FLOVEYOR

Set up and run

USER MANUAL

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Set up and run

A guide to diagnosing and eliminating problems

Here is an overview of the key things to consider when installing and operating a Floveyor. While it provides instructions for trouble shooting the most common problems, it is not a substitute for expert technical advice.

Adhering to aero-mechanical conveying design and operational best practices helps ensure that the Floveyor fulfils its potential for high performance hassle free operation. Problems arise when poorly trained operators and maintenance personnel modify the equipment against the operating standards established during the design and planning stage of each custom fit installation.

Using noise to monitor operations

When processing product, the Floveyor should run silently or with very minimal noise. Any knocking or hitting sounds are indicators that something is wrong.

Typical noise levels

Floveyors generally operate within safe levels for machinery although levels will change according to the types of materials being conveyed. For example:

> Course granular materials – rock, salt, hard plastic granules or small stones - 87dB(A)

> Wheat of similar sized grains – approximately 60dB(A)

> Fine powders such as wheat flour or potato flakes – approximately 50dB(A)

If a Floveyor is used for materials that produce noise levels above regulated limits, it is important to implement work place safety initiatives. Internationally, legislated safe noise levels vary and the end user is responsible for maintaining a safe work environment. If the Floveyor produces excess noise as a result of handling various granules then hearing protection must be used. Alternatively tube lagging can be supplied for noise dampening. Floveyor can assist with various methods for mitigating noise risks.

Excessive or unusual noise may signal a problem such as: a foreign object caught in the conveyor, a vibration caused by a loose fitting, damage to the tube sections or incorrect rope tension.

TOP TIPS

* Monitor the sound of the Floveyor during production to ensure that noise levels are normal and consistent
* Check the rope assembly, tubes and all the fittings as soon as the Floveyor sounds noisy or clunky

Install adequate venting

The Floveyor displaces air at an equivalent volume to the volume of product being conveyed.

Installing 3rd party equipment up and downstream of the Floveyor can cause problems due to inadequate venting. If the infeed point becomes blocked, return air struggles to pass through the system. This reduces the aeration of the product leading to inefficient operation and reduced output.

Therefore it is good practice to ensure the equipment is adequately vented for optimal performance.

TOP TIPS

* Ensure adequate venting at the in-feed housing where air is returned from the discharge point of the Floveyor

Manage challenging products

As discussed in the 'materials handled' section of our website, it is important to assess the suitability of some products and manage the characteristics of others.

The conveyor has 'pinch points'. These are areas where larger particles can catch between the discs, sprockets, feed housing or tubes. The larger the particle, the greater the chance of pinching. If the particle is friable, this is not a problem. If the particle is hard, problems may occur.

The following material properties can present problems for aero-mechanical conveying.

> Cohesive powders containing oils or fat or a high moisture content can cause residue build up inside the conveyor impeding the critical high velocity sweep of the discs through the conveyor's tubes

> Products with large hard particles can 'pinch' between the disc and sprocket housing, contributing to accelerated disc wear and tear or rope fatigue

TOP TIPS

* Check the Floveyor's feed housing, discharge housing and headchute for evidence of residue build up
* Check the suitability of any materials other than the ones the Floveyor was specifically commissioned for, before implementing new applications

Chemical attack

Chemical agents, washing solutions, and acids are often the cause of premature failure of non-stainless rope assemblies. Even Floveyor's polymer coated ropes contain a galvanized wire (Zinc) interior, which can be susceptible to aggressive chemicals.

Rusting around the wire or joiner can occasionally be seen as evidence of chemical attack on a rope assembly in apparent good condition.

TOP TIPS

* Review the chemical suitability of handled products and the resistance of the rope assembly to guard against chemical attack

Manage moist products

The Floveyor is not designed to convey wet products. It is vital to understand the dramatic impact a material's moisture content can have on the Floveyor's performance.

Powders containing moisture content can cause residue build up inside the conveyor, impeding the critical high velocity sweep of the discs through the conveyor's tubes. A high level of moisture in the product can also increase the resistance and stress on the rope assembly during conveying, leading to premature failure.

The following two types of moisture absorbing materials can be problematic for the Floveyor if not correctly managed:

> **Hygroscopic materials**, which absorb atmospheric moisture and become damp and sticky. For example Sulfuric Acid is eminently suitable to be handled in a Floveyor as a relatively dry, free flowing powder at 4% moisture content. However it becomes impossible to handle satisfactorily as a slimy sludge when the moisture content is allowed to rise around 10%.

