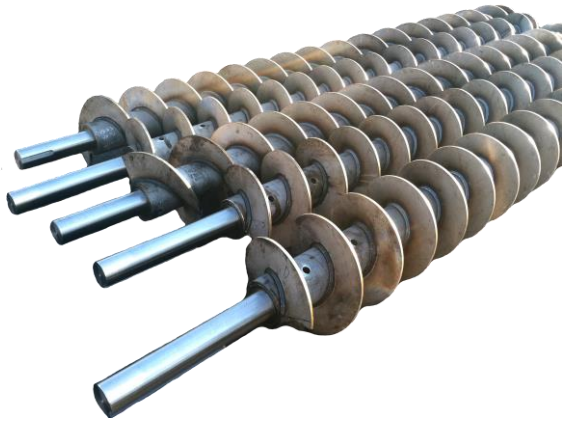
PRECISION
PRECISION MACHINE & MANUFACTURING, INC.

Screw Conveyor

Service & Maintenance Manual



WO#:	_____
DWG#:	_____
Diameter:	_____
Pitch:	_____
Pipe Size:	_____
Flight Material:	_____
Flight Hand:	LH / RH
Rotation:	CW / CCW
Flow Direction:	Towards Drive / Away From Drive

Congratulations!

You have purchased the most rugged and durable screw conveyor on the market, and you should experience long, reliable service from the Precision custom screw conveyor.

We stand ready to answer any questions and assist you as necessary to help you get the optimum performance from your screw conveyor. Please contact our office in Eugene, Oregon USA at (541) 484-9841.

Please carefully review all of the material in this Service & Maintenance Manual.

Additional information, including videos and brochures, can be found on our website at **www.premach.com**

By fully understanding how your screw is constructed, assembled, and operated, you will be able to properly install and maintain it for long and trouble-free service.

If there is anything further that we can do to assist you, please contact us. Your feedback is important to us.

Thanks for your business!

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Safety

Safety is a primary concern at Precision Machine and Mfg., and we encourage our customers to make it their top priority also.

State and local rules vary from location to location, and it is the user's responsibility to follow those standards. These procedures are a must for the safe operation and maintenance of the Precision Screw Conveyors including but not limited to the screw, trough, drive, etc.:

A. *Personal Protection Equipment must be worn while working on the conveyor.*

B. *All guards and safety devices must be in place while the conveyor is in operation.*

C. *If maintenance is performed with the conveyor in place, all appropriate lockout and tag-out devices must be in place to prevent power to the conveyor.*

D. *Normal operation of the conveyor may create burrs and sharp edges. Caution must be taken when handling the conveyor and its components.*

E. *The conveyor and many of the components are very heavy. Sufficient manpower and/or hoists must be used when they are moved.*

Any safety decals, shields, and other protective features designed into the Precision screw conveyor and furnished with it or recommended for it are there for your protection.

The operation and maintenance of the Precision screw conveyor should be restricted to only those personnel trained in its use.

The various precautions and recommendations detailed in this Manual are not necessarily all inclusive. This manual is designed to provide general safety and operational guidance relating to typical installations with which we are familiar.

If you have any safety or operational questions pertaining to the design, operation, or application of your Precision screw conveyor, we encourage you to contact Precision for assistance.

Warnings

1. Lockout procedures should be documented and followed prior to any inspections or maintenance. These should be installed prior to initial startup.

    → *These lockouts are **not** the responsibility of Precision Machine & Manufacturing, Inc.*

2. Screw conveyors can cause severe physical injury if proper safety procedures are not observed during the course of operation, maintenance, inspection, or clearing of an equipment jam.

    → *The drive motor must be locked out before inspection or service of this equipment.*

3. Even when locked out, do not climb on top of, or support oneself by the trough or lid and do not reach inside with any body part. Sufficient weight can cause the lid to fail and physical contact with screw conveyor could result in severe injury.

