DOWNLOAD PDF HYDRAULIC SYSTEM TROUBLESHOOTING GUIDE

Chapter 1 : Hydraulic System Troubleshooting | Advanced Fluid Systems

calendrierdelascience.com Printed 5/9/02 1 Condensed Table - Causes of Trouble and Their Effects in Hydraulic Installations Source of Trouble, Effects 1 Mechanical Drive 2.

Your safety is important to us! Gradual or sudden loss of pressure or flow resulting in a loss of power is common in hydraulic system failure. These step-by-step procedures should help you locate and remedy the problem quickly. Wrong oil in system. Filter dirty or clogged. Drain oil and replace filter or filter element. Oil lines dirty or collapsed. Air leaks in pump suction line. Repair or replace as necessary. Worn or dirty pump. Clean, repair or replace. Check for contaminated oil. Drain and flush system. Badly worn components valves, cylinders, etc. Examine and test for internal or external leakage. Check for cause of wear. Check all components, particularly the relief valve for proper settings. Refer to technical manuals. Check unit specifications for load limits. Slipping or broken pump drive. Repair or replace belts, couplings, etc. Check for proper alignment or tension. Check suction side of system for leaks. Allow ample warm-up period. Dirty or damaged components. Clear or repair as necessary. Restrictions in filters or lines. Allow oil to warm up before operating machine. Low pump drive speed. Increase engine speed check manual for recommendations. Check suction side for leaks. Badly worn pump, valves, cylinders, etc. Repair or replace as needed. Check orifices, relief valves, etc. Replace seals or damaged lines. Replace or adjust as necessary. Engine running too fast. Return control valve to neutral when not in use. Incorrect oil, low oil, dirty oil. Use recommended oil, fill reservoir, clean oil, replace filter elements. Excessive component internal leakage. Repair or replace component as necessary. Restriction in filters or lines. Clean dirt and mud from reservoir and components. Replace, clean or add oil as needed. Check suction line and component seals for suction leaks. Suction line plugged or too small, inlet screen plugged. Follow instructions packed with unit. Use of pipe fitting in inlet. Replace with correct fitting. Refer to installation instructions. Loose or broken parts. Control valve not centering when released. Check for spool binding. Tie-bolts too tight stack valves. Handle bracket screws loose. Seals damaged or worn. Back pressure or restriction in tank line. Use power beyond when necessary. Cracked port or body. Use of a valve without loadcheck. Replace with recommended valve.

Chapter 2 : Hydraulic Systems Ltd. :: Reference :: Hydraulic Troubleshooting - Step 1

4 Troubleshooting Guide & Maintenance Hints General The troubleshooting charts and maintenance hints that follow are of a general system nature but should.

Ford Tractor Hydraulic System Troubleshooting by Wesley Tucker Ford tractors use hydraulic assist systems to raise, lower or move a variety of lifts, loaders and earth-moving tools. All Ford tractors have the same hydraulic components: Controls Check all the connections and control valves operating the system if the control reaction is slow. Inspect all the valves opening and closing within the system for full actuation. All valves need to be properly seated with tight fittings and seals. Direct cabling or motorized actuators operate the valves, depending on your Ford tractor model. Make sure the cables are tight and the motors perform to specifications. Fluid Check all the fittings attached to the pump, reservoir, filter housing, hoses and pistons if the system often needs more fluid, or you see fluid puddles of fluid around or on the Ford tractor. Check for pinhole leaks in the rubber hoses. Hoses can leak a lot of fluid through small holes under pressure. The reservoir drain plug needs to be tight. Inspect all the seals on the pump assembly for any leaks, and tighten, repair or replace if necessary. Vibration Check all the clamps and mounts if your Ford tractor is vibrating too much when using the hydraulics. Go around and tighten all the plastic and stainless steel clamps and brackets. Always check these clamps when the system is pressurized. When the system is not operating, loose brackets or clamps night not be apparent. Power Check the pump and the fluid pressure if the hydraulic-powered apparatus appears weak and is not moving properly. Inspect the power supply for the hydraulic pump and drive belt to make sure both perform to specifications. Pumps will not achieve full pressure with a slipping belt. Check the reservoir and add fluid to correct levels. Hydraulic systems work best with exact fluid levels. More fluid will not mean more power. Replace the filter regularly to avoid problems with accumulated contamination. If the filter is dirty or clogged, it will prevent the fluid from freely going from the reservoir to the pump and returning. Check the hydraulic pistons. Any dents or wearing can cause the pistons to bind and not move freely when pressurized. Troubleshooting the Ford 8N Hydraulic Lift About the Author Wesley Tucker is a lifelong southerner whose politics are objective, whose sports are many and whose avocations range from aviation to anthropology to history and all forms of media.

