Cablevey® CONVEYORS

The Gentle Way to Convey®

TUBULAR DRAG CONVEYORS HANDBOOK

Selection, Installation and Maintenance

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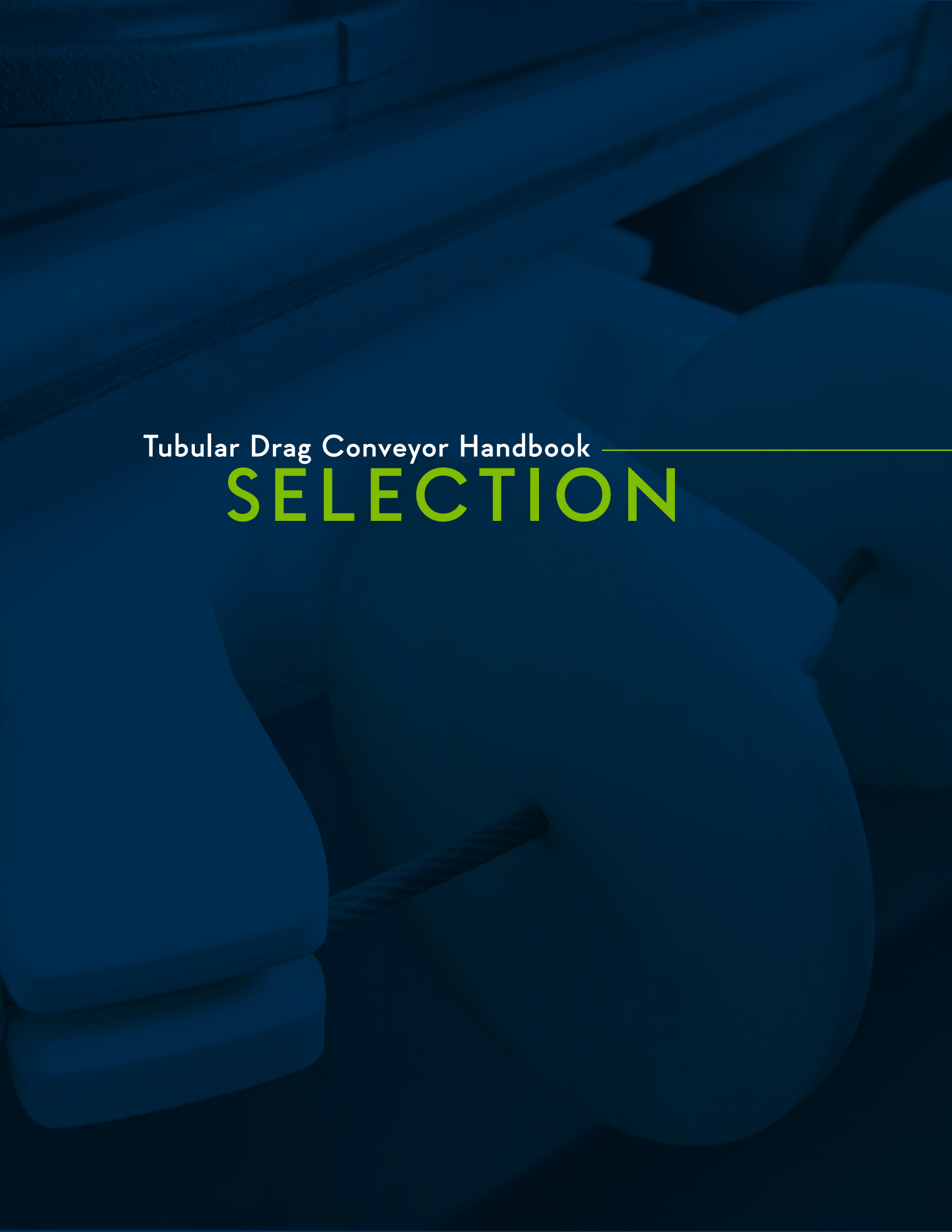
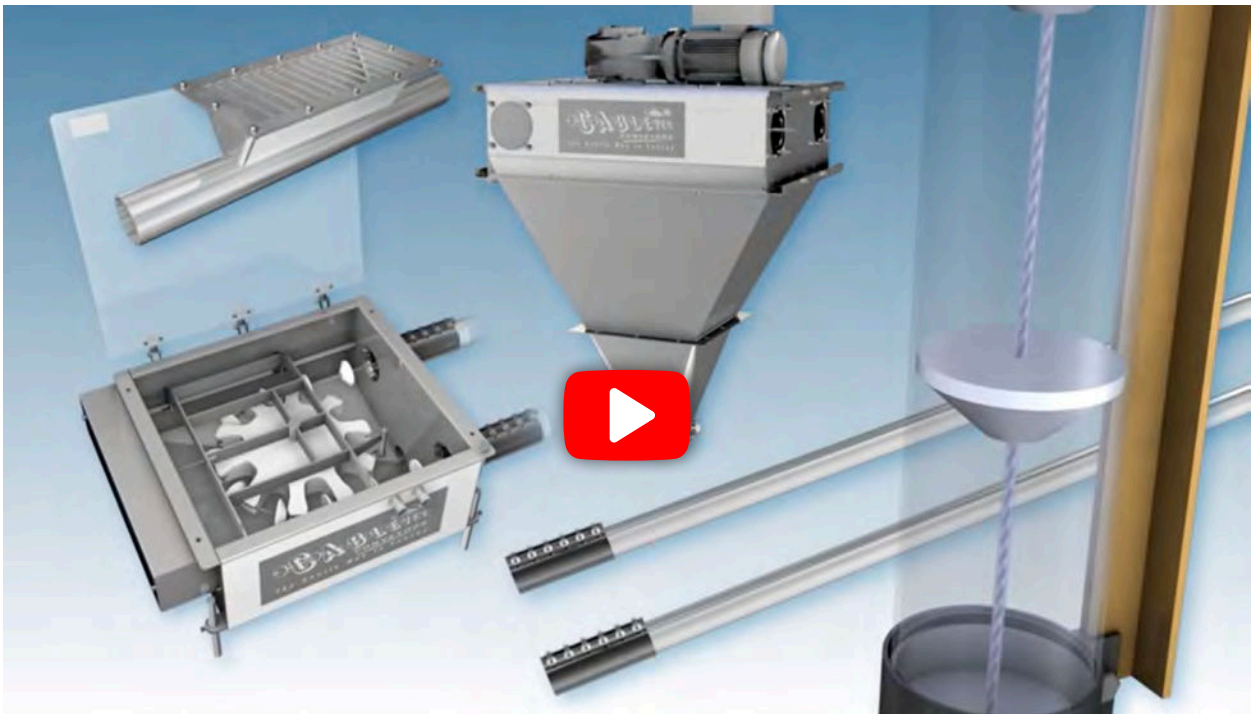


