SCREW CONVEYOR BASICS

The KWS Screw Conveyor Engineering Guide will provide assistance in the design of a screw conveyor or system, yielding optimum performance and efficiency.

Primary considerations for the selection of a screw conveyor are:

1. Type and condition of the bulk material to be conveyed including maximum particle size and specific bulk density
2. Capacity or feed rate of bulk material to be conveyed expressed in pounds per hour, tons per hour, or cubic feet per hour
3. Required distance and incline the bulk material is to be conveyed
4. Design conditions such as materials of construction, inlet feed conditions and operating temperature

The Engineering Guide provides the necessary information for selecting a screw conveyor in a series of five steps. These steps are arranged in logical order and are divided into separate sections for simplicity.

The five steps are:

1. Establish characteristics of the bulk material to be conveyed.
2. Determine conveyor size and speed based on capacity.
3. Calculate horsepower requirements.
4. Verify torque rating of components.
5. Select conveyor components.

Typical KWS Screw Conveyor

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.

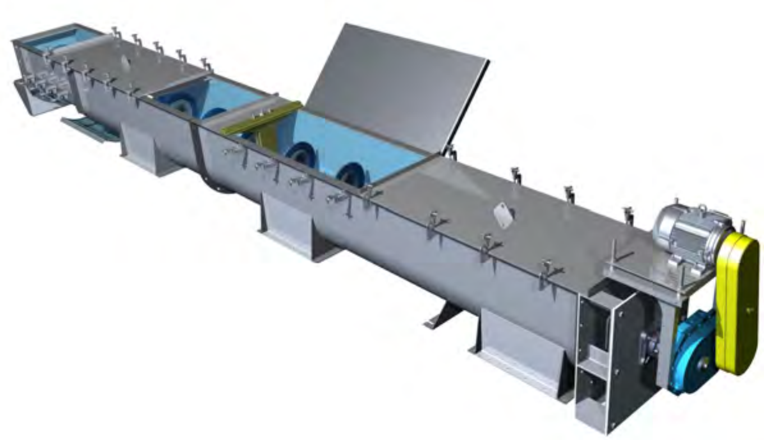
The inlet of a screw conveyor is always control fed by another device such as:

- 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



TYPES OF SCREW CONVEYORS

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.

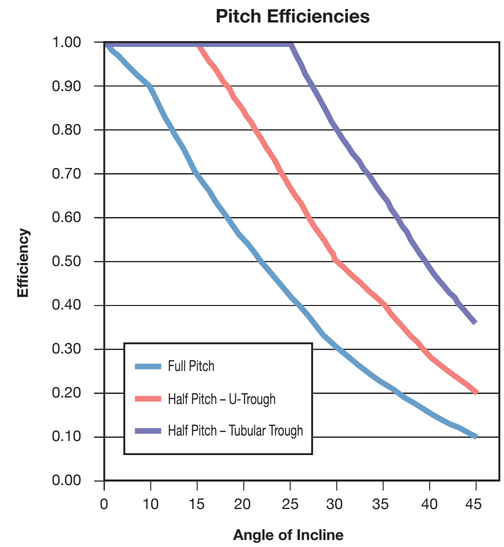
The following are design and construction features to consider when designing an inclined screw conveyor:

- 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.

TYPES OF SCREW CONVEYORS

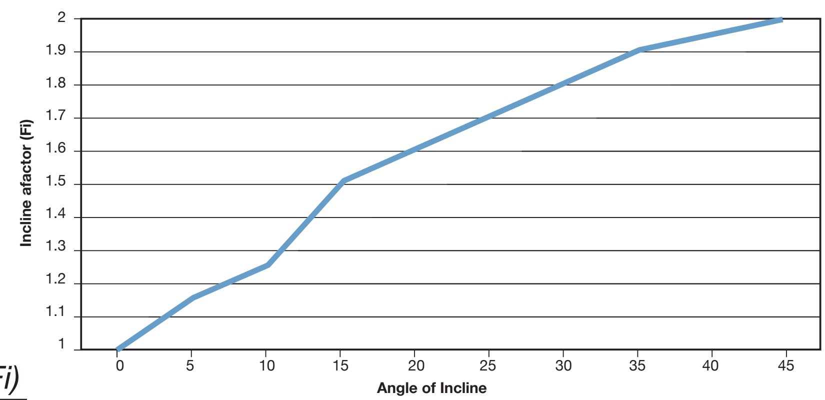
Pitch Efficiency

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.



