

TYPES OF SCREW CONVEYORS

Horizontal Screw Conveyors

Horizontal screw conveyors are the most widely used type of screw conveyor. Used to convey bulk materials from one part of a process to another, horizontal screw conveyors are available in a wide range of sizes, lengths, configurations and materials of construction.

Screw conveyors are typically designed to convey bulk materials at 15, 30 or 45-percent trough loading, depending upon material characteristics of the specific bulk material. As a general rule, trough loading of 45-percent can be used for light, free-flowing and non-abrasive bulk materials. Trough loadings of 15 and 30-percent are typically used for denser, sluggish and more abrasive bulk materials.

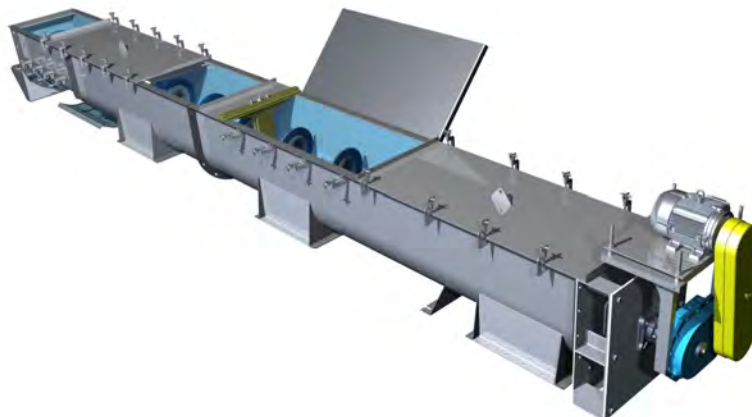
The inlet of a screw conveyor is always control fed by another device such as:

- Screw Conveyor
- Screw Feeder
- Belt Conveyor
- Rotary Airlock
- Volumetric or Gravimetric Feeder

The recommended location for the drive unit is on the discharge end of a screw conveyor which pulls the bulk material to the drive end. With this arrangement, each screw section is put in tension as the bulk material is conveyed toward the discharge of a screw conveyor, reducing wear and fatigue on the conveyor components.

Advantages of Using Screw Conveyors

- Ideal for conveying dry to semi-fluid bulk materials – free flowing to sluggish
- Cost-effective when compared to other conveying devices such as belt, pneumatic or aero-mechanical
- Efficiently distributes bulk materials to various locations using multiple inlet and discharge points
- Totally enclosed for dusty, corrosive or hazardous environments



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Inclined Screw Conveyors

Inclined screw conveyors typically operate from slightly above the horizontal position to 45-degrees from the horizontal position. Above 45-degrees an inclined screw conveyor is considered a vertical screw conveyor and must be designed in accordance with the KWS Engineering Guide for Vertical Screw Conveyors. As the degree of incline increases, conveying efficiency is reduced and horsepower requirements increase due to the effects of gravity and bulk material fall back. Conveying efficiency is affected by angle of incline, characteristics of the specific bulk material, type of screw conveyor trough and screw pitch. KWS recommends designing screw conveyors using the lowest possible degree of incline for maximum efficiency.

The following are design and construction features to consider when designing an inclined screw conveyor:

- Incline Up to 10-Degrees – Loss in conveying efficiency is minimal on inclines up to 10-degrees. A screw conveyor with U-trough and full pitch screw is sufficient for most applications. Loss in efficiency can be overcome by increasing the speed of the screw conveyor, increasing the diameter of the screw conveyor or reducing the pitch of the screw.
- Incline Between 10 and 20-Degrees – Loss in conveying efficiency is typically between 10 and 40-percent on inclines up to 20-degrees. A screw conveyor with U-trough and 2/3-pitch screw is sufficient for most applications. Loss in efficiency can also be overcome by increasing the speed or the diameter of the screw conveyor. Additional horsepower is required to overcome gravity and bulk material fall back.
- Incline Between 20 and 30-Degrees – Loss in conveying efficiency is typically between 10 and 70-percent on inclines up to 30-degrees. A screw conveyor with tubular housing and reduced pitch screw (1/2 or 2/3) is recommended for most applications. Loss in efficiency can also be overcome by increasing the speed or the diameter of the screw conveyor. Additional horsepower is required to overcome gravity and bulk material fall back.
- Incline Between 30 and 45-Degrees – Loss in conveying efficiency is typically between 30 and 90-percent on inclines up to 45-degrees. A screw conveyor with tubular housing and reduced pitch screw (1/2 or 2/3) and larger diameter is recommended for most applications. Increasing the speed of the screw conveyor is also required. Additional horsepower is required to overcome gravity and bulk material fall back.