Tubular Drag Conveyor Handbook

SELECTION

MAINTENANCE TIPS FOR OPTIMAL CONVEYOR PERFORMANCE



Industrial processing companies replacing a current line or adding a line extension to their operating facilities can select from among multiple conveyor technologies or types. Regardless of the technology selected the goal remains the same—to move products in a safe, effective and efficient manner while minimizing operating and maintenance costs and sparing labor. This article will discuss the various considerations a plant operator should consider when selecting and configuring a Cablevey tubular drag style conveying technology for his or her facility.

Proper system design can provide a materials handling solution that will supply years of reliable service. Cablevey tubular drag style disc and cable conveyors offer gentle conveyance of friable materials, to preserve product integrity, avoid ingredient sifting, and effectively contain dust. The enclosed nature of the tube style conveyor technology contributes to plant hygiene while simultaneously preventing foreign contaminants from entering the product stream.

Modular components offer flexibility in design to help the system fit within even tight plant footprints, or spaces. System design, to accommodate space and specification, involves an ongoing process from discovery through shipment and even installation.

Direct engineer to draftsman communication creates initial drawings, layout and project finalization. First, however, the Cablevey team collects vital information that impacts the system's dimensions, placement and direction.

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QUESTIONS TO ASK ABOUT THE PRODUCT OR MATERIAL CONVEYED

One of the first considerations focuses on the product to be conveyed. Typical questions about the product can include:

- What material is going to be transported?
- Are there material ratios to be considered in the product mix?
- What are the minimum and maximum bulk densities?
- Are some of the materials more delicate than others, or more friable?
- Is the material abrasive or sticky and if so, to what degree?
- What is the product moisture level?
- Is combustibility a concern?
- What is the product's ambient temperature?
- Has there been a problem with product degradation with current or previous systems?
- Are there any current expansion plans (i.e., new SKU introductions or changes in product lines)
- What is the desired volume or throughput?

Volume/Throughput

A range of tube diameters allow for transport of different materials from powder to pet food, offering varying capacities depending on product bulk density. Options include:

- Two-inch diameter tube conveyor systems originally designed to move mash and grain mixes. Now, these commonly move chaff, cookie crumbs, seeds and ground coffee. Maximum capacity transports up to 75 Ft3/hr (3,000 lbs.).
- The four-inch diameter series, our most popular size, offers a maximum capacity of up to 525 Ft3/hr (21,000 lbs.).
- The six-inch diameter tube series transports up to 1240 Ft3/hr (@49,000 lbs.)
- The eight-inch, high-volume cable conveyor is the latest introduction to the series of conveyor sizes. This model offers a system capacity of up to 2,000 Ft3/hr (80,000 lbs.).

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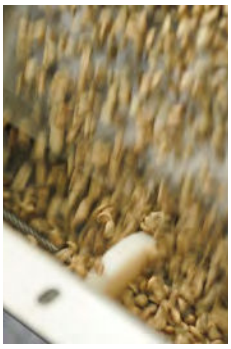
Product Integrity

While throughput and volume are important, a system that maintains product integrity or avoids product degradation, reduces waste to boost profitability. The cable and tube conveyor technology design gently handles materials from inlets to discharges by holding those materials between the discs within the enclosed tube.

Sweeps navigate curves and directional changes to convey materials to the desired discharge station; however, the disc and cable conveyor design means materials are not blown or forced through the sweeps as with other types of conveyor technology. Friable materials are conveyed without battering, stress or friction to keep breakage to a bare minimum. Multinational corporations and larger processors paring down product breakage by even a single percentage point will create a dramatic return on investment in less than a year, with incremental savings accrued over the lifetime of the equipment.



Flexibility in Design Due to Modular Components

One of the unique features of a Cablevey tubular drag style conveying system is its flexibility in design due to the modular construction style. The basic components can be assembled in myriad configurations to fit within the allotted space or plant footprint desired, including taking advantage of overhead space, or moving product from one building to another and for different elevations, from grain silos to mezzanines.

