

# HYDRAULIC POWER PACK AND ACTUATOR SYSTEM



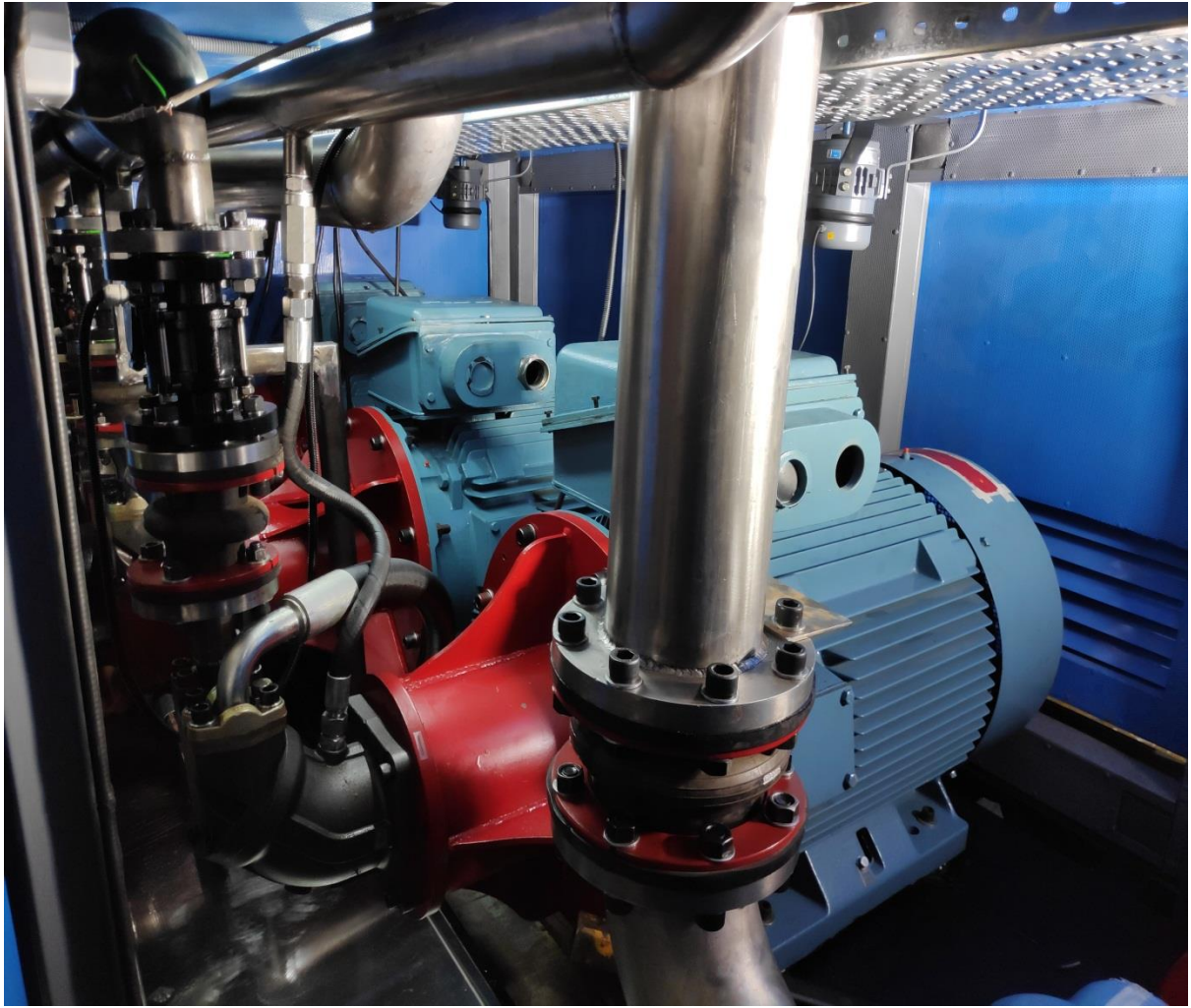
# INTRODUCTION

A hydraulic power supply is required to be designed with proper pumping capacity i.e. Pressure and flow to cater various electro hydraulic actuators and other facilities as per specifications. Filtration system is specified in following specification to maintain oil cleanliness required for use of contamination sensitive components e.g. hydrostatic bearings, servo valves etc. The pumping system should consist of one charging pump and three main hydraulic pumps out of which two are fixed displacement axial piston pumps and third being a variable displacement axial piston pump. First, variable displacement pump shall be run and other fixed displacement pump shall be started when requirement of flow increases. In addition to this there will be electrostatic oil cleaner, cooling tower, dehydration and degasification unit etc. The power pack shall have local control panel for operation and control of various subsystems (electrostatic oil cleaner, cooling tower, dehydration and degasification unit), pumps of power pack; vary pressure through electrically modulated valve.

A junction box has to be provided for remote control of all the above features (as described in local control panel) from main computer control system.

For the On Line diagnosis of the system, sensor is provided at following locations:

1. Temperature at Inlet and Outlet of the system of both heat exchanger and at the inlet and outlet of the chiller line.
2. Temperature transmitter (RTD SENSOR) is provided oil inlet of Heat exchanger.



