREDICTABLE IS THE STRUCTURE)

4

SORTATION SYSTEM SELECTION

These questions should help zone in on the product; you can also find below the product handling capability matrix to understand the suitability of different product types across other sorting systems. The products have been broadly classified as the following.

PRODUCT TYPE	ABBR.	PRODUCT TYPE	ABBR.
CORRUGATED CARTONS	CC	STRAPS	ST
PLASTIC TOTES	PT	STRINGS	SR
BAGGED APPAREL	BA	LOOSE ITEMS	LO
PARCEL	PA	LARGE PARCEL	LP
STRETCH WRAPPED	SW		

TYPE	SORTER TECHNOLOGY	CC	PT	BA	PA	SW	ST	SR	LO	LP
N-LINE	PUSHER	4	4	1	1	2	2	1	1	0
N-LINE	NARROW BELT SORTER 90 DEGREES	3	3	1	1	3	2	1	1	1
M-LINE	BELTED PIVOT WHEEL	3	3	1	3	3	1	1	1	0
M-LINE	NARROW BELT SORTER 30 DEGREES	3	3	1	1	3	2	1	1	0
M-LINE	HIGH DENSITY SLIDING SHOE	2	2	4	4	2	2	1	4	0
M-LINE	SLIDING SHOE	4	4	3	2	2	2	1	1	1
M-LINE	SLIDING SHOE FOR VERY LARGE ITEMS	4	4	2	3	3	3	2	2	4
LOOP	BOMB BAY	1	0	4	2	2	2	2	3	0
LOOP	TILT TRAY	4	3	2	2	2	3	2	2	1
LOOP	CROSS BELT	4	2	4	4	2	4	2	3	1

KEY

4 EXCELLENT

3 GOOD

2 FAIR

1 POOR

0 N/A

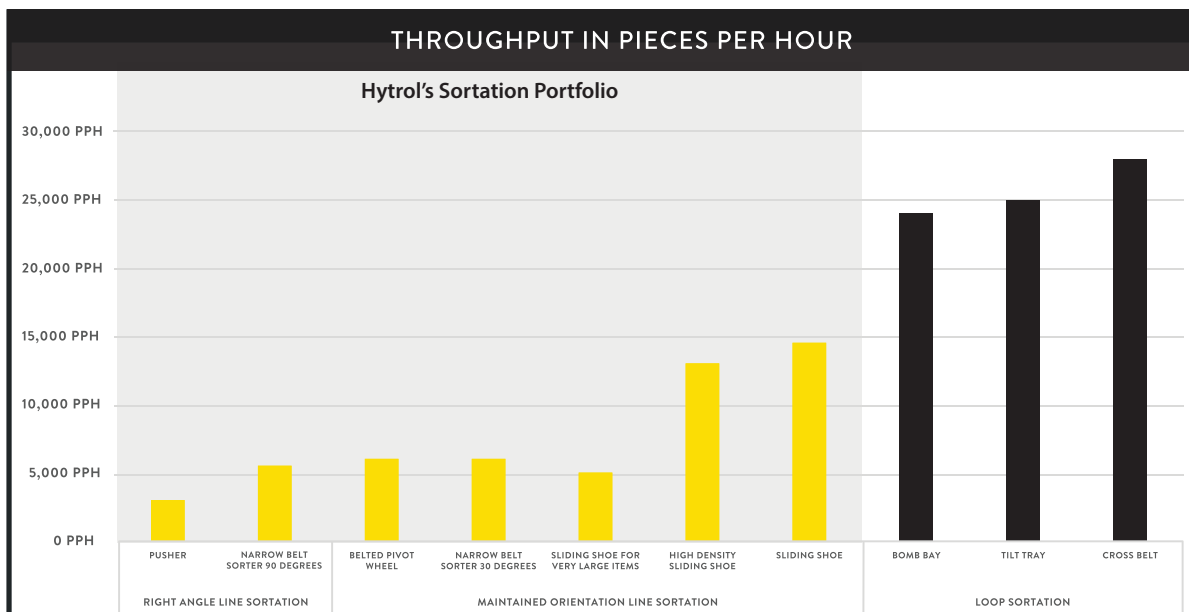
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SORTATION SYSTEM SELECTION

Throughput:

Throughput is another key criterion when selecting and designing a sortation system. A range of variables such as product availability, product dimensions, and barcode quality will affect the throughput of the system, which means that the overall average throughput during operations shall differ significantly from the sorter's designed capacity.

