

# Turbine Mechanical Equipment - Hydraulic Power Unit

## Major Components

- Hydraulic fluid reservoir
- Hydraulic pump motors
- Hydraulic pumps
- Accumulators
- Filters
- Reservoir heater
- Heat exchanger
- Air breather/moisture separator
- Drip pan



## Introduction

The hydraulic power unit (HPU) provides the actuator assemblies with a constant source of pressurized hydraulic fluid for positioning the steam valves. The HPU also removes particulate contamination and provides cooling of the hydraulic fluid.

Two fully redundant, pressure compensated, variable volume piston pumps supply hydraulic fluid to the main EHC header. One of the main pumps is always in “stand-by” mode, and automatically starts if the pressure discharge from the “primary” pump drops below the set point.

This transfer occurs without affecting the main EHC header pressure. System accumulators (one located on the HPU) act as pressurized fluid reservoirs and quickly provides for system demands during rapid valve excursions.

A “kidney” pump and motor are provided as part of the unit to filter and cool the hydraulic fluid, and can remain in service when the main pumps are shut down.

A reservoir heater is used to warm the hydraulic fluid during cold weather operation and start-up. Two water-cooled heat exchangers are provided to maintain the fluid temperature within the normal operating range.

## Hydraulic Fluid Reservoir

The hydraulic fluid reservoir is a custom stainless steel design with an internal baffle, site glass, return line down-spouts terminated below the fluid level, drain connection with isolation valve, internal electric heater, air breather, and access cover plate. The reservoir is mounted on an elevated stand to provide all of the pumps with a flooded suction. The system return lines enter through the top of the reservoir and terminate below the fluid level to reduce foaming.

The main function of the reservoir is to store and supply hydraulic fluid used by the system. Additionally, the reservoir walls provide surface area to radiate heat.

The reservoir also acts as a deaerator, allowing entrained air to rise to the fluid surface and escape through the breather.

## Hydraulic Pump Motors

HPU motors are a TEFC design rated for severe duty and employ a c-face style pump mount.

All the motors on the HPU are rated for continuous duty. The kidney pump motor and main pump motor sizes are selected based on the maximum pump volume and system operating pressure.

## Hydraulic Pumps

In the hydraulic system, the pumps convert mechanical energy into hydraulic energy (hydraulic horsepower) to be used by the actuators to position steam control valves.

The two main EHC pumps are pressure compensated, variable volume, axial piston pumps. Adjusting the stroke of the pistons controls the pump output volume. A movable plate controls the piston stroke. As the system pressure begins to decrease the plate is moved, via the pressure compensator, to increase the piston stroke and therefore provide more flow. This system allows the pump output volume to vary while maintaining a constant system pressure.

## Accumulator(s)

Unlike gases, hydraulic fluids are essentially incompressible. Gas charged accumulators provide a means to store the hydraulic fluid under pressure. As hydraulic fluid enters the accumulator on the fluid side, the gas above the fluid is compressed. Any tendency for pressure to decrease at the accumulator inlet forces fluid back out into the system.

The accumulators provided with this system use an expandable bladder to separate the oil and gas sides. Bladder type accumulators have the advantage of rapid response to pressure fluctuations because of the lightweight, low inertia, bladder. The accumulator assembly is comprised of two individual bottles, each

with an isolation and bleed down valve. Each bottle can be serviced with the unit on-line. Pressure gage and relief valves are part of the safety manifold included with each individual bottle.

## Filters

Contamination control is of the utmost importance on today's high-pressure hydraulic control systems. Although a great deal is known about reduction and prevention of contamination ingress into hydraulic systems, it has been estimated that as much as 70% of hydraulic system failures are due to poor fluid condition. The HPU employs two types of filters to remove contamination. The Kidney circuit filter is used to remove contamination from the fluid as the system is filled from the 55-gallon shipping containers. Many users assume that the fluid arrives in the shipping containers "clean". This is not the case. The fluid should be filtered prior to entering the HPU reservoir. This is achieved by closing the kidney pump suction line isolation valve at the reservoir bottom, and opening the customer fill connection isolation valve. When the pump is started, it will draw fluid from the drum and move it through the kidney filter assembly before entering the reservoir. The kidney duplex filter (duplex design provides two filter elements per assembly, allowing on-line filter element changes without bypassing an element) also provides continuous filtration for the fluid in the reservoir.

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