While reliable and efficient and gentle on delicate materials, the tubular conveying system is comprised of components that allow operators to easily maintain, service and clean the system. Components include the cables, discs, tubes in stainless or clear FDA-approved plastic for viewing purposes, drives, turnarounds and sweeps.

Direction and Distance

Materials can travel horizontally or vertically, from multiple inlets to discharges. As far as distance, materials have been conveyed up to 300 feet in a single system; however distance is determined by the number of sweeps, required capacity and the type of product being conveyed.

Sweeps are available for system configuration in 30-, 60-, or 90-degree angles. The design and layout often require minimal modification to the existing facility.

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Layout and Elevation

The cable and disc system offers a variety of potential configurations capable of operating on multiple planes, from feed silos to the production floor to a mezzanine level. with few limits on direction or height. Sample layouts can include inline, a loop, vertical transfer or a combination or blend of horizontal-vertical-horizontal. Systems can take product from one building into another.

Footprint

A recent survey conducted by Cablevey® Conveyors with more than 200 representatives at food processing firms revealed that 91% of respondents said their business experienced growth in the 2021-2022 timeframe. The survey also revealed a high level of automation within this industry. Most companies operate multiple conveyor lines, with 83% of companies surveyed operating 6 or more conveyor system in their facilities and 26% of companies operating more than 25 conveyor systems across business units.

With multiple lines already operating within a finite amount of space, a new or replacement system that can be configured in multiple ways to fit within that space or footprint has heightened importance. Replacing a bucket elevator for example, with a drag cable system, involves careful selection of sweeps and placement of the turnaround, not just for space concerns but also to facilitate cleaning and maintenance.

A cabled conveyor system can take advantage of overhead space as long as the operator can still access the system with a lift or via a mezzanine.

Feed/Discharge

Automated discharge configurations allow for continual material processing and delivery. Cablevey offers standard inlets for the various diameter systems. Our design engineers can work with your specifications for the number, size and type of inlets and discharges for single or blended product mixes.

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Plant Sanitation and Cleanability

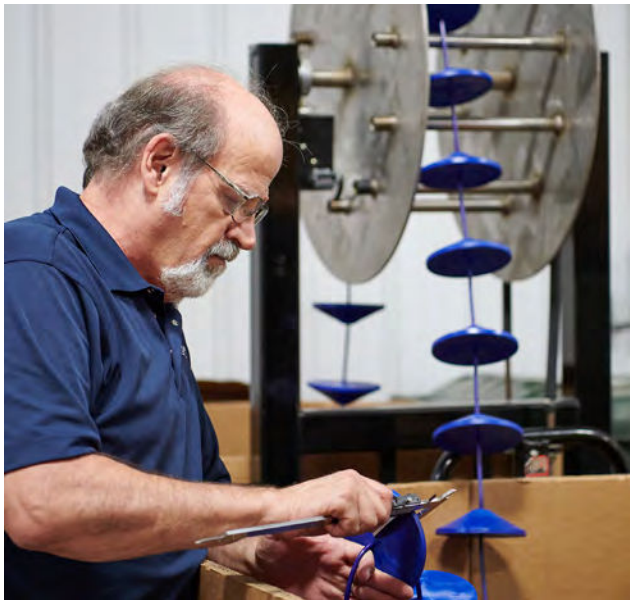
An important consideration when selecting system components relies on the plant's cleaning system and whether or not production must meet FDA regulations.

Does the plant rely on wet or dry cleaning? Are there regular washdowns? Does the system need to accommodate clean-in-place (CIP) routines? These play a role in dictating material choices for the system and components, most often constructed of stainless steel or FDA approved polymers.

The enclosed system drastically cuts down on dust for greater plant sanitation and safety. This enclosed conveyor virtually eliminates the potential for foreign contaminants to enter the product stream.

In terms of cleaning the system itself, Cablevey offers a variety of optional cleaning elements for a dry clean designed to meet a variety of swab-test standards. These cleaning elements can include brushes, air knives, and single use sponges. Urethane clean out discs are a replaceable standard to help keep tubes free from dust, product fragments or residue.

Supervised Installation



The installation is a critical last step in the design process. During professional, supervised installation, the technician can recommend revisions to the layout or system movement when onsite for visual inspection.

Any recommended changes must be approved by the applications department for validation and feasibility; however, the technicians have decades of experience with service and installation troubleshooting.

These final adjustments can ensure the system will operate to its maximum potential, while permitting easy cleaning and maintenance.

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Energy Considerations

Conveying systems, sometimes called "energy hogs," generally consume quite a bit of the energy used in a processing plant. This only increases its importance in an era of rising energy costs and compliance to corporate sustainability pledges.

The design of the cable and disc conveying system features a compact drive unit that operates to its full potential while relying on a minimal amount of horsepower, drastically cutting the energy expenditure of the system compared to alternative conveyor technologies. The smaller drive offers benefits such as:

- Dramatically less power use
- Quieter operations for a better work environment
- Lower energy usage cuts operating costs over the lifetime of the system

Our engineering staff and technical team members are happy to discuss more specifics about the design process for your unique materials handling needs. Cablevey fills a unique niche for gentle transport of friable materials, trusted in thousands of operating facilities in more than 65 countries around the world. Ask us to help design your new or replacement system today.

