SIX MONTHS TO A STRONGER OPERATION

SORTATION SYSTEMS EDITION
YOUR SYSTEM, ONLY BETTER.

WELCOME

This month’s topic in D.L. Neu’s six month series focuses on sortation systems. The information in this edition strategically builds off of the previous editions from October and November. Both mechanical and control systems are addressed this month, specifically for the sortation process in your distribution center(s).

The sortation process in many operations represents the heart of the overall system and is a key component to maintaining a highly efficient and effective operation. Keeping these complex parts of the system well maintained and running at peak levels helps make the overall system run that much more efficient.

Challenges that exist in conveyor systems invariably show up and magnified at the systems’ sorters. At least 99% of cartons should go through your sorter with no issues. If you are not there now, use the (6) six opportunities in this month’s edition to get there.
**GENERAL SORTATION REVIEW**

Automated sortation is the process of identifying a carton and, based on the needs of the processes for that carton, switching it from one conveyor line to another or several lines.

Below are a few examples of where sortation may be utilized:
- Inbound operations to route carton receipts to different put-away locations
- Inbound operations to perform vendor compliance checks
- Picking operation to route cartons to the appropriate pick zones
- Quality check routing
- Outbound operation for shipping sortation to route cartons by shipping type, store location, etc.
- Outbound operation to arrange cartons in delivery sequence

Your current sorter was designed based on your operational demands at the time of implementation. Is your sorter still the best option for your current operation? Use the charts below published by MHI ([www.mhi.org](http://www.mhi.org)) to help you evaluate.

The chart below illustrates considerations for item type, including size, weight and minimum gapping requirements. Zoom in to see details.
The chart below represents typical “rules of thumb” rates by sortation technology. These rates assume average item sizes. Zoom in to see details.


Regardless of the specific sortation equipment, most sortation systems are designed around the following subcomponents / subsystems:

- Accumulation conveyor to feed the sortation system
- Induction conveyor to pull gaps and singulate (to line up single file and separate) cartons onto the sorter
- Scanning to identify the cartons, most likely a laser or camera scanning system
- Tracking system to track cartons to the appropriate destination take-away conveyor (PLC, WCS, WMS, etc.)
- Sorter conveyor that has the mechanism to physically move the cartons from one conveyor line to another
- Take-away conveyor or destination conveyor line
- Carton recirculation for cartons that don’t successfully divert
- Hospital / Jack-pot line for “bad” cartons (i.e. no label, bad label, etc.)

**SPECIFIC DESIGN ELEMENT OPPORTUNITIES: QUEUE PRIOR TO INDUCTION**

**Opportunity 1: Accumulation Conveyor Operation**

A key component to make a sortation system operate at peak performance is the accumulation conveyor feeding the inbound induction conveyor. Properly accumulating cartons to keep them from bunching up, getting side-by-side or rotated improperly could prevent over 50% of induction issues at your sorter.

As previously discussed in the October Mechanical Edition, many items can be addressed to improve this sub-system. Please see the link to the October edition for more information: [http://www.dlneu.com/mechanical-edition](http://www.dlneu.com/mechanical-edition)

A sortation system operates most efficiently when the cartons arrive to the induction conveyor looking like the picture below:

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**Good Example**

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**Poor Example**
SPECIFIC DESIGN ELEMENT OPPORTUNITIES: INDUCTION

Opportunity 2: Proper Carton Gapping
The purpose of the induction system is to properly control and space or “gap” cartons to singulate them onto the sorter. Immediately after this gapping process is where the cartons are identified and the tracking process starts.

Making sure that your induction system is pulling the proper gaps between cartons is very important. If cartons are too close together or side-by-side, they may be misidentified and sorted incorrectly. Each sorter type has a unique requirement on the exact gap to pull; please consult your system design documentation for this information.

The process of properly gapping cartons may degrade over time due to a number of factors as a system ages.

Here are a few things to consider:

- Have your carton sizes changed since the system was first commissioned?
  - Cartons that are smaller than the original design size may not pull a large enough gap.

- Has the gapping mechanism degraded with age?
  - Belts worn and not properly stopping or starting cartons
  - Pulleys worn and causing belting to slip
  - Solenoid valves not switching in a timely fashion
  - Missing gap filler rollers causing cartons to tumble at conveyor transition
SPECIFIC DESIGN ELEMENT OPPORTUNITIES: SCANNING

The process of properly identifying a specific carton is typically done by reading a barcode on the carton. RFID tags or color sensing may also be utilized.

Keeping this equipment operating at top performance levels is very important to a system’s overall performance. If cartons cannot be properly identified, they are inducted as “no-reads” and sent to a specific jackpot lane or recirculated back through the system. At some of the higher sortation rates of 100 to 150 cartons per minute, a no-read rate as little as 0.5% starts to bog the system down and degrade system throughput.

Opportunity 3: Scanner Maintenance / Calibration

Routine maintenance on your scanners is an important aspect of keeping them working effectively. Schedule a regular bi-yearly maintenance review by a trained technician.

Here is a partial list of items that should be reviewed during a scanner maintenance visit:

- Test laser function
- Test scan quality
- Verify communication settings
- Make any necessary optical adjustments
SPECIFIC DESIGN ELEMENT OPPORTUNITIES: TRACKING

Once a carton has been properly gapped and identified, the system starts a process to track the carton to the appropriate destination. Depending on the design of the system, the distance to track may be anywhere from five feet to several hundred feet.