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

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.

TYPES OF SCREW CONVEYORS

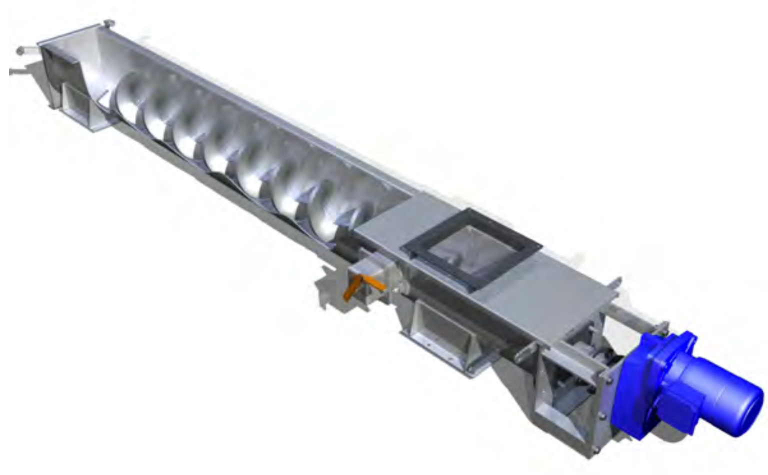
Shaftless Screw Conveyors
Bulk materials discharged from centrifuges, filter presses or mixers can easily be conveyed using a KWS Shaftless Screw Conveyor. Our shaftless design provides a non-clogging conveying surface that allows difficult-to-convey materials to become easy-to-convey. The perfect solution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

TYPES OF SCREW CONVEYORS

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

TYPES OF SCREW FEEDERS

Screw Feeders

Screw feeders are designed to meter bulk materials and are typically located at the beginning of a process. Capacity or feed rate can be accurately controlled with screw feeders. Variable speed drives improve metering accuracy and can provide a wide range of feed rates. Screw feeders are available in a variety of sizes, lengths, configurations and materials of construction.

The inlet of a screw feeder is always flood loaded (100-percent). A screw feeder is typically mounted directly to a:

- Hopper – Square or rectangular in shape with sloped bottom and limited storage capacity
- Bin – Square or rectangular in shape with sloped bottom and large storage capacity
- Silo – Cylindrical in shape with cone or mass-flow bottom and large storage capacity

Several factors must be considered when designing a screw feeder, including:

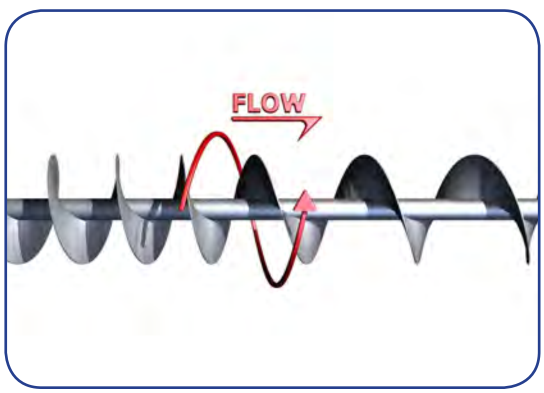
1. Flow characteristics of bulk material being stored and metered
2. Density of bulk material in both stored and metered condition
3. Maximum and minimum capacity or feed rate of process
4. Bulk material size with screen analysis
5. Width and length of screw feeder inlet opening
6. Overall length of screw feeder
7. Height of bulk material in hopper, bin or silo

With the screw feeder inlet flood loaded (100-percent), the design of the screw in the inlet area and the screw speed determine the desired capacity or feed rate.

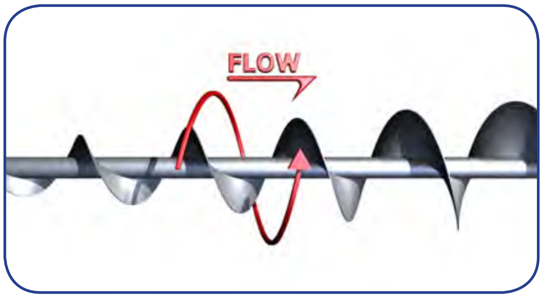
Most screw feeders are less than 20-feet in length because the use of internal hanger bearings is not recommended. In most applications a short screw feeder will meter a bulk material to a screw conveyor for transfer to the next step of the process.