> **Deliquescent materials** that can form syrup when they absorb moisture. Dried syrup can form hard crystals or lumps causing problems for the Floveyor's components. Installing preconditioning equipment to prevent or sieve lumps will help to manage this problem

TOP TIPS

* Ensure that material samples tested for suitability accurately reflect the moisture level of the product intended for processing
* Design the system to deal with the inherent challenges posed by moisture absorbing materials
* Schedule preventive maintenance and cleaning to prevent internal buildups, if your materials have problematic characteristics

Safe, efficient dust extraction

A dust extraction system can be used with a Floveyor under strict conditions when applied to the discharge or in feed equipment. Floveyors displace air at a volume equivalent to the volume of product conveyed, so the extraction requirement is extremely small.

Under normal aero-mechanical operation the materials aerate during conveyance and essentially 'float' between the flights on the rope assembly. When a vacuum is applied to the system, the materials no longer 'float' between the flights; instead they are 'dragged' up the tubes on the lower disc, putting excess stress on the rope assemblies.

TOP TIPS

* Never apply a vacuum to the Floveyor itself, as suction will disrupt conveyor's dynamics leading to premature rope failure
* Include a slide gate or control valve if applying dust extraction to the conveyor. This will allow for adjustments to the level of extraction to match the passive air movements
* Ensure both up and downstream equipment are not creating a vacuum within the Floveyor

Operate efficiently

Never stop or start the Floveyor under load

Never stop or start the Floveyor under load. This will greatly reduce the operating life of the rope assembly, leading to premature failure and breakdowns.

It is essential to add complementary equipment such as a screwfeeder, sliding baffle or rotary valve to the infeed equipment to control the in feed of materials and allow for the correct shutdown procedures.

TOP TIPS

* Turn the Floveyor on approximately 10 seconds prior to introducing product into the system
* Stop the supply of product and run the Floveyor for 15-20 seconds until all product has left the system

Minimise run time

Stop the Floveyor when it is not in use to protect the rope assembly from unnecessary wear.

TOP TIPS

* Synchronise the Floveyor start stop times with batching requirements to allow for the safe ramp up and ramp down procedures

Manage frequent starts

Install a soft start motor starter if a specific application requires frequent starting and stopping.

The soft start gradually increases the speed of the conveyor, unlike the normal motor starter, which instantly brings the conveyor up to speed. The soft start is far gentler on the rope assembly.

Maintain correct speeds

Beneath the Floveyor's simple appearance is a sophisticated piece of precision engineered technology.

It is vital to maintain conveyor speeds at their factory specifications to avoid rope failure.

Changes to the conveying speeds will alter the fluidization and product flow dynamics. This will put greater stress on the Floveyor's internal components, often leading to premature rope assembly failure.

TOP TIPS

* Never use a VFD to alter the factory speeds of the Floveyor
* Control product flow rates at the infeed of the Floveyor, with the aid of screwfeeders, dosing equipment, rotary valves, and sensor controlled sliding baffles

NOTE: The Floveyor drive should never be considered a method of adjusting and toggling product throughputs.

The Floveyor shaft speed should be operating at about 240+/-5% RPM for an F3 Floveyor and 267 +/-5% RPM for an F4/F5 Floveyor.

Checking motor and rope assembly direction

The Floveyor is a directional drive system so the rope assembly must travel in the right direction for the product to discharge appropriately.

