

Date: 05-18-16

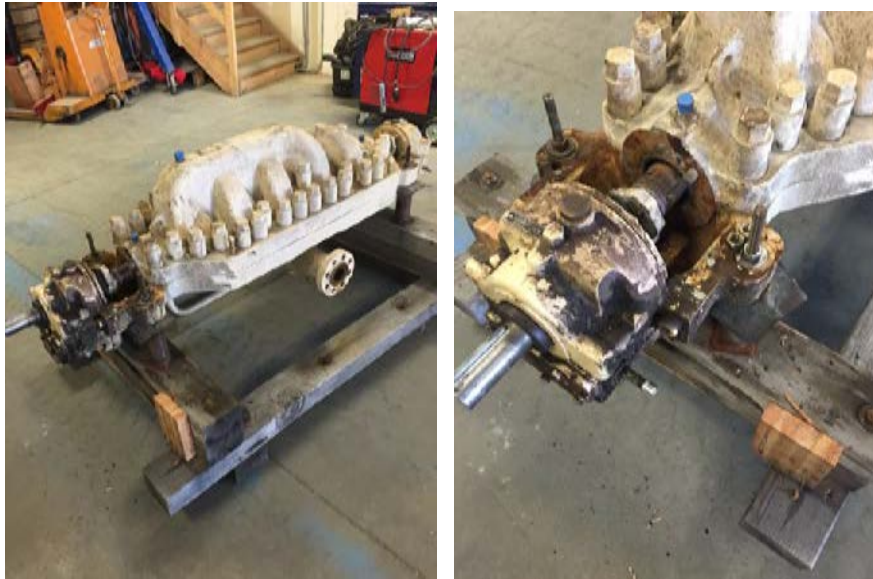
Customer: **EXAMPLE**  
Group:  
Quote Number:  
Product Type:

Model:  
Size:  
Serial Number:  
Manufacturer:

### AS FOUND REPORT WITH RECOMMENDED REPAIR

We are pleased to provide our proposal for your consideration. Below you will find the work required along with photos for your review.

#### Pump as received



#### Evaluation Summary of Key Findings

- 1) Casing will need to be line bored to restor all internal fits.
- 2) Foreign objects were found in the 1<sup>st</sup> stage impeller. The first stage impeller was cracked in 4 places.
- 3) 8<sup>th</sup> stage casing wear ring was broken in half and parts were not in the pump casing. 8<sup>th</sup> stage impeller wear ring was missing.



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Scale in suction nozzle



Damaged Thrust Bearing



Radial Bearing





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Debris in 1<sup>ST</sup> stage suction impeller



Broken casing wear ring and damaged impeller wear ring





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Worn center bushing



Worn packing wear sleeve





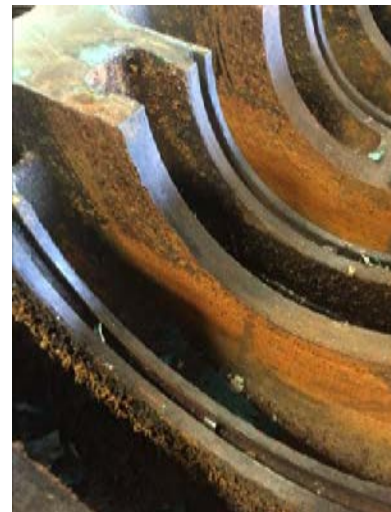
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Run out check 0.0015" – 0.002"



Worn pump housing from 1<sup>ST</sup> stage impeller



## SCOPE OF WORK

### DISASSEMBLY & INSPECTION – THIS PORTION IS COMPLETEED

- Photograph disassembly
- Perform all required pre-disassembly checks
- Match mark parts as required
- Mark parts pallets with correct job number
- Remove bearing housing assemblies and packing glands
- Check casing fits to determine if line bore is required
- Perform complete dimensional and visual inspection on all parts
- Provide Final Complete work scope and quote

### Detailed Component Inspection

#### **CASING RINGS-EYE SIDE**

- All casing rings are worn and require replacement with new.

**Bores are worn and damaged from contact with impellers**

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#### **CASING RINGS-HUB SIDE**

All case hub rings are worn and require replacement



**Bores are worn from contact with impellers**

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## IMPELLERS

- Wear on the back side
- 1<sup>st</sup> stage impeller cracked in 4 places and will need to be replaced.



Wear on backside



Cracked

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## CENTER BUSHING

- Replace with new.



**Bore is worn and all outside dia's are out of round**

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## CENTER SLEEVE

- Manufacture new

## THROTTLE BUSHING

- Manufacture new
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## STUFFING BOX BUSHINGS

Replace with new



**Bores worn over spec**

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## BEARING HOUSINGS. (Coupling end.)

