

## COLD CASE HANDLING CONSIDERATIONS

For environment below 32°F, conveyor equipment requires specialization.

To withstand severe temperatures, bearings should be specified for cold environments.

Conveyor systems can be designed for increased personnel safety.

Effective conveyor layouts make use of the high cost of refrigerated space.

Plastic belt conveyor systems used in cold environment allow for more automation and customization than roller conveying systems.

Maintenance time and cost are higher in cold environments.

This paper addresses the unique challenges of operating conveyors in cold food environments and compares conveying options for differing applications in extreme cold temperatures. More specifically, it will compare roller-driven and plastic belt conveyors in the categories of:

- Initial Investment
- Durability
- Safety
- Design/Flexibility



## Cold Room Manufacturing Challenges

Conveying products in temperatures at or below freezing presents unique challenges to food manufacturers. Special consideration for conveyor selection begins at 32° F. In temperatures as low as - 40° F, specifications for conveyors and components need further specialization in order to operate efficiently and effectively. It can be said, therefore, that lower manufacturing temperatures place greater demands on equipment, and warrant more intense scrutiny of purchasing approaches in order to realize the best return on an equipment investment.

Although the same could be said for many areas of a facility's operation, freezing environments make decisions that balance performance and investment even more critical. This translates to an overwhelming need to understand where a lower-cost roller conveyor option will readily meet a company's needs, as well as where it could potentially limit production outcomes. Similarly, there's great value in taking the time to investigate how a more involved investment in a plastic belt conveyor could aid in reducing downtime, improving fulfillment speeds and making the overall work environment more suitable for floor workers, production managers and plant engineering personnel.

# Frozen Food Environments



## Roller-Driven Conveyors

### Initial Investment

As a lower-priced, commodity purchase, a roller conveyor requires less initial capital investment, which in today's challenging economic times can offer an understandably attractive option. Their standard functionality also makes sense in a number of less demanding environments.

### Durability

A 20' section of roller-driven conveyor will typically require 168 to 188 ball bearings, all of which need maintenance and eventual replacement. While such requirements may be present in any manufacturing environment, frozen processing environments provide additional stress on mechanical systems, further decreasing the operating life of each bearing.

So added consideration must be given to the reduced lifetime of these 160+ bearings under the stress of cold environments - an environment that these bearings most likely were not specified to have to endure. This means plant floor personnel could be subjected to more frequent periods of downtime as maintenance personnel address issues with not just bearings, but other components and equipment material compositions that may not have been constructed to meet the demands of constant use in a frozen environment. Unfortunately most, if not all, roller-driven conveyors are intended for more general use in less demanding environments. This is important to remember even after the modifications described above have been made.

Unlike their roller-driven counterparts, plastic chain conveyors provide operators a variety of material compositions that are engineered for use in cold conveying operations. Different grades of plastic can provide varying advantages over aluminum or steel, depending on the user's requirements.

### Safety

Due to the limited customization options provided by many roller conveyors currently on the market, the ability to implement equipment that can manipulate product as it passes along is somewhat restricted, so more manual effort is required of employees on the floor. Although the initial cost savings can be realized by roller conveyors, additional manual efforts have the potential to pose serious safety concerns, especially in cold environments where employees must wear bulky, insulating clothing and gloves. Such protective clothing already poses an increased risk of getting tangled or caught in conveying equipment, heightening the chance of an on-the-job injury.

Beyond the hazards posed by personal protective equipment, employees in cold environments obviously also face general dangers associated with the temperatures themselves. Cold environments, for example, increase the likelihood of ice buildup on the facility floor, which can lead to slip-and-fall injuries. Cold conditions can also lead to the tensing of muscles, which can be especially dangerous for manufacturing workers performing repetitive tasks that require consistent use of the same muscle group. Simply reducing the amount of time employees are required to be on the floor in cold environments, as well as the number of more strenuous movements, could significantly reduce the potential of workplace injury.



*Traditional roller bearing*



Further, most roller conveyors typically have one composition option: steel. Many have been critical of temperature-conductive metals being used in a cold manufacturing environment due to the potential for unintentional skin-to-steel contact that can pose a serious risk to line operators and maintenance personnel. In addition to the unfortunate ramifications of the injury, the plant also has to compensate for the associated unscheduled downtime.

### Design/Flexibility

In exchange for their lower initial cost, users will have to accommodate a modular design that allows for very little customization and presents limitations in handling turns or curves in the conveying line. This can present some challenges as plant managers look to make the most out of every square inch of floor space in maximizing production potential.

More available space means the ability to produce or distribute greater quantities of product, which is a major advantage for a facility as processors increasingly look at consolidating operations in generating more output from fewer locations as a significant cost-cutting strategy. Additionally, a less customizable offering can

further hinder those with already limited production or distribution space.

Concerns about efficient use of floor space are especially front-of-mind for those operating in cold manufacturing environments, as refrigerated areas cost more to operate due to the obvious climate controls that must be integrated. So the more efficient this space operates, the more cost-efficient the facility as a whole can run. There's also the human factor, as in order to negotiate the functionality of modular roller conveyors, cold processing facilities may require line workers to perform tasks manually to make up for the lack of automation that can be integrated.