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Tubular Drag Conveyor Handbook

INSTALLATION

PROPER INSTALLATION IS KEY TO STREAMLINE OPERATIONS AND OPTIMIZE EFFICIENCIES

The importance of proper installation cannot be overemphasized. Most service calls and often conveyor failure can be traced to improper installation. In addition, an improper installation or one that is not supervised will void the system warranty. The best time to fix a problem is before it begins. Proper installation under professional supervision can help promote plant efficiencies, help avoid prematurely worn parts or worse, complete system failure. Learn what to expect from supervised installation with a Cablevey expert technician.

Before diving into the topic, a brief overview of the system itself can help operators understand what to expect from the system and the parts that will require installation.

What is a Tubular Conveyor?

A tubular cable and disc, drag style conveyor operates within an enclosed tube, either stainless steel, fiberglass or plastic, depending on the end use application. Inside the tube, a cable runs the length of the tube with multiple discs spaced evenly along the length of the cable. The cable itself is stainless steel, sealed within a nylon jacket, to prevent food particles or debris from accumulating in the cable strands.

The ends of the tubular conveyor form an endless loop, powered by a motor-driven sprocket that sits within a drive or turnaround unit. A modular system design that offers flexibility for horizontal or vertical movement also allows for changes in the number and position of inlets, discharges or outlets, and conveyor length and route possibilities.

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Material enters through an inlet into the space between the discs, which then gently propel the material forward to the next processing or packaging station. Once past the inlet, the tubes are fully enclosed, to help:

- Minimize contamination risks
- Dramatically reduce exposure to ambient conditions
- Virtually eliminate dust, to enhance sanitation, reduce health risks and cut the risk of explosions
- Help facilities comply with FSMA and FDA requirements.

The disc or flight propulsion gently conveys friable materials from inlet to discharge, cutting breakage to as little as less than one percent, compared to product waste from breakage experienced with other systems that rely on forced air or freefall designs. Any amount of breakage or product waste cuts profitability.

The tubular drag style conveyor's solid circular discs or flights:

- Ease material movement
- Reduce product degradation
- Protects integrity of mixes and blends

Warranty Coverage

The installation manual includes a copy of the warranty. The gear motor is warranted for one year, while the system components are warranted under normal use and service for 90 days from the date of purchase, when the system is installed within its recommended limitations. Part of this recommendation includes supervised installation.

Each system also includes identification plates to help aid service calls. This identification plate is located on the drive unit on the motor. It includes pertinent information such as the machine serial number, its manufacture date, contact information for Cablevey and more.

Installation Process

Cablevey tubular drag style conveyors can be installed in a new facility or facility extension. However, the conveyor systems most often are installed to replace a different, existing style conveyor, or to help increase production. The types of conveyors it replaces can represent many kinds, such as bucket elevators, screw augers, or pneumatic systems. The reasons for replacement can vary from a desire to improve product quality by decreasing breakages or foreign contaminants, to improving energy efficiencies and meeting sanitary compliance.

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System design is complete at this stage, taking into careful consideration the materials being conveyed, the distance and the available plant footprint, especially when fitting within existing space for another system replacement.

Just prior to installation, the Cablevey technician will review the engineering diagram. The operator or plant manager is provided with a comprehensive 17-point checklist to follow to ensure a smooth installation process. This checklist includes information about ways to properly cut and hang the tubes, how to set up the drive and turnaround, prepare the electrical system and essential equipment required for the installation itself.

The installation manual supplied with each system sold is a comprehensive guide containing step-by-step instructions with diagrams and photos to aid the process. These installation manuals are available on the company website.

Supervised Installation

Some facilities have a dedicated team assigned to installs, while other facilities might need a recommendation for a team of millwrights. In either case, the best possible practice is to have a Cablevey technician provide supervision for the installation. A tubular drag style conveyor system is uniquely designed and engineered. All it takes is one gap between conveyor sections or tubes to create a large issue, and this can happen with the most experienced millwright team or skilled pipe fitters.

Supervised installation is required to maintain the system warranty. In addition, it supplies the operating facility with the opportunity to conduct system verification. The supervision technician will run a camera through the installation to verify it for tube abutment, to ensure there are no gaps. The camera supplies a video of the length of the system, supplying the facts and data needed to correct it.

Troubleshooting Potential Issues

Gaps between the tubing can allow dust to escape, damage or lose product, reduce system efficiencies or, at worst, cause premature system failure. Components will wear out and contaminants can enter in, to the point where bits of metal can enter the tubing causing metal tube scraping, scraps of metal falling into tubing gaps, and causing material contamination, and eventual system failure.

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Often, improper installation issues are not immediately visible. Premature failure will exhibit itself as components wear out faster than their anticipated lifespan. For example, a cable designed to last two years might only last six months instead. Or in an effort to fix an issue, an operator might compensate by putting more tension on the cable to lift discs back into line. This exceeds the recommended tension, and the cable wears out, or stretches and then sags. This is preventable through system verification via supervised installation and easier to address at installation, than to fix when the system fails.

The difference between the initial sale and the supervised installation is a visual and practical check to ensure that it will be accessible for service and maintenance. Sometimes the main impact is the system's height, and whether the conveyor can be accessed with a lift or via a mezzanine. Or the fit might be very tight when a conveying line is added between other production equipment on the processing floor. In either case, supervised installation takes into consideration the system's accessibility. It is at this point that on occasion, the installation supervisor might need to extend the system, shift it slightly or even change the system layout. Any changes at this stage are verified by our applications department.

