



EQUIPMENT REPAIR REPORT

Customer:

Page 1 of 15

Our Reference: Sales order #5000004890

Subject: Goulds Pump Repair

Date: October, 2010

Attention:

Thank you for choosing ProSpec Technologies Inc. as your source for this pump repair estimate. We appreciate the opportunity to provide you with this assessment. Following is our report of initial findings and a summary of the work required.

EQUIPMENT INFORMATION

Description: Centrifugal pump. Bare pump only

Manufacturer: Goulds

Type: Horizontally Split, Double Suction

Serial:

Model: 3410M

Size: 4x6-15

RPM: 1800

Casing: Foot Mounted, horizontal

Lubrication: Flood Oil

Shaft Sealing: Mechanical Seal

Rotation: Right Hand

Impeller: Double suction, fully enclosed, iron

Current impeller diameter: 13.375 inches

Suction porting: 6 inches at 150# FF

Discharge porting: 4 inches at 150# FF

INITIAL OBSERVATIONS

Upon receipt a thorough inspection of the unit was conducted. The exterior of the pump was found to be in generally good condition with corrosion in areas where the finish coat had been removed or damaged. Casing feet, bearing housing arms, flanges and casing mating half surfaces were in very good condition. The pump interior was again found to be in good condition with only surface rust and the occasional flaked area with major corroded areas. The critical area around cutwater was in quite good condition and would require no repair or material addition.

The original constant level oilers (item 251 on the attached cross section) were missing and will be replaced. Both anti-friction bearings (112 and 168) and all three oil seals (333 and 332) are expectedly in need of replacement.

The drive end bearing housing (134) was scored under the bearing which indicates that the outer race of the bearing may have rotated in the housing. We measured the diameter at this point and recorded it as 2.835" at one location and 2.842" at second location. This housing will be replaced.

We measured the shaft run out at the location indicated in the drawing below. The shaft is straight and does not require replacement however it is grooved at the locations indicated below. We will chrome the shaft at these locations to provide leak free operation at the bearing frame lip seals.

The shaft sleeves (126) are grooved and worn as can be seen in the photo below. In order to ensure a proper seal at the o-ring in the mechanical seal the sleeves require replacement.

The mechanical seals may have been operational without sufficient process fluid lubrication. The seal faces were cracked and very polished which is an indication that they were running very hot. The o-rings as can be seen in the photo were very cracked and very brittle. The cracked o-ring is another sign of excessive heat at the seal. The mechanical seals require replacement. When this pump was first supplied in 1993 the mechanical seal was supplied with viton elastomers and carbon vs tungsten carbide faces. The pump as we assessed it had tungsten carbide vs tungsten carbide faces. In an effort to ensure you are getting sufficient life from the seals we should review the system conditions prior to proceeding with a repair to ensure we have the correct seal faces and elastomer material. If the fluid is boiler feed water then carbon vs silicon carbide with EPDM would work best.

We noticed that the flush lines were missing when we received the pump. These lines are required and have been included for in the quotation below. If the pump is in operation on a suction lift and these lines were not in use then the seals may not have been lubricated properly.

The glands are eroded at the point that the mechanical seal o-rings mate with the gland. The glands pictured below require replacement.

The impeller and wear rings were in good condition. We measured the radial clearance at 0.006” and recorded it in the diagram below. This clearance is acceptable and the impeller and wear rings are suitable for reuse.

SCOPE OF WORK

- Receive unit, perform initial visual inspection and record findings.
- Disassemble unit, perform rough cleaning, detailed inspection and record findings.
- Sand blast the interior and exterior surfaces using Ebony Grit copper slag and polish all machine fit surfaces.
- Chase all threads, utilize all new fasteners and assemble with never seize thread lube.
- Chrome the shaft at the required points.
- Balance the rotating element
- Reassemble the pump with a driven side housing, new mechanical seals, new bearings, bearing lock nuts, bearing lock nut washers, oil seals, keys, constant level oilers, shaft sleeves, shaft sleeve nuts, flush lines
- Clean and prepare exterior surfaces for finish coat. Mask off accordingly.
- Apply AK 90 Gloss blue paint to internal and exterior non-machined surfaces.
- Perform final inspection and apply appropriate tags and identification plates.
- Touch up finish, package and prepare for shipment.

