Conveyor
SELECTION GUIDE
FOR BULK HANDLING

How to buy the ideal food-safe conveying system for your business

Your guide to powder and granule conveyors

INTRODUCTION

This selection guide helps you assess conveyor systems for dry powders and granules used in the food and beverage industry. If you're considering investing in a bulk materials conveyor system, this guide will be a good first step for making a considered purchasing decision from amongst different conveyor technologies.

GATHERING INFORMATION ABOUT YOUR OPERATION

The more information you have about your operation and goals, the easier it will be to decide on your application's ideal conveying system. Supplying a complete needs analysis will help any vendor develop the best possible solution – and pricepoint – for you.

As a first step in the buying process, see this handy 14-point checklist and collect as much information as possible before starting your evaluation process.

Purchasing a Conveying System for Food and Beverage Materials Handling

CHECKLIST: DATA TO COLLECT ABOUT YOUR MANUFACTURING OPERATION

1. **What is the equipment expected to do? What is your business and what is the end result of the manufacturing process?** Conveying coffee beans is going to attract different considerations than lupin flour. ☐
2. **What type of bulk food materials will be conveyed?** ☐
   - Bulk density or weight of materials
   - Handling characteristics of powders
     - Abrasiveness
     - Size of particles
     - Moisture content
     - Hygroscopic and deliquescent content
     - Oil and wax content
     - Fragility of materials/subject to breakage
     - Blended mixes
     - Combustible or explosive dust
3. **What throughput rates and volumes are expected/required for the system?** ☐
4. **Is accurate ingredient dosing required and if so, at what accuracy?** ☐
5. **Does the integrity of the material being conveyed need to be maintained?** ☐
6. **What are the horizontal and vertical distances to be conveyed?** ☐
7. **What is the layout of the equipment in your plant?** ☐
   - Are there any 90-degree bends in the conveying path?
   - Is cross-contamination a possibility?
   - Do you have cleanroom constraints?
   - Is there a requirement to contain materials in the event of a spill?
   - Do you need fixed or mobile conveying equipment?
8. **How many pick-up points do you have?** ☐
9. **How will the bulk materials be delivered?** ☐
10. **What infeed device is located at the pick-up point?** ☐
    - Manual bag tipping
    - Bulk bag unloading
    - Plant-to-plant connections
    - Formulation (dosing) systems
    - Road vehicle unloading
11. **Where is the material going?** ☐
    - How many delivery points?
    - What is the size of the opening?
12. **How much headroom is available?** ☐
    - Can false ceilings or tiles be removed?
    - Can the system be fixed to your plant ceiling?
13. **Do you experience fumes, vapour or hot/cold extremes in your plant?** ☐
14. **What is your electricity supply?** ☐

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ISSUES IN CONVEYING FOOD AND BEVERAGE MATERIALS

While every operation is different, there are common concerns for anyone conveying edible dry powders and granules. Key points to consider include:

BUILT FOR SPEED

How many kilograms per hour do you want to achieve to meet demand? If you're not sure, what are you currently achieving? The conveyor throughput should be specified to handle loading all the raw materials required for the batch as quickly as possible to maximise production efficiency.

TIP: Often, it is far more economical to select a conveyor with surplus capacity during the planning stage than to upgrade a system once operational.

BREAKAGE: DO YOU NEED A GENTLE TOUCH?

Dry ingredient materials like sugar, coffee beans, milk powder, salt, nuts and cereal are friable and require a conveying system that can efficiently convey fragile materials. This includes any transfer points that may contribute to particle degradation.

TIP: Due diligence and experience in food processing design will save issues with quality and breakage at later stages.

GOING WITH THE FLOW

Are you using bulk materials with low flow properties, like powdered sugar, cocoa or lactose? If so, certain conveying methods may be more suitable over others. Very fine, hygroscopic, sticky or fatty substances can cause problems for many conveying systems.

TIP: Both the infeed arrangement and discharge and chutes must be designed to cater to the worst of the material characteristics.