4. When using a Precision screw conveyor, ensure that there is sufficient strength in all support beams and bolts to carry the weight of the conveyor and material, as well as any sudden dynamic forces or fatigue stresses from its extended use.

5. Welding or burning on any part of the screw conveyor is not recommended. Any distortion of the conveyor caused by welding or burning could cause the screw to interfere with the trough, causing premature wear, or severe deflection in the screw.

6. Power and control wiring should be installed by a licensed and experienced electrician to assure safe and productive operation of the Precision screw conveyor.

7. Handling the screw prior to installation should be done by experienced rigging/lifting personnel only. Take all precautions to avoid damage while unloading.

Introduction

The Precision screw conveyor is designed for a long service life, and ease of operation with low maintenance. Familiarization with the conveyor and its function is a must, along with a routine maintenance plan. A rigorous maintenance schedule will optimize the efficiency and life of the conveyor.

The system operator should fully understand the function of the screw conveyor to know its proper operation. The unit serves primarily as a metering conveyor, to feed a bulk product into process equipment or to move material across long spans, horizontally, inclined, or declined.

Each Precision Screw Conveyor is configured or designed for a specific custom application based on information provided by the customer. Care should be exercised to operate the conveyor in accord with the design parameters on which it was built. Over-loading, over-speeding, and other variations from the original parameters may lead to failure, shortened conveyor life, or variation in the customer's process.

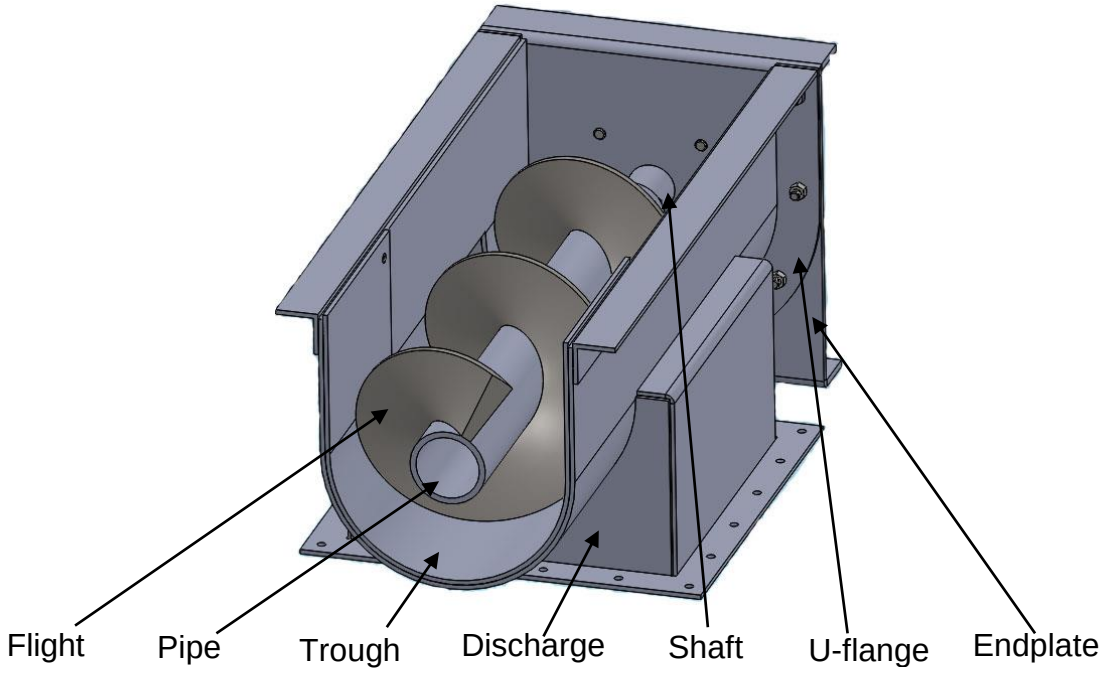
Precision's sizing system for the custom Screw Conveyor generally refers to the screw diameter and pitch followed by the pipe or tube size it is mounted on.

