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DISTRIBUTION AND MATERIALS HANDLING FOCUS

Are Conveyor Technology Providers Keeping Pace With Demand For More Flexible, Adaptable Equipment and System Solutions?

SCDigest Editorial Staff

One of the most vital pieces of logistics equipment in a Distribution Center has been and will continue to be the conveyor. And whether it's a belt or roller type, conveyors carry a large range of items throughout the DC, operating nearly 24/7 at some facilities.

As companies contemplate more highly automated systems, they will continue to look to material handling equipment manufactures to provide the appropriate technologies. This two-part article provides a comprehensive, albeit conveyor focused, update on trends and advances in material handling technology across a narrow range of top conveyor system providers relative to flexibility, and adaptability.

The report also shows how improvements in equipment design and control are increasing system performance and reliability while lowering maintenance cost. All of these advancements and technologies are currently available or, as we point out where appropriate, are within months of being launched.

Accompanying this article is the first of a new SCDigest/Distribution Digest series of analytic publications, which we call a Materials Handling Tech Note. These will be a series of ongoing research notes that look at various aspects of the materials handling and distribution market and practice. The first one looks at how recent changes in conveyor technology from leading providers have made today's systems much more flexible than in the past. It can be downloaded here: Materials Handling Tech Note: Advances in Conveyor Technology increasing System Flexibility.

Below, we summarize an array of advances in conveyor technology for 2010.

Looking Behind the Scenes

The manufacturers of case handling conveyors, like that which is typically found in distribution centers, are continually introducing design improvements that make their products and systems more efficient and versatile than ever before.

New materials used in the manufacture of rollers, bearings and conveying surfaces have reduced noise, friction, heat, wear, and horsepower requirements. And, at a time of increasing power costs, energy efficient motors and drive components are reducing power requirements. While some of the developments are driven by specific requirements, like cooler and freezer applications, the product development yield is often beneficial across the broad spectrum of material handling requirements.

Much of the new developments are "behind-the-scenes" so to speak, producing conveyors that look better than their predecessors. Newer systems that hide all of their components from view have been popular in Europe and are now showing up on this side of the Atlantic as well.

Phil Kaffenberger, Vice President Engineering, HK Systems, Inc., explains that wiring, drives, controls and pneumatics are mounted behind or within the conveyor frame, and/or (depending on customer prefer-

ence) can be hidden behind shrouds or plastic windows.

Not only does this present a more attractive appearance, but it also reduces noise and fluid leaks. And, although the components may not be visible, conveyor manufacturers say they're still highly accessible for repair purposes.

Modularity Using *LEGO*-like Building Block Approach

Ken Ruehrdanz, Market Development Manager, Dematic Corp., comments that in today's dynamic logistics world, conveyor systems need to accommodate more changes more often in the operation. According to Ruehrdanz that means the foundation of the conveyor system should be modular.

At Dematic, this is accomplished by establishing one side channel design and a series of common parts for all conveyor modules from inclines, declines, accumulation, transportation, curves, etc. Ruehrdanz says this approach allows modules, such as a right angle transfer, steerable wheel diverter, or a segmented belt section to be moved and remounted in the common side channel to a new location in the system with ease and speed. The photo nearby shows the Dematic Wheel Sorter Module installed in the bed of a standard conveyor frame.

Another definition of modular means the ability to mix and match AC driven conveyor with DC motor driven rollers. For example, a DC roller curve could be implemented with motorized rollers while connecting to a straight section of AC powered accumulation conveyor.

Kevin Klueber, Product Manager, Intelligrated/FKI, says this makes perfect sense because it cost less to run one AC-driven conveyor in a long straight section versus many zones of DC motorized rollers. (We will discuss motor driven roller (MDR) conveyor technology in more detail in part 2 of this series next week.)

Modular design also means that it's no longer necessary to tear out the conveyors when requirements change.

Modular design also means that it's no longer necessary to tear out the conveyors when requirements change. Technicians can simply rearrange the modules in a different path. As an example, Intelligrated will soon release new cartridge-style transfer bands.

Conveyors then become reusable assets. Modular "plug and convey" designs allow conveyor sections to be moved and reconfigured to another location or building and into a different application. This is an area where the conveyor industry has made great strides, but still has a ways to go in terms of complete modularity.

A Faster but More Sensitive Conveyor

Among the most significant changes in conveyor technology is the move from mechanical sensors to electronic sensors. A move that has been driven by the conflicting demands for higher speed with increased sensitivity for handling smaller lighter weight cartons.

Electronic sensing has many advantages. It allows for higher speeds, reduces noise and lessens the need for maintenance because there are no moving parts to wear out. It also extends the range of items that can be handled via conveyor. With most mechanical sensors, cartons

need to weigh several pounds to trigger a sensor. The new electronic sensors, by contrast, can be tripped by the cartons physical presents alone thus eliminating the weight factor.

Buyers need to be careful here because while some manufacturers have incorporated electronic sensors into their standard product line, others still offer them as optional to mechanical sensors. You need to make sure you know what's being provided.

Kaffenberger, at HK systems, points out that in a zero pressure live roller accumulation conveyor, accumulation zone lengths are no longer based on how far apart the sensors are, but are instead determined by the size of the cartons conveyed.

Klueber agrees, saying that Intelligrated has developed "crowder functionality" that allows for even smaller gaps, further increasing carton accumulation density per lineal foot of conveyor while also increasing system throughput. Kind of a two-for-one benefit.