Chapter 3 : Symptoms of Common Hydraulic Problems and Their Root Causes

Basic Diagram for a Typical Hydraulic System Symptoms Many of the failures in a hydraulic system show similar symptoms: a gradual or sudden loss of high pressure, resulting in loss of power or loss of speed in the cylinders.

It involves a lot of science and sometimes, a bit of art. Incorrect diagnosis prolongs downtime and can result in the unnecessary repair or replacement of serviceable components. Avoiding these costly mistakes requires the correct equipment and a logical approach. The process of troubleshooting should always begin with checking and eliminating the easy things first. The benefits of this approach are clearly illustrated by a recent troubleshooting situation. The machine in question had a complex hydraulic system, the heart of which comprised two engines driving 10 pumps. Six of the pumps were variable displacement units and four of these had electronic horsepower control. The symptoms of the problem were slow cycle times combined with engine lug-down loss of engine rpm. The machine had just been fitted with a new set of pumps. The mechanic in charge diagnosed that the hydraulic system was tuned above the power curve of the engines, that is, the hydraulic system was demanding more power than the engines could produce. This resulted in engine lug-down and therefore slow cycle times. The other possible explanation was that the engines were not producing their rated horsepower. In order to eliminate the easy things first the complexity of the hydraulic system meant that it would take approximately four hours to run a complete system check and tune-up , I inquired about the condition of the engines and their service history. The mechanic not only assured me that the engines were in top shape, he was adamant that this was a hydraulic problem. Four hours later, after running a complete check of the hydraulic system without finding anything significant, I was not surprised to find that the problem remained unchanged. After a lengthy discussion, I convinced the mechanic to change the fuel filters and air cleaner elements on both engines. This fixed the problem. It turned out that a bad batch of fuel had caused premature clogging of the engine fuel filters, which prevented the engines from developing their rated horsepower. Assess The Problem and Eliminate The Obvious Before you incur the expense of hiring a technician, assess the problem and eliminate all of the obvious, possible causes. In the previous example, if the relatively simple task of changing the engine fuel filters had been carried out when the problem was first noticed, an expensive service call and four hours downtime could have been avoided. A wire that had broken off a solenoid valve, a pin that had fallen out of a mechanical linkage, an isolation valve that had vibrated closed, a blocked heat exchanger. But you may be annoyed with yourself for not checking something so obvious, knowing that you could have easily saved a couple hundred dollars. But it is nowhere near as costly as paying for the unnecessary repair or replacement of serviceable components, as a result of incorrect diagnosis of a problem. Several years ago, I was asked for a second opinion on the condition of a set of pumps operating a processing plant. The customer had called in a technician to check the performance of these pumps and was alarmed when the technician advised that all four pumps needed repair. The pumps in question were variable-displacement units fitted with constant power control. The power required to drive a hydraulic pump is a product of flow and pressure. A constant power or power-limiting control operates by reducing the displacement, and therefore flow, from the pump as pressure increases, so that the power rating of the prime mover is not exceeded. The advantage of this control is that more flow is available at lower pressures, so the machine operates faster under light loads. This results in better utilization of the power available from the prime mover. Pump performance is checked using a flow-tester to load the pump and measure its flow rate. As resistance to flow is increased, pressure increases and the flow available from the pump to do useful work decreases because of internal leakage. The difference in the measured flow rate between no load and full load determines the volume of internal leakage and therefore pump performance. I tested all four pumps, recording flow against pressure from no load through to maximum working pressure. In my report, I explained to the customer how the tests revealed that pump flow did decrease significantly as pressure increased, but that this is a normal characteristic of a pump fitted with constant power control. I further advised that apart from the constant power control requiring adjustment on two of the pumps, the performance of all four pumps was acceptable. I suspect it was the latter, with the technician failing to either establish or understand that the pumps he was testing were fitted with constant power control. This ignorance led to an incorrect interpretation of the test results. Whatever the explanation, the customer could have paid thousands of dollars for unnecessary repairs, if he had not sought a second opinion. When you have a problem with your hydraulic equipment, carry out an informed assessment of the problem and eliminate the obvious before you call a technician.