Commissioning the New Conveyor

Machine commissioning involves a complete system check prior to running the conveyor. A dry run ensures the cable moves smoothly, the turnaround carriage remains still, and the amp draw meets levels projected for the model installed. A sample run involves the same factors with product in the system, to troubleshoot any potential problems and remedy the issue prior to the first production run.

As production progresses, many customers opt for an annual service agreement, of particular value when a company owns and operates multiple conveyor lines within one or more facilities. The value of a service agreement grows exponentially in a tight labor market, when preventive maintenance is a rare luxury. Companies that are short-staffed find themselves in the unenviable position of choosing or being forced to run to failure instead of following the recommended, regular, preventive maintenance schedule. A service agreement supplies relief in a tight labor market using qualified Cablevey technicians to help keep systems operating at peak efficiencies.

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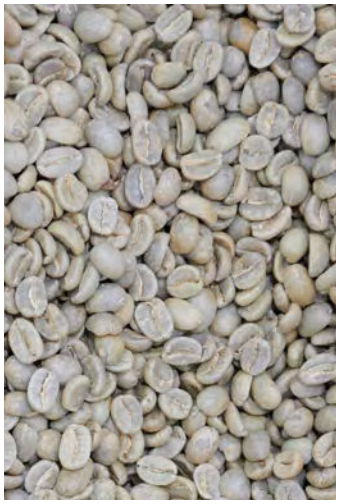
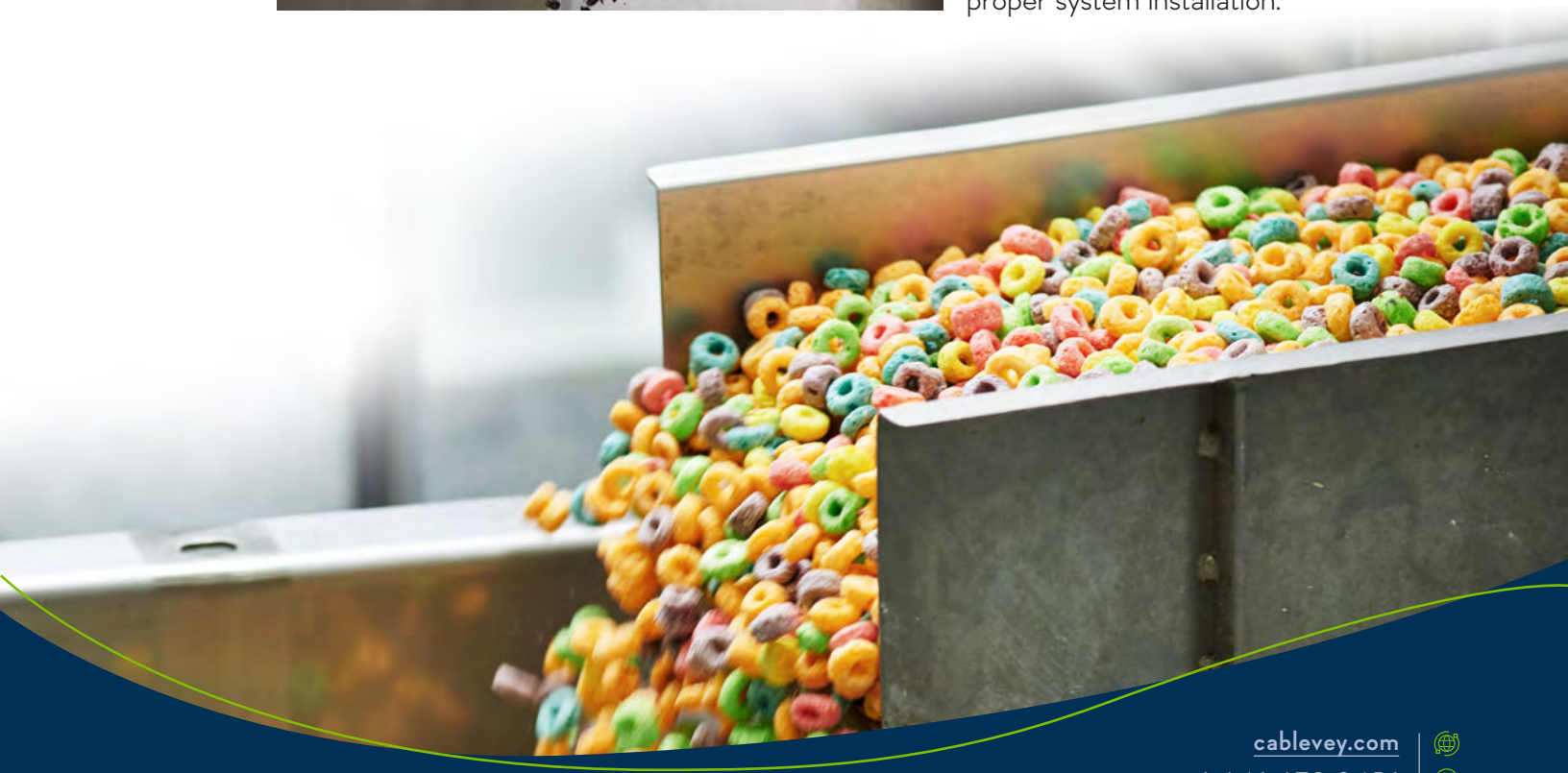
Reliable, Gentle Conveyance of Friable Materials



Cablevey Conveyors have earned a reputation for reliability and gentle conveyance for fragile materials, particularly within the food processing industry. Thousands of installations in more than 65 countries worldwide convey more than 1,000 different types of materials, from breakfast cereals to snacks, nuts, grains, seeds, powders, pet foods, coffee and more. The nature of these conveyed materials means that any gap or system discrepancy due to improper installation can rapidly unravel all of the benefits the system is designed to supply.