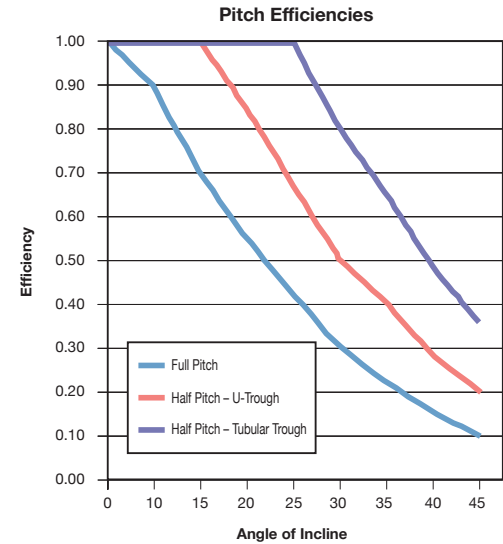




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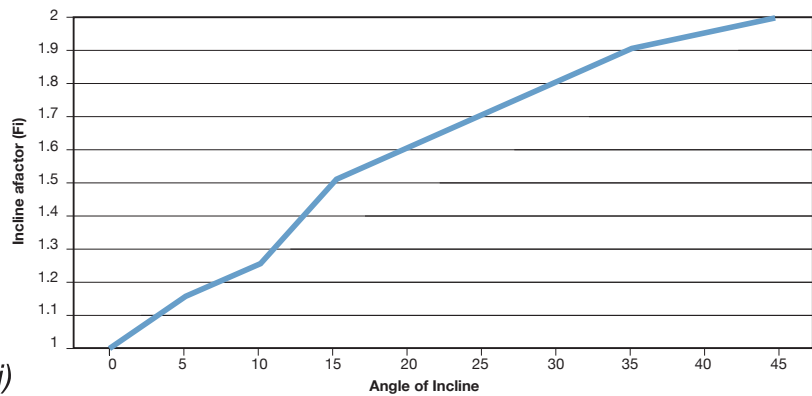
Pitch Efficiency

The Pitch Efficiency chart shows the relative conveying efficiency at different degrees of incline and pitch configurations. As the degree of incline increases, reduced pitch screws (1/2 and 2/3) are more efficient than full pitch screws. The combination of reduced pitch screws (1/2 and 2/3) and tubular housings provide the highest conveying efficiency.



Horsepower Requirements

The horsepower requirements for inclined screw conveyors increase with the degree of incline. The Horsepower Factor (Fi) is incorporated into the standard screw conveyor horsepower calculations to compensate for the additional horsepower required to overcome gravity and bulk material fall back.



$$TSHP(i) = \frac{FHP + (MHP^* \times Fi)}{e}$$

TSHP (i) = Total Shaft HP for Inclined Screw Conveyor

FHP = Friction HP (HP required to drive the conveyor empty)

MHP = Material HP (HP required to move the material)

Fi = Incline Factor

e = Drive Efficiency (Typical value of 0.88 is used for a shaft mount reducer/motor)

* If calculated Material Horsepower is less than 5HP it should be corrected for potential overload. Use the Corrected Material HP Chart.