Chapter 4 : Hydraulic Troubleshooting: Getting the Correct Diagnosis - The First Time

In any troubleshooting situation, no matter how simple or complex the hydraulic system, always start with the basics. This ensures that the obvious is never overlooked. In order for the 'obvious' to be obvious, the fundamental laws of hydraulics must be kept in mind.

In the case of hydraulic systems, there are three easily detectable symptoms that give early warning of root cause conditions. These symptoms are abnormal noise, high fluid temperature and slow operation. Abnormal Noise Abnormal noise in hydraulic systems is often caused by aeration or cavitation. Aeration occurs when air contaminates the hydraulic fluid. Air in the hydraulic fluid makes an alarming banging or knocking noise when it compresses and decompresses, as it circulates through the system. Other symptoms include foaming of the fluid and erratic actuator movement. Aeration accelerates degradation of the fluid and causes damage to system components through loss of lubrication, overheating and burning of seals. For this reason, it is important to make sure pump intake lines are in good condition and all clamps and fittings are tight. Flexible intake lines can become porous with age; therefore, replace old or suspect intake lines. If the fluid level in the reservoir is low, a vortex can develop, allowing air to enter the pump intake. Check the fluid level in the reservoir, and if low, fill to the correct level. In some systems, air can enter the pump through its shaft seal. Check the condition of the pump shaft seal and if it is leaking, replace it. Cavitation occurs when the volume of fluid demanded by any part of a hydraulic circuit exceeds the volume of fluid being supplied. This causes the absolute pressure in that part of the circuit to fall below the vapor pressure of the hydraulic fluid. This results in the formation of vapor cavities within the fluid, which implode when compressed, causing a characteristic knocking noise. The consequences of cavitation in a hydraulic system can be serious. Cavitation causes metal erosion, which damages hydraulic components and contaminates the fluid. In extreme cases, cavitation can cause mechanical failure of system components. While cavitation can occur just about anywhere within a hydraulic circuit, it commonly occurs at the pump. A clogged inlet strainer or restricted intake line will cause the fluid in the intake line to vaporize. If the pump has an inlet strainer or filter, it is important for it not to become clogged. If a gate-type isolation valve is fitted to the intake line, it must be fully open. This type of isolation device is prone to vibrating closed. The intake line between the reservoir and pump should not be restricted. Flexible intake lines are prone to collapsing with age; therefore, replace old or suspect intake lines. Hydraulic systems dissipate heat through the reservoir. Therefore, the reservoir fluid level should be monitored and maintained at the correct level. Check that there are no obstructions to airflow around the reservoir, such as a build up of dirt or debris. It is important to inspect the heat exchanger and ensure that the core is not blocked. The ability of the heat exchanger to dissipate heat is dependent on the flow rate of both the hydraulic fluid and the cooling air or water circulating through the exchanger. Therefore, check the performance of all cooling circuit components and replace as necessary. When fluid moves from an area of high pressure to an area of low pressure without performing useful work pressure drop , heat is generated. This means that any component that has abnormal internal leakage will increase the heat load on the system. This could be anything from a cylinder that is leaking high-pressure fluid past its piston seal, to an incorrectly adjusted relief valve. Identify and change-out any heat-generating components. Air generates heat when compressed. This means that aeration increases the heat load on the hydraulic system. As already explained, cavitation is the formation of vapor cavities within the fluid. These cavities generate heat when compressed. Like aeration, cavitation increases heat load. Therefore, inspect the system for possible causes of aeration and cavitation. In addition to damaging seals and reducing the service life of the hydraulic fluid, high fluid temperature can cause damage to system components through inadequate lubrication as a result of excessive thinning of the oil film low viscosity. To prevent damage caused by high fluid temperature, a fluid temperature alarm should be installed in the system and all high temperature indications investigated and rectified immediately. Slow Operation A reduction in machine performance is often the first indication that there is something wrong with a hydraulic system. This usually manifests itself in longer cycle times or slow operation. It is important to remember that in a hydraulic system, flow determines actuator speed and response. Therefore, a loss of speed indicates a loss of flow. Flow can escape from a hydraulic circuit through external or internal leakage. External leakage such as a burst hose is usually obvious and therefore easy to find. Internal leakage can occur in the pump, valves or actuators, and unless you are gifted with X-ray vision, is more difficult to isolate. As previously noted, where there is internal leakage there is a pressure drop, and where there is a pressure drop heat is generated. This makes an infrared thermometer a useful tool for identifying components with abnormal internal leakage. However, temperature measurement is not always conclusive in isolating internal leakage and in these cases the use of a hydraulic flow-tester will be required. The influence of internal leakage on heat load means that slow operation and high fluid temperature often appear together. This can be a vicious circle. When fluid temperature increases, viscosity decreases. When viscosity decreases, internal leakage increases. When internal leakage increases, heat load increases, resulting in a further increase in fluid temperature and so the cycle continues. Proactively monitoring noise, fluid temperature and cycle times is an effective way to detect conditions that can lead to costly component failures and unscheduled downtime of hydraulic equipment. In most cases, informed observation is all that is required.

