Title Goulds Centrifugal Pump

Materials Required

- "PGBU Tailboard Ready Reference Card" (safety)
- Rags
- Shim pack
- Emery cloth
- Magic marker or spray bluing
- Duct tape (for shims)

Tool(s) Required

- Standard mechanics tool box
- Flashlight
- Wire brush
- V-blocks or rollers
- Small straight edge
- Spanner wrench
- Large internal snap ring pliers
- Micrometer set
- Dial indicator set with magnetic base
- Shaft key wrench
- Files

Reference(s)

- Installation, Operation, and Maintenance Instructions; Goulds Vendor Manual
- Product News Bulletin #194; Goulds Pumps

PUMP DISASSEMBLY

_____ 1. Ensure the pump is safely isolated.

a. De-energize and lock-out the motor breaker.
b. Close and tag any suction and discharge valves.
c. Drain the pump casing.

____ 2. Uncouple the pump from the motor

a. Remove the bolts from the coupling cover.
b. Remove the flex grid joining the pump and motor coupling.
c. Remove the motor from the base.

_____ 3. Remove the coupling hub from the pump shaft.

a. Mark the hub position with a felt tip pen.
b. Use a soft-face hammer to remove the hub.

_____ 4. Measure the pump shaft axial and radial run out.

a. Axial shaft movement (thrust) is 0.004" maximum.
b. Radial run out is 0.004" TIR maximum.
c. Coupling face and hub run out not to exceed .002” maximum.

_____ 5. Remove the Trico oiler or sightglass from the bearing frame.

a. Remove the oiler bulb
b. Unscrew the oiler.
c. Explain the method the Trico oiler maintains the oil level in the pump.

_____ 6. Drain the lubricating oil from the bearing frame.

a. Remove the oil drain plug.
b. Wipe the area around the oil drain hole with a clean shop towel.
c. Place an oil container under the oil drain hole.
d. Replace the oil drain plug.

_____ 7. Inspect the used oil

a. Bearing wear – metal particles in the oil
b. Bearing overheating – burnt oil smell.

_____ 8. Properly dispose the used oil.

a. Per company policy or procedure.

_____ 9. Remove the pump housing.

a. Loosen and remove the frame foot bolts.
b. Identify and tag any shims found under the frame feet.
c. Remove the casing bolts.
d. Tighten the two jacking screws evenly to start working the assembly out of its fit.
e. Remove the pump housing from the pump assembly.

NOTE:	**Keep the pull out assembly mounted to the pump base.**

_____ 10. Remove the impeller from the shaft.

a. Install the shaft key wrench.
b. Turn the impeller until the wrench handle is pointing up.
c. Rotate the impeller rapidly counterclockwise until the wrench bangs against the workbench.

NOTE:	**It may be necessary to do this several times to loosen the impeller.**

d. Unscrew the impeller.

_____ 11. Remove the stuffing box cover.

a. Remove the seal gland nuts and slide toward the deflector.
b. Loosen and remove the nuts that hold the stuffing box cover in place.
c. Remove the stuffing box cover

_____ 12. Remove the mechanical seal.

a. Remove the mechanical seal/sleeve as a unit.

_____ 13. Remove the shaft slinger (deflector).

a. Slide the seal gland off the shaft.
b. Slide the Teflon slinger off the shaft.

NOTE:	**Due to the interference fit, a slight resistance will be felt when removing the slinger**.

_____ 14. Remove the bearing and shaft assembly from the bearing frame.

a. Remove the thrust bearing housing clamping bolts.
b. Tighten the jacking/adjusting screws to start the bearing and shaft assembly out of its fit.

CAUTION: Applying too much pressure to the jacking/adjusting screws can break the thrust bearing housing.

c. Remove the bearing and shaft assembly by sliding it out by hand after the thrust bearing housing has cleared its fit.

_____ 15. Remove the thrust bearing from the thrust bearing housing.

a. Remove the thrust bearing snap ring.
b. Support the bearing housing and pull the thrust bearing out of its fit.