Upset Conditions

Screw conveyors located on inclines over 10-degrees must be designed to start and operate under upset conditions. An upset condition is caused when normal flow in an inclined screw conveyor is interrupted and the bulk material inside the conveyor slips back to the lower end, filling up the conveyor. Additional horsepower is required to restart and convey the bulk material because the conveyor will temporarily experience 100-percent trough loading. Please consult KWS Engineering for the proper design of inclined screw conveyors for upset conditions.

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Shaftless Screw Conveyors

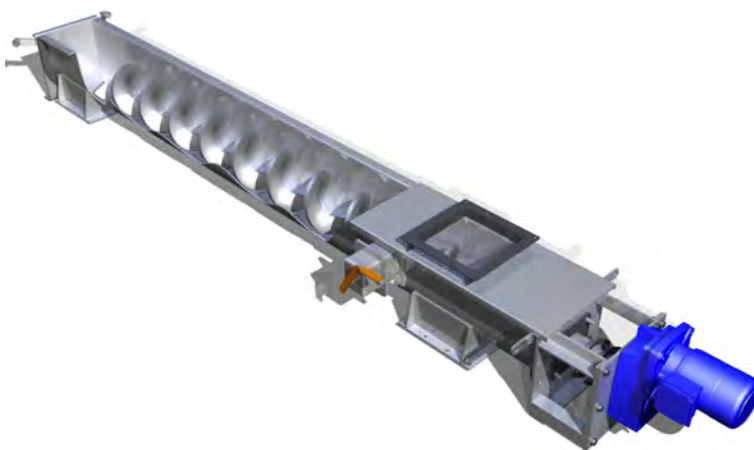
Bulk materials discharged from centrifuges, filter presses or mixers can easily be conveyed using a KWS Shaftless Screw Conveyor. Our shaftless design provides a non-clogging conveying surface that allows difficult-to-convey materials to become easy-to-convey. The perfect solution for handling bulk materials with high moisture content is the KWS Shaftless Screw Conveyor.

Advantages of Shaftless Screw Conveyors

- Ideal for handling sticky and sluggish bulk materials
- Improved conveying efficiency when compared to other types of conveyors
- Allows greater flexibility for plant layout due to configurations available
- Internal bearings are eliminated

KWS Shaftless Screw Conveyors are successfully used throughout the chemical, food, minerals processing and wastewater treatment industries for conveying everything from catalysts to dewatered biosolids.

KWS developed the industry standards for shaftless screw conveyors and continues to create new and improved design standards. Our high strength alloy spirals are the hardest, strongest and toughest in the industry. For more information regarding shaftless screw conveyors consult the *KWS Shaftless Screw Conveyor Engineering Guide* located on our website.



Engineering Guide Available at:
www.KWSMFG.com

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Vertical Screw Conveyors

Vertical screw conveyors are a very efficient method for elevating a variety of bulk materials at very steep inclines or completely vertical. KWS considers any screw conveyor located on an incline over 45-degrees to be a vertical screw conveyor. The compact design allows for the vertical screw conveyor to fit into almost any plant layout. With a minimum number of moving parts, the vertical screw conveyor is a cost-effective and dependable component of any bulk material handling process.

Advantages of Vertical Screw Conveyors

- Ideal for handling dry to semi-fluid materials
- Capacities up to 6,000 cubic feet per hour.
- Ability to elevate bulk materials up to 30-feet without use of internal bearings.
- Totally enclosed design for dust and vapor-tight requirements.

KWS designs and supplies vertical screw conveyors to meet the needs of many industries, such as chemical, minerals processing, food, wood products and wastewater treatment. For example, our unique shaftless vertical screw conveyor design is used in many wastewater treatment facilities for elevating dewatered biosolids.

KWS Vertical Screw Conveyors are available in many configurations. Inlet sections can be offset to either side or can be in-line. Horizontal feed conveyors are required to accurately meter bulk materials directly to the vertical conveyor's inlet for maximum efficiency.

For more information regarding vertical screw conveyors, consult the *KWS Vertical Screw Conveyor Engineering Guide* located on our website.



Engineering Guide Available at:
www.KWSMFG.com