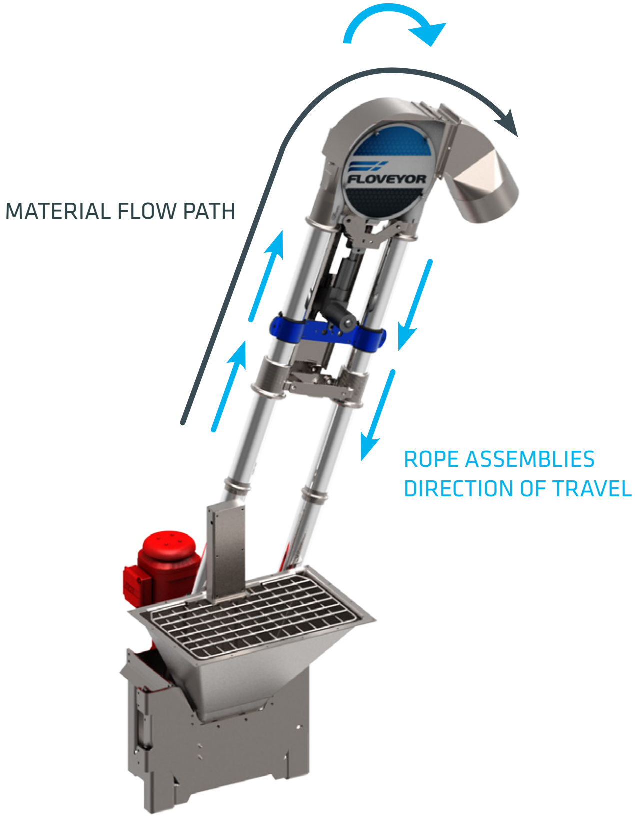
An incorrectly wired or poorly commissioned Floveyor, or one that has been tampered with post installation by electrical personnel could be running in reverse.

It is imperative to confirm that the rope assembly is travelling in the correct direction prior to conveying product. Ensure the Floveyor is discharging material over the top sprocket.

A Floveyor running in reverse will not discharge material, causing it to recirculate and stress the internal components. This will rapidly destroy the rope assembly and bearings.

TOP TIPS

* Check the direction of the drive by looking into the nameplate on the discharge housing. The discharge housing sprocket will rotate clockwise towards the headchute on a correctly configured Floveyor



Manage in and out feed

Match discharge chutes and receiving vessels to applications

The Floveyor runs at speeds of 4-7 meters per second. In order to adequately discharge the conveyed materials, the product must be thrown from the discharge by centrifugal force without resistance or impediment.

An incorrectly designed or sized discharge chute will cause problems with backfill and product recirculation.

Incorrectly designed or sized discharge chutes will often backfill a Floveyor causing stalling or damage to a rope. The discharge chute will then empty itself once product supply has been cut, making it difficult for inexperienced operators to diagnose the problem.

Recirculating product causes premature failure of the bearings, seals and rope assembly, and potential damage to the machine.

A discharge chute of between 200-300mm in diameter, depending on the material characteristics enables product to discharge easily, Choosing the right sized chute will allow correct operation and prevent problems of back up and recirculation.

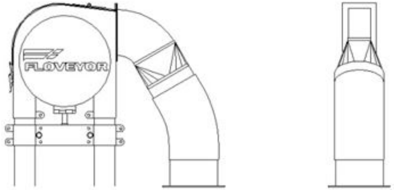
Unfortunately, users often install smaller, inappropriate mating discharges at an angle that does not allow product to discharge freely. In general the discharge connection should be kept to the supplied size and situated as close as possible to the receiving vessel with a minimum of discharge ductwork. The discharge ductwork is often an area where product will build up and ultimately plug.

Set discharge chutes at the correct angle

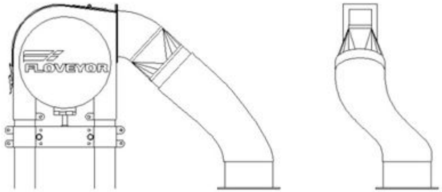
The minimum angle of repose required on the discharge chute, should never be less than the minimum angle of repose of all materials being handled. The appropriate angle will change for different materials and it is vital to set this correctly before conveying begins.

Floveyor usually recommend a minimum of 60 degrees discharge angle and a 200mm (F3/F4) & 250mm (F5) diameter for the design of discharge chutes to adequately cope with material capacities to be conveyed.

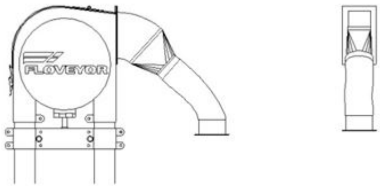
The following illustration provides examples of correct and incorrect discharge design.