Total estimated price for the repair \$

The price above is an estimate for the work we know is required. It is unlikely that the pump requires anything other than that described above. However if we do find the requirement for other parts we will stop and advise you prior to proceeding.

Delivery - Work can be complete within approximately 4 weeks of your approval.

ProSpec’s standard evaluation fee is \$. Should you opt for the repair, the above sum will be waived. Standard repairs carry a 90 day limited warranty

Thank you very much for the opportunity to present our report. Please contact us with any questions or additional information requirements.

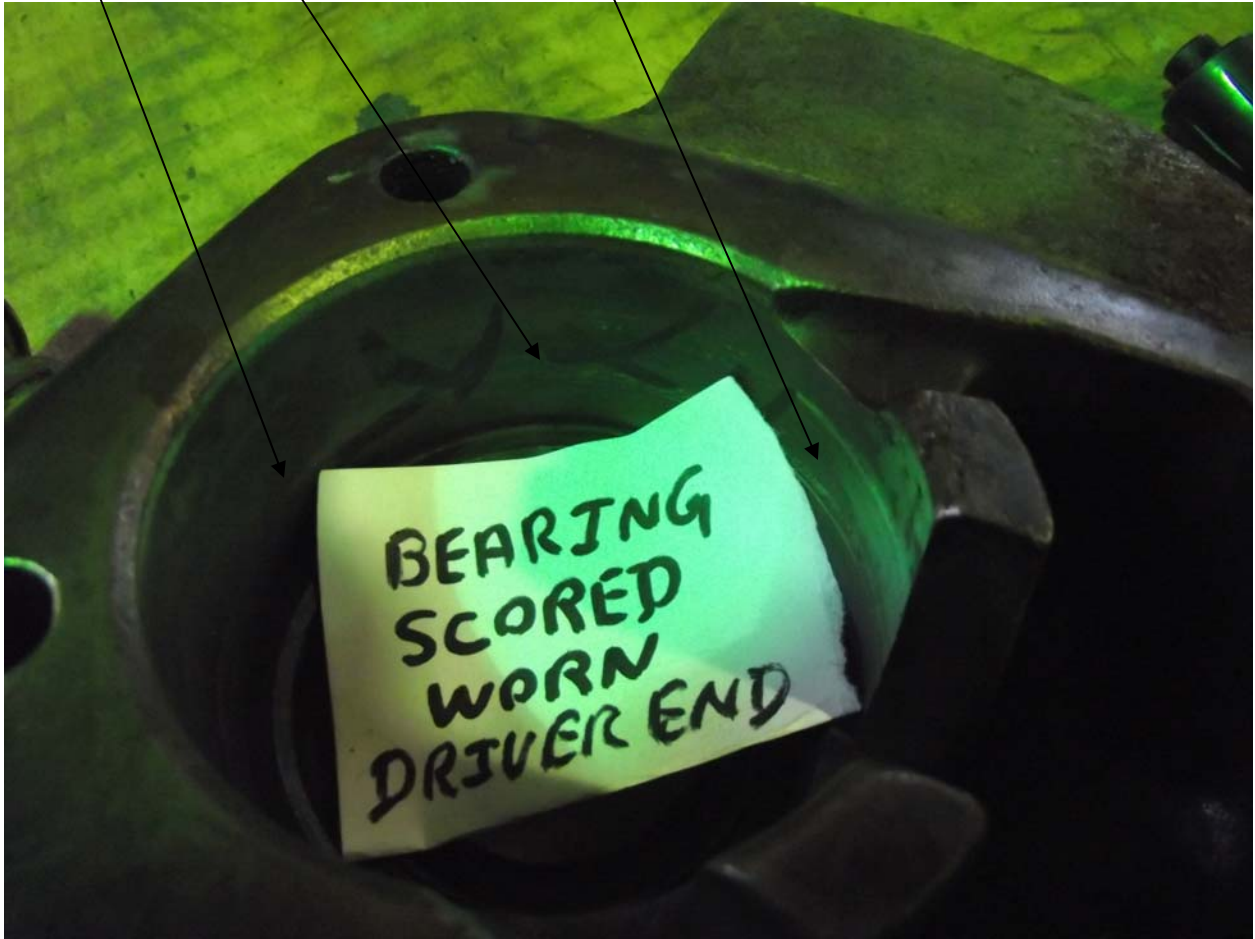
Best regards,

Mark Lemieux
Customer Service
Phn: 905-629-3100 x27
Fax: 905-629-3500
mlemieux@prospectech.com

Pump as it arrived at our shop.



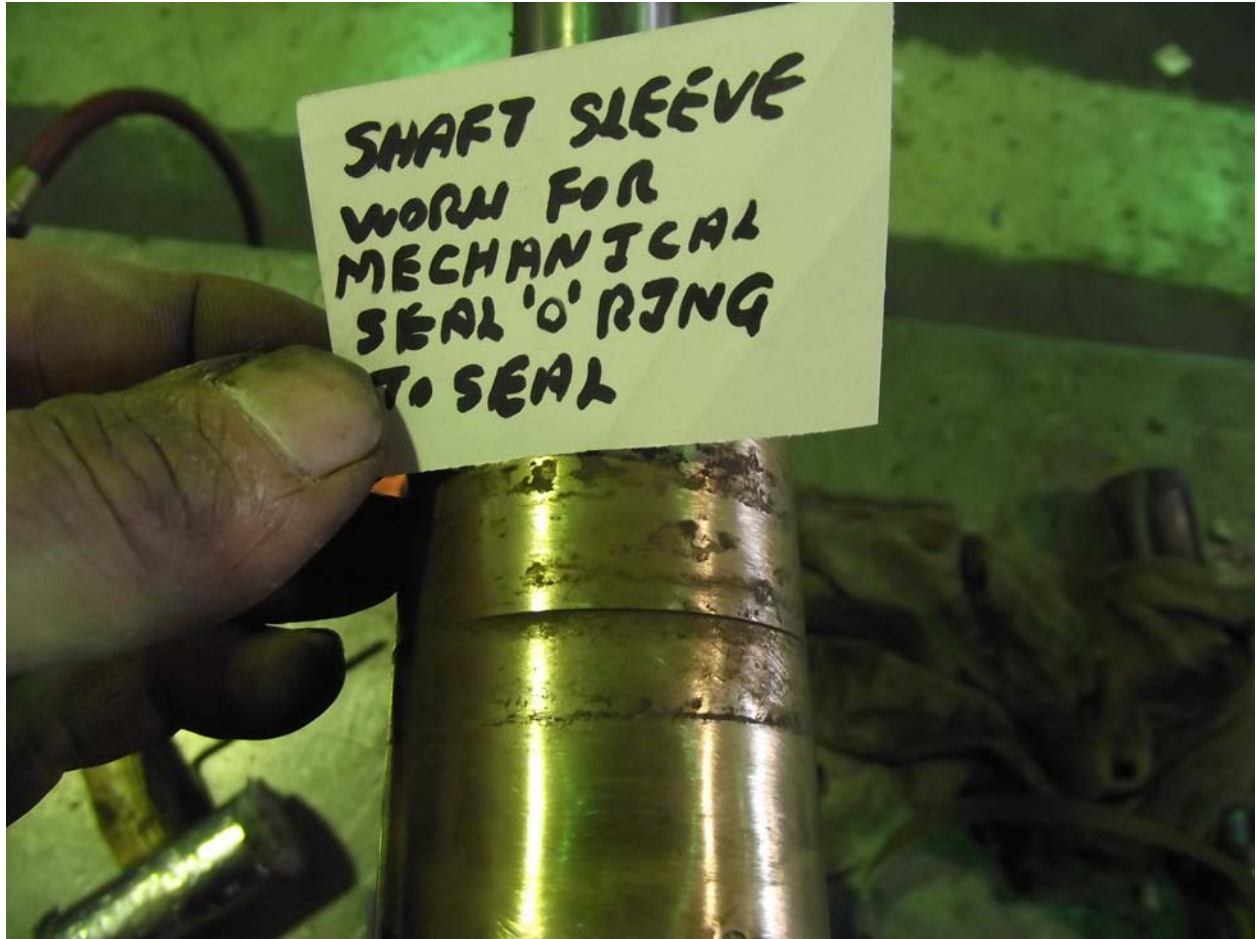
The bearing frame (134) on the drive end is scored.



