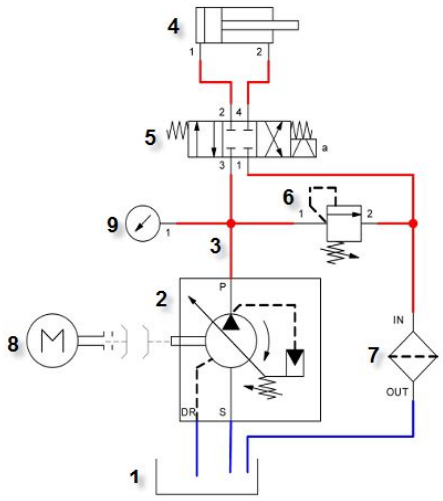
Hydraulic System Overview

There is a saying that a hydraulic system is "controlling a leak under pressure". In order to understand this logic and properly maintain a hydraulic system, we need to understand what a hydraulic system is and what the functions of the components involved are.

Let's take a minute to consider what components would make up a simple hydraulic system. The minimum requirements should be:

- **Tank (1)** – a reservoir to hold the fluid that will transmit the power
- **Pump (2)** – creates the flow of fluid from the tank to the circuit components
- **Hose (3)** – carries the fluid for transmission of power
- **Actuator (4)** – typically a motor to perform work through rotary motion or a cylinder for linear motion.
- **Directional control valve (5)** – controls the movement of the actuator, either forward or reverse
- **Relief valve (6)** – limits the circuit pressure to protect all of the components in the system
- **Filter (7)** – ensures the fluid is kept contaminant free
- **Drive system (8)** – provides the power to rotate the pump
- **Gauge (9)** – to monitor system operation.



(*Diagram of a simple hydraulic system*)

Once the **drive system** is activated the **pump** will begin the flow of oil from the **tank** through the **hoses** into the system. Based on the volume of the pump at a given RPM we can determine the speed at which the actuators within the circuit will operate. Or as one trainer said so well "It takes flow to go".

A common logic miscue is that the pump is the cause of pressure within the circuit. The pressure is actually the result of restriction to flow from the pump. If we were to continue to pump oil into the circuit with nowhere for the oil to go, the pressure within the circuit will rise until something gives. To avoid catastrophic damage within the system we add a **relief valve** to limit system pressure. The relief valve opens at a preset pressure value to vent (leak) the oil back to the tank.

When we shift the **directional control valve,** we allow the oil from the pump to flow (leak) into an **actuator** and perform work in a linear or rotary direction. When the actuator has resistance to work, the pressure within the system will rise to overcome the restriction to flow. Herein lays the logic of "controlling a leak under pressure".

One of the most common causes of failure within a hydraulic system is contamination. A **filter** in the return line of the system will ensure that any contaminants that are created or dislodged within the system under normal operation are captured and will prevent component failure.

A **gauge** installed in the system between the pump and the rest of the circuit will monitor the operating conditions. This gauge tells us how much pressure it takes to overcome the restriction to flow. If the flow of oil to the actuator is blocked, we can use the gauge to determine at what pressure the relief valve opens.

Because a hydraulic system is doing work it is generating heat. Now, consideration has to be given to two other components in our hydraulic system. A **heat exchanger** is required to dissipate the heat generated in the system. A **thermostat** is used to maintain a desired operating temperature by either by-passing or diverting the oil to the heat exchanger.

A final consideration should be given to the most important part of the hydraulic system and that is the hydraulic diagram. Without this item, we cannot map out the flow and pressure performance of the system. Schramm Inc. has created a rig specific diagram for each rig despite the fact that many rigs are optioned with similar equipment. You can contact Schramm, Inc. through this website for an e-copy of your hydraulic diagram. Please be sure to include your rig Serial Number to ensure we provide you the correct hydraulic diagram.