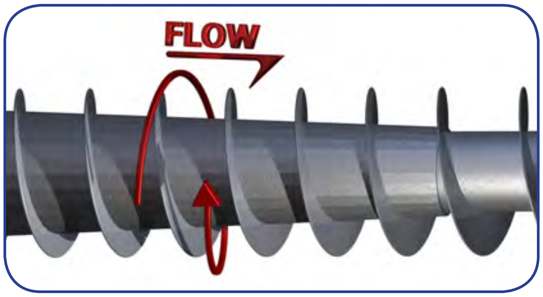
KWS designs and manufactures three types of screw feeders:

Variable or Stepped Pitch – The pitch of the screw varies from shorter to longer as the screw progresses toward the discharge of the screw feeder. With variable pitch, every pitch increases in length in the inlet section creating more available volume for addition of bulk materials from the hopper. With stepped pitch the flight pitch changes in increments. For example, a stepped pitch screw feeder may have 2-feet of 1/3 pitch, then 2-feet of 2/3 pitch in the inlet section.



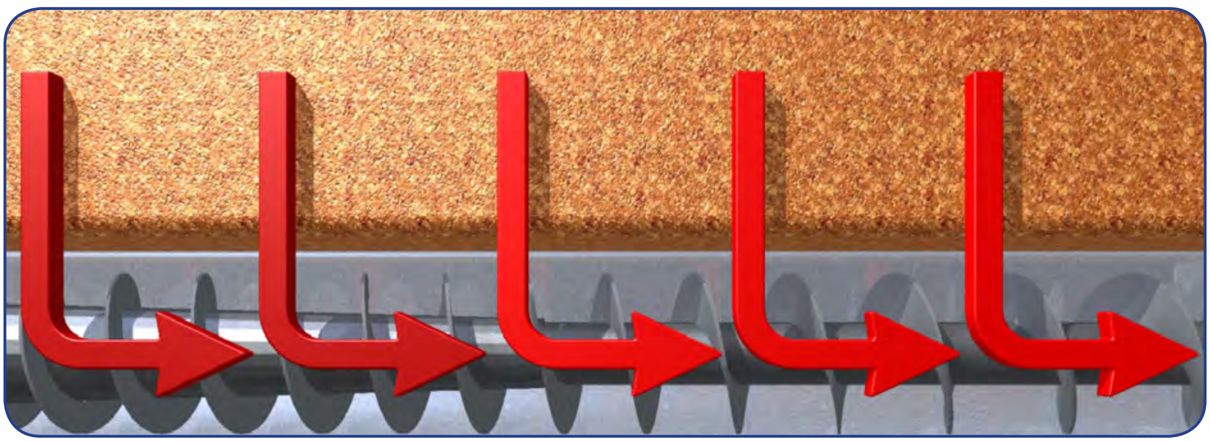
TYPES OF SCREW FEEDERS





Tapered Outside Diameter – The outside diameter of the screw is tapered from the rear of the inlet opening to the shroud creating more available volume for addition of bulk materials from the hopper.

Mass Flow – The mass flow design was developed by Jenike & Johanson and is a combination of variable pitch and tapered inside diameter. A tapered cone is located on the center pipe of the screw from the rear of the inlet opening to approximately the center of the inlet opening. Short pitch flights are mounted on the cone creating available volume for addition of bulk materials from the hopper. Variable pitch is then added to the screw starting where the cone ends and continuing to the discharge.