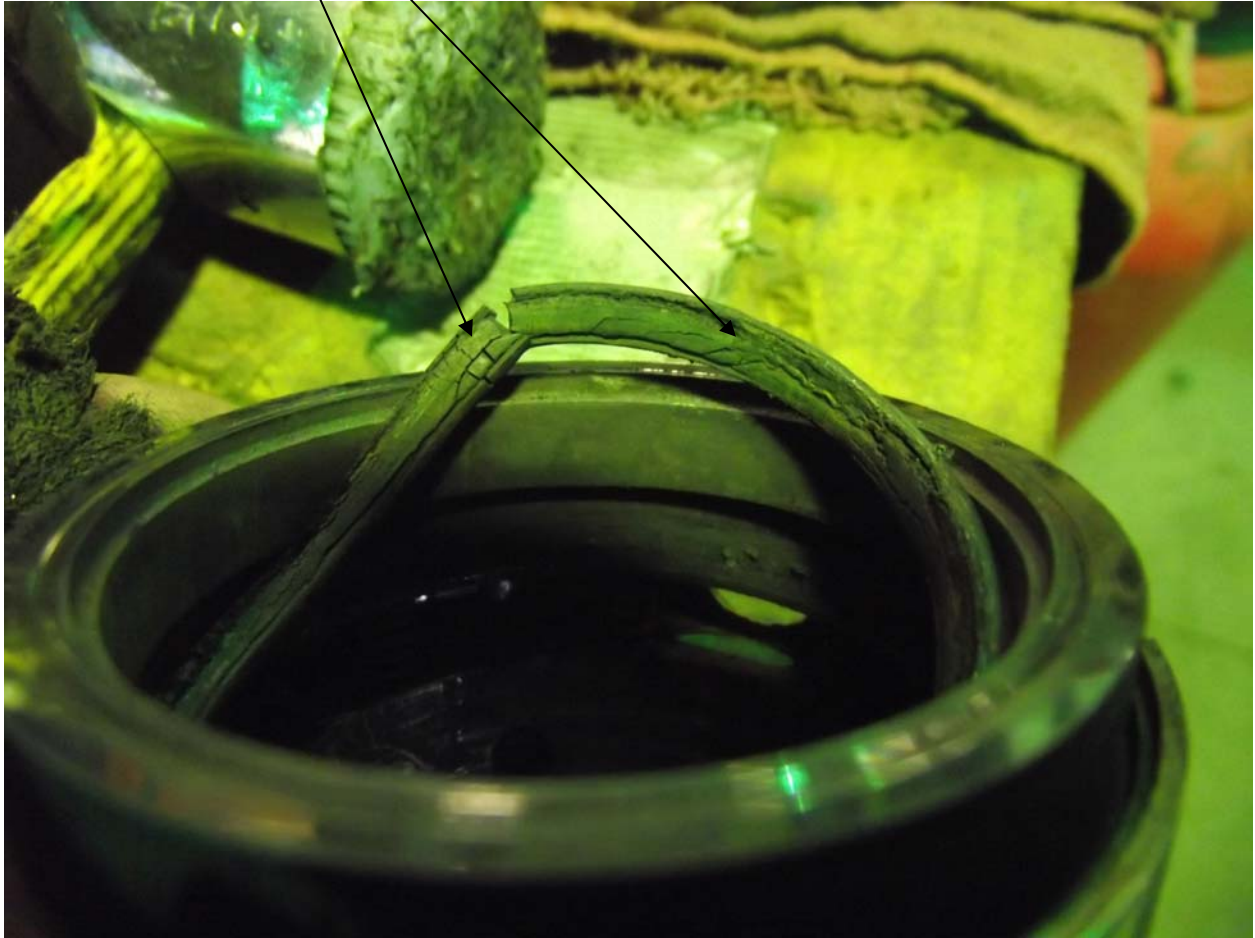
The shaft is grooved at the location where the lip seals run.