BE NIMBLE; BE QUICK

Are you setting up a dedicated process line, or do you need to accommodate a myriad of raw materials? Some technologies are problematic when moving between powders and granules, potentially resulting in blockages, downtime, and environmental contamination.

TIP: Select a conveyor that adapts to multiple materials.

INTEGRITY IS EVERYTHING

Are you looking to transfer a finished product or a blend of various raw materials? Maintaining blend consistency is essential to ensure the quality of your product.

TIP: Maintaining the integrity of your blended product reduces costs associated with scrap and rework.

CONTAMINATION ELIMINATION

Many conveying systems are inherently susceptible to material retention, which poses a contamination threat. Watch out for dead zones in the conveyor where materials won't clear – this leads to bacteria and cross-contamination risks.

TIP: Look for a conveying system focused on hygienic engineering standards.

MAKING THE SWITCH (AND KEEPING IT CLEAN)

To maintain sanitary operations, it's crucial to consider batch changes, cleaning and validation requirements, and plant layout and accessibility. Switching from one batch of product to another creates challenging hygiene conditions. Considerations include:

- Preparing the conveyor for cleaning: does it require special tools or significant man-hours?
- Can you use both dry-cleaning and wet-cleaning methods? Is the conveyor self-draining with no product or liquid collection points?
- Do you need fixed cleaning – clean-in-place (CIP) – or can you use a dedicated cleaning room for clean-out-of-place (COP) sanitation?
- Are you able to reclaim materials as part of the cleaning process, to help reduce waste and spillages?
- What is the finish of the metal and materials used in the system?
    - Are all the contact parts compliant with FDA & EC food regulations?
    - Are the contact parts resistant to cleaning solutions, or will you experience corrosion with repeated washing or sanitising?
    - Does the manufacturer follow Good Manufacturing Practices (GMP)? Free iron contamination in stainless steel is common, resulting in surface rust and corrosion in exposed stainless surfaces. Segregation of carbon steel and stainless steel manufacturing, as well as surface passivation, is recommended.
    - Electropolishing of product contact parts is recommended because it ensures a smoother surface (Ra < 0.8µm) and inhibits surface contamination.

DANGER: EXPLOSION MAY OCCUR!

Nearly all dry powder ingredients in the food and beverage industry are capable of dust explosion in the right conditions. Although an explosible dust cloud is not generally expected within processing buildings, explosive conditions are regularly present and formed during material handling. This extends to processing equipment such as conveyors, hoppers, silos and bins.

TIP: Hazardous areas classification is best done by professionals or organisations who understand the chemistry and requisite safety levels of your process. This is an essential step to selecting and installing the appropriate equipment.

THE VAPOURS RUB

Are you feeding dry materials into wet process lines? Often in beverage or confectionery processing, sugars and other powders are fed into liquid vessels. When these vessels are at temperatures above ambient, there are risks of vapours travelling into the downstream conveyor and associated chutes. This will lead to internal blockages if not adequately cleaned and maintained.

TIP: The addition of a vapour take-off, smart chute design, and inspection and cleaning procedures should all be considered to mitigate potential failures.

ENGINEERED FOR EXCELLENCE

The machinery used in food and beverage materials handling requires extra consideration for hygiene, sanitation and food safety requirements. This applies to all parts of the conveyor including conveying elements and contact surfaces, guarding and housings, drive arrangements, infeed and discharge transitions, dust filtration and air handling.

Find out what types of materials, welding procedures, and surface finishing are used during construction. Consider where the drive motor is located for maintenance ease. Are witness holes, seals, and voids engineered to eliminate the risk of oil contamination in the process? Are the motor lubricants suitable for food processing? Is the IP rating suitable for the environment?

TIP: The manufacturer's engineering department will readily answer your questions about how their conveyors are manufactured. If they can't or won't answer your questions, it should be a cause for concern.

WHAT TO EVALUATE IN FOOD AND BEVERAGE CONVEYORS

It is crucial to short-list suppliers that understand your needs, processes, and materials. If you've completed the 14-point checklist, you'll already have the vendor information at your fingertips so they can provide you with a meaningful recommendation and proposal.