The exact mechanical and electrical components that comprise the tracking operation vary by sorter style and overall system design. Making sure your maintenance personnel are familiar with these elements is important to the following opportunities.

Opportunity 4: Information is received in a timely fashion

Once a carton has been identified by the scanning system, the barcode information needs to be passed up to the control system to identify the appropriate conveyor destination. Once the control system identifies the destination, that location information is assigned to that particular carton and the carton tracked to the appropriate location. A lag in the communication between the scanning and control systems can cause cartons to not be diverted correctly because the information was late in being assigned to the carton.

Many of today’s scanning systems operate on an Ethernet network. If other devices are also located on the same network they may cause the network speed to lag. Making sure the communication network (Ethernet, serial, etc.) is operating at peak speed is an important aspect of carton tracking.
Specific Design Element Opportunities: Divert

Opportunity 5: How to train your sorter
As we have discussed with other components of your system, as they age their reaction times may need adjustment. This also applies with the mechanical and electrical devices that accomplish the divert action of transferring a carton from the sorter to the take-away conveyor. Divert timing that gets out of adjustment can cause cartons to become jammed, destinations to be missed, or actual components of the system to wear prematurely and break.

Checking the divert timing is a matter of physically observing the system to verify that the components are reacting in the designed manner. This adjustment process is called “training the sorter”. It is not uncommon to have to retrain a sorter on a yearly or more basis. As the equipment ages, retraining on a more frequent interval may become necessary.

Training and retraining a sorter is something that should only be done by a trained technician either on your maintenance staff or an outside expert.
SPECIFIC DESIGN ELEMENT OPPORTUNITIES: TAKE-AWAY CONVEYOR

Opportunity 6: Guardrail and Transitions Adjustment
The transition from the sortation conveyor to the take-away conveyor is another key area to review. Verifying that guardrail is adjusted properly and not catching cartons can help greatly to successfully divert a carton and also reduce carton damage. In addition, if there are gap plates or other devices at the transition between conveyors, making sure they are properly adjusted is critical.
SPECIFIC DESIGN ELEMENT OPPORTUNITIES: POP-UP WHEEL / NARROW BELT SORTERS

Below is a general list of items to review on a quarterly basis for the Pop-up Wheel / Narrow Belt style sorters. Consulting the maintenance documentation for your specific sorter will provide details on each of these items.

- Air Pressure correctly adjusted
- Belt Tracking / Wear
- Divert wheel wear

SPECIFIC DESIGN ELEMENT OPPORTUNITIES: SLAT SORTERS

Below is a list of items to review on a quarterly basis for Slat Sorter style sorters. Consulting the maintenance documentation for your specific sorter will provide details on each of these items.

- Proper amount of oiling on chain
- Chain Stretch
- Slat Skew
- Amp Draw
- Divert shoe wear
- Broken pin connector sensors working properly
- Inspect drive sprockets

Use your sorter as a telling point for what issues exist elsewhere in your system. At least 99% of cartons should go through your sorter with no issue.

In January we’ll be discovering opportunities to gain overall operational efficiencies within your system.
QUICK CHECKLIST

☐ Using the charts above or by requesting information HERE confirm that the sorter you
currently have still meets the needs of your changing operation.

☐ Properly accumulate cartons to keep them from bunching up, getting side-by-side or
rotated improperly to prevent over 50% of induction issues at your sorter.

☐ Make sure that your induction system is pulling the proper gaps between cartons. Each
sorter type has a unique requirement on the exact gap to pull; consult your system
design documentation for this information.

☐ Have your carton sizes changed since the system was first commissioned?
  - Cartons that are smaller than the original design size may not pull a large enough
gap.

☐ Has the gapping mechanism degraded with age?
  - Belts worn and not properly stopping or starting cartons
  - Pulleys worn and causing belting to slip
  - Solenoid valves not switching in a timely fashion
  - Missing gap filler rollers causing cartons to tumble at conveyor transition

☐ A regular bi-yearly maintenance review of your scanning systems by a trained technician
is invaluable. Here is a partial list of items that should be reviewed during a scanner
maintenance visit:
  - Test laser function
  - Test scan quality
  - Verify communication settings
  - Make any necessary optical adjustments

☐ Make sure the communication network (Ethernet, serial, etc.) is operating at peak speed
is an important aspect of carton tracking to reduce lag. Your system may lag if other
devices beyond your scanning systems are located on the same network.

☐ Retrain your sorter for proper divert times on at least an annual basis.

☐ Verify that guardrail is adjusted properly and not catching cartons at the transition from
sortation conveyor to take away conveyor to successfully divert a carton and reduce
carton damage.

Contact D.L. Neu & Associates, Inc.
Marc Gordon                Kevin Hinken
(616) 583-0638              (616) 583-0638
MarcG@dlneu.com            KevinH@dlneu.com

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Six Months to a Stronger Operation

- Mechanical Systems
  October 2014

- Control Systems
  November 2014

- Sortation Systems
  December 2014

- Overall Operational Efficiency
  January 2015

- Energy Management
  February 2015

- Planning for Growth
  March 2015

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