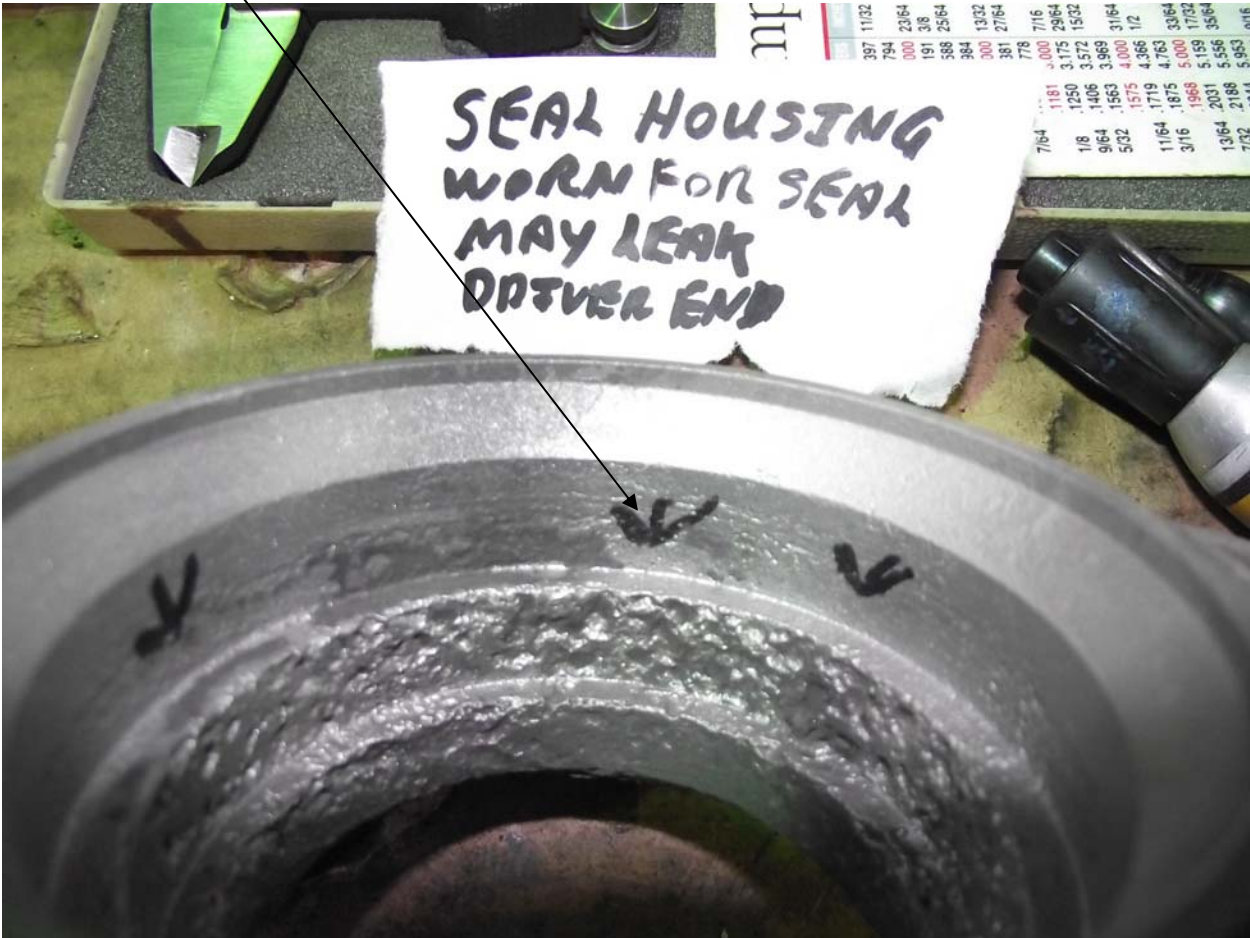
The shaft sleeves are grooved and worn at the location of mechanical seal.



