**Work instruction for Maintenance of pumps**

Objective Maintenance of pumps

Scope All Pumps in plant

Responsibility Engineer in charge and workmen at job

PPEs to be used Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage Land contamination

Oil traced waste generation Land contamination & Resource Depletion

Noise Work environment

Waste water Resource Depletion

Hazards Identified

Mechanical Hazard Slip, fall and trap

Physical hazard Noise, electrical

Human behavior improper housekeeping, Non use of PPEs, Alcoholism

PRECHECKS:-

Get the work permit

Take electrical shut down of the pump.

Open the priming chamber drain valve.

Isolate the pump discharge valve.

PROCEDURE:-

After getting clearance from operation department start to remove strainer dummy.

Remove and clean the pump suction strainer.

Flush the pump suction line while open pump discharge valve.

For multi stage pump like BFP, CEP, Strainer line flushing not required.

After removal of strainer inform the chemist for checking strainer contamination.

After getting clearance from chemist install the strainer properly and check the leakages from flange while opening the suction valve.

For RWP/CWP fix strainer top dummy after proper cleaning.

Remove the coupling guard and check the coupling gap, condition of bolt, nut, washer and rubber bush.

Check the tightness of bearing housing/bearing housing cover bolt.

If found leakages from gland packing then planned for tightened or replace the same.

Before replacing the gland packing remove the gland packing cooling pipe line and clean it properly.

For multi stages pump cooling water circulation provided for bearing, gland packing etc., remove the same flush the line properly and check the direction of water flow.

Remove the gland follower and existing gland packing with help of proper tools.

Fix the new gland packing and tightened with gland follower properly.

Fit the gland cooling line after cleaning.

Check the tightness of casing stud, pump foundation bolt, motor foundation bolt.

Put the coupling guard properly. Arrest the gland leakage if any

Give the clearance for trail run,

During trail run put the grease on bearings and tightened the gland follower if there is heavy leakage observed maintain the slight leakages from gland packing.

If trail run found satisfactorily then cancel the work permit by concerned engineer.

**Work instruction for Servicing/Overhauling of PUMP**

Objective Maintenance of pumps

Scope All Pumps in plant

Responsibility Engineer in charge and workmen at job

PPEs to be used Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage Land contamination

Oil traced waste generation Land contamination & Resource Depletion

Generation of waste oil Generation of hazardous waste

Noise Work environment

Waste water Resource Depletion

Hazards Identified

Mechanical Hazard Slip, fall and trap

Human behavior improper housekeeping, Non use of PPEs, Alcoholism

Physical hazard Noise

PRECHECKS:-

Get the work permit

Take electrical shut down of the pump.

Open the priming chamber drain valve.

Isolate the pump discharge valve.

PROCEDURE:-

After getting clearance from operation department start to remove strainer dummy.

Remove gland sealing/cooling line, casing bolts, bearing housing and bearing cover plate bolt of both bearing, gland follower and gland stud.

Hold the lifting equipment properly under close supervision of concerned engineer and work man.

Remove the top pump casing cover with the help of lifting equipment and shifted to safe place.

Remove lantern ring, grub screw after removal of top casing.

Remove the complete pump assembly with the help of lifting equipment and shift to safe place.

Clean the entire assembly properly.

Remove the coupling with the help of puller, cutting set and hammer.

Before using cutting set safety precaution must be follow as instructed in GEL/Mech/WI-07

During removal of coupling use all the necessary safety precaution.

After removal of coupling weight for few hours for cooling.

Remove the Bearing housing properly and clean the thoroughly.

Remove the bearing lock nut and clean the bearing.

Remove the Bearing with the help of puller.

Clean Bearing housing & shaft with clean cloth

Remove the water thrower, sleeve, stuffing bush, impeller with neck ring etc.,

After complete dismantling of assembly clean the shaft, sleeve, bush, coupling with emery sheet.

Start the assembly of same fix the impeller with proper key locking system.

Put the impeller neck ring, sleeve, stuffing bush, Water thrower and bearing back cover plate.

Put the bearing with the help of induction heater, heat the bearing up to required temperature.

After fixing the bearing in shaft wait for few hours, put the bearing locknut with proper tightening, apply grease on bearing housing and bearing.

Tightening the bearing and bearing cover plate bolt.

Fix the coupling with the help of induction heater/ gas cutting set.

Put the assembly back in to the pump bottom casing position and fix the lantern ring.

Replace the casing gasket if found damages.

Place the top casing to its position and confirm the tightness of bolt

Rotate the assembly manually for checking freeness or clearance.

Put the gland sealing line and put gland packing with proper tighten of gland follower.

Start the alignment work while maintaining air gap between couplings, providing the shim at the bottom of motor and maintain the alignment reading of both radial and axial below 0.05mm.

After completion of alignment work, tight the foundation bolt properly and start the couple with the help of coupling bolt, nut, washer and rubber bush.

Before placing the rubber bush, check the fitting of rubber bush on coupling, put the coupling guard properly.

Give the clearance for trail run,

During trail run put the grease on bearings and tightened the gland follower if there is heavy leakage observed maintain the slight leakages from gland packing. If trail run found satisfactorily then cancel the work permit by concerned engineer.

**Work instruction for Servicing/Overhauling BFP/CEP PUMP**

Objective Maintenance of pumps

Scope All Pumps in plant

Responsibility Engineer in charge and workmen at job

PPEs to be used Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage Land contamination

Oil traced waste generation Land contamination & Resource Depletion

Generation of waste oil Generation of hazardous waste

Noise Work environment

Waste water Resource Depletion

Hazards Identified

Mechanical Hazard Slip, fall and trap

Human behavior Improper housekeeping, Non use of PPEs, Alcoholism

Physical hazard Noise

PRECHECKS:-

Get the work permit

Take electrical shut down of the pump.