MATERIALS TESTING – Before purchasing a conveying system, run a material test on every single dry powder and granule you may handle. Any manufacturer should be willing to do this for you or provide a case study and/or reference for a similar material and application.

In situations where it may not be practical to undertake testing, focus on the problematic materials and extremes when validating the conveyor.

It may not be feasible to predict and test every possible material and blend combination, so look to test materials to account for:

- Extremes of particle sizes
- Waxy, fatty, or sticky materials
- Hygroscopic and deliquescent materials
- Friable materials or those easily damaged
- Variable bulk densities, from very low to extremely heavy
- Blends, and maintaining the integrity of blends
- Materials with a known history of problems or challenges in handling.

TIP: If you're dealing with difficult materials when conveying, even small differences like processing plants with multiple locations or using powders from different suppliers may have an impact on conveying and overall product quality.

CONVEYING MECHANISM – Ropes, chains, wires, belts, or discs used in conveyors should be designed for minimal contact with food materials. Where food does come in contact with the conveyor, all surfaces should be devoid of cracks, crevices and fasteners, to eliminate contamination risks. Where edible materials are being exposed, look for smooth surfaces and food-grade compliant coatings.

TIP: If compressed air conveyors are being considered, ensure the supply source, filtration systems and media are suitable for the application because purchasing these additional components can become costly when establishing a new system.

ROUTES AND PLANT – Consider whether you need to transport materials across horizontal or vertical axes, or discharge into single or multiple dropout points along the conveyor. Do you need to start and stop the conveyor while it's under load?

LOADING RAW MATERIALS – How will your raw materials feed into the conveyor? Consider your material infeed requirements and logistics, including manual bags, bulk bags (FIBC) and road vehicles. Often, an installation will fail due to oversights at the conveyor's infeed and discharge, not due to the conveyor itself.

TIP: One of the leading causes of unplanned downtime in a conveying system is the result of material contamination. Knives, tools, bags, plastics, lumps, and fasteners can all cause a system to go down.

METERING/FLOW CONTROL – Many conveying technologies are unable to meter raw ingredients into the process accurately. They may require a low-in-weight dosing system, rotary valve, volumetric feeders, or high-level/low-level sensors on transition hoppers to achieve process requirements.

CLEANING EASE – Look for a conveyor with minimal parts and the ability for quick and efficient cleaning. You want your conveyor to spend most of its time making you money, not costing you money being out of service.

LONGEVITY – Most conveyors are engineered to have a design life of 25 years, excluding wear on components. Companies who manufacture their own machinery and equipment tend to provide better-quality products.

ACCESSIBILITY – Look for conveyors requiring little effort and no specialised technical knowledge to maintain. Be aware of how much downtime, resources, and specialised equipment are necessary to bring the conveyor back online in a failure or for routine maintenance and cleaning.

TOTAL COST OF OWNERSHIP – Consider the cost of operating and maintaining the system. Energy efficiency is crucial to the overall cost of ownership. Also, the labour and resources needed for cleaning the conveyor can quickly become your highest cost.

Other things to consider include equipment maintenance/service costs, replacement parts – cost and frequency required, availability of replacement parts, local customer service agents, and the machinery's average life span. Also, consider whether the conveying system you choose requires additional filtering systems or ancillary equipment.

SAFETY – Look for a supplier who engineers and manufacturers their equipment to prevailing machine safety standards, ideally to global ISO standards. Consider dust explosion risks and the safety requirements for your environment and safety system. Safety switches are an additional consideration if regular access to the internals of a conveyor is required.

TIP: A risk assessment should be conducted before specifying what equipment and safety mechanisms are selected.

ELECTRICITY – Is your electrical system and circuit suitable for a food manufacturing site? This is especially important if electrical safety switches are required.

DUST CONTAINMENT – Handling powders or granules may produce dust off granules/pellets (so-called fines), ensure the conveyors on your short list have a hermetically sealed design so dust does not contaminate the external environment. Belt conveyors and bucket elevators should not be considered for handling fine powders due to the inherent issues with managing dust.