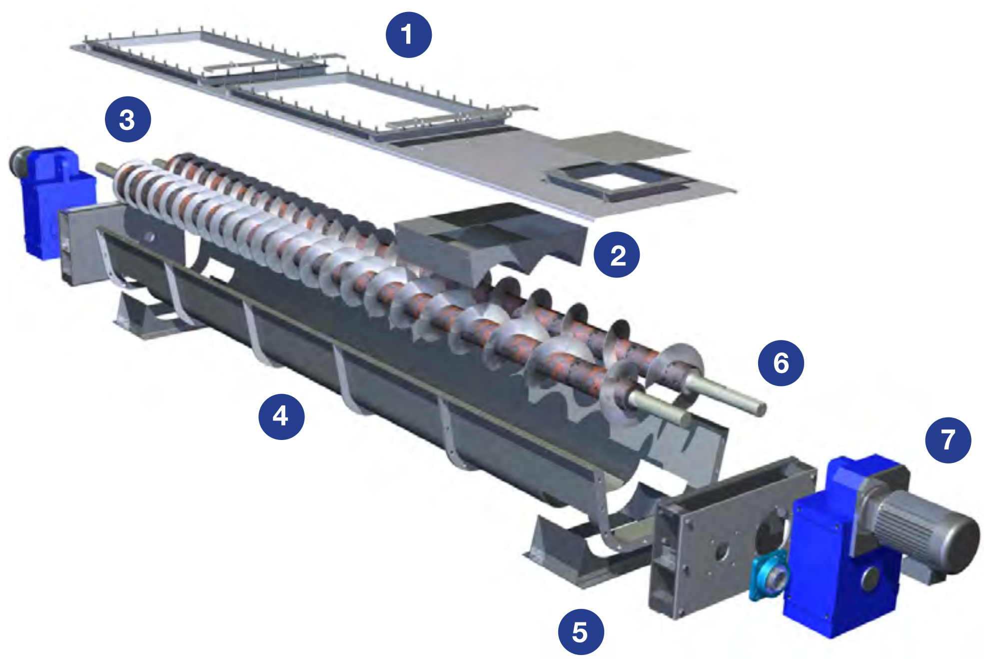
Mass flow in a hopper

Screw feeders can be composed of one, two or virtually any number of screws. A screw feeder with multiple screws is considered a live bottom screw feeder.

TYPES OF SCREW FEEDERS

Basic Screw Feeder Design

It is not recommended to design screw feeders with uniform outside diameter and constant pitch because bulk materials will fill the screw from the rear of the inlet opening first, creating rat-holing, stagnant material and possible bridging of bulk materials above the screw feeder. To draw bulk materials evenly across the full length of the inlet each flight must increase in available volume as the screw progresses towards the discharge of the screw feeder. Variable pitch, tapered outside diameter (OD) or mass flow screw design is required.



1. Inlet opening matches bin or hopper discharge.
2. Feeder Shroud prevents material flooding.
3. Twin mass flow, variable pitch screw feeder permits even draw off of material.
4. Twin screw trough.
5. Discharge opening.
6. Solid shafting transmits rotary motion to gear reducer.
7. Independent gear boxes to drive each screw.

TYPES OF SCREW FEEDERS

Feeder Shroud

Screw feeders must be equipped with a shroud for at least 2 pitches beyond the inlet opening to prevent flooding of the bulk material past the inlet. The shroud is a curved cover that converts a standard U-trough into a tubular housing to prevent bulk materials from flooding past the screw. Extended shrouds, tubular housings or short pitch flights can be utilized for accurate feed rate control when metering very free flowing bulk materials.

Screw Feeder Capacity and Speed

The pitch of the last screw flight going into the shroud determines the feed rate of the screw feeder and is called the Control Pitch. The Control Pitch is typically less than full pitch. The capacity of the Control Pitch is calculated in cubic feet per hour per RPM. The speed of the screw feeder can be determined by dividing the maximum screw feeder capacity in cubic feet per hour by the capacity of the Control Pitch in cubic feet per hour per RPM. Most screw feeder speeds are lower than standard screw conveyor speeds. For example, in heavy industrial applications, screw feeders typically operate at speeds less than 20-RPM. More torque is generated at lower operating speeds ensuring the screw feeder does not stall at start-up.