## TECHNICAL SPECIFICATION

- Filler Breather: Minimum 100 micron for oil and 3 micron for Air.
- Temperature Gauge: 0 to 150 Deg. C, Dial Size:5" , Port Size:1/2" BSPP(Male),MOC:Stem-SS-304
- Oil Reservoir: SS304, 2000 liters of hydraulic oil with appropriate free space above oil level.
- Filter. 10micron (abs). 2000lpm.
- Filter. 3 micron (abs).
- Level Switch
- . Operating fluid temperature range -10 0C to 100 0C.
- Ball Valve with Limit Switch: 10 bars.
- Electric Motor for Cooling Line Pump: 3 phase AC, 415 V  $\pm$ 10%, 50 HZ  $\pm$  5%, Nominal speed: 1400-1500 rpm.
- Anti-Vibration Pads.
- Shell and Tube Heat Exchanger: Maximum oil temp.: 50 °C, Ambient temp. : 30 to 35 deg. C, Oil flow: 700 lpm, Heat removal capacity: 300KW, Oil pressure: 10 bar.
- Cooling Tower: Cooling Rating: 95 Ton, Motor Power: 3.7 kW.
- Variable Displacement Axial Piston type Pump: Max. Operating pressure: 250bar, Design pressure: 315 bars, Flow capacity: 220lpm is preferable.
- Fixed Displacement Axial Piston type Pump: Operating pressure: 250bar, Design pressure: 315 bars, Flow capacity: 220lpm is preferable, flow capacity ( $\pm$ 5%) at operating speed i.e. 1440 rpm.



## **APPLICATION**

It is used to pressure and flow to cater various electro hydraulic actuators and other facilities.

## OPERATING PROCEDURE

### FOR FUEL CONSUMPTION MEASUREMENT SYSTEM

**a) Step 1:**

Check all the connections. Now before starting the system make sure the manual valve (1.0) which is located at the loco suction and automated valve(7.0) is open as it have limit switch we can check it by naked eye as well as PLC.

**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):

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).

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**e) Step 5:**

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 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 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:**

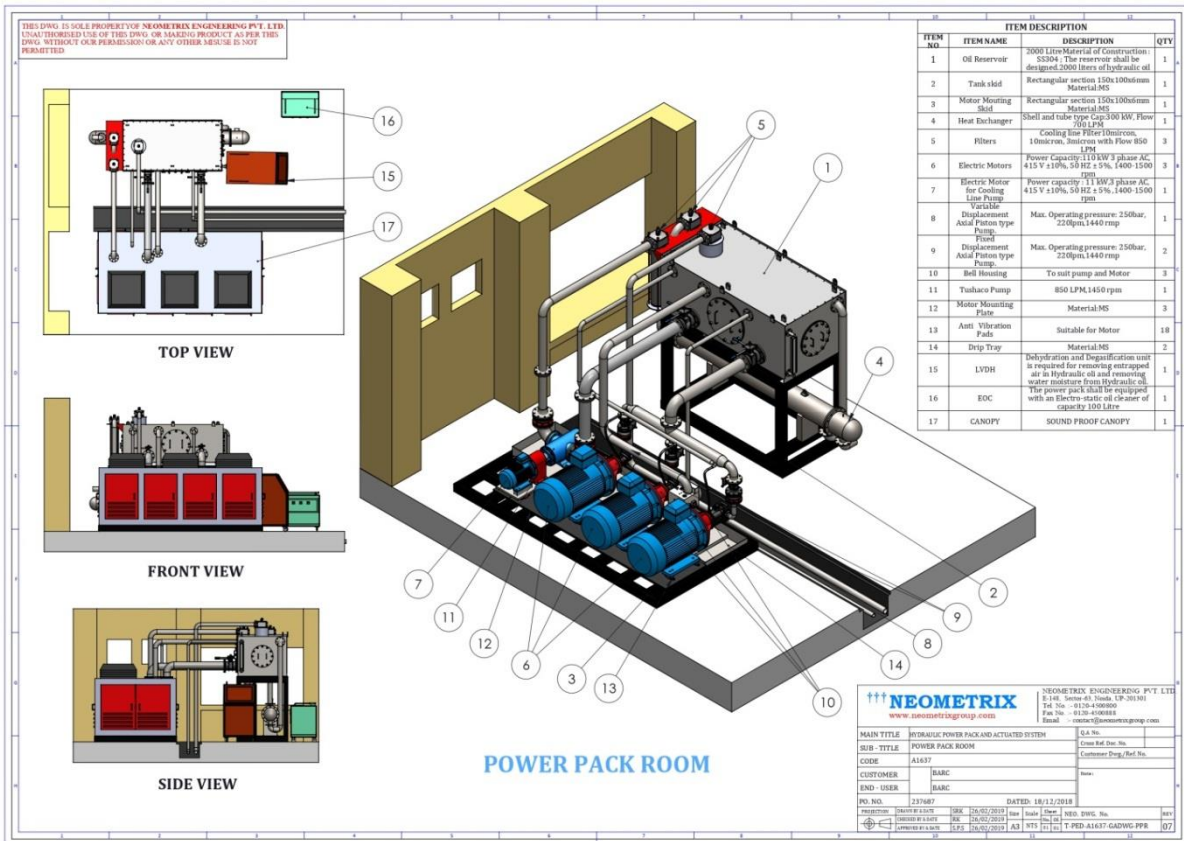
After completion of filling operation, the loco engine will start suction of fuel from SS tank by passing through heat exchanger. During combustion process of fuel, some fuel will return by the engine as there will be some leak off and return line like Right bank leak off, Left bank leak off, Fuel transfer 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.

**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.





## KEY FEATURES

1. The capacitor of hydraulic power pack is 300 kW.
2. Max operating pressure is 250 bars.
3. It consists of Variable Displacement Axial Piston type Pump.
4. It consist Fixed Displacement Axial Piston type Pump.
5. The cooling rate of cooling tower is 95 Ton with Motor Power of 3.7 kW.
6. Pressure Transmitter with Digital indicator with range of 0-300bar.

## **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.
- ✓ Take extra care while installing or removing the cables.
- ✓ Turn off the main MCB of the power supply when not to be used for a long time.

## 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.