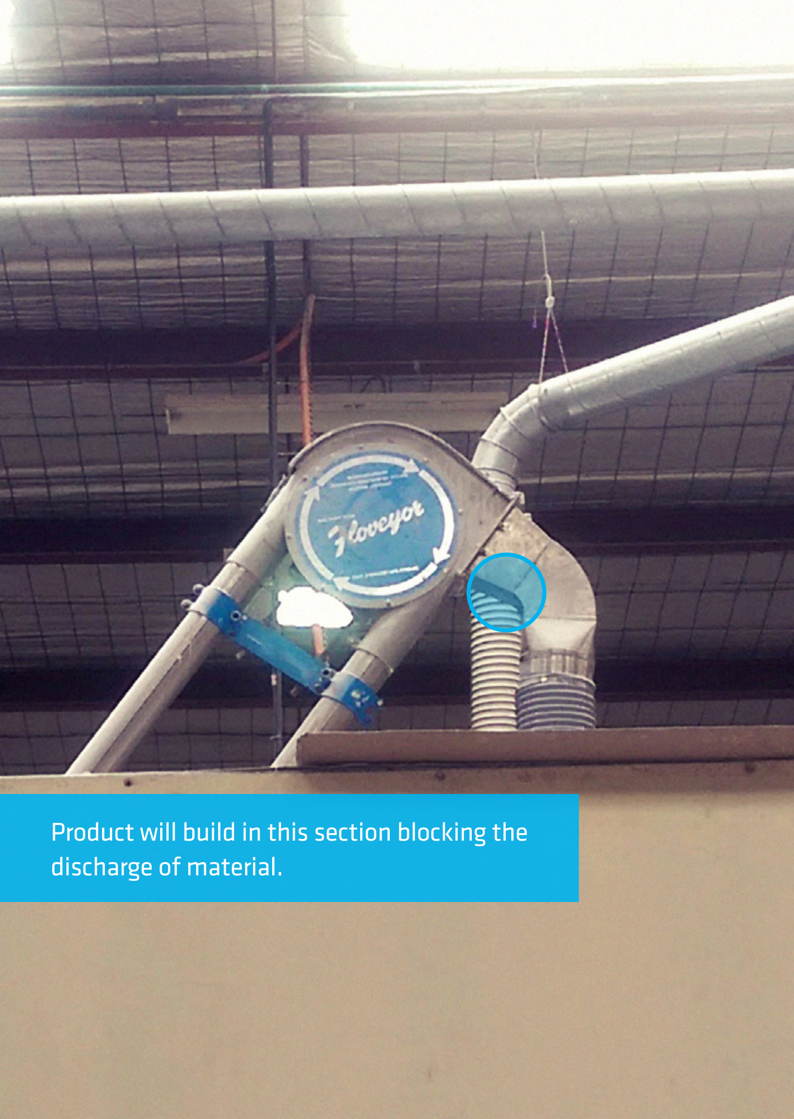
✓ This is the recommended angle and width for discharging most materials.



✗ This configuration, due to the shallow angle and twisted chute, will likely result in a build-up of material and ultimately, a blockage.



✗ This configuration, due to the funnelling of material into a narrower tube than the discharge, will likely result in a blockage.



Product will build in this section blocking the discharge of material.

Shallow discharge angle will result in internal blockages causing the Floveyor to backfill and stall.

Monitor levels in the receiving vessel

A poorly integrated receiving vessel can cause problems within the conveying system. Often the receiving vessel will overfill with no signal to the Floveyor to stop conveying and feeding product. This leads to recirculation and premature component failure.

Manage this problem by fitting the receiving vessel with high level sensors and PLC controls. These sensors are designed to trigger and cut off the product supply, leaving a safe buffer level. This allows the Floveyor to empty the remaining product without overfilling the receiving vessel.

TOP TIPS

* Do not reduce the size of the original discharge connection. It has been designed specifically to work efficiently with a particular product
* Install the discharge connection as close as possible to the receiving vessel. Minimise the amount of discharge ductwork to reduce the problem of product build up and plugging in this area
* Set the angle of repose on the discharge chute to match specific products
* Fit the receiving vessel with appropriate high level sensors installed in the right places to prevent the risk of overfilling

Clear a blocked inlet

The Floveyor feed inlet uses gravity to move the product into the feed housing. Sound preplanning and system design to select the appropriate complementary equipment will minimise the likelihood of feeding problems such as bridging.

TOP TIPS

* Fix feeding difficulties by implementing one of the following options:
  - Changing to a hopper with steeper valley angles
  - Adding a flow aid such as a vibrator or pneumatic bin aerator
  - Installing a rotary valve, slide gate, pneumatic baffle or screw feeder to control flow rates

Keep contaminants out

Foreign contaminants entering the Floveyor are one of the biggest causes of premature rope failure.

Knives, spanners, nuts and bolts, excessively large hard product lumps, bulk bags etc. will damage many of the conveyor's components leading to operational and maintenance problems.