Screw Feeder Horsepower Requirements

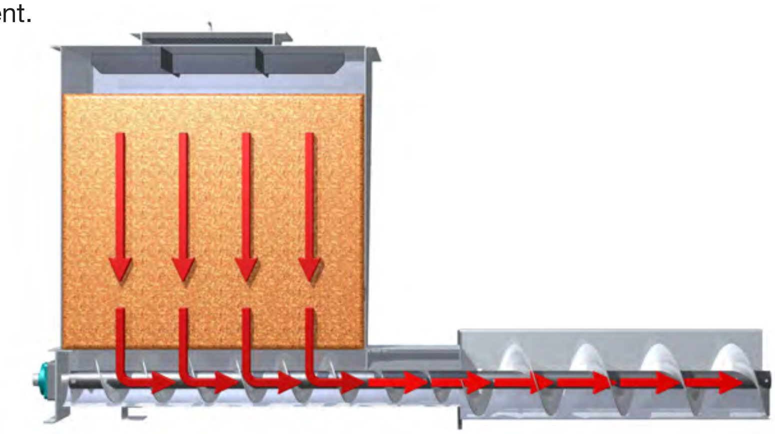
The horsepower and torque requirements for a screw feeder are much higher than a comparable screw conveyor. A screw feeder must start up with a flood loaded inlet and the head load weight of the bulk material in the inlet section. Bulk materials also tend to pack when under pressure in a hopper, bin or silo. As the bulk material density increases, so do the horsepower and torque requirements. The Material Factor or HP Factor (MF) can exceed 4.0 for some bulk materials when under pressure and packed. The start-up horsepower and torque can easily be 2.5 times the normal operating conditions. Please consult the KWS Engineering Department for proper screw feeder design.

TYPES OF SCREW FEEDERS

OTHER TYPES OF SCREW FEEDERS

Multiple Diameter Screw Feeder/Conveyor

Multiple Diameter Screw Feeder/Conveyors consist of a screw feeder with an extension conveyor. A smaller diameter screw feeder is located under a hopper, bin or silo and is flood loaded. The screw feeder meters the bulk material to the larger diameter extension conveyor. When the bulk material reaches the extension conveyor the trough loading decreases and the bulk material is conveyed to the discharge. Hanger bearings are allowed in the extension conveyor as long as the trough loading is below 45-percent.



Live Bottom Screw Feeder

Live bottom screw feeders are designed for use on large silos, bins and hoppers with large discharge openings. The live bottom screw feeder utilizes multiple feeder screws in tandem to create a "live bottom" to prevent bridging. Bulk materials are metered and drawn out equally from the full width and length of the inlet opening. Live bottom screw feeders are used on bulk materials which tend to pack or bridge easily.

When designing a screw feeder, every application is unique. For this reason, please consult KWS Engineering for proper recommendations concerning your particular needs.

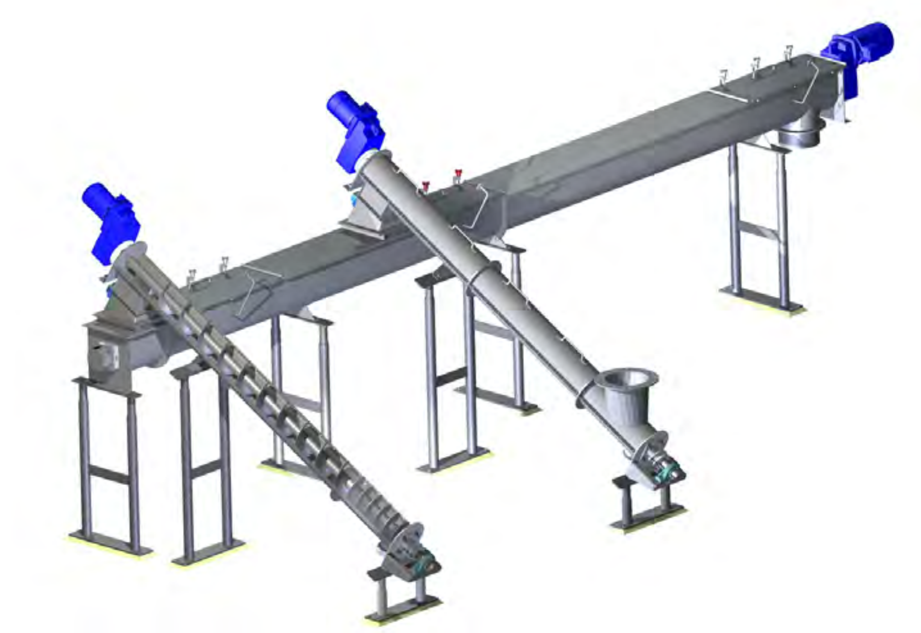
TYPES OF SCREW FEEDERS

Inclined Screw Feeders
Inclined screw feeders meter and elevate bulk materials from hoppers, bins or silos and perform the same function as horizontal screw feeders. However, special care is required when designing inclined screw feeders.