- Hone faces
- Clean I.D.'s and coat non machine areas with insulating varnish
- Over bore, insert and machine to spec.

## BEARING HOUSINGS. (Thrust end.)

- Hone faces
- Clean I.D.'s and coat non machine areas with insulating varnish
- Over bore, insert and machine to spec.



**Bearing housing bores are worn over spec. Peening marks visible from previous repair.**

## BEARING HSG END CAPS

- Clean and reuse
  - Hone contact faces, clean and coat non machined areas bearings with insulating varnish
-



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**ROTOR ASSEMBLY**



**Rotor prior to removing impellers**

**Shaft**



**Manufacture new shaft**

**Casing rings**



**Manufacture new casing rings**



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## Impellers



Impeller wear rings are worn.



Debris lodged in impeller vanes



Cracked impeller shroud.



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## CASE STUDS

- Clean and chase threads

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## CAP NUTS

- Clean and chase threads
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## PUMP CASING – REPAIR



- Weld repair casing at areas of high wear
  - Machine both split line gasket faces
  - Line bore all internal fits to original spec
  - Tap all holes
  - Debur all fits and grooves
  - Clean all passages
  - Manufacture new split line gasket using specified materials (0.015" thickness)
  - Install case studs and tighten
- 

### Repair Summary:

- Complete disassembly and inspection
- Manufacture new shaft
- Replace shaft nuts
- Repair impellers by welding
- Replace impeller wear rings
- Replace Casing wear rings
- Repair bearing housings
- Complete casing line bore to return internal fits to spec
- Replace shaft sleeves
- Replace packing sleeves
- Replace bearings
- Replace stuffing box bushings
- Machine Center bushing
- Replace lantern rings
- Replace oil rings
- Balance to G2.5 Specifications
- Complete Assembly



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## **ASSEMBLY**

- Verify all repair work is complete
  - Record all final sizes, clearances and settings
  - Verify all required documentation is complete
  - Verify all parts are cleaned and ready for assembly
  - Install rotor with stationeries into casing lower half
  - Check rotor float without top half installed
  - Install upper half casing and torque bolting
  - Check rotor float with top half installed
  - Install bearing housings with assembly/alignment ball bearings and centralize rotor
  - Set running position and insure locked end play
  - Drill and ream for dowel pins
  - Reinstall housings
  - Paint pump with hi temperature paint
- 

## **PRICE AND DELIVERY**

**Pricing for repair –**

**Delivery –**

1. Freight to plant site is not included in pricing.
2. Freight from site to factory prepaid by CAC Industrial Equipment Ltd.
3. Pricing and Delivery are valid for thirty (30) day, unless extended in writing
4. ITT - PRO Services Terms and Conditions of Sale apply
5. Warranty period of one (1) year in accordance with warranty clause of
6. ITT - PRO Services Terms and Conditions of Sale
7. Supply a complete repair report with an as repaired Bill of Materials for the completed pump.



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Detailed Inspection Form

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MULTI-STAGE HORIZONTAL SPLIT CASE DIFFUSER PUMP

JOB #:	79798	CUSTOMER:	CAC
DATE:	May 4/2016	INSPECTED BY:	Jeff Rich
<b>PUMP DATA</b>			
MFG.:		MODEL:	
SIZE:		# OF STAGES:	
<b>DISASSEMBLY</b>		<b>CASE INSPECTION</b>	
Suction nozzle coated in scale			
What is the condition of the parting face:		Good	
<u>Warpage</u> when checked with straight edge:			
<b>Mic All Bore Sizes:</b>			
Stuffing Box Thrust End At Mechanical Seal Register:	3.998"	Stuffing Box Coupling End At Mech Seal Register:	3.997"
Thrust End Seal Gland Register OD:	3.990"	Coupling End Seal Gland Register OD:	3.992"
Clearance:	0.008"	Clearance:	0.005"
Throttle Bushing Fits Cplg End:	3.238"	Throttle Bushing Fit Thrust End:	3.347"
<b>Diffuser/Channel Ring Fits:</b>			
STAGE		STAGE	
1	5.246"	7	5.249"
2	5.237"	8	5.247"
3	5.245"	9	5.753"
4	5.248"	10	
5	5.250"	11	
6	5.243"	12	
Make Bushings for Boring Bar and Check Bore for <u>Runout</u> :	<input type="checkbox"/>	GOOD	<input type="checkbox"/> BAD
Check all bores, including stuffing boxes for any signs of washing or cracking. Any suspicious signs?			



