# OPERATING AND MAINTENANCE MANUAL

**Project : BMP PUMP TEST RIG WITH JIB CRANE**

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- State of the art Test Rig Design, Development, Fabrication, Installation, Commissioning, Training & Support.
- Refurbishment/ Up gradation of the Existing Test Rigs.
- Maintenance (AMC) contracts of Existing Test Rigs.
- Operations Contract for the Test Rigs.
- Setting up of complete Testing Infrastructure including civil infrastructure.

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**With Best Regards,**

**Shailendra Pratap Singh**
**CEO**



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# Chapter 1



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# Chapter 1.1 Do's & Don'ts for the System

## 1.1 Do's:

- ✓ Read the User Manual in detail before operating the System.
- ✓ Check that all the manual valve of the system are open when the system is in operation.
- ✓ As certain what tools and equipment are required to carry out the job.
- ✓ Use proper tools to suit the job and avoid unnecessary dismantling.
- ✓ Ensure that all nuts, screws, pipe connectors and covers are properly tightened.
- ✓ Check the proper grounding of the system before operating.
- ✓ Check all the supplies voltage.
- ✓ Make sure the coupling is tight before operating.
- ✓ There should be no loose wiring and all the naked contacts are well insulated.
- ✓ All the power supplies are in operation mode before running the application.
- ✓ Make sure all rotating elements are covered.
- ✓ Insulate electrical (internal and external) motor connections.
- ✓ In case of high vibration in the system immediately shut down the testing.
- ✓ Before starting the test ensure proper mounting of the motor with the shaft.
- ✓ Only trained/qualified service personnel are authorized to service the unit.
- ✓ Connect the unit only to the recommended mains sockets.
- ✓ Turn off the main MCB of the power supply when not to be used for a long time.



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## 1 .2 Don'ts:

- Do not touch the sensors or their mountings.
- Do not touch any wire inside the panel.
- Do not run the machine without opening of manual valve.
- Do not touch any rotating part when in operation.
- Do not put anything in the front of cooler blower.
- Do not put the system in irregular surface.
- Do not change the readings of electrical instrument i.e. **RTD.**
- Do not run the motor/start test if the mounting bolts/fasteners are loose.
- Do not tamper with the power supply trim pots as this may lead to change in voltage levels and damage expensive components.
- Do not open the door of panel without turning OFF the main MCB.
- Do not increase the voltage level of the power supply beyond the rated voltage of the test motor.
- Do not operate the system with wet hands.
- Do not pull the wires coming out of the test bench.
- Do not start the test sequence without the coupling the motor with the shaft.
- Do not tamper or change the wiring without the presence of trained NEOMETRIX Personnel as this may lead to unwanted results and also damage the components.
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# Chapter 2

## Warnings:

- Make sure that all electronic products are earth-grounded, to ensure Personal safety and proper operation.


- All sensors are that is RTD and all the very sensitive; please never try to touch them.

# Chapter 03



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## Legends & Abbreviation

| Sl No. | Abbreviation | Meaning |
|---|---|---|
| 1 | HYD TANK 1,2 | Oil reservoir. 150lts,50ltrs |
| 2 | P-1 | Pump |
| 3 | M-1 | Elect motor for testing pump |
| 5 | M-2 | Electric motor for charging pump |
| 7 | PT | Pressure transmitter |
| 8 | RV | Manually settable relief valve |
| 9 | TT | Temperature transmitter |
| 10 | CV | Check valve |
| 11 | PG-1,2 | Press gauge |
| 12 | BR-1 | Breather |
| 13 | LI | Level indicator |
| 14 | FR- | Filter. 10micron |



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# Chapter 03

## DESCRIPTION OF

# BMP TEST RIG WITH JIB CRANE

## (PROJECT NO. A3984)

**BMP Pump Test Rig with Jib Crane:** is a Testing Facility for gear pump in which we supply motor 3.7kw, motor 5.5kw with belt power transmission arrangement, vane pump, Reservoir 150ltrs, collection tank 50ltrs Unit as Per Technical Specifications.

1. The Ball valve (6.0) at the suction of charging pump is manually operated along with limit switch which tells us that the valve is open or close. The Collection Tank Filling Pump/Motor shall start only if this valve is open.

2. Two Phase Electrical Motor (M2) of 3.7 kw for operating Charge pump(P1).

3. Vane pump with Displacement 22cm3/rev and maximum pressure 17.5 kg/cm2

4. Two Phase Electrical Motor (M1) of 5.5 kw for operating testing pump (17.0)

5. Filter Clogging Indicator Switch (13.0) which indicates that the Filter is clogged.

6. Heater (4.0) is used for increasing the temperature of oil in reservoir.
7. Temperature Sensors (RTD) (3.1) installed to monitor the tank Oil temperature.
8. Level Gauge (2.0) is mounted on tank which shows the level of hydraulic oil of tank.



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9. Pressure Gauge (4.0) is mounted in pump delivery line which shows the pressure in delivery line.
10. Filler Breather (5.0) mounted over the tank whose function is to filter any air and enters inside the tank.
11. The Pressure transmitter (11.1, 11.2) is mounted which shows the pressure with the help of signal.
12. Relief valve (10.0) is mounted on delivery line to set the pressure range.
13. Testing pump fixture (17.0) in which pump is being test.
14. Needle valve at collection tank inlet.
15. Ball Valve at inlet of testing pump for on off.
16. Ball valve at outlet of testing pump for on off.
17. Flow meter at outlet line of testing pump for knowing the outlet flow of testing pump.
18. Reservoir (1.0) 150ltrs Capacity in which temperature of oil increases.
19. Collection Tank (19.0) 50ltrs capacity.



