

September 2011
Precision Reliability Seminar
Portland, Oregon

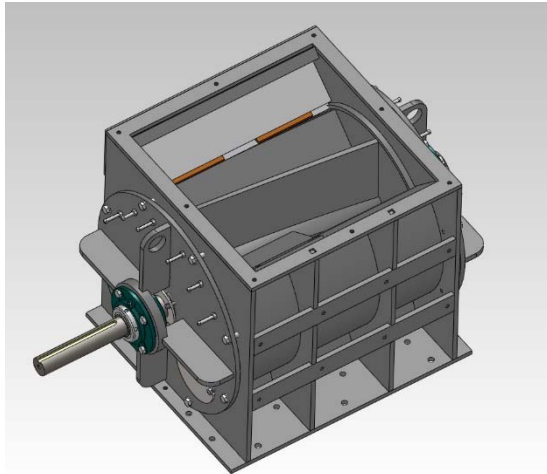
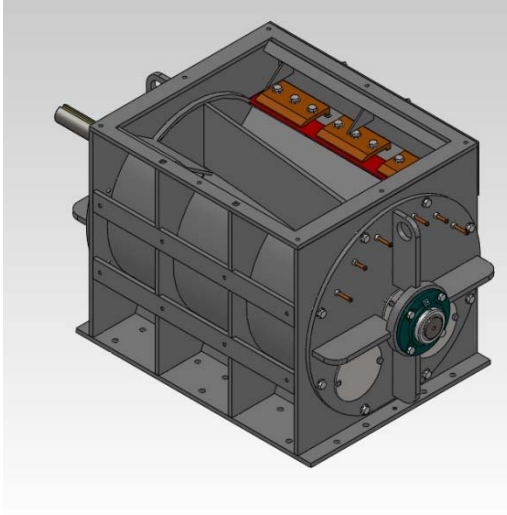
Rotary Feeder Reliability

Rotary Feeder Reliability

1. Basic design, components, & terminology – The Basics
2. Proper sizing
3. Proper installation
4. Recommended service
5. Trouble-shooting
6. Rebuilding



Rotary Feeder Reliability – The Basics



- Terminology
 - Rotation: CW or CCW
 - Sizes: 14x18 to 30x45 or larger
 - Rotor Helix: RH or LH
 - Knives:
 - Single/Double
 - Top/Bottom
- RPM target

Rotary Feeder Reliability – The Basics

- Feeders from Precision Machine are a highly precise, machined piece of equipment built to tight tolerances to assure maximum performance
 - In manufacturing, internal clearance (rotor to barrel) is held at 0.001" per side per inch of rotor diameter
 - A 30" inch diameter rotor would have a clearance of 0.015" per side
- If the material being handled is at a temperature above ambient, Precision machines the rotor diameter to account for thermal expansion to prevent rotor lock-up

Rotary Feeder Reliability – Proper Sizing

Sizing feeders - a math problem driven by key assumptions and key targets; and subject to judgment and experience

- Desired throughput – how many lbs or tons per hour
20 tons per hour
 $20 \times 2000 = 40,000$ lbs/hour
- Material & bulk density – wet or dry; mixed or pure; bulk density (in the real world of the mill...)
Bulk density = 15 lbs/cu ft
 $40,000 \div 15 = 2667$ cu ft/hr
- Feeding/loading – under a full head of material? Intermittently fed? Variable?
50% pocket loading
 $2667 \times 2 = 5334$ cu ft/hr
- Other factors that may enter into the math:
 - Temperature of material
 - Fed by...
 - Feeding into...60 min/hour
 $5334 \div 60 = 89$ cu ft/min

25x30 feeder has a CFR of 5.94
 $89 \div 5.94 = 14.98$ RPM, which is an acceptable speed

Rotary Feeder Reliability – Proper Installation & Start-Up

→ Part One – Before Initial Start-Up

- LOCKOUT/TAGOUT ALL POWER
- Lubricate all bearings and gear reducers
- Check to be sure that no tools or foreign objects are in the feeder
- Turn drive unit by hand to check for any misalignments or obstructions
- Check all safety devices and covers for proper installation and function