For example, a 12x12 on 6" sch80 pipe, refers to a screw with a 12" outer screw diameter and a 12" pitch mounted on 6" sch80 pipe, (which has an outer diameter of 6-5/8".)

Pitch refers to the linear distance, along the pipe, of one flight's full revolution/helix. Care should be exercised in sizing and specifying screw conveyors to assure that correct capacities can be met. Care should also be made in documenting and communicating the proper pipe/tube size. For example: 6" sch80 pipe has an OD of 6-5/8" while 6" tube has an OD of 6".

The screw conveyor is offered in a multitude of configurations that utilize different combinations of materials, thicknesses, and hard surfacing procedures for longest possible life. Custom engineered conveyors will last longer and maximize cost effectiveness. Standard screw conveyors are constructed out of mild steel. In addition, Precision screw conveyors may be constructed of, AR plate, Tribraze, or stainless steel.

Precision's terminology for the various screw conveyor components are as follows:



A. The **flights** are mounted externally along the **pipe** and they can potentially be replaced, reworked, or otherwise repaired after repeated use and wear. Flights may be RH helix, LH helix, or a conveyor may have both RH and LH simultaneously. (LH helix is seen above.)

B. In certain rebuild applications the **pipe** can be salvaged and the flights removed to rebuild the screw. Normally when **pipe** thickness is worn enough the entire screw must be replaced. This minimum thickness is dependent upon the design and size of the screw.

C. **Shafts** are sized and designed to support the screw and transfer rotational power from the drive. In most cases they are bolted in place on either end of the **pipe**. Typically, both ends of the **pipe** will be fitted with **bushings** (not pictured). **Bushings** are machined and welded in place to allow a precise slip fit for the **shaft** size of choice.

D. Bolted externally to each **endplate** is a **flange bearing** (not pictured). These bearings support the screw **shafts** and can be replaced after prolonged use and wear. The **endplate** is bolted to the **trough's, U-flange.**

E. Often the **trough's** lifetime will surpass that of the screw. The **trough** can be repaired sectionally by removing the system and unbolting a section at the **U-flange**. The **trough** allows material to enter the system by **inlet** (not pictured), and exit by **discharge.**

Installation and Startup

NOTE: BEFORE ANY INSPECTION OR MAINTENANCE, YOU MUST FOLLOW STANDARD 'LOCK-OUT/TAG-OUT' PROCEDURES FOR ALL POWER SOURCES AS DEFINED BY OSHA. SEE WARNINGS

A. Rotation – Precision's screw conveyors are designed to rotate in either direction based on desired material flow. Material may be pushed or pulled towards the discharge on either end relative to the drive's location and the screws hand and rotation.

B. Clearances – The clearance between the screw's outer diameter and the trough's inner diameter is set at Precision's factory and no field adjustment is possible.

The clearance between the screw's ends and the trough endplates is also set at Precision's factory. Shipping and/or installation may cause the screw conveyor to shift side-to-side. A rubbing noise or binding of the screw conveyor may be an indication that the screw has shifted and is contacting one of the endplates. The clearance can be adjusted in the field by loosening the set screws on the bearing collars and gear drive and repositioning the screw to center it in the trough and then re-tightening the set screws in their proper position.

C. Lubrication – Each Precision supplied gearbox and motor is shipped from Precision's factory pre-lubricated unless otherwise requested or tagged on the screw.

D. Wiring – Power and control wiring of the screw conveyor's accessories should be completed by a qualified electrician with careful attention paid to the rotation direction of the screw to ensure material passage from infeed to discharge.

E. Temperature – When an order is placed with Precision for a screw conveyor, the customer may need to specify a temperature for the material that will be passing through the unit. Most commonly, this is "ambient" meaning that material will be at roughly the same temperature as the conveyor's surroundings. However, if the material is to arrive at the conveyor in an elevated temperature that should be noted at the time the order is placed.

Precision will design the screw to sufficiently protect against increased deflection due to high material temperature. Precision will properly design the clearances to account for any thermal expansion that may take place causing interference between the screw and trough.