TOP TIPS

* Install a safety grid in the in-feed equipment
* Train operators to take care to not drop contaminants into the system
* Maintain a level of quality in the raw material supply

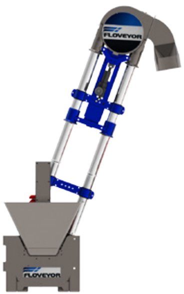
Managing distance and drive

Choose an appropriate distance

It is important to follow the strict Floveyor equipment specifications when implementing aero-mechanical conveying solutions in longer length applications. Floveyors operating beyond the maximum recommended lengths will experience significantly more issues with ongoing maintenance.

MODEL

F3



RECOMMENDED LENGTH LIMIT

40' or 12.2m

MAXIMUM LENGTH LIMIT

45' or 13.72m

MODEL

F4

RECOMMENDED LENGTH LIMIT

60' or 18.29m

MAXIMUM LENGTH LIMIT

65' or 19.81m

MODEL

F5

RECOMMENDED LENGTH LIMIT

50' or 15.24m

MAXIMUM LENGTH LIMIT

55' or 16.76m

* **NOTE** the F5 has a lower max height than the F4 due to the weight of the Rope Assembly when loaded causing excessive stretch in comparison.

** **NOTE** the recommended length is under normal operating conditions, including long operational hours and heavier density products.

*** **NOTE** the maximum length limit can be reached when handling gentle and light density materials, smaller batch operations, with lower operational hours.

It is important to understand the reasons for imposing strict length limits and the potential consequences of extending the equipment outside these specifications.

Excessive length will put pressure on the rope assembly causing it to over stretch and lose tension. The problems of loose tension are addressed in detail in the 'Care for the Rope Assembly' manual. They include, the rope slapping around in the tubes, excess wear on discs and tubes and discs 'walking out' of the sprocket notches.

Note that the elastic properties of the wire rope mean it can 'appear' to be tensioned correctly when the Floveyor is not operating. However on full speed operation and under load, the rope will stretch and the wear and tear associated with having 'loose tension' will occur.

Finally the Floveyor's aero-dynamics begin to fail in long full speed machines particularly near vertical, resulting in a reduction of least 10% capacity with some products.

Configure drag conveyors correctly

Floveyor's tubular drag conveyors provide ideal low speed distribution systems for conveying materials over distances of up to 45m. They are also an optimal solution for applications needing complex configurations fitted with numerous inlet and discharge points.

Correctly configured drag units reduce wear on the rope assembly and save on maintenance. Floveyors running at slower rates reduce the elasticity of the rope assembly causing far less stretching than full speed operations. There is also less potential for the rope to walk out of the sprocket.

Understanding the following drag conveying parameters will help to install and manage this equipment correctly.

Drag systems:

> Operate at around 40% of materials handling capacity of full speed Floveyors

> Run at a rate around one quarter of full speed Floveyors

> Maximum running RPMs are around 60RPM and can RPMs drop down to as low as 1 or 2

> Operate at a maximum incline of approximately 45°

MODEL

F3

MAXIMUM LENGTH LIMIT

120' or 36.58m

* Depending on materials being handled, flow rates & bulk densities.

MODEL

F4

MAXIMUM LENGTH LIMIT

150' or 45.72m

* Depending on materials being handled, flow rates & bulk densities.

MODEL

F5

MAXIMUM LENGTH LIMIT

150' or 45.72m

* Depending on materials being handled, flow rates & bulk densities.

TOP TIPS

* Calculate volume efficiencies and flow rates to avoid overloading the drag unit, which works at a slower rate than a full speed operation

Configure for top or bottom drive

Ideally all Floveyors should be driven from the top to maximise operational efficiency. This maximises performance and minimises wear by pulling the rope assembly through the tube instead of pushing it. In longer applications, bottom drive units tend to walk the rope assembly out of the idler sprocket at the top causing the rope assembly to jam and the Floveyor to stall.

It is possible to drive Floveyors from the bottom for smaller applications up to 25’ 0” / 7.6m in centre-to-centre distance. However it is essential to follow these strict length cut offs:

> Bottom Drive <25’ or 7.62m centre-to-centre distance

> Top Drive >25’ or 7.62m centre-to-centre distance

Any lengths greater than this cut off must be top drive.

Get in touch with us

Contact us to streamline your bulk material handling operations.

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