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 restore all internal fits.
2) Foreign objects were found in the 1st stage impeller. The first stage impeller was cracked in 4 places.
3) 8th stage casing wear ring was broken in half and parts were not in the pump casing. 8th stage impeller wear ring was missing.
Scale in suction nozzle

Damaged Thrust Bearing  Radial Bearing
Debris in 1ST stage suction impeller

Broken casing wear ring and damaged impeller wear ring
Worn center bushing

Worn packing wear sleeve
Run out check 0.0015” - 0.002”

Worn pump housing from 1st stage impeller
SCOPE OF WORK

DISASSEMBLY & INSPECTION - THIS PORTION IS COMPLETED

- 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

CASING RINGS-HUB SIDE
All case hub rings are worn and require replacement

Bores are worn from contact with impellers
**IMPELLERS**
- Wear on the back side
- 1st stage impeller cracked in 4 places and will need to be replaced.

**CENTER BUSHING**
- Bore is worn and all outside dia's are out of round
- Replace with new.

**CENTER SLEEVE**
- Manufacture new

**THROTTLE BUSHING**
- Manufacture new
STUFFING BOX BUSHINGS
Replace with new

Bores worn over spec

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
ROTOR ASSEMBLY

Rotor prior to removing impellers

Shaft

Manufacture new shaft

Casing rings

Manufacture new casing rings
Impellers

Impeller wear rings are worn. Debris lodged in impeller vanes

Cracked impeller shroud.

CASE STUDS
- Clean and chase threads

CAP NUTS
- Clean and chase threads
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

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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
**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

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**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.
ITT PRO SERVICE CENTERS
MULTI-STAGE HORIZONTAL SPLIT CASE DIFFUSER PUMP

<table>
<thead>
<tr>
<th>JOB #</th>
<th>79798</th>
<th>CUSTOMER:</th>
<th>CAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>May 4/2016</td>
<td>INSPECTED BY:</td>
<td>Jeff Rich</td>
</tr>
</tbody>
</table>

**PUMP DATA**

<table>
<thead>
<tr>
<th>MFG.</th>
<th></th>
<th>MODEL.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE.</td>
<td></td>
<td># OF STAGES.</td>
<td></td>
</tr>
</tbody>
</table>

**DISASSEMBLY CASE INSPECTION**

Suction nozzle coated in scale

**What is the condition of the paring face:** Good

**Warpage when checked with straight edge:**

**Mic All Bore Sizes:**

<table>
<thead>
<tr>
<th>Stuffing Box Thrust End</th>
<th>Stuffing Box Coupling End</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Mechanical Seal Register: 3.998”</td>
<td>At Mech Seal Register: 3.997”</td>
</tr>
<tr>
<td>Thrust End Seal Gland Register OD: 3.990”</td>
<td>Coupling End Seal Gland Register OD: 3.992”</td>
</tr>
<tr>
<td>Clearance: 0.008”</td>
<td>Clearance: 0.005”</td>
</tr>
</tbody>
</table>

| Throttle Bushing Fits Cplg End: 3.238” | Throttle Bushing Fit Thrust End: 3.347” |

**Diffuser/Channel Ring Fits:**

<table>
<thead>
<tr>
<th>STAGE</th>
<th>5.246”</th>
<th>5.248”</th>
<th>5.245”</th>
<th>5.237”</th>
<th>5.243”</th>
<th>5.250”</th>
<th>5.247”</th>
<th>5.249”</th>
<th>5.753”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Make Bushings for Boring Bar and Check Bore for Runout: GOOD BAD

Check all bores, including stuffing boxes for any signs of washing or cracking. Any suspicious signs?
### What is the condition of the stuffing box face on each end?

<table>
<thead>
<tr>
<th>THRUST END</th>
<th>Scratches?</th>
<th>OK</th>
<th>Washing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUPLING END</td>
<td>Scratches?</td>
<td>OK</td>
<td>Washing?</td>
</tr>
</tbody>
</table>

How are threads in gland holes? Good need to be tapped.

### What is the condition of the threaded holes in the parting faces?

| 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 | Yes |
| C.E. | Yes |

### What is the condition of the suction flange?

| Sizes | |

### 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 re boring? 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.
## DISASSEMBLY

<table>
<thead>
<tr>
<th>BEARING HOUSINGS - RADIAL END</th>
</tr>
</thead>
</table>

### BEARING TYPE:

- **Babbit Lined?**
  - Yes
  - No

- **OD SIZE**

- **ID SIZE**

### Bearing Type Details:

- **Ball Bearing?**
  - Yes
  - No

- **If Yes, what is the BRG #**
  - SKF 5309C3 423039X

- **Does it have a temperature probe?**
  - Yes
  - No

### Housing Details:

- **What size is the bearing fit in the bore of the housings?**
  - 3.938"