Streamlining processing operations, to avoid potential downtime, in the future, or worse — a complete system breakdown, will keep your conveyor running optimally. This will help maintain profitability through uninterrupted productivity because of proper system installation.



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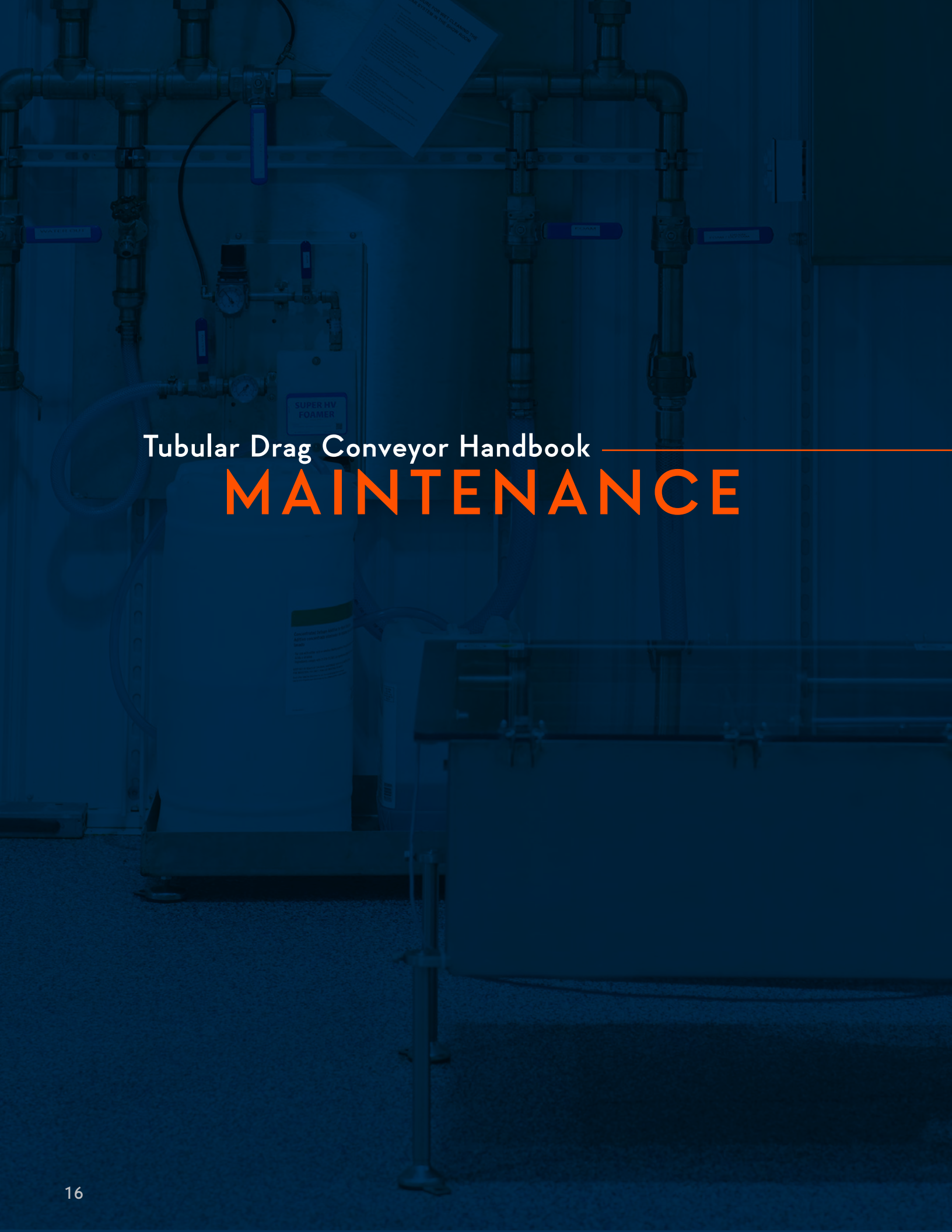
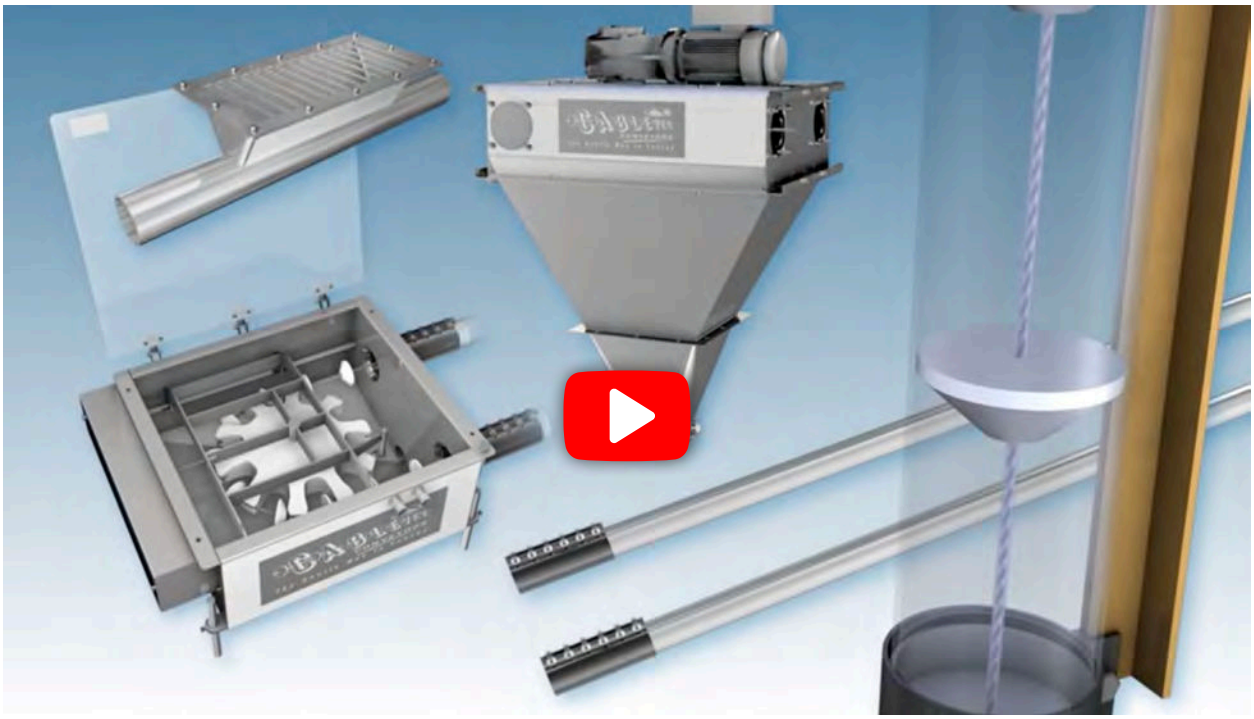