Knowledge of the flow characteristics of bulk materials is extremely important for successful inclined screw feeder design. The angle of repose and flowability of a bulk material will determine the design of the screw feeder and the maximum angle of incline. Testing of bulk materials is required for all inclined screw feeders before a proper design can be established. Bulk material samples can be sent to KWS for laboratory and field testing.

Basic Inclined Screw Feeder Design
Inclined screw feeders must be designed to meter a desired capacity or feed rate and elevate a bulk material to a desired height. Screw feeders become less efficient when inclined over 5-degrees from the horizontal position. The loss of efficiency is determined based on the degree of incline of the screw feeder and the angle of repose and flowability of the bulk material. The diameter of the inclined screw feeder can be selected once the incline efficiency factor is determined.

Inclined screw feeders utilizing U-troughs are typically used on inclines up to 15-degrees and tubular housings are recommended for inclines over 15-degrees. Reducing the pitch of the screw increases the incline efficiency factor because the shorter pitch provides a better conveying surface and bulk materials do not fall back when compared to full pitch flights. Full pitch flights are the least efficient at metering and conveying bulk materials on an incline.



TYPES OF SCREW FEEDERS

Inclined Screw Feeder Capacity and Speed

Inclined screw feeders typically operate at higher speeds when compared to horizontal screw feeders because additional speed is required to elevate a bulk material and overcome the forces of gravity and bulk material fall back. The desired capacity is adjusted using the incline efficiency factor calculated from testing of the bulk material. The speed of the inclined screw feeder can then be determined.

Inclined Screw Feeder Horsepower Requirements

Inclined screw feeders require more horsepower and torque when compared to a horizontal screw feeder. Additional horsepower and torque is required to elevate a bulk material and overcome the forces of gravity and bulk material fall back. Bulk materials can become packed inside an inclined screw feeder, causing more demand on the drive unit.

Inlet Length

The inlet length on an inclined screw feeder must be kept to a minimum to prevent the bulk material from falling back over the top of the flights in the inlet section. Typically, the length of the inlet should not exceed 2 times the diameter of the screw for an inclined screw feeder.

Flight Pitch Changes

Inclined screw feeders are typically designed with multiple flight pitch changes. Shorter flight pitches are used in the inlet section to control the capacity or feed rate. Typically, the flight pitch increases beyond the inlet to reduce the trough loading to less than 100-percent. The conveying efficiency must be calculated in the longer flight pitch section to make sure the desired capacity or feed rate is met. Improper design of the flight pitches could result in the inclined screw feeder becoming plugged at the transition from shorter to longer pitch flights.

Inclined screw feeders can be a very important part of your process. Please consult KWS Engineering for proper inclined screw feeder design.

BULK MATERIAL CHARACTERISTICS

Conveyor size, speed and horsepower requirements are directly affected by the following characteristics of the conveyed bulk material. More specific information will be discussed in the ensuing pages clarifying several of the factors listed in the Bulk Material Table.

Maximum Particle Size and Bulk Material Lump Size

Particle size is measured in inches or by a mesh screen gauge. Other material size designations such as irregular, shredded, or % oil have special considerations in the design process. In addition to particle size, lump size is also an important consideration and will be discussed in detail in the next few pages.

Bulk Density

Conveying capacity for screw conveyors and screw feeders is calculated volumetrically in cubic feet per hour (ft^3/hr). The bulk density of the bulk material is needed in order to convert capacities given in tons per hour or pounds per hour to cubic feet per hour.

The bulk density column of the Bulk Material Table provides an average bulk density or a range of bulk densities for each bulk material. Accurate bulk density information is needed for selecting the proper screw conveyor or screw feeder.

% Trough Loading

Trough loading is a prime factor in determining conveyor size and is based on the maximum depth at which bulk materials will flow through a screw conveyor without causing undue wear on the conveyor components, such as screws, hanger bearings, couplings shafts and troughs. The recommended trough loading is lower for abrasive bulk materials in comparison to non-abrasive bulk materials.