_____ 16. Remove the thrust and radial bearings from the shaft.

a. Depress the lock washer's locking tab (thrust bearing).
b. Loosen the lock nut with a spanner wrench (thrust bearing).
c. Unscrew and remove the lock nut and lock washer (thrust bearing).
d. Remove the bearing using a hydraulic press (thrust and radial bearing) or puller.
   - Support the inner and outer race.
   - Apply even pressure to the pump shaft.

PUMP COMPONENT INSPECTION

_____ 17. Clean the pump components.

a. O-ring and snap ring grooves are free of any foreign debris.
b. Threaded fasteners have been chased or are free of any burrs/nicks.
c. Gasket surfaces are free of any old gasket material.

_____ 18. Inspect the pump shaft.

a. The oil seal fit areas, located directly outboard of each bearing fit, are smooth and clean.
b. The bearing fit areas are smooth and free of gall marks.
c. The stuffing box area is smooth and free of scratches.
d. Measure the run out.
   - Place the shaft in V-blocks or rollers.
   - Setup a magnetic base dial indicator.
   - Notify the Supervisor if run out is greater than 0.002".

_____ 19. Inspect the stuffing box bore and cover.

a. Clean and check for excessive damage.
b. Measure the stuffing box bore concentricity with a dial indicator. (0.003" TIR maximum)

_____ 20. Inspect the bearing frame.

a. The bearing frame interior/oil reservoir is clean.
b. The radial bearing bore is smooth and not damaged.

_____ 21. Inspect the impeller.

a. Replace the impeller if it shows excessive erosion, corrosion, extreme wear, or vane breakage.
b. Check the O-ring groove and impeller hub for signs of degradation.

____ 22. Inspect the following pump/mechanical seal components.

a. Seal faces:
- Wear patterns,
- Heat cracking,
- Cracked hard face,
- Chipping, flaking, or peeling,
- Deep wear in the hard face.

b. O-rings:
- Swelling or extrusion,
- Cracks or hardness,
- Compression set,
- Cuts or nicks.

c. Springs:
- Breakage or cracks,
- Fatigue (shorter than new springs).

d. Seal drive:
- Shiny or dented drive pins or anti-rotation pins,
- Bent drive pins,
- Corrosion,
- Drive screws slipped on the sleeve.

e. Rotary metal casing:
- Discoloration of the metal,
- Corrosion or pitting,
- Excessive deposits on the body of the seal cage,
- Set screws cutting into the body,
- Circular marks on the outer diameter of the body.

PUMP REASSEMBLY

_____ 23. Install new thrust and radial bearings.

a. Press the bearing onto its fit with a hydraulic press (thrust and radial bearing) or slide on after heating with oil bath, oven or induction heater.
   - Support the inner and outer race.
   - Verify that the shaft enters the bearing evenly.
   - Apply even pressure to the pump shaft.

b. Install the bearing lock washer on the shaft and up against the inner race of the thrust bearing (thrust bearing).

c. Install and tighten the locknut with a spanner wrench (thrust bearing).

d. Check to see if one of the lock washer tabs aligns to one of the slots in the locknut after the locknut is firmly tightened (thrust bearing).

CAUTION:	**Do not loosen the locknut to align a tab to a slot. Continue tightening the locknut until alignment occurs.**

e. Set the lock washer tab firmly in one of the slots of the locknut (thrust bearing).

_____ 24. Prepare the thrust bearing housing for bearing installation.

a. Verify the thrust bearing bore is smooth and not damaged.
b. Verify the snap ring and O-ring grooves are clean.
c. Verify the housing interior is clean and free of all foreign material.
d. Wipe out the bearing frame/oil reservoir with a lint free rag.
e. Verify the bearing frame vent cap air passages are clean.
f. Verify the radial bearing oil return hole is clean.
g. Apply a thin film of lubricant to the thrust bearing housing bore and outer race of the thrust bearing.

_____ 25. Install the bearing shaft assembly into the thrust bearing housing.

a. The bearing housing snap ring is installed with the flat side facing the thrust bearing.

_____ 26. Install the bearing shaft assembly and thrust bearing housing into the bearing frame.

a. Apply a thin film of lubricant to the bore of the thrust bearing housing and the outer race of the thrust bearing.
b. Guide the bearing and shaft assembly into the bearing frame.