Tubular Drag Conveyor Handbook

MAINTENANCE

MAINTENANCE TIPS FOR OPTIMAL CONVEYOR PERFORMANCE



Cleanliness and predictive maintenance technology can help critical conveyance systems continue to provide uninterrupted service for efficient operations in food processing and manufacturing. Cleanliness is always part of system maintenance as systems need to accommodate stringent and frequent cleaning sessions for food processors to meet regulatory standards for food safety. It also relates to dust containment, a safety issue regardless of industry type. Predictive maintenance technologies can help determine the health and performance of internal system components. At a minimum, monthly maintenance performed by internal staff will keep the conveying system operating to its fullest potential.

Industry Opinions on the Importance of Maintenance

In a comprehensive industry survey about conveying conducted by Cablevey among more than 200 professionals in the food processing industry, 54% of respondents identified cleaning and maintenance as the greatest challenge facing their operations related to conveying materials. A connected issue, downtime due to these services, was ranked second in importance, with 33% of respondents naming it as a major challenge. And more than half of those surveyed, or 56%, said that maintenance issues posed a top driver for updating their conveying processes. These findings highlight the need to address cleaning and maintenance of conveying equipment by ensuring methods are both easy to implement and minimize downtime.

This also points out the fact that these aspects of conveying systems don't exist in a vacuum and are, or should be, primary considerations during the design and installation phases. Find out how a few simple checkpoints and/or tools can supply the minimal maintenance requirements of a Cablevey system.

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The First Step

The first time the conveyor tubes themselves should be cleaned is before the cables and discs are added. For example, any minute metal fragments created or deposited during installation need to be cleared out of the tubing. If any would remain, the coefficient of friction dragging them through the tubing has the potential to create significant damage.

Where regular cleaning cycles are concerned, some conveyor systems need to be disassembled for a thorough clean. Also, it should be noted that not all conveyor systems can accommodate all types of cleaning methods. A tubular drag cable and disc system are suitable for clean in place, dry or wet cleaning methods. In terms of timing, no operator welcomes the downtime associated with sanitation cycles, however, the Cablevey system's cleaning cycle completes in a much shorter timeframe than other comparable technologies.

Sanitation methods and mandated or preferred cleaning methods should be discussed during the design phase of the system layout. If wet cleaning methods are employed for example, the position or availability of drains to dispose of the water and liquids is an important consideration.

Pneumatic Retrofits and Tensioning Kits (Self-Tensioning Device)

One area of emphasis during service calls to current customers is a retrofit process to replace the existing stainless-steel springs using our pneumatic tensioning system. The pneumatic devices manage cable tension. Proper cable tension is a major contributing factor to the overall function, dependability, longevity, and power of the conveyor system.

Overall, tensioning extremes should be avoided. When tension is set too low, the cable can disengage from the sprocket, causing a malfunction. When the tension is too high, cables can stretch, decreasing their useful lifespan. In addition, excess friction can burn through excess energy usage contributing to higher utility costs and increased system wear and tear.