- **Is housing a split type?**
  - Yes
  - No

- **If split, did it have a gasket?**
  - Yes
  - No

### Condition of Faces:

- **Condition of Faces:**

- **Thickness of Gasket:**

### Condition of Pump Case:

- **What is the condition of the face where it bolts to the pump case?**
  - Good

### Conditions of Rings:

- **Does it use an oil slinger ring?**
  - Yes
  - No

- **Condition of rings:**
  - Good

### End Cover Condition:

- **What is the condition of the end cover?**
  - Good

### Gaskets:

- **Are there gaskets?**
  - Yes
  - No

- **Sizes:**

### Deflectors:

- **What is the condition of the deflectors?**

### Notes:

- **NOTES:**
  - New split line gasket will be manufactured
# ITT PRO SERVICE CENTERS

## MULTI-STAGE HORIZONTAL SPLIT CASE DIFFUSER PUMP

### DISASSEMBLY BEARING HOUSINGS - THRUST END

**BEARING TYPE:**

<table>
<thead>
<tr>
<th>Rabbit Lined?</th>
<th>Yes</th>
<th>No</th>
<th>X</th>
<th>If Yes is it Split?</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD SIZE</td>
<td></td>
<td></td>
<td></td>
<td>ID SIZE:</td>
</tr>
</tbody>
</table>

**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 setup? 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? 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

Are there gaskets? X Reuse Rework

Sizes:

What is the condition of the deflectors?

What is the cond. of the shaft locating ring, if used?

NOTES:
### DISASSEMBLY ROTATING ELEMENT INSPECTION

<table>
<thead>
<tr>
<th>ELEMENT ROTATION FORM COUPLING END:</th>
<th>CW</th>
<th>CCW</th>
<th>X</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CPLG MFG:</th>
<th>N/A</th>
<th>Type:</th>
<th>Size:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Coupling bore fit to Shaft:</th>
<th>To Motor:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MECHANICAL SEAL MFG:</th>
<th>Packing</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Model:</th>
<th>Type:</th>
<th>Part Number:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Repair:</th>
<th>Replace:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SHAFT SLEEVES</th>
<th>Reuse:</th>
<th>Repair:</th>
<th>Replace:</th>
<th>X</th>
</tr>
</thead>
</table>

How are impellers numbered from coupling end? Yes

### DISASSEMBLY PUMP SHAFT

| Material: | | Runout: 0.0015" - 0.002" |
|-----------|-------------------------|

<table>
<thead>
<tr>
<th>Bearing Fit Sizes:</th>
<th>Coupling End: 1.771&quot;</th>
<th>Thrust End: 1.771&quot;</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Thrust Disc Fit Dia:</th>
<th>Ball Brgs:</th>
<th>X</th>
<th>Babbit Brg</th>
</tr>
</thead>
</table>

If Ball Bearings, list bearing # and qty:

Radial: SKF 3309 DNR C8M quantity 1
Thrust: SKF 6309 / C3 423059X Quantity 1

<table>
<thead>
<tr>
<th>Condition of Shaft Grooves:</th>
<th>Cond. of Keyways:</th>
<th>Good</th>
</tr>
</thead>
</table>

| Condition of Threads: | Good | | O-ring Areas: | |
|-----------------------|------|-----|----------------|
# Multi-Stage Horizontal Split Case Diffuser Pump

## Disassembly and Clearances

<table>
<thead>
<tr>
<th>Part</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft Runout</td>
<td>0.0015&quot; - 0.002&quot;</td>
</tr>
<tr>
<td>Radial Bearing Bore</td>
<td>1.771&quot;</td>
</tr>
<tr>
<td>Radial Bearing Shaft Diam.</td>
<td>1.771&quot;</td>
</tr>
<tr>
<td>Radial Throttle Bushing Bore</td>
<td>1.771&quot;</td>
</tr>
<tr>
<td>Sleeve OD</td>
<td>1.771&quot;</td>
</tr>
<tr>
<td>Radial Throttle Bushing Shaft Diam.</td>
<td>0</td>
</tr>
<tr>
<td>Clearance</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coupling</th>
<th>Clearance</th>
<th>Thrust</th>
</tr>
</thead>
<tbody>
<tr>
<td>End</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Shaft OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impeller Bore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIT: Clear or Interference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impeller Back Ring OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Ring Bushing ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impeller Front Ring OD</td>
<td>4.610(^\circ)</td>
<td>4.6055(^\circ)</td>
</tr>
<tr>
<td>Channel Ring ID</td>
<td>4.626(^\circ)</td>
<td>Broken</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffuser OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impeller Diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance Sleeve OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center Sleeve OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance Bushing ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center Bushing ID</td>
<td>2.987(^\circ)</td>
<td></td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>