Isolate the pump Suction, discharge, balancing Leak Off and Recirculation valve.

Isolate cooling lines of Pump.

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PROCEDURE:-

Allow the Pump to cool down to ambient temperature before dismantling Pump.

After getting clearance from operation department, Isolation of Equipment with LOTO box, drain the suction and discharge line. After draining the Feed Water, start to remove strainer dummy.

Remove cooling line of gland seal and bearing housing.

Decouple Pump and Motor. Remove the coupling with the help of puller, hydraulic jack, cutting set and hammer.

Before using cutting set safety precaution must be follow as instructed in GEL/Mech/WI/07.

During removal of coupling use all the necessary safety precaution.

After removal of coupling wait for few hours for cooling.

Remove all the casing bolts of pump.

Clean the entire assembly properly and kept/dip the entire removed stud, bolt nut in to diesel.

Remove bearing housing cover plate of Non-drive End. Remove the Bearing housing properly from NDE and clean them thoroughly. Remove the bearing lock nut and clean the bearing. Remove the Bearing with the help of puller.Clean Bearing housing & shaft with clean cloth.

Remove deflector after removing bearing housing.

Remove Mechanical seal, stuffing box and Balance Drum and shaft sleeve.

Similarly remove bearing housing, bearing, deflector, stuffing box, mechanical seal, Balance drum and shaft sleeve of Drive End.

While removing the hydraulic parts of Pump, Mark the stage casing, diffuser, impeller, casing wear ring with stage number during dismantling as it has to be fitted in same order.

After complete dismantling of assembly, clean Pump Parts and Prepare Lubricants.

Always renew seal rings/gasket. Only use glycerine or Kluber Proba 270 Paste for O-ring seals.

Start assembly of hydraulic Pump part by referring to marking done during dismantling.

With pumps having a large number of stages, the pump casing must be adjusted to the deflection line of the shaft.

While pump is assembled horizontally, the stage casings should not be supported underneath before the tie bolts are tightened, so that the stage casings can be “suspended".

Clean shaft, impeller bores and coat the contact surfaces slightly with lubricant.

Insert key for the first impeller, and push impeller onto shaft stop

Insert diffuser in the first stage casing and slide it into the centering element of the diffuser device - if necessary, knock with a rubber hammer. Place O-ring seal for sealing against next stage casing.

Insert key and push on next impeller from the non-drive side.

Fit another pre-assembled stage casing (with diffuser) - if necessary, knock with a rubber hammer. Place O-ring seal. Assemble remaining stages in the same way.

Slide delivery casing with inserted last diffuser and O-ring seal on the spigot of the last stage casing.

Drive side: Place O-ring seal on the spigot of the diffuser device and mount suction casing.

Adjust and support pump suction and discharge casing feet on a smooth steel plate.

Fit tie bolts, discs and nuts. Clamp the whole hydraulic assembly together evenly and crosswise.

Assemble balance drum by inserting key into shaft. Place O-ring seal into the balance drum bore and push balance drum onto shaft. Slide balance drum liner with O-ring seal into delivery casing bore and allow the cylindrical dowel pin preventing rotation to engage in the hole. Insert key into shaft and place split ring in the shaft groove. Slide sleeve with collar over it.

Assemble shaft seal housing by inserting O-ring seal into the groove of shaft seal housing. Locate shaft seal on both delivery casing and suction casing. (In suction casing or Drive End side after spacer sleeve).

Assemble NDE Mechanical seal by pushing complete preassemble mechanical seal into sealing chamber.

Lubricate surface of spacer sleeve, push inboard labyrinth seal on spacer sleeve.

Mount Bearing bracket to push labyrinth seal into bearing bracket bore.

Assemble thrust bearing upto shaft stop into bearing bracket bore by heating in oil bath or induction heater up to 80-100 deg. C. Install spacer ring, lock washer and bearing lock nut. Tighten it and bend tang of lock washer into lock nut slot. Do not over-tighten Locknut. Insert O-ring seal in bearing cover and fit bearing cover with hexagonal screws. Lubricate shaft sleeve and Install outboard Labyrinth seal on shaft into bear cover bore.

Similarly install Mechanical seal, Bearing Bracket, radial bearing. Fit spacer, Lock washer and Locknut and tighten for Drive end as well.

Check freeness by running rotor. If found satisfactory, check axial clearance and proceed with final assembly.

Thrust bearing axial clearance should be between 0.04 to 0.06 mm. If less than 0.04 mm same can be corrected by tightening locknut of thrust bearing.

Mount the coupling half on Pump Drive end, Proceed for alignment. The maximum admissible axial misalignment is 0.05 mm on diameter, although ≤ 0.03 mm is preferrable.The maximum admissible radial misalignment is 0.1 mm on diameter, although ≤ 0.05 mm is preferrable.

After alignment, couple the equipment with driver and install coupling guard. Connect oil cup and fill with new oil. Connect cooling lines. Normalize the electrical Isolation and Mechanical Isolation.

Take trial run. Note vibration reading. Listen for abnormal sound. Feel temperature reading for hotness of housing and take temperature reading through thermocouple and temperature gun.

If after overhaul, taper roller bearing temperature is more than 90 deg. C. As a first measure check for end play.

After trial run is satisfactory, cancel the work permit and normalize the equipment.

Vibration reading during trial should be in the range of 2-5 mm/s.