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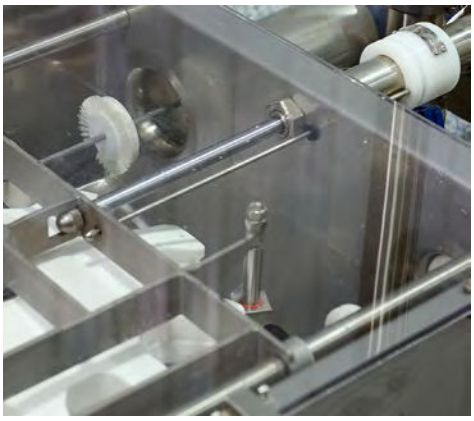
Pneumatic tensioning supplies greater safety than spring tension, as springs under a great deal of tension, released suddenly, can pose the threat of injury. Pneumatic tensioning devices are available for two-inch, four-inch, six-inch and eight-inch tube diameter conveying systems. The retrofit is simple, requiring no special tooling beyond an air compressor for operation. Pneumatic tensioning supplies multiple advantages such as:



- Accurate cable tension over its entire range of travel
- Automatic shutdown when cable tension is too loose
- Adjustable tension settings suitable for different product runs or sanitation procedures
- Less complexity with simple operations adjusted with a single knob calibrated according to the pressure gauge
- Consistent tension via the pneumatic piston
- Lower maintenance
- Improved conveyor performance

The Importance of Accessibility

A feature related to cleaning and maintenance, not mentioned during the industry survey but during many a service call, is accessibility. A system design needs to ensure easy access for the plant's maintenance crew to conduct service checks, replace worn parts, and perform general maintenance tasks. The easier the system is to access, the more likely it is that staff will perform preventive maintenance.

Even with quality built in and highly engineered designs, there is no system and no part that will last forever. Parts are going to wear out and need replacing and accessibility to perform this task is key. Replacement parts on the tubular drag style system would include discs, cable couplings and occasionally a sprocket.

Monthly Maintenance Recommendation (30/60/90)

A good rule of thumb is a monthly maintenance check, following the 30/60/90 philosophy, or a check at least every thirty days of operation. The same checklist for monthly maintenance should be followed and the checkups will help keep the system running more efficiently when they occur on a regular basis.

The thirty-day recommendation is suggested as a starting point. However, depending on system operations, either the abrasive nature of materials passing through the system or shift, or running 24/7; the more abrasive the material, and the more hours the system operates, the shorter the timeframe would be between maintenance checks.

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Some operations check the equipment once or even twice a week. Depending on system operations, the timeline for regular maintenance checks might occur more frequently. During that monthly maintenance check, the crew or operator should examine the following:

- Connectors
- Cable
- Timing
- Toothpicks
- Internal sweeps
- Discs
- Springs
- Pneumatic tensioning cylinder

Overall Plant Impact

Proper design, installation and maintenance of the tubular drag cable and disc conveyor will streamline production, improve product quality and sustain a better plant environment due to the following benefits:

- Less fugitive dust due to enclosed system for:
  - *Greater safety*
  - *A more hygienic plant environment*
- Decreased potential for product contamination
- Protection from ambient conditions
- Eliminate spills/breakage and product waste or loss
- Optimize lifespan of conveying equipment

Service Agreement

Labor markets are tight, and this has a corresponding negative impact on capital equipment. Faced with a decreased labor force, many companies cannot perform significant service on the equipment or preventive maintenance. When a company operates multiple conveyor lines, a viable, economical, and sensible option is a service agreement. The service agreement brings in not just a pair of outside hands, but experienced technicians dedicated to troubleshooting and fixing issues with tubular style conveyors.

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An annual service agreement can include a variety of checkpoints and services such as:

- A Cablevey technician performing an on-site audit of your system
- Staff training for preventative maintenance
- Working alongside staff for a better understanding of proper maintenance procedures
- Technical and continuous system updates
- Enhanced safety, tension and timing tips

Impact on ROI (Return on Investment)

The Cablevey enclosed tubular drag style conveyors have provided hundreds of companies with gentle, efficient conveying that has solved some pressing challenges related to product integrity, cleaning and maintenance, and energy conservation.

Nippon Coffee Trading Co. in Osaka, Japan, sees the value in cleaning discs that help maximize food safety with technology that makes the cleaning process intuitive. This, in addition to the ability to delicately convey its green coffee beans without breakage, helps minimize the firm's financial losses from broken or degraded products and improves overall productivity and quality.

A specialty brewer in Iowa appreciated the swift installation and clear instructions for piping tolerances that helped save time, frustration and potential errors. The versatile and compact tubular conveying system is now this brewery's preferred method to transport fragile grains through the brewing process.

The premier almond producer out of Spain, Almendras Llopis, likes the enclosed system's ability to eliminate exogenous foreign matter to help maintain high standards for food safety and cleanliness. The system can be cleaned without disassembling, which saves production time. Equally as important, product is carefully and gently transported with very little breakage compared to other systems, such as pneumatic transportation, which helps the bottom line.

And Farmina, a specialist in pet nutrition, selected the Cablevey tubular drag conveyor because the system transports its pet food with virtually no breakage or waste, is highly adaptable, consumes little energy compared to other conveyor technologies and requires little downtime due to ease of cleaning and maintenance.

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Experience the advantages a Cablevey tubular drag style conveyor can supply for your plant operations, with simple, sensible, and short cleaning cycles, easy maintenance, energy savings and gentle transport of friable materials. Or, if you are an existing customer, ask about a pneumatic tensioning retrofit or service agreement package. Cablevey Conveyors continually strives for product advancement and improvements, and enhanced customer service.

ABOUT CABLEVEY CONVEYORS

Cablevey Conveyors is a global specialty conveyor manufacturer that designs, engineers, assembles, and services tubular drag cable and disc conveyor systems. With customers in more than 66 countries, the company specializes in moving materials for food/beverage and industrial powder processors that seek food-grade conveying performance with clean, fast, energy-efficient, and cost-effective systems. Learn more at www.cablevey.com.

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