If the temperature was not correctly specified, it is possible that a screw-to-trough contact can take place and this will often show up within the first few hours of operation. The most common symptom will be a regular scraping or ticking sound as the screw turns. In more serious cases where the temperature is considerably different, it can result in the screw over-deflecting or locking up.

F. Shaft Packing & Sealing – In typical systems, shaft sealing can be completed with waste pack seals on both ends. In negative pressure systems additional sealing may be necessary.

Inspection and Preventative Maintenance

NOTE: BEFORE ANY INSPECTION OR MAINTENANCE, YOU MUST FOLLOW STANDARD 'LOCK-OUT/TAG-OUT' PROCEDURES FOR ALL POWER SOURCES AS DEFINED BY OSHA. SEE WARNINGS

A. Daily Inspection – A short visual inspection of the screw conveyor each day will result in the early detection of any possible maintenance or operational issues so that the user will experience reliable, trouble-free performance.

The daily inspection should include looking for: 1) any evidence of material escaping around the shafts, 2) any evidence of material escaping around the inlet or discharge flanges, 3) any unusual and prolonged noises or scraping suggesting that internal components are not behaving properly, and 4) any indication that grease is required.

B. Lubrication - Precision recommends the use of a good-quality, all-purpose grease for lubricating the conveyor bearings. The grease should be appropriate for the temperature conditions where the conveyor is installed. Too much grease will damage bearing seals and should be avoided.

Precision recommends that the lubrication of the screw conveyor's bearings be checked bi-monthly. More frequent re-lubrication is generally not necessary but will depend on the operating conditions in the customer's location and the duty cycle for the Precision screw conveyor.

C. Shaft Packing & Seal Adjustment - Over time, the waste pack seal's packing will begin to lose their effectiveness due to the rotational movement of the shaft. The most obvious way to detect a loss of effectiveness is to look for visual evidence that air or the material (dust or small particles) being processed is escaping around the shaft.

Maintenance Procedures

NOTE: BEFORE ANY INSPECTION OR MAINTENANCE, YOU MUST FOLLOW STANDARD 'LOCK-OUT/TAG-OUT' PROCEDURES FOR ALL POWER SOURCES AS DEFINED BY OSHA. SEE WARNINGS

A. Shaft Seal Packing Replacement - When the waste pack seal shows leakage the packing media can be replaced through the open top end of the waste pack seal.

B. Bearing Replacement – The Dodge Type E piloted flange bearings that are standard on the Precision screw conveyor are very reliable and should provide years of dependable service with proper maintenance. In the event that a bearing replacement is necessary, the steps in the procedure are as follows:

1. Support the screw sufficiently on either end, so that the bearings no long bear the load of the screw. Do not support the screw from the middle. Lift from both ends independently.

2. Wipe any excess grease or other surface contaminants off the drive shaft outboard of the shaft seal assembly; this will make it easier to slide the bearing away from the endplate and to slide it back into place

3. Loosen the set screw on the bearing collar

4. Remove the four bolts that hold the bearing into the endplate and slide the bearing off the shaft.

5. Slide the new bearing onto the shaft and push it up into endplate; align the bolt holes and re-install the four bolts. The bearing will center the shaft and rotor once the bearing is firmly re-seated in the endplate.

6. Firmly tighten the set screw after aligning with the dimple in the shaft. If there is no dimple on the shaft where the bearing is being replaced, tighten the set screw as much as possible.

C. Screw Conveyor Disassembly – In cases where the screw or trough requires repair, it is possible for the unit to be disassembled either in its operation position, within your plant or at our factory in Eugene. Complete or partial disassembly may be necessary to repair flight sections, pipe, shafts, or trough sections.

If complete disassembly is required, in the case of trough replacement, it is advised that the entire unit be removed from operation before any disassembly begins. If partial disassembly is required the unit may be disassembled in place. In both cases Precision recommends that the screw conveyors be disassembled "one end at a time" rather than trying to simultaneously disassemble both ends.