→ Part Two – Initial Start-Up, *Without Material*

- Reenergize power to feeder and start conveyor briefly; check for proper rotation and correct if necessary
- Run for several hours as a break-in period; check for unusual noises, high bearing temperatures, etc
- Stop feeder and LOCKOUT/TAGOUT ALL POWER
- Open door and inspect knife clamps and internal clearances

→ Part Three – Initial Start-Up, *With Material*

- Reenergize power and run feeder for several minutes without material; gradually introduce material to feeder until design capacity is reached
- Operate the feeder at design capacity for several hours; check motor amperage under load and compare to full load amperage capacity of motor
- Stop feeder and LOCKOUT/TAGOUT ALL POWER; open door and check knife clamps and internal clearances

Rotary Feeder Reliability – Recommended Service

- Do not...weld on the feeder
- Do...inspect and adjust knife clearance regularly
- Do...inspect and adjust brass end seals regularly
- Do...periodically inspect bearings for proper lubrication
- Do...inspect shaft seal/packing gland
- Do...inspect rotor for wearing of the rotor vanes and tips
- Do...replace knives if they are excessively worn

Rotary Feeder Reliability – Knife Maintenance

The life of a rotary feeder depends on the maintenance of the knives!!!

- Poor knife maintenance will:
 - Lead to premature scoring and deterioration of the barrel's chrome plating
 - Lead to a loss of shearing action which can cause large pieces to jam in the feeder
 - Lead to a build-up of pitch or other resins on feeder components
 - Lead to unequal wearing of feeder components causing poor performance
- As knives become nicked, rounded, or improperly fitted the housing and the rotor will experience excessive wear
- Knives can be re-ground or replaced; frequency will vary depending on run-time and type of material being handled

Rotary Feeder Reliability – Knife Maintenance

- Visually inspect knife condition by opening the access door and examining the knife
 - Look for missing clamps or clamp bolts
 - Look for misaligned or loose knives or clamps
 - Look for chips or other damage to the knives

- Check knife clearances using a feeler gauge and re-set clearance as appropriate
 - Clearance between knife and rotor tips should be approximately $\frac{1}{2}$ of the clearance between the rotor and housing
 - Be sure to check clearances in several positions along the knife

Rotary Feeder Reliability – Brass End Seals

- The rotor brass end seals are not as prone to misalignment or varying clearances as the knives and therefore do not need to be checked as frequently
- Clearances are set at the factory at 0.002" – 0.004"
- See the two-page **"Brass End-Seal Adjustment" handout** at the back of this packet for detailed instructions on how to properly adjust clearances

Rotary Feeder Reliability – Trouble-Shooting

Symptom: *Excessive material blow-by*

Corrective Action:

- 1) Adjust brass seals to proper clearance
- 2) If seal adjustment doesn't reduce blow-by, may be time for a rebuild

Symptom: *Feeder stalling*

Corrective action:

- 1) Brass seals may be too tight – adjust to proper clearance
- 2) Material build-up or pitch build-up – use cleanouts

Symptom: *Not discharging sufficient material*

Corrective Action:

- 1) Check RPM – likely running too fast
- 2) Check for system changes – has feed rate changed?
- 3) Contact Precision to check feeder sizing

Symptom: *Feeder jamming*

Corrective Action:

- 1) Check for foreign objects in feedstock or in the feeder itself
- 2) Check for dull, broken, or missing knives
- 3) Check for oversized materials in feedstock

Rotary Feeder Reliability – Trouble-Shooting

Symptom: *Feeder not turning*

Corrective Action:

- 1) Check for broken shaft
- 2) Check for broken hub or bushing
- 3) Check for foreign object wedged in feeder

Rotary Feeder Reliability – Rebuilding

→ Indicators that it may be time to rebuild:

- Visual inspection of the barrel shows excessive gouging or cuts in the metal
- Complete or nearly complete wearing off of the chrome treatment to the barrel
- Rotor tip material completely worn off and rotor-to-barrel clearance that has reached 2X to 3X the original specified clearance

→ Limitations to rebuilding

- Barrels that have already been rebuilt two or more times likely have too little barrel material left to make rebuilding practical
 - Barrel replacement can be an option but will increase the cost of rebuilding

Questions on Rotary Feeder Reliability?

Thanks for your Time and Attention!