Material Factor (MF)

Material factor represents the resistance of a bulk material to be conveyed and is used for calculating screw conveyor horsepower. The material factor may vary for screw feeders. Please consult KWS Engineering for screw feeder applications.

Component / Bearing Series

The recommended component series assists in the selection of screw conveyor components for a given bulk material. In general, lighter duty construction is acceptable for free flowing and non-abrasive bulk materials. Heavier duty construction is recommended for sluggish and abrasive bulk materials. The alphabetical code refers to the general component series and the numerical code refers to hanger bearing recommendations.

Abrasiveness, Corrosiveness, Flowability, and Special Characteristics

Each of these characteristics affect how the material reacts to and moves through the conveyor.

The characteristics explanations and the Bulk Material Table on the following pages contain important information for the proper design of screw conveyors and screw feeders. Please contact KWS Engineering for materials not listed in the Bulk Material Table.

BULK MATERIAL CHARACTERISTICS

Bulk Material Lump Size

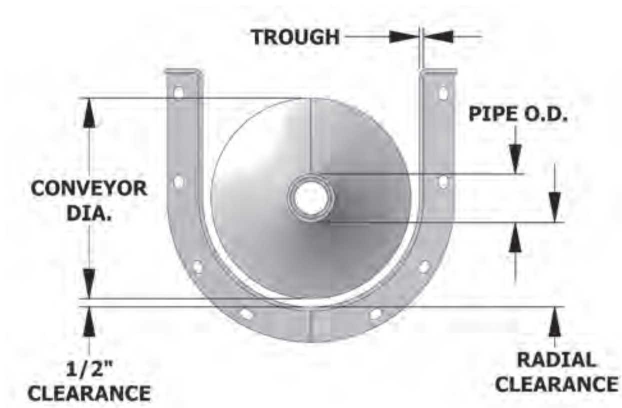
Bulk material lump size must be considered when designing a screw conveyor. Screw conveyor diameter not only depends on the capacity of the bulk material to be conveyed, but also the size and proportion of lumps in the bulk material. Lump size is determined by the maximum dimension of the largest lumps. If a lump has one dimension much longer than its transverse cross-section, then the longer dimension will be used to determine the lump size.

The character of the lump must also be considered when designing a screw conveyor. Some bulk materials have hard lumps that won't break up when conveyed by a screw conveyor. Other bulk materials may have lumps that are fairly hard but degrade when conveyed causing a reduction in the lump size. Bulk materials that have lumps that are easily broken up when conveyed have no limitations on conveyor size.

The allowable size of a lump in a screw conveyor is a function of the radial clearance between the outside diameter of the center pipe and the radius of the inside of the trough, as well as the proportion of lumps in the mix. The screw conveyor must be able to convey the lumps without impeding bulk material flow or damaging the conveyor. The lumps must be able to fit in the clearance between the center pipe and the inside of the trough. Radial clearance is shown below.

Bulk Material Lump Classification

Bulk materials are classified based on the percentage of lumps in the total mixture.



Class 1

Class 1 bulk materials are a mixture of lumps and fines in which not more than 10-percent are lumps ranging from maximum size to 1/2 of maximum size and 90-percent are lumps smaller than 1/2 of maximum size.

Class 2

Class 2 bulk materials are a mixture of lumps and fines in which not more than 25-percent are lumps ranging from maximum size to 1/2 of maximum size and 75-percent are lumps smaller than 1/2 of maximum size.

Class 3

Class 3 bulk materials are a mixture of lumps and fines in which not more than 95-percent are lumps ranging from maximum size to 1/2 of maximum size and 5-percent are lumps smaller than 1/2 of maximum size.