Good Looking, and Smart Too

Today's conveyors are faster, quieter, and more adaptable that ever before. You could also say that they're smarter too, based on the liberal use of small, relatively inexpensive electronic photo sensors and microprocessors that communicate real-time critical information to higher level software systems such as a Warehouse Control System (WCS).

There are several different approaches to conveyor control. Primarily, system providers are using some form of network control. According to Kaffenberger, there is not a lot of discrete wiring out to photo eyes anymore. Instead, he says that HK Systems uses networks like DeviceNet, Ethernet, and ASI, which are commonly used in the industry to collect signals and to initiate commands to activate a conveyor device.

HK Systems emphasizes its version of auto calibration, meaning that the equipment will continue to self-adjust as it normally wears.

Kaffenberger points out that one of the most important considerations, relative to accumulation control, is that there are choices. There are several different approaches all involving the use of a photo sensor of one class or another, but each one of them according to the amount of control that needs to be exerted by the highest level including being networked in.

For example, there are simple DC and AC photo sensors that are available for applications where no network control is required. All they can do is control the accumulation zone immediately downstream of it. This is the least expensive, simplest to maintain sensor.

At the high end, networks are used to collect signals from "smart" sensors. These smart sensors, in addition to the actual control of the zones can provide diagnostic feedback. They can indicate exactly where an interruption in flow has occurred, as well as identifying equipment and/or system faults.

Faster and Easier Maintenance

All of this real-time operational information can be communicated directly to maintenance crews PDA, or via e-mail message to a laptop or text message to cell phone allowing for a quicker more informed response.

Schematics and step-by-step tutorial videos can be stored within the system so that a maintenance technician with a wireless laptop can access repair information directly from the site. These immediate fault recognition and resolution features can reduce downtime for DCs with limited maintenance resources.

Other maintenance tasks have become easier as well. Conveyor components such as drives and belts that used to take hours to change out can now be serviced in less than half the time. Klueber points out that Intelligrated has recently developed a line of new live roller V-belt curves and spurs where the endless belt loop can be removed and replaced in just a few minutes.

As it relates to components like sensors and control valves, etc - all snap into the conveyor frame or mounting bracket. No nuts, bolts and hand tools are required to replace such components. Airlines also are equipped with snap connections while electric is "plug-n-play".

Kaffenberger says that all components are "pinned" so that they cannot be installed incorrectly. However, AC motor drives are seldom equipped for plug-n-play as it is not cost effective given that there are relative few (dozens) of them in a typical system compared to hundreds or even thousands of components.

HK Systems emphasizes its version of auto calibration, meaning that the equipment will continue to self-adjust as it normally wears. It says that it tends to limit the amount of time maintenance people are working on adjustments.

As an example, on a belt driven live roller conveyor auto calibration would continue to apply proper driving pressure to the carrying rollers as the belt becomes thinner over time. Auto calibration is also used to provide critical feedback during initial setup, run-in, and ongoing real-time monitoring of specialized equipment like a sorter to compensate for chain stretch as it wears.

Conveyors are approaching speeds of 500 plus feet per minute, with sorters actually attaining blazing-fast speeds up to 700 feet per minute.

Automatic Speed Control

A popular accessory on automobiles for many years – now available on conveyors.

Conveyor speeds have been steadily increasing. Some conveyors are approaching speeds of 500 plus feet per minute, with sorters actually attaining blazing-fast speeds up to 700 feet per minute. At these speeds the system would be handling and sorting cartons in the 200 to 250 per minute range. Of course, that's not an advantage if the rest of the operation is unable to keep up. If you can't pick, pack and load at those rates, ultra-fast conveying and sortation may create bottlenecks that offset any gains achieved through greater velocity.

Kaffenberger says that requirements for ultra high rates above 150 cases per minute are rare. He points out that conveyor equipment running at those higher rates naturally generates more noise and cause accelerated ware and tear on major components.

In the typical DC logistics system operation there are times of slow or no volume followed by dramatic surges. In response to these highly fluctuating volume patterns, conveyor manufacturers are being pressured by their customers to better accommodate this operational reality.

As a result today's conveyor systems can be equipped with automatic speed control through innovative solutions such as more responsive servo and VFD (variable frequency drive) control. Klueber says that at the beginning of a work shift, the operations manager enters the expected case volume into the Warehouse Control System (WCS). This then allows the conveyor system to automatically slow down or speed up to more closely match volume demand within system design parameters and constraints.

But, there is still room for improvement. Therefore, a highly competitive, industry-wide design initiative is underway to reduce the gap between cartons as they are being merged and inducted onto sorters. Smaller gaps serve to increase the population of cartons on the conveyor, producing higher throughput volume while at the same time reducing speed. Additional benefits are in lower noise level, lower maintenance cost, and improved system performance.

To a large degree these speed control and gap initiatives have been made possible due to the continued increase in relatively cheap computing power and

faster processing capability. Thus allowing software engineers to develop more sophisticated logic based programs that optimize conveyor speed while minimizing carton gaps at critical merge and sorter induction points. Also, equipment like high capacity cross-belt sorters are now available that can sort at right angles, which further reduces gap and speed requirements.

In part 2 of this series next week, we will explore how conveyor systems are networked and integrated so that multiple sub-systems communicate and work as one unified system, advances in low voltage Motor Driven Roller and future technology, plus how one company moved from a manual operation to being fully automated.

What is your reaction to these advances in conveyor technology? Do you have any direct experience with them, good or bad? Which do you view as the most important? Let us know your thoughts at the Feedback button below.

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