**TITLE: - SOP for Starting of MLPU at PHBMPL Barauni station**

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| **SL. NO.** | **ACTIVITY** | **RESPONSIBILITY** |
| 1 | Ensure that Pre-starting activity – Station Line-up, Sufficient availability of Suction Pressure etc. as Per SOP Document | Shift In charge |
| 2 | Air venting if required, to be done through priming line, till a clear stream of fresh LPG is observed. After ensuring the same, the priming line valve and suction valve to be closed. Venting required to avoid dual phased LPG in suction arm. | -Do- |
| 3 | Check Lube Oil in bearing housing of pump (MP-1, MP2, MP3) and glycol level in level gauge in seal plan API 52 (both DE & NDE side) and top up if required. | -Do- |
| 4 | Line up MLPU with VFDs. (Follow Procedure detailed on Next page).VFD Line UP command to be given in SCADA. | -Do- |
| 5 | Ensure that Motor feeder (MP1/MP2/MP3), VFD Feeder (VFD1/VFD2) & Isolators are in ‘ON’ position and power supply is available. | -Do- |
| 6 | Ensure that pumping unit is available on Remote/ SCADA. Ensure availability of HT Power/ VFD Switch. | -Do- |
| 7 | Check if ‘Emergency shutdown’ is not pressed. | -Do- |
| 8 | Pump Prepare Command to be given at SCADA console. | -Do- |
| 9 | If it doesn’t prepare, then physically check above mentioned points (1-7). | -Do- |
| 10 | Important: Pump start command is given only if sufficient suction pressure is available. i.e. more than 11.6 kg/cm2. |  |
| 11 | If above conditions are ‘OK’, then start command to be given from SCADA console. |  |
| 12 | Monitor parameters of Pumps and motors as instructed by OEM and Operation Manual. Abnormal sound, vibration, leakage etc if observed, appropriate corrective steps to be taken. |  |
| 13 | Once the operation has stabilized, hourly parameters to be noted down as mentioned in Logbook Sheet. |  |
| 14 | Downstream stations (Muzaffarpur/Motihari) are informed about start up of the mainline pumps and subsequent receipt of LPG at their end. |  |
| 15 | All communications and events to be logged in the log book. |  |
| 16 | Ensure that Pre-starting activity – Station Line-up, Sufficient availability of Suction Pressure etc. as per SOP Document |  |

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| RECORDS GENERATED : | 1) | SHIFT LOGBOOK SHEET |
|  | 2) | SHIFT HANDING OVER REGISTER |
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**DETAILED PROCEDURES INVOLVED IN OPERATION OF VFD BASED MLPU (MP1/MP2)**

**PRE-START OPERATION OF VFDS**

1. Any VFD (VFD-1, VFD-2) can be used to operate any MLPU Motor (MP-1, MP-2).
2. Before energizing the VFD make sure that:
   1. AC Units inside the VFD room are switched ON.
   2. VFD UPS Unit is switched ON.
   3. Control supply of the corresponding VCB is on and LCD Display and LED indicators on the VCB are functioning.
3. Depending on the VFD-Motor combination chosen for operation, the corresponding isolator to be switched ON as per the following matrix.

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| **Isolator Matrix** | MP-1 | MP-2 |
| VFD-1 | VCB11 | VCB12 |
| VFD-2 | VCB21 | VCB22 |

1. After aligning the VFD with the Motor by switching ON the corresponding isolator, power supply to the VFDs can be extended by making ON the corresponding VFD Incomer VCB.
2. Once VCB is made ON , VFD is ready for Operation.

**MLPU OPERATION USING VFD**

Once the VFDs (VFD-1/2) are ready for operation after completion of pre-start procedure, MLPU Motors (1/2) can be energized in three ways- Remote, Local and Field.