CAUTION: Use care to avoid damaging the bearing frame oil seal.

NOTE: The word "TOP" is casted into the flange of the thrust bearing housing and must be installed face-up.

c. Install and tighten the bearing housing clamp bolts.
d. Install the bearing housing jacking screws.

_____ 27. Verify shaft end play

a. Mount a dial indicator to read the shaft (impeller end).
b. Move the shaft forward and backward observing the indicator movement.
c. Movement should be within the following tolerances:

Shaft End Play	
Double row bearings	.0011 .0019
Duplex bearings	.0007 .0010

_____ 28. Verify shaft runout

a. Mount dial indicator to the pump frame.
b. Install impeller.
c. If reading is greater than .002, disassemble and determine the cause.
d. Remove the impeller.

_____ 29. Verify bearing frame face runout

a. Mount the dial indicator to the shaft.
b. Rotate the shaft so the indicator rides along the fit for 360º.
c. If reading is greater than .001, disassemble and determine the cause.

_____ 30. Install the shaft slinger (deflector).

a. Slight force is applied to slide the slinger onto the shaft.

_____ **31. Position the mechanical seal gland.**

a. Gland is inserted over the shaft next to the oil deflector.

_____ **32. Install the mechanical seal.**

a. Position the mechanical seal rotary unit on the shaft sleeve in relation to the stuffing box face.

_____ **33. Install the stuffing box cover**

a. Metal-to-metal contact is made with the frame adapter.
b. Install and tighten the stuffing box cover stud nuts.

_____ **34. Verify the stuffing box cover runout.**

a. Mount a dial indicator to the end of the pump shaft.
b. Rotate the indicator 360º.
c. If reading is greater than .005" determine cause and correct.

_____ **35. Install the pump impeller and set preliminary clearance.**

a. Install a new impeller O-ring.
b. Thread the impeller onto the shaft.
c. Impeller is butted up against the end of the shaft sleeve.
d. Tighten the impeller with the shaft key wrench.
e. Back off clamping bolts.
f. Holding a .010 feeler gauge between the stuffing box and the impeller, tighten the jacking screws until the impeller is .010 from the stuffing box cover.

_____ **36. Install the mechanical seal gland.**

a. The gland is kept square to its fit during tightening of the fasteners.

_____ **37. Install the pull-out assembly.**

a. Clean the casing fit areas.
b. Verify the gasket seat area is clean and that all traces of the old gasket material are removed.
c. Install a new case gasket.
d. Install the pull-out assembly.
e. Install and tighten the casing bolts in a cross-hatch pattern

CAUTION: The assembly must NOT go metal-to-metal with the casing during fastener tightening.

f. Install any shims previously removed.
g. Install and tighten the bearing frame foot bolts.

_____ 38. Install the pump coupling hub.

a. Tap with a soft-faced hammer until the hub reaches the reference mark.

_____ 39. Refill the bearing lubricating oil reservoir.

a. Check the oiler stem setting and install it on the oiler cup.
b. Fill and refill the oiler bulb as often as necessary to complete the filling of the bearing frame.

_____ 40. Set the impeller clearance.

a. Move the rotating element toward the pump casing until the impeller rubs against the casing.
b. Relax the jacking screws and tighten the clamping screws to push the entire rotating element toward the casing.
c. Relax all of the clamping screws and insert a feeler gauge between
d. .008" and .015" between the head of each screw and the face of the bearing housing.
e. Snug each clamping screw against the feeler gauge.
f. Remove the feeler gauge.
g. Tighten the jacking screws evenly to move the impeller away from the casing as much as the clamp screw setting will allow.
h. Verify the clamping screws are tight.
i. Tighten the mechanical seal drive collar.
j. Check that the shaft rotates freely without any rubbing.