If a partial disassembly is required consider the following procedure:

1. Unbolt and remove the trough cover to access the screw. Support the trough and screw system fully on both ends so that no sections are cantilevered. This support should be independent of all bolts and bearings that typically support it.

2. Loosen and the set screw in the tail-shaft bearing collar.

3. Loosen and remove the bolts holding the tail shaft, bearing and waste pack seal in place. Then remove from the endplate. In cases where a pillow block bearing is used to support the tail shaft, ignore step (3).

4. Loosen and remove the bolts in the endplate that support the trough's U-flange. Then carefully remove the endplate from the assembly.

5. Loosen any set screws on the drive-shaft side that are engaged with the shaft, presumably by the bearing and gear drive system.

6. Carefully slide the screw out of the gearbox and bearing in the direction of the tail shaft and then hoist the screw out of the trough.

If a complete disassembly is required, it is advised that the entire trough system be removed from its operational mounted position. This procedure will be case dependent and it is highly encouraged for each plant to maximize safety in this operation.

For reassembly reverse the above steps ensuring all bolts are tightened properly and support structures are prepped for loading.

D. Material Cleanout – Standard screw conveyors are equipped in various manners with cover plates that are bolted to the trough. In order to clean out any material buildup or clog, remove the bolts that hold the cover in place, remove the lid and safely clean out the trough as desired.

Precision Machine & Mfg, Inc. Standard Warranty

WARRANTY

Precision Machine and Manufacturing, Inc. warrants products of its manufacture to be free from defects in material and workmanship if properly installed, maintained, and operated under normal conditions with competent supervision.

No person, agent, representative or dealer is authorized to give any warranties on behalf of Precision Machine and Manufacturing, Inc. nor to assume for Precision Machine and Manufacturing, Inc. any other liability in connection with any of Precision Machine and Manufacturing, Inc. products.

This warranty shall extend for one (1) year from date of installation provided this equipment has been put into service within ninety (90) days after shipment from Precision Machine and Manufacturing, Inc. factory. If repairs or replacements are made by the Purchaser without Precision Machine and Manufacturing, Inc. prior written consent, Precision Machine and Manufacturing, Inc. warranty shall cease to be in effect. No allowance will be granted for any repairs or alterations made by the Purchaser without Precision Machine and Manufacturing, Inc. prior written consent.

Machinery, equipment and accessories furnished by Precision Machine and Manufacturing, Inc. but manufactured by others, are warranted only to the extent of the original manufacturer's warranty to Precision Machine and Manufacturing, Inc.

Precision Machine and Manufacturing, Inc. agrees at its option to repair at the point of shipment or to replace without charge f.o.b. point of shipment, any part or parts of products of Precision Machine and Manufacturing, Inc. manufacture, which within the specified warranty period shall be proved to Precision Machine and Manufacturing, Inc. satisfaction to have been defective when shipped, provided the Purchaser promptly notified Precision Machine and Manufacturing, Inc., in writing, of such alleged defect.

Precision Machine and Manufacturing, Inc. liability to Purchaser, whether in contract or in tort arising out of warranties, representations, instructions, or defects from any cause shall be limited to repairing or replacing of the defective part or parts as aforesaid, f.o.b. point of shipment.

No liability whatsoever shall attach to Precision Machine and Manufacturing, Inc. until said products have been paid for.

EXCEPT AS STATED IN THIS SECTION AND IN THE PRECEDING SECTION TITLED "WARRANTY" AND EXCEPT AS TO TITLE, THERE ARE NO GUARANTEES OR WARRANTIES OF MERCHANTABILITY, FITNESS, PERFORMANCE OR OTHERWISE, EXPRESS, IMPLIED OR STATUTORY, AND PRECISION MACHINE AND MANUFACTURING, INC. SHALL HAVE NO LIABILITY FOR CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES, HOWSOEVER CAUSED.

DATE INSTALLED_____

CONVEYOR SIZE_____