The pre-start checks shall be as follows:

* 1. Check that the MOVs in the process line are opened such that the line is through for operation using MLPUs (MP1/MP2).
  2. Check that the level of coolant in seal cooling plan is sufficient.
  3. Check that the Lube Oil level in the Mainline Pump is sufficient.
  4. Check that necessary suction pressure is available for running the MLPU.
  5. Check that all RTD’s & BTD’s , Vibration transmitters, Level switches, Pressure switches and seal cooling motors are healthy.
  6. Check that VFD UPS, VFD aux supply is ON and healthy
  7. Check that HT VFD breaker relays is in Healthy condition
  8. Check that all MLPU MOV’s are in Remote position.
  9. Check that selected isolator for MLPU (MP1/MP2) is switched ON
  10. Check that HT VFD (VFD1/VFD2) feeders are in remote position.
  11. Check that VFD panel is kept in remote position.
  12. Check that Local control station for seal cooling motors is energized and placed in remote position.
  13. Check that the Emergency Stop Push Button in VFD VCB is in released position.
  14. Check that the Field Stop Push Button is in released position.
  15. Check that the Emergency Stop Push Button in VFD panel is in released position.
  16. If required, carry out air venting of the mainline pump.

**REMOTE:**

**Remote Operation can be performed by using either PLC terminal or SCADA terminal in MANUAL mode**

1. Carry out all pre-start checks as mentioned above.
2. If any fault exists in PLC/SCADA screen Press ’Maintenance’
3. MP1/MP2 Reset command may be given if any lag in SCADA control
4. Check whether selected feeder and isolator for MLPU- VFD combination is switched ON.
5. VFD (VFD1/VFD2) Line up command to be given in SCADA. Subsequent activities to be done in following ways:
   1. Once issued, VFD ready signal appears on screen.
   2. Aligned VFD data will appear on PLC/SCADA screen
   3. Press Pump Prepare Command (MP1/MP2) on Screen
   4. Suction MOV starts opening & Seal Plan motor Starts for coolant circulation.
   5. Start the Mainline Pump by giving **start** command from SCADA. Motor gets started with the lined up VFD at minimum speed pre-set i.e 1350 rpm. Pump discharge will also open automatically. Make sure that discharge MOV is actually opening in field.
   6. Running indication will appear on screen
   7. Check the flow in Main line from MFM-2102.
6. For stopping MLPU (MP1/MP2), bring RPM of MLPU to 2000 (minimum) and give STOP command from SCADA.

**LOCAL:**

**Local operation should be taken place only in presence of trained electrical and Instrumentation engineers. Local operation should be performed only in emergency/ critical situation**

1. VFD start mode should be selected as Local from the VFD panel.
2. Seal cooling plan should be in Manual position.
3. The sequence of operation shall be as follows:
   1. One person shall be placed in front of the MLPU (MP1/MP2) with Walkie talkie.
   2. One person shall be placed in front of the VFD (VFD1/VFD2) with Walkie talkie.
   3. Suction MOV to be kept fully opened by operating locally
   4. Once MLPU (MP1/MP2) is ready for operation the person in front of MLPU shall issue clearance.
   5. On receiving the clearance VFD (VFD1/VFD2) shall be started by using the Drive Start push button on the VFD.
   6. As soon as start command issued on drive,
4. person standing near Discharge MOV will give open command to it.
5. Person standing near Seal cooling motors should give start command to all seal cooling motors
6. Make sure that discharge MOV opens.
7. Make sure that temperature, vibration, pressure and level of MLPU stays within permissible limits.
8. Make sure that Seal Cooling motors are running.
9. Check the flow in Main line from MFM 2102 ,.
10. Speed increase and Speed Decrease Push buttons shall be used to set the speed of the VFD in coordination with the person standing in front of the MLPU depending upon the suction and discharge pressure of the MLPU.
11. For stopping MLPU (MP1/MP2), bring RPM of MLPU to 2000 (minimum) and push Drive Stop button on the VFD.