BULK MATERIAL CHARACTERISTICS

Lump Size Ratio

Lump Size Ratio (R) is a function of screw conveyor radial clearance and lump size. The ratio is used to determine the correct screw conveyor design based on maximum bulk material lump size.

$$Ratio,\ R = \frac{Radial\ Clearance\ \ inches}{Lump\ Size,\ inches}$$

Bulk Material Lump Size Table						
Screw Dia.	Pipe Size	Pipe O.D.	Radial Clearance	Class 1 (R = 1.75)	Class 2 (R = 2.5)	Class 3 (R = 4.5)
4”	1-1/4”	1-5/8”	1-11/16”	3/4”	1/2”	1/4”
6”	2”	2-3/8”	2-5/16”	1-1/4”	3/4”	1/2”
9”	2”	2-3/8”	3-13/16”	2”	1-1/2”	3/4”
	2-1/2”	2-7/8”	3-9/19”	2”	1-1/4”	3/4”
12”	2-1/2”	2-7/8”	5-1/16”	2-3/4”	2”	1”
	”3	3-1/2”	4-3/4”	2-1/2”	1-3/4”	1”
	3-1/2”	4”	4-1/2”	2-1/2”	1-3/4”	3/4”
14”	3”	3-1/2”	5-3/4”	3-1/4”	2-1/4”	1-1/4”
	3-1/2”	4”	5-1/2”	3”	2”	1”
16”	3-1/2”	4”	6-1/2”	3-1/2”	2-1/2”	1-1/4”
	4”	4-1/2”	6-1/4”	3-1/2”	2-1/4”	1-1/4”
18”	3-1/2”	4”	7-1/2”	4-1/4”	2-3/4”	1-1/2”
	4”	4-1/2”	7-1/4”	4”	2-3/4”	1-1/2”
20”	3-1/2”	4”	8-1/2”	4-3/4”	3-1/4”	1-3/4”
	4”	4-1/2”	8-1/4”	4-1/2”	3-1/4”	1-3/4”
24”	4”	4-1/2”	10-1/4”	5-3/4”	4”	2-1/4”
30”	5”	5-9/16”	12-11/16”	7”	5”	2-3/4”
36”	6”	6-5/8”	15-3/16”	8-1/2”	6”	3-1/4”

BULK MATERIAL CHARACTERISTICS

Trough Loading

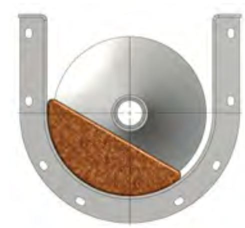
Trough loading is the depth of a bulk material in the trough of a screw conveyor and is measured in percent when compared to a full trough. A full trough is considered 100-percent full. Recommended trough loadings of 15, 30 and 45-percent were developed based on the characteristics of bulk materials. The recommended trough loading for a screw conveyor is a function of the density, abrasiveness and flowability of a bulk material. For a given capacity, screw conveyor size and speed is determined by trough loading percentage.

15% Trough Loading

Bulk materials with a density range of 50 to 120 lbs/ft^3 that are extremely abrasive and sluggish such as alumina, glass cullet or potash are difficult to convey and do not easily flow through a screw conveyor. The trough loading must be kept well below the center pipe to reduce undue wear on the conveyor components such as screws, hanger bearings, couplings shafts and troughs. The recommended trough loading for bulk materials with similar characteristics is 15-percent.

30%A Trough Loading

Bulk materials with a density range of 15 to 60 lbs/ft^3 that are mildly abrasive and free-flowing such as carbon black, fish meal or spent brewers grain will flow through a screw conveyor. The trough loading can be raised to a level below the center pipe without causing undue wear on the conveyor components such as screws, hanger bearings, couplings shafts and troughs. The recommended trough loading for bulk materials with similar characteristics is 30-percent.



30%B Trough Loading

Bulk materials with a density range of 30 to 80 lbs/ft^3 that are very abrasive with average flowability such as crushed bauxite, cement clinker or flue dust are difficult to convey and do not easily flow through a screw conveyor. The trough loading can be raised to a level below the center pipe without causing undue wear on the conveyor components such as screws, hanger bearings, couplings shafts and troughs. The recommended trough loading for bulk materials with similar characteristics is 30-percent. The screw conveyor speed is reduced for bulk materials with 30B trough loading when compared to bulk materials with 30A trough loading.

45% Trough Loading

Bulk materials with a density range of 5 to 40 lbs/ft^3 that are non-abrasive and very free-flowing such as alfalfa, baking soda or hulled rice will easily flow through a screw conveyor. The trough loading can be raised to the level of the center pipe without causing undue wear on the conveyor components such as screws, hanger bearings, couplings shafts and troughs. The recommended trough loading for bulk materials with similar characteristics is 45-percent.