Centrifuge Operation and Greasing Procedures

Vision Machine Inc.
Technical Support

BOWL RPM

Bowl should be run at slowest RPM possible to achieve the desired results

Faster bowl RPM means shorter bearing life and more wear, maintenance, and consumable costs on machine

In most cases, the faster the bowl RPM the drier the solids will be and the cleaner the effluent will be. Conversely, slower bowl RPM will give you wetter solids and dirtier liquids

BACKDRIVE RPM & DIFFERENTIAL SPEED

Differential speed is the difference in RPM between bowl and conveyor and is also referred to as rake speed, delta speed or conveyor speed

Backdrive motor controls conveyor to bowl differential RPM

All Vision Machine, Inc. centrifuges utilize lagging conveyor design. That is to say the conveyor is always turning slower than the bowl when operating

Formulas to determine differential speed

- Forward direction (same rotation as bowl)
  (Bowl RPM – Backdrive RPM) / Gearbox ratio = Differential Speed

- Reverse direction (opposite rotation to bowl)
  (Bowl RPM + Backdrive RPM) / Gearbox ratio = Differential Speed

- Example #1
  Bowl running 3500 RPM, backdrive running 1800 RPM in forward and gearbox ratio of 76:1
  (3500 – 1800) / 76 = 22.37 RPM differential speed

- Example #2
  Bowl running 2500 RPM, backdrive running 1000 RPM in reverse and gearbox ratio of 76:1
  (2500 + 1000) / 76 = 46.05 RPM differential speed

The backdrive controls the conveyor speed in relation to the bowl, not to ground

- In forward direction, the faster you run the backdrive motor the slower the conveyor turns in relation to bowl

- In reverse direction (opposite rotation to bowl), the faster you run the backdrive motor the faster the conveyor turns in relation to bowl

POOL DEPTH

Pool depth refers to the column of water in the bowl when measured from ID of bowl towards center

On all Vision Machine, Inc. centrifuges, 1 is shallowest pool depth setting. Each subsequent number is an incrementally deeper amount even though the numbers are not evenly spaced around effluent port. For example, 2 may be 1/8" deeper than 1, 3 will be 1/8" deeper than 2, etc.

- Deeper pool depths give cleaner effluent and wetter solids
- Shallower pool depths give drier solids and dirtier effluent

As a general rule, deeper pool depths demand less torque on gearbox

- Deeper pool depths reduce wear on machine in most applications
- Deeper pool depths allow for more product retention time

FEED RATE AND GPM

Do not slug machine with product. Increase feed rate slowly until ramped up to desired feed rate

Feed rate affects centrifuge output. Simply put, you should not expect the same results at 100 GPM that you experienced at 50 GPM

Fluid properties such as viscosity and solids content will vary the throughput a machine can handle. Just because a machine can handle 100 GPM of fresh water does not necessarily mean it will take 100 GPM of all products

- Higher feed rates will usually give you dirtier effluent and wetter solids due to decreased product retention time in bowl
- Higher feed rates increase wear and tear and maintenance

Feed limiting parameters are

- Main drive motor has reached full load amps
- Backdrive has reached torque trip point
- Product burping or spraying or misting out around feed tube
- Spillover point has been reached. Spillover is defined as water is coming out of solids end of machine after wall cake has been established

It is not recommended to operate machine at maximum feed limits as this greatly increases wear and subsequent maintenance costs. Vision Machine, Inc. recommends operating machine at around 60 - 75% of max feed when throughput is most important variable

MAIN BEARING LUBRICATION

This is a set of guidelines for greasing bearings, not set in stone rules.

The bearing manufacturer has provided replenishment rates based on operating conditions that do not work for a decanter centrifuge application. However, we have had great success running our bearings on grease. Main bearing lubrication should be thought of as a dynamic and evolving procedure. Your circumstance may, and probably will, be different from any other application and will have to be adapted to your exact operating parameters

- There is no “normal” operating temperature range
- RPM, ambient temperature, process fluid temperature, belt tension, bearing alignment and other factors all play a role in “normal” running temperature and lubrication frequency
- “Normal” bearing temperature is usually somewhere between ambient temperature and 50-degrees above ambient
- Bearings should never be operated above 185-degrees Fahrenheit
- Main bearings should be given approximately one shot of grease, from standard hand pumped grease gun, for every 8 hours of operation time
- Grease should be pumped in slowly
- Bearing temperature should be measured on the surface of the main bearing pillow block over Vision Machine logo or with controls provided when centrifuge was purchased

DO NOT PUMP MORE THAN 5 SHOTS OF GREASE PER BEARING AT ANY ONE TIME. EVER. Excess grease can cause bearing failure faster than too little grease

Regarding temperature - Give main bearing one shot of grease

If bearing cools down after greasing, your bearing was starving for grease.

- If this occurs, wait one hour and give one more shot of grease. Repeat this procedure until bearing temperature rises slightly and then cools back down to “normal”

If bearing heats up after greasing, this is normal and your bearing has the appropriate amount of grease. Allow machine to continue to operate and the temperature will gradually come back down to “normal” operating temperature. Cool down may take up to several hours

If bearing heats up after greasing and does not come back down to “normal” within 5 hours or reaches 185-degrees F, your bearing has too much grease

- If bearing does not cool down to “normal” within 5 hours but stays below 185-degrees F, skip next scheduled greasing
- If bearing reaches 185-degrees F, simply shut down machine and allow bearing to cool down for approximately one hour. Re-start machine and most frequently, but not always, bearing will heat up again and gradually come back to “normal”
- If bearing exceeds 185-degrees F again after shutting down and allowing to cool off, **your bearing still has too much grease.** Shut down again, allow to cool off and re-start. This process may need to be repeated several times but rarely more than 3 times
- **When in doubt, err to the side of ONE additional shot of grease**. It is better to add a little too much grease and heat up the bearing slightly than to starve the bearing for lubrication and cause premature failure

CONVEYOR BEARING LUBRICATION

Conveyor bearings should be purged once per week

If machine is equipped with purge hole plugs, remove plugs and SLOWLY pump grease into fitting until clean grease purges out of port. Repeat process on solids end and liquid end of machine.

- DO NOT USE AUTOMATIC GREASE GUN as this will blow out the conveyor seals
- Take note of contaminated grease. This is an indication that seals have been compromised and will lead to conveyor bearing failure
- Solids end conveyor bearing usually takes less grease to purge than liquid end conveyor bearings

OVERHUNG LOAD ADAPTER LUBRICATION

OHLA should be given 3 – 5 shots of grease once per week

Regarding temperature, same rules apply as when greasing main bearings

OPERATIONAL GUIDELINES

For Drier Solids

Slow down differential RPM
Trade-off is increased torque

Change pool depth to shallower setting
Trade-off is increased torque and dirtier effluent

Decrease feed rate
Trade-off is less fluid processed

Increase bowl RPM
Trade-off is more maintenance and associated costs and shorter duration between major repairs

For Cleaner Effluent

Change pool depth to deeper setting
Trade-off is wetter solids

Slow down differential RPM
Trade-off is increased torque and drier solids

Decrease feed rate
Trade-off is less fluid processed

Increase bowl RPM
Trade-off is more maintenance and associated costs and shorter duration between major repairs

To decrease backdrive torque

Change pool depth to deeper setting
Trade-off is wetter solids

Speed up differential RPM
Trade-off is wetter solids

Decrease bowl RPM
Trade-off is wetter solids and dirtier effluent

Decrease feed rate
Trade-off is less fluid processed