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# Chapter: 5

## OPERATING PROCEDURE

### BMP PUMP TEST RIG

**a) Step 1:**

Check all the connections. Now before starting the system make sure the manual Ball valve with Limit switch (6.0) which is located at the suction and the limit switch we can check it by naked eye as well as on Front panel.

**b) Step 2:**

Push the start button to operate the motor pump assembly.

**c) Step 3:**

There is an electrically actuated valve which is available just after pump and filter, will automatically open and the filling operation will start.

**d) Step 4:**

There are two type of operations available in control panel i.e.

a) Local b) Remote

**Please Note: "On Control Panel User has to select the Switch "Local or Remote".**

Pre-Set/ Pre-Configured System Configuration Settings on HMI installed on Control Panel (CP):



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1- **MAX Fuel Tank Mass (Max FTM)**: Max Mass of the Fuel Tank (Tank Mass+ Fuel Mass) in Kg

2- **MIN Fuel Tank Mass (Min FTM)**:: Min Mass of the Fuel Tank (Tank Mass+ Fuel Mass) in Kg

(Please Note: The "**Max FTM**: Max Mass of the Fuel Tank" is used to STOP the Fuel Tank Filling Pump Motor. Also "**Min FTM** Min Mass of the Fuel Tank" will give warning on Tower Light & HMI).

(Please Note: The "**Max FTM**: Max Mass of the Fuel Tank" is used to STOP the Fuel Tank Filling Pump Motor. Also "**Min FTM** Min Mass of the Fuel Tank" will give warning on Tower Light & HMI). Also the Hooter will generate sound.

**e) <u>Step 5:</u>**

When the Fuel Tank needs to be filled, the USER can use the HMI Screen available on Control Panel (CP) for Fuel Tank Filling locally as follows:

1- User Presses "**Start Fuel Tank Filling**" button on HMI. The following operations will get performed:
   1- First the PLC Controller will check the Tank Mass from IND 570 to see the actual fuel available in the Tank. If it is already at or above **MaxFTM**, it will simply give a pop up on HMI screen saying Fuel Tank is full. It will also show the actual Fuel Mass in the Fuel Tank.
   2- In case the Fuel Tank is not full to pre-set level (**MaxFTM**), the PLC Controller will automatically open the electrically operated Valve – Fuel Circuit Code: (7.0). Through the Limit switch



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mounted on Valve (7.0) PLC controller will become sure that the Valve (7.0) is now open. Through the limit switch mounted on Valve 1.0 the PLC controller will know that Suction Valve (1.0) is open. In case Suction Valve (1.0) is not open it will give Pop-up on HMI and yellow light will glow on Tower Light. It will ask user/operator to open the Suction Valve (1.0). Please note that Suction Valve (1.0) is to be kept open always. Once PLC controller is sure that Valve (1.0) and Valve (7.0) are open, it will put on the Electric Motor (3.0) and the filling process will start. PLC Controller will also look at Clogging Indicator Switch connected with Filter (6.0) while Fuel Tank is being filled. In case the Fuel Filter (6.0) is clogged, it will give a pop up on HMI screen. The mass of the Fuel Tank will keep increasing, as the fuel is being pumped into the Fuel Tank. The controller will stop the electric motor (3.0) once the Fuel Tank is filled to preset level. In case the mass of the Fuel tank does not increase when Motor (3.0) is running then PLC controller will immediately STOP the motor and will give pop up “Fuel supply from LOCO Tank not available” on HMI on Control Panel (CP).

3) Once the Fuel Tank reaches its **Max FTM** level, the following activities shall be performed by the PLC controller:

- PLC Controller will stop the electric motor (3.0).
- PLC Controller will Close Valve (7.0).
- PLC Controller will wait for 30 seconds after closing Valve (7.0) to ensure that fuel dripping from fill pipe stops. At



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this moment the Mass of the Fuel Tank will stay constant (stabilize). The Mass of the Fuel can be seen on HMI.

- Now the Fuel Tank Filling operation is complete.

**Safety Interlocks implemented in Control Panel (CP):**

1- Electric Motor (3.0) will start only when Valve (1.0) and Valve (7.0) are open.

Electric Motor (3.0) will never run if the Fuel Tank Mass is at or above the Pre-Set **MaxFTM**.

After reaching the maximum level, it will give signal on PLC as we have level switch for that. If in case level switch will not work we have an arrangement of secondary containment which will protect the load cell from fuel.

### f) Step 6:

After completion of filling operation, the loco engine will start suction of fuel from SS tank by passing through heat exchanger. During combustion process of fuel , some fuel will return by the engine as there will be some leak off and return line like Right bank leak off , Left bank leak off , Fuel transfer pump relief and Regulated power return so we have an arrangement of heat exchanger (shell and tube type) at power return line and chiller of 12TR capacity. These heat exchanger is designed in such a way that there will be 0.**01Bar** pressure drop in fuel line. As the fuel passes from heat exchanger we have RTD sensor at inlet and outlet of each of them to know the exact temperature of fuel. Two number of RTD sensor is placed at inlet and outlet of chiller line to know the chilled water temperature and to maintain the temperature of fuel to desired valve we have two fuel temperature control valve.



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**g) Step 7:**

By operating the system for a certain interval of time, we can actually calculate the Net Fuel consumption by monitoring the fuel which is been consumed by the engine as it will give digital output on load cell panel.



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