TIP: Infeed and discharge arrangements should be designed and selected to minimise any dust created during the process.

MAINTENANCE – Determine how much regular maintenance is required and the extent of training needed to keep your conveyor running efficiently. Is the equipment proprietary, or can your staff perform maintenance?

COMPLIANCE – Find out what certifications and safety standards are being met. Ensure the supplier can issue a formal Declaration of Compliance for any parts in contact with foodstuffs and reference migration testing and certification performed by an external Quality Assurance provider.

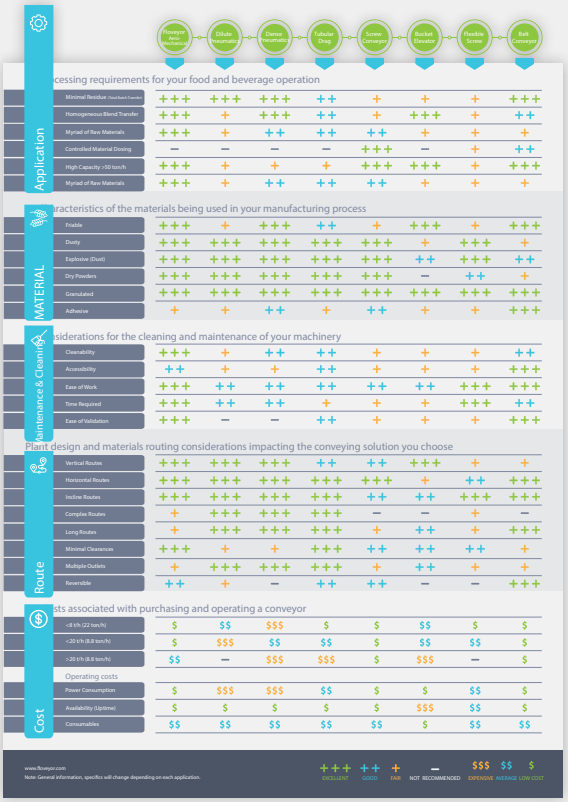
TIP: The US FDA compliance should be provided at minimum, with the European Commission (EC) regulations considered the gold standard of food safety standards. A reputable supplier will be compliant with both.

COMPANY PEDIGREE – What is the reputation of the company manufacturing the conveying system? Are they specialists in the type of conveying you require? What is their history of engineering in the company, and what is the longevity of their machinery? Do they have a reliable distribution system to ensure speedy delivery of machinery, equipment and parts? Are they able to provide an end-to-end materials handling system, from raw materials to downstream process equipment? Can they provide custom-made equipment and machinery to meet the unique requirements of a manufacturing plant? What kind of after-purchase support and customer service can you expect?

COMPARISON OF CONVEYOR TECHNOLOGIES

See the Food and Beverage Conveying Comparative Technologies poster for an in-depth analysis of routing, application, materials and costings of the following conveying types:

- Aero-Mechanical (AMC)
- Dilute Pneumatics
- Dense Pneumatics
- Tubular Drag
- Screw Conveyor
- Bucket Elevator
- Flexible Screw
- Belt Conveyor



CONCLUSION

Working your way through this buying guide will put you on firm footing for making a considered decision about what conveyor, materials handling system and supplier will be suitable for your food and beverage manufacturing business. Your new conveyor will be a crucial part of your production chain and will become a hardworking partner in your operation for decades to come.

ABOUT FLOVEYOR, INVENTOR AND ORIGINAL AMC MANUFACTURER

Floveyor was established in 1958 in Perth, Western Australia, where they continue their pioneering work as the inventors of aero-mechanical conveying (AMC). Floveyor specialises in the engineering and manufacturing of machines and equipment to efficiently convey dry powders and granules. Known for versatility and longevity, original Floveyor machinery is used for materials handling in the food and beverage industry by the world's largest brands and small manufacturers. To learn more, visit **www.floveyor.com**

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