It is worth noting, however, that conventional roller conveyors can and have been modified for cold temperatures. As this article has discussed, special bearings, grease and other components can be embedded in adapting to the 0° F to - 40° F environment. The level of modification and the way that a particular roller conveyor model is designed and engineered will dictate the level of additional project investment.

This makes checking for cold temperature engineering and components on both roller conveyor and plastic belt solutions a priority. While the initial price on a plastic belt system may be higher to start, after the necessary modifications are made to a roller system, those savings can dissolve even before fully addressing the issues of durability and safety.

## Plastic Chain Conveyors

### Initial Investment

Many have found the added initial cost of plastic chain conveyors is an investment that provides a better long-term return in meeting frozen food conveying needs.



# Frozen Food Environments



## Durability

Although the level of potential customization is greater with plastic chain conveyors, their construction is simplified in many ways. For example, instead of the 160+ bearings required to operate every 20' of a roller-driven conveyor, a plastic chain conveyor requires only four industrial grade bearings over the same length. Fewer mechanical parts mean fewer things can fail, break or be in need of maintenance, so all of these associated costs are less than the roller-driven counterpart. In addition, high-performance plastic chain conveyors from leading companies use higher-quality components, like industrial-grade bearings, that are designed for harsh environments and therefore last longer.

Common reliability issues with roller conveyors include bearings seizing up, hex hole boring and roller drop out; while the modular make-up of plastic chain allows sections to be more quickly replaced, with up-time being a premium in cold environments. Additionally, different grades of belting material provide varying advantages, depending on operational requirements. In cold packaging environments there are a number of plastics that can be specified for maximum durability in meeting the demands of specific temperature ranges. While plastic chain conveyors do offer significantly fewer maintenance concerns, it would be unfair to position them as completely without fault. The nature of the cold environment will lead to accumulation and pop-up issues with the sections of a plastic chain conveyor. While these are quick fixes, they are still factors to be considered.

Similarly, the chance of operational failure of a single roller in a typical roller-driven conveying system increases in cold environments, leading to the need for continued maintenance of the entire system, or each roller. Since plastic chain conveyors operate more cohesively, they require only a single system replacement once every three to five years, which can be regularly scheduled around a facility's production timelines.



*Industrial-grade bearings well-suited for cold environments.*

Beyond the flexibility, durability and safety concerns enumerated above, manufacturers selecting conveying equipment for use in frozen food environments must also consider the unique lubrication demands of a cold environment and the options made available by the manufacturer of the equipment under consideration.

Concerns about lubricant viscosity in cold environments are significant. Many conveyor manufacturers installing equipment in freezing environments will utilize a traditional oil-based lubricant that is well-suited for general manufacturing environments but of lesser quality than the grease-based lubricant recommended for more demanding temperature applications. These grease-based lubricants keep conveying equipment running at peak performance even in incredibly cold environments, whereas most oil lubricants will produce sluggish performance and require more frequent maintenance action.

## Safety

In terms of worker safety, the material composition of plastic chain conveyors poses a reduced risk of injury in case of accidental skin contact with the conveyor. And, as will be discussed more thoroughly, the flexibility of design allows workers to spend less time interacting with product on the conveyors, thus making their jobs easier and limiting the number of opportunities they have to experience an injury.



In keeping with worker safety concerns, it would be easy to overlook the benefits of a quieter operation. With all the other inherent safety concerns presented by a frozen working area, the ability to decrease noise levels ensures safer conditions where employees face fewer communication and work distraction issues. Plastic belt conveyors meet OSHA requirements for acceptable noise levels and, according to a study from a major consumer goods manufacturer, plastic belts can provide a noise reduction of 2 – 3 dB when compared to roller systems.

### Design/Flexibility

Conventional roller conveyor systems offer modular construction. While modularity can be cost-effective, it is limiting in terms of size and layout options. Due to the design flexibility of plastic belt systems, they can be customized to better mesh with a work area's set-up in negotiating tight curves or sitting close to walls in order to conserve floor space. As mentioned above, this allows plants to realize the benefits of running more cost-effectively from both energy consumption and product volume perspectives.

With the ability to provide a more flexible layout, plastic belt conveyors can also offer greater product control options. While both roller and plastic belt systems can be specified with accumulation zones, pop-up stops, transfers and product turning or diverting, plastic belt systems offer additional functionality for handling a greater variety of package types and sizes, from bundles and less stable compositions, to small and large cases. Roller systems often have difficulty with case skewing and jamming in similar situations.

### Conclusion

In addition to the data presented above, it should also be noted that research performed by leading plastic chain conveyor companies have found their products to realize a 50 percent reduction in installation and downtime and up to an 85 percent reduction in maintenance and related costs in an ambient environment. These findings are amplified by worker restrictions in extreme temperatures.

In evaluating a case handling system for a cold room environment, these factors, along with the greater design flexibility, added durability and increased worker safety should all be considered when positioning a plastic chain conveyor versus the roller-driven alternative.

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*Nercon specializes in packaging line engineering and design, controls integration and conveyor manufacturing. Having a great depth of experience in frozen food industries, Nercon's engineers are proficient at designing fully integrated and automated conveyor lines for frozen food packaging and in extreme cold room temperatures. Nercon has been a conveyor and equipment supplier to the top frozen food manufacturers for more than ten years. For more information, visit [www.nercon.com](http://www.nercon.com), search phrase "frozen food."*



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