PUMP SHAFT ALIGNMENT

_____41. Align the pump and motor using the straightedge and feeler gauge method.

a. Horizontal and vertical angularity (face) ± 0.002"
b. Horizontal and vertical offset ± 0.005"

NOTE: Vertical angular misalignment.

a. Pump coupling diameter = A
b. Misalignment = B
c. Distance from pump coupling face to the motor front feet = C
d Distance from pump coupling face to the motor rear feet = D

FORMULA: Front feet movement: F = B/A x C
Rear feet movement: R = B/A x D

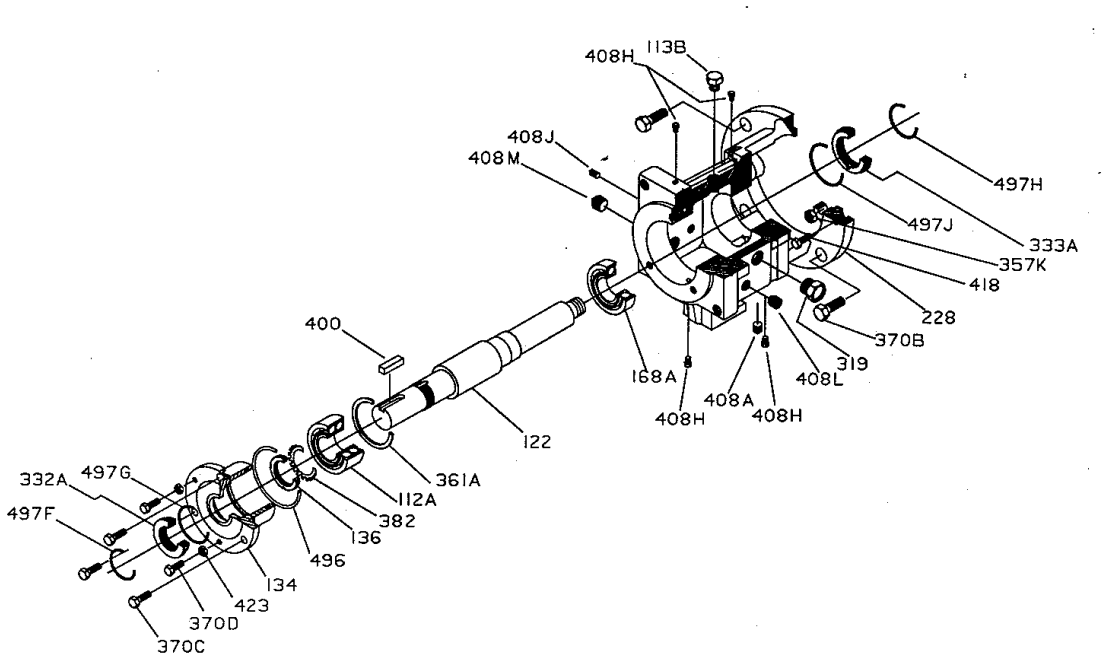
_____ 42. Take final alignment readings.

a. Horizontal and vertical angularity (face) ± 0.002"
b. Horizontal and vertical offset ± 0.005"

_____ 43. Clean the work area.

a. Trash is properly disposed.
b. Tools are placed back in the tool box.

ATTACHMENT A.



112A	Outboard Bearing
113B	Plug – Oil Fill
122	Shaft – Less Sleeve
134	Bearing Housing
136	Bearing Locknut
168A	Radial Bearing
228	Bearing Frame
319	Sight Glass
332A	Outboard Labyrinth Seal (w/O-rings)
333A	Inboard Labyrinth Seal (w/O-rings)
357K	Gland Stud Nuts
361A	Retaining Ring
370B	Bolt – Frame-to-Adaptor
370C	Clamp Bolt – Bearing Housing
370D	Jack Bolt – Bearing Housing
382	Bearing Lockwasher
400	Coupling Key
408A	Plug – Oil Drain
408H	Plug – Oil Mist Connection
408J	Plug – Oiler
408L	Plug – Oil Cooler Inlet
408M	Plug – Oil Cooler Outlet
418	Jack Bolt – Adaptor-to-Case
423	Jam Nut – Bearing Housing Jack Bolt
496	O-Ring Bearing Housing
497F	O-Ring Outboard Labyrinth Rotor
497G	O-Ring Outboard Labyrinth Stator