The throughput depends on variables such as system speed, product dimensions, and required gap. The chart below elaborates the range of throughput for different sorter technologies.



1. This chart indicates the range of throughput for different sortation technologies.
Note: Values will differ when correlated to a specific application.
2. Please note that the economics related to selecting sorters will be covered later.
3. The sorter technology illustrated above in yellow are all part of Hytrol's extensive sortation portfolio.

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SORTATION SYSTEM SELECTION

Footprint and Destinations:

Another essential while selecting a sortation system is the number of sort destinations typically related to the number of stores, delivery routes, or orders based on the business requirement. With real estate becoming increasingly scarce and expensive, optimizing space efficiency and layout flexibility is a key factor to consider.

Available floor space will dictate which technology may be used. The products are fed in at the front with line sorters and sorted off to the side. With loop sorters, products are fed from the side – usually from multiple positions – and sorted off either side. Cross belt, tilt tray and bomb bay sorters are typically loop sorters; the others listed are generally line sorters. Other parameters to consider regarding space are the required width of the outfeed and the centerline distance between outfeed conveyors.



ECONOMICS OF SELECTING A SORTATION SYSTEM

Two key factors to understanding sorter system economics are the Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) implications for your business. A good return on investment (ROI) can only be possible if there is a proper balance between the CAPEX and OPEX, regardless of the technology selected.

The technical evaluations of throughput, product type and footprint will help provide you with the right fit.

5 — ECONOMICS OF SELECTING A SORTATION SYSTEM

Capital Expenditure:

In terms of capital expenditure or CAPEX, a common mistake is overdesigning the sorter system. For example, a business may select a high throughput sorter for a low range application as most sorters can manage lower throughput. Hytrol highly recommends that the sorter selection be made to optimize the business's current throughput and manage the growth rate. It is important to purchase within your current throughput range to avoid overspending on a high rate you may not fully utilize.

The chart below maps out the CAPEX implications of different sorter types.

SORTER TECHNOLOGY	COST INDEX
CROSS BELT	MOST EXPENSIVE
TILT TRAY	
BOMB BAY	
SLIDING SHOE	
HIGH DENSITY SLIDING SHOE	
SLIDING SHOE FOR VERY LARGE ITEMS	
NARROW BELT SORTER 30 DEGREES	
NARROW BELT SORTER 90 DEGREES	
BELTED PIVOT WHEEL	
PUSHER	LEAST EXPENSIVE

5 — ECONOMICS OF SELECTING A SORTATION SYSTEM

Operational Expenditure:

Businesses tend to overlook the operations expenditure of the system. Contributing factors of OPEX are as follows:

- SPARE PARTS REQUIRED
- ENERGY/AIR CONSUMED
- SERVICE SUPPORT FOR THE LIFECYCLE OF THE SYSTEM
- MAINTAINABILITY
- RELIABILITY

The system's reliability is not tangible; however, it plays one of the most crucial parts in the decision-making process. For example, having a reliable partner ensures the alignment of the OPEX parameters and better engagement during the lifecycle of the sorter. The installed base is a tangible reference to the reliability and the success of your sortation solution partner.

Hytrol offers 24/7 customer service through our Customer Care division. In addition, Hytrol's Training Department can provide customer training which showcases crucial knowledge for operators and maintenance personnel to keep systems up and running with very little downtime.