The mechanical seals may have been operating without process fluid lubrication. The o-rings are hard and brittle.



The glands have eroded in the area of the O-rings.



Coating applied on lower casing.



SHAFT RUNOUT CHECK

Sales Order Number 5000004890.

PUMP #4X6-15

Run out on pump disassembly

At Coupling Diameter	At Bearing Diameter 1	At Bearing Diameter 2	At Impeller Diameter
0.000"	0.000"	0.000"	0.000"

On pump assembly

Coupling Diameter	Bearing Diameter 1	Bearing Diameter 2	Impeller Diameter

k. Remove impeller.

(1) S Group (fig. 3-7).

- (a) Using snap ring pliers, remove retaining rings (361H).
- (b) Drive or press impeller (101) off shaft.
- (c) Remove key (178).

(2) M, L, XL Groups.

CAUTION

Do not damage impeller hub surface which is sealed by sleeve gasket.

- (a) Scribe a mark on the shaft to mark the location of the impeller hub.
- (b) Drive or press impeller (101) off shaft.
- (c) Remove key (178).

3-8. INSPECTION.

a. O-rings - Inspect O-rings (497) and replace if damaged. (M, L, XL groups only).

b. Wear Rings - The original radial clearance between the impeller and the casing wear rings is shown in fig. 3-5 and table 3-2. When hydraulic performance is reduced substantially, the casing rings should be replaced.