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What is the condition of the stuffing box face on each end?			
THRUST END:	Scratches?	OK	Washing?
COUPLING END:	Scratches?	OK	Washing?
How are threads in gland holes?		Good need to be tapped	
What is the condition of the threaded holes in the parting faces?			Good
Sizes:			1.250"
What is the condition of the dowel pin holes?		Dowel pins seized in place	
Size:			
What are the face conditions of the bottom half where the bearing housings mount?			
Good			
Are the faces smooth and flat?		Thrust End	Coupling End
		Yes	Yes
Are the threads good?		T.E.: Yes	C.E. Yes
			Sizes:
What is the condition of the suction flange?		Good	
What is the condition of the discharge flange?		Good	
What is the condition of the splitters?		N/A	
What is the condition of the pump feet?		Clean up Required	
What is the condition of the balance lines?		N/A	
What is the thickness of the gasket used between the parting faces?			0.015"
Are gaskets used anywhere else such as cooling jacket covers, etc?			Bearing housing front cover
If so, what are their sizes?			
Are all the studs and cap nuts in good reusable condition?			Yes
If not, list description of what is needed. Sizes, threads per inch, lengths and quantity.			
Are there any broken bolts or studs that need to be removed?			NO
Does the case need reboring? If yes, why?		Yes, Casing fits are worn	
COMMENTS: Site should look into reasons on why foreign object would be getting into the Suction of the pump.			





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DISASSEMBLY		BEARING HOUSINGS - THRUST END			
<b>BEARING TYPE:</b>					
Babbit Lined?	Yes		No	X	If Yes is it Split?
		OD SIZE			ID SIZE:
Ball Bearing for Thrust?	Yes	X	No		
If Yes is it	Double Row:	SKF 3309 DNR C8M	Single Row:		
How are they mounted? (Face to Face, etc):		One bearing not two			
What are the bearing numbers?					
Is it another type of thrust set up?			Yes		No X
If yes, what type and describe:					
What is the condition of the parts?					
What size are the bearing fits in the housing?					
		3.938"			
Is it a split housing?	NO	Did it have a gasket?			
Condition of face:		Thickness of gasket?			
What is the condition of the face where it bolts to the pump case?					
Good					
Is all bolting good?	Yes				
Does it have an oil slinger ring?	Yes	How Many?	1		
What is their condition?	Good				
What is the condition of the end covers	Good	Reuse	X	Rework	
Are there gaskets?		Sizes:			
What is the condition of the deflectors?					
What is the cond. of the shaft locating ring, if used?					
NOTES:					



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<b>DISASSEMBLY</b>				<b>ROTATING ELEMENT INSPECTION</b>			
ELEMENT ROTATION FORM		COUPLING END:	CW		CCW	X	
CPLG MFG:	N/A	Type:		Size:			
Coupling bore fit to Shaft:				To Motor:			
MECHANICAL SEAL MFG:		Packing					
Model:		Type:		Part Number:			
Repair:		Replace:					
SHAFT SLEEVES	Reuse:		Repair:		Replace:	X	
How are impellers numbered from coupling end?		Yes					
<b>DISASSEMBLY</b>				<b>PUMP SHAFT</b>			
Material:		Runout:	0.0015" - 0.002"				
Bearing Fit Sizes:		Coupling End:	1.771"	Thrust End:	1.771"		
Thrust Disc Fit Dia:		Ball Brgs:	X	Babbit Brg			
If Ball Bearings, list bearing # and qty:							
Radial:	SKF 3309 DNR C8M quantity 1		Thrust:	SKF 6309 / C3 423059X Quantity 1			
Condition of Shaft Grooves:				Cond. of Keyways:		Good	
Condition of Threads:		Good		O-ring Areas:			



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DISASSEMBLY		CLEARANCES					
		Shaft Runout:		0.0015"- 0.002"			
Radial Bearing Bore:	1.771"				Radial Throttle Bushing Bore:	1.771"	
Radial Bearing Shaft Dia:	1.771"				Sleeve OD:	1.771"	
Clearance:	0				Clearance:	0	
Coupling						Thrust	
End						End	
	1	2	3	4	5	6	
Shaft OD							
Impeller Bore							
FIT: Clear or Interference							
Impeller Back Ring OD:							
Channel Ring Bushing ID							
Clearance							
Impeller Front Ring OD	4.610"				4.6085"		
Channel Ring ID	4.626"				Broken		
Clearance							
Diffuser OD							
Case ID							
Clearance							
Impeller Diameter							
Balance Sleeve OD:					Center Sleeve OD:		
Balance Bushing ID:					Center Bushing ID:		2.987"
Clearance:					Clearance:		