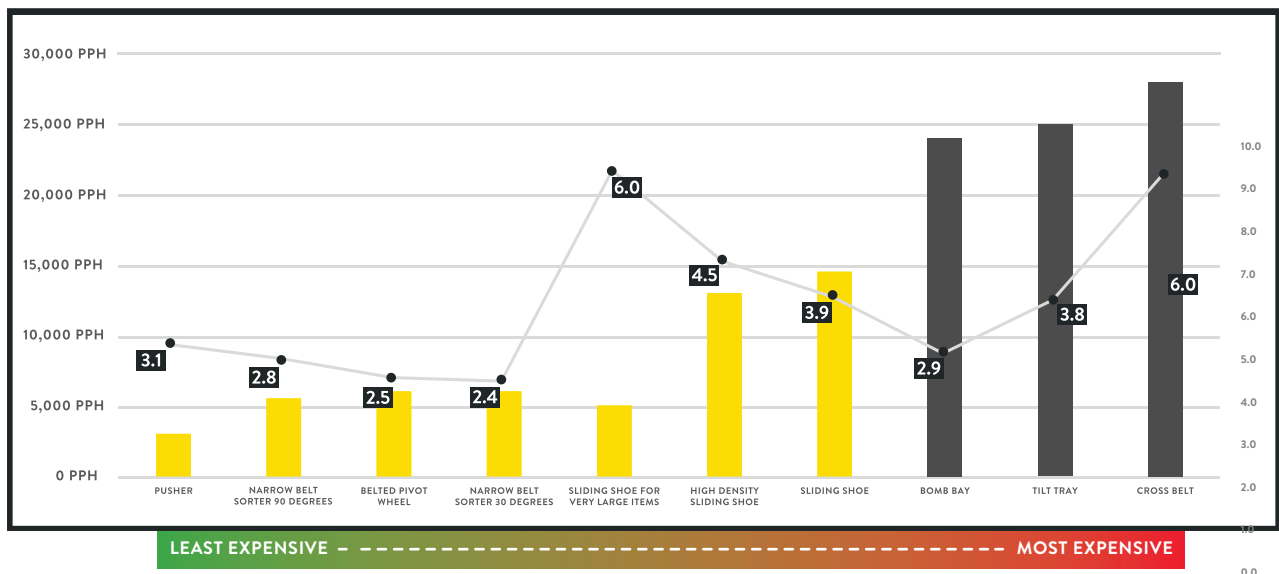
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ECONOMICS OF SELECTING A SORTATION SYSTEM

Conclusion:

By combining the data of throughput, product variety, and CAPEX, you can make an informed choice on the best sortation technology for your business. Your data graph may resemble the example below.

- THROUGHPUT OF THE SORTER
- VARIETY INDEX: THE VARIETY OF PRODUCTS THE SORTER CAN HANDLE ON A SCALE OF 0-10 (FOR PRODUCTS AS MENTIONED IN THE PRODUCT TYPE SEGMENT)
- THE CAPEX IMPLICATION OF THE SORTER AS AN INDICATOR OF THE COST INVOLVED FOR OUTRIGHT PURCHASE OF THE SORTER



6 — HYTROL & SORTATION

Why Choose Hytrol:

Hytrol Conveyor Company, Inc. is an industry expert in automated material handling solutions. Hytrol is the largest conveyor and sortation system manufacturer in North America. Our success is attributed to our firm commitment to systems, solutions, and service. A vital component of The Hytrol Advantage is our Integration Partner Network, which comprises more than 100 locations worldwide. As a result, we deliver innovative products and applications that improve profitability and sustainability to your business and by extension, the supply chain.

Our cutting-edge manufacturing facilities in Jonesboro and Fort Smith, Arkansas operate under Lean principles to produce conveyors with the shortest lead times in the industry. In addition, organized focus factories enable us to improve our processes and manufacture top-tier solutions continually.

Our References:

After putting substantial thought into the selection process for the best sortation conveyor, you need to feel confident in the manufacturer's capability to provide the most reliable and accurate system. With over 700 dependable systems across the globe in various industries, Hytrol ticks all the right boxes to offer you the most proven technology to suit your sortation needs.

Hytrol has established itself as a key supplier of systems to over 95% of the top companies in the e-commerce, warehousing, retail, and manufacturing sectors to ensure smooth operations through our partners. In 2021, Hytrol and our partners provided solutions for 22 companies in the "Gartner Supply Chain Top 25" which means the company supplies material handling solutions for 88 percent of the top supply chains in the world.

6 — HYTROL & SORTATION

Benefits of Choosing Hytrol:

- 75+ Years of Industry Experience
- Over 700 Active Systems Around the World
- Shortest Lead Times in the Industry
- Diversified Support Network
- 24X7 Support for Concept and Systems Engineering
- Product Designed for Sustainability
- Competitive Pricing
- Customer Application Testing
- Start-Up Assistance
- Continuous Customer Training and Education

TO LEARN MORE, CONTACT A **HYTROL INTEGRATION PARTNER** NEAR YOU, OR
FEEL FREE TO REACH OUT TO HYTROL'S BUSINESS DEVELOPMENT TEAM WITH
ANY QUESTIONS YOU MAY HAVE: **BUSINESSDEV@HYTROL.COM**.