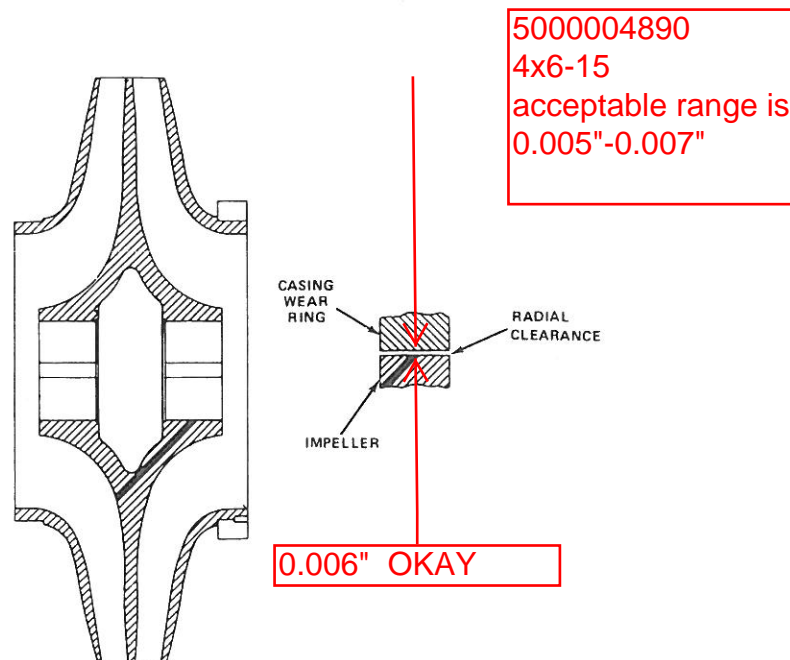


Figure 3-5

RADIAL CLEARANCE

<i>GROUP</i>	<i>PUMP</i>	<i>IRON AND BRONZE</i>	<i>STEEL</i>
S	2x3-11 3x4-10 4x6-9 4x6-11 4x6-11H 4x6-13 4x6-13H	.005 - .007"(.013 - .018mm)	.009 - .011"(.022 - .028mm)
M	4x6-15 6x8-11 6x8-14 6x8-14H 6x8-17 8x10-11 8x10-12 8x10-14	.005 - .007"(.013 - .018mm)	.009 - .011"(.022 - .028mm)
L	6x8-22 6x10-17 8x10-17	.005 - .007"(.013 - .018mm)	.009 - .011"(.022 - .028mm)
	8x10-17H	.0055 - .0075"(.014 - .019mm)	.010 - .012"(.025 - .030mm)
	8x10-21	.005 - .007"(.013 - .018mm)	.009 - .011"(.022 - .028mm)
	10x12-12	.0055 - .0075"(.014 - .019mm)	.010 - .012"(.025 - .030mm)
	10x12-14	.005 - .007"(.013 - .018mm)	.010 - .012"(.022 - .028mm)
	10x12-17	.0065 - .0085"(.017 - .022mm)	.011 - .013"(.028 - .033mm)
XL	10x12-12H 10x12-15	.0055 - .0075"(.014 - .019mm)	.010 - .012"(.025 - .030mm)
	12x14-15	.0065 - .0085"(.017 - .022mm)	.011 - .013"(.028 - .033mm)

Table 3-2

TABLE 4-1 — ILLUSTRATED PARTS LIST WITH MATERIALS OF CONSTRUCTION

Item	No. Req'd per pump	Part Name	Material			
			Bronze - Fitted	All Iron	All Iron / 316 Rot. El.	All 316SS
320	6	Retaining Set Screw, Impeller Wear Ring (Optional)	2229			
332A	1	Labyrinth Seal, Outboard	6241			
333A	2	Labyrinth Seal, Inboard	6241			
351	1	Casing Gasket, Parting	5108			
353	4	Studs, Gland (Packing)	2229			
353	8	Studs, Gland (Mechanical Seal)	2229			
355	4	Hex Nuts, Gland	2228			
356A	4	Studs, Parting	2210			
360	2	Gasket, End Cover to Bearing Housing	5130			
360Q	2	Gasket, Gland to Case	5163			
361	1	Retaining Ring, Thrust Bearing	Steel			
361H	2	Retaining Ring, Impeller (S Group only)	Steel	Stainless Steel		
371C	8	Hex Cap Screw	2210			
372U	4	Hex Cap Screw	2210			
418	2	Jacking Bolt	2210			
425	4	Hex Nuts, Parting	2210			
426	Variable	Hex Cap Screw, Parting	2210			
428	2	Gasket, Sleeve to Impeller (M, L, and XL only)	5180			
445A	2	Anti-Rotation Pin, Casing Wear Ring	2223	2229		
469G	2	Tapered Pin with Hex Nut	2210			
494	2	Cooling Assembly (Optional)	Copper Tube, Fitting			
497	2	O-ring, Sleeve Nut (M, L, and XL only)	5302			

* S Group 2223 (All Iron & Bronze-Fitted Construction).

2229 (All 316 & 316 Trim Construction).

