As seen in

THE TRITON

NAUTICAL NEWS FOR CAPTAINS AND CREWS

/tritonnews www.The-Triton.com January 2017

Hydraulic systems offer world of benefits, but only if regular maintenance is followed

Engineer's Angle

Rich Merhige

The mechanical systems of vessels are designed so that many of their processes necessitate the movement of something from one location to another, or a force be applied in some way to secure or shape a product.

Prime movers facilitate these important processes that control everything from opening and shutting a watertight door, moving an anchor, or opening and closing a valve.

Most prime movers are diesel or electrical, but enclosed fluids can also be used to transmit energy to apply force to produce a straight or rotating motion. These fluid-based systems are called hydraulic systems.

Although one system will differ from another based on application, hydraulic systems all have five basic parts that allow them to function in the same manner:

1. A hydraulic pump converts mechanical into hydraulic energy. The pump puts hydraulic fluid under pressure. It's comprised of pipes and valves, along with an accumulator on the pump's discharge side.

It also has a tiny oil reservoir where it's able to take suction.

Hydraulic systems are a convenient method of transferring power over long distances.

There's a float-type alarm that signals when the fluid is low, which will trip the pump, stopping the suction when needed for safety reasons.

2. Valves allow this hydraulic energy to be controlled. The pump will discharge fluid into the valve unit by way of a relief valve. This relieves excess pressure back into the pump's reservoir tank.

Once the pressurized oil passes the control valve and enters the hydraulic cylinder or motor, it begins performing its work (rotating/moving/applying force, etc.) and loses pressure.

Once it loses pressure, it drains back into the reservoir.

3. Hydraulic cylinders convert the hydraulic energy into linear force, motion or rotation.

4. Hydraulic motors convert the hydraulic energy into continuous rotary motion.

5. Ancillary equipment including filters, heat exchangers, tanks and piping complete practical circuits. Hydraulic circuits are a closed system where the hydraulic fluid returns, under pressure, having just performed work.

Hydraulic systems come with many advantages. They're a convenient method of transferring power over long distances. They have fully variable speed for motion, allowing for smooth uptake of load, and powers can be continuously transmitted while speed changes. Torque/high static forces can be attained and maintained for long periods of time.

See **HYDRAULICS**, over

Disadvantages really show up in hydraulics when maintenance not followed, monitored

HYDRAULICS, from front

Hydraulic systems are extremely safe and reliable, even in some of the most tumultuous environmental conditions, and overload is easily prevented. They are also cost effective alternatives.

When proper maintenance is lacking, the disadvantages become less forgiving. These systems can be messy. When high pressure is not properly monitored, serious accidents can occur. Likewise, neglecting leaks can cause the fluids to ignite, causing major fires or explosions.

As with any systems, there are basics of hydraulic system maintenance:

1. Do your homework. The frequency that the hydraulic oil must be renewed is dependent on oil temperature, the application, work cycle and filtration.

2. Hoses should be labeled with date of manufacture.

3. A hose assembly's life expectancy is directly related to the operating parameters of the application. Hose assembly failures can be the result of misapplication such as abrasion or over-pressurization.

4. Ensure the hydraulic hoses in place are correct for the application, are not outdated, and are correctly installed. They should also be checked for corrosion, and inspected closely after experiencing high pressure.

5. Closely monitor the temperature of the system. Temperature guidelines are based on the oil's viscosity.

6. Always check for spilled or leaking oil and isolate it, if possible. Granules, filters or boom pads should be used to clean it.

7. Change filters in accordance with the manufacturer's recommendations.

When proper maintenance is lacking, the disadvantages of hydraulics become less forgiving. When high pressure is not properly monitored, serious accidents can occur.

8. Inspect hoses frequently for wear. Some common causes of hose assembly failures are:

a. Expired service life; 10 years is a good rule of thumb.

b. Improper hose insertion depth.

c. Fitting shell was not crimped to the required dimensions.

d. Hose twisted.

e. Abrasion of the hose caused by excessive rubbing or chafing. Install sleeves or reposition to prevent rubbing.

f. Hose minimum bend radius exceeded. Hoses should run two times its diameter before it begins to bend.

g. Fluid incompatibility. Inner tube deteriorates, may swell and delaminate. Make sure the hose is compatible with the fluid before installing.

h. Dry rot (dry air aged). Common in refrigerated or air drying systems.

i. Excessive temperatures. Hose becomes brittle and resists bending. Install heat guards, use a hose that can withstand the temperature, or change the operating environment.

j. Excessive pressure. Cavitation will cause excessive temperatures. Similar to above. Review application.

9. Stay on top of fluid levels and know when they need to be replenished or renewed.

10. Select the proper fluid.

Proper and timely maintenance of hydraulic systems can lead to many years of successful use, with a significant return on investment.

Rich Merhige is owner of Advanced Mechanical Enterprises and Advanced Maintenance Engineering in Ft. Lauderdale (www.AMEsolutions.com).