**FIELD**

**Field operation should be taken place only in presence of trained electrical and Instrumentation engineers. Filed operation should be performed only in emergency/ critical situation**

1. VFD start mode should be selected as Field from the VFD panel (VFD1/VFD2).
2. Seal cooling plan should be in Manual position.
3. The sequence of operation shall be as follows:
   1. Once MLPU is ready for operation VFD shall be started by using the start button on the Field Push Button station of the corresponding VFD.
   2. NOTE: The operator must be fully aware about which particular VFD has been aligned with which MLPU and accordingly select the VFD Field Push Button station to be operated.
4. One person shall be placed in front of the MLPU with Walkie talkie.
5. One person shall be placed in front of the VFD with Walkie talkie.
6. Once MLPU is ready for operation, the person in front of MLPU shall issue clearance.
7. Suction MOV to be kept fully opened.
8. On receiving the clearance, VFD shall be started by using the Drive Start push button on the VFD.
9. As soon as start command issued on drive,
   1. person standing near Discharge MOV will give open command
   2. Person standing near Seal cooling motors should give start command to all seal cooling motors
   3. Make sure that discharge MOV opens.
   4. Make sure that temperature, vibration, pressure and level of MLPU stays within permissible limits.
   5. Make sure that Seal Cooling motors are running.
   6. Check the flow in Main line from MFM 2102.
   7. Speed increase and Speed Decrease Push buttons shall be used to set the speed of the VFD depending upon the suction and discharge pressure of the MLPU.
10. For stopping MLPU (MP1/MP2), bring RPM of MLPU to 2000 (minimum) and push Stop button on the LCS of (MP1/MP2).

**DETAILED PROCEDURES INVOLVED IN OPERATION OF SOFT STARTER BASED MLPU (MP3)**

**PRE-START CHECKS**

MP3 can be energized in two ways- Remote and Local

The pre-start checks shall be as follows:

1. Check that the MOVs in the process line are opened such that the line is through for operation using MP3.
2. Check that the level of coolant in seal cooling plan is sufficient.
3. Check that the Lube Oil level in the Mainline Pump is sufficient.
4. Check that necessary suction pressure is available for running the MLPU.
5. Check that all RTD’s & BTD’s , Vibration transmitters, Level switches, Pressure switches and seal cooling motors are healthy.
6. Check that MP3 HT breaker relays is in Healthy condition
7. Check that all MLPU MOV’s are in Remote position.
8. Check that selected isolator for MP3 is switched ON
9. Check that HT MP3 feeder is in remote position.
10. Check that Soft Starter is kept in remote position.
11. Check that Local control station for seal cooling motors is energized and placed in remote position.
12. Check that the Field Stop Push Button is in released position.
13. Check that the Emergency Stop Push Button on MP3 HT breaker is in released position.
14. If required, carry out air venting of the mainline pump.

**REMOTE:**

**Remote Operation can be performed by using either PLC terminal or SCADA terminal in MANUAL mode**

1. Carry out all pre-start checks as mentioned above.
2. If any fault exists in PLC/SCADA screen Press ’Maintenance’
3. MP3 Reset command may be given if any lag in SCADA control
4. Check whether selected feeder and soft starter for MP3 is switched ON.
5. Press MP3 Pump Prepare Command on Screen
6. Suction MOV starts opening & Seal Plan motor Starts for coolant circulation.
7. Start the Mainline Pump by giving **start** command from SCADA. Motor gets started to full RPM gradually. Pump discharge will also open automatically. Make sure that discharge MOV is actually opening in field.
8. Running indication will appear on screen
9. Check the flow in Main line from MFM-2102.
10. For stopping MP3, give STOP command from SCADA.

**LOCAL:**

**Local operation should be taken place only in presence of trained electrical and Instrumentation engineers. Local operation should be performed only in emergency/ critical situation**

1. MP3 HT breaker should be selected as Local.
2. One person shall be placed in front of the MP3 with Walkie talkie.
3. One person shall be placed in front of the MP3 HT breaker in PMCC Room with Walkie talkie.
4. Suction MOV to be kept fully opened by operating locally
5. Seal cooling plan should be started manually.
6. Once MP3 is ready for operation the person in front of MLPU shall issue clearance.
7. On receiving the clearance MP3 HT Breaker shall be started by turning TNC switch to close position.
8. As soon as start command issued to MP3, person standing near Discharge MOV will give open command to it.
9. Make sure that discharge MOV opens.
10. Make sure that temperature, vibration, pressure and level of MLPU stays within permissible limits.
11. Make sure that Seal Cooling motors are running.
12. Check the flow in Main line from MFM 2102.
13. For stopping MP3, give STOP command from HT Breaker or Field LCS.