** S Group 2226

*** Contact your Goulds Pumps representative for information on seal options

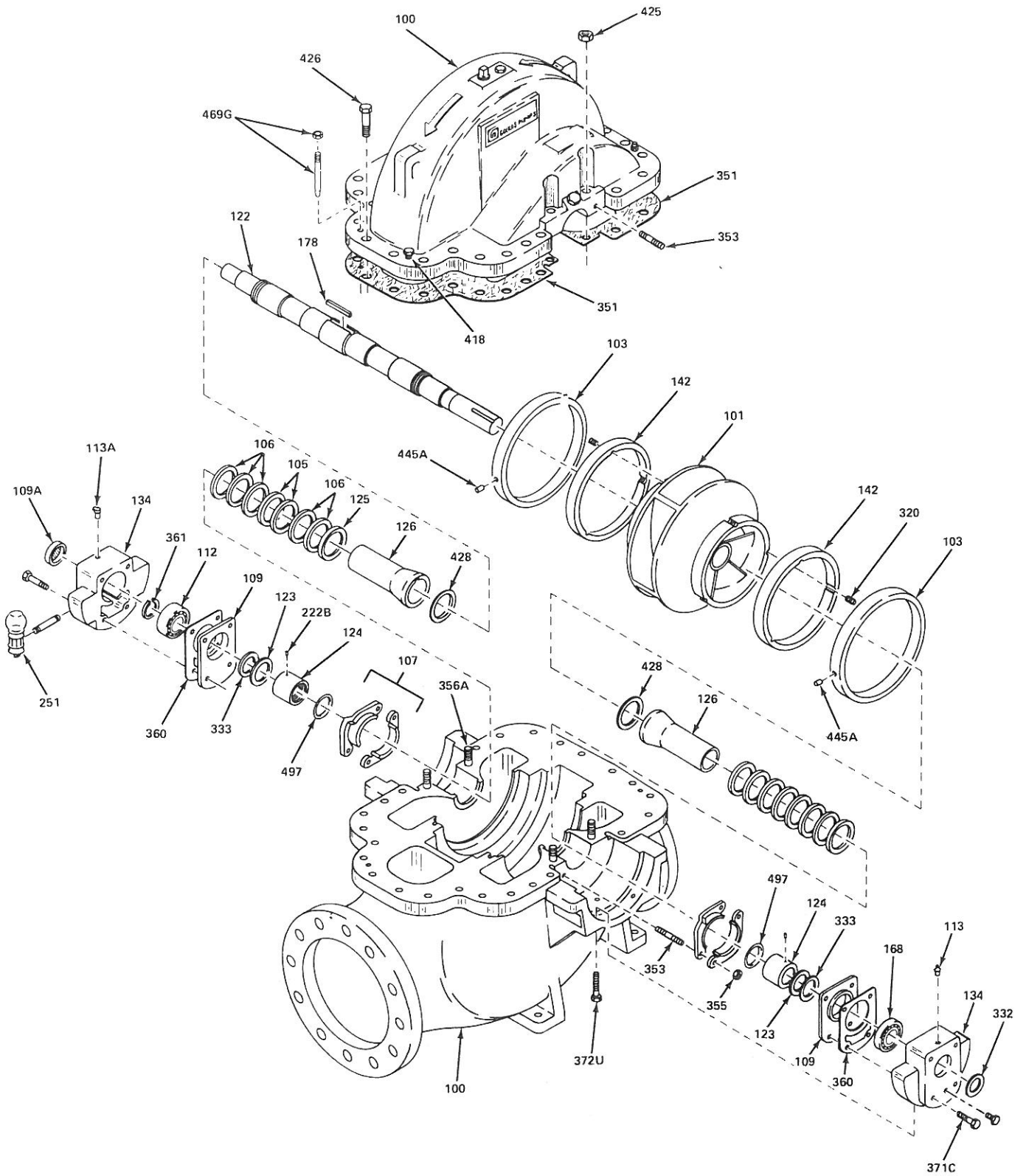


Figure 4-1

Completed repair.