Chapter 5 : Hydraulic Systems Ltd. :: Reference :: Hydraulic Troubleshooting

Hydraulic System Troubleshooting Guide Follow these steps to make an initial diagnosis of what may be causing a low or no pressure situation with a Hydra-Tech hydraulic.

Troubleshooting Tips for Hydraulic Systems Download Data Sheet This data sheet describes a step-by-step check-out procedure for hydraulic systems which have previously been working satisfactorily but which have developed trouble, usually over a hour working period, which renders them inoperative. It is not intended as a diagnostic check of new systems which may have been incorrectly designed. Other supplementary information on specific components such as pumps, cylinders, and valves will be found in other data sheet issues, and is referenced in the text. For checking out a system it is usually necessary to have at least one pressure gauge, installed in the pump line as shown in the diagram. The diagram shows the major components used in nearly all hydraulic systems. Most system failures can be pinpointed to one of these components. Basic Diagram for a Typical Hydraulic System Symptoms Many of the failures in a hydraulic system show similar symptoms: The cylinder s may not move at all, or if they do they may move too slowly or may stall under light loads. Often the loss of power is accompanied by an increase in pump noise, especially as the pump tries to build up pressure against a load. Of course, any major component pump, relief valve, cylinder, 4-way valve, filter, etc. And in a highly sophisticated system there are other minor components which could be at fault, but these possibilities are too numerous to be covered in this brief discussion of troubleshooting. By following an organized step-by-step testing procedure in the order given here, the problem can usually be traced to a general area, then if necessary, each component in that area can be tested or can temporarily be replaced by another similar component known to be good. Step 1 - Pump Inlet Strainer Probably the field trouble encountered more often is cavitation of the hydraulic pump inlet caused by dirt build-up on the inlet strainer. This can happen on a new system after only a few hours operation as well as on a system which has been in service for a long time. It produces the symptoms described above: If the strainer is not located next to the pump inlet, it will usually be found immersed below the oil level in the reservoir. Some operators are not aware of this strainer, or if they are, they do not give it attention until the system fails, at which time the pump may be ruined. If not regularly cleaned or replaced, sooner or later the strainer will become sufficiently restricted to cause a breakdown of the entire system. The inlet strainer should be removed for inspection and should always be cleaned before re-installation. Wire mesh strainers can be cleaned with an air hose, blowing from the inside out. They can also be washed in a solvent, scrubbing them with a bristle brush. The solvent should be compatible with the hydraulic fluid in the tank. For example, kerosene may be used on strainers operating in petroleum oil. Avoid the use of gasoline, lacquer thinner, or other solvents which are explosive or highly flammable. The strainer should then be blown out whether or not it appears to be dirty. Some clogging materials cannot be seen except on very close inspection. If there are any holes in the mesh or if there is any apparent physical damage, the strainer should be replaced. When re-installing the strainer, inspect all joints in the inlet plumbing for air leaks, particularly at union joints. There must be no air leaks in the pump inlet line. If it does not, there is danger of a vortex forming above the strainer which may allow air to enter the system when the pump is running. Notice the condition of the inlet hose if one is used. A partially collapsed hose or one with internal swelling has the same effect as a clogged inlet strainer. Step 2- Pump and Relief Valve If cleaning the pump inlet strainer does not correct the trouble, isolate the pump and relief valve from the rest of the system by disconnecting the plumbing at Point B and capping both ends of the disconnected lines. This deadheads the pump into the relief valve. Start the pump and watch for build-up of pressure on the gauge while tightening the relief valve adjustment. If full pressure can be developed, obviously the pump and relief valve are operating correctly and the trouble is further down the line. If full pressure cannot be developed in this test, continue with Step 3. Step 3 - Pump or Relief Valve Further testing must be done to determine whether the pump or the relief valve is at fault. If possible, disconnect the tank return line from the relief valve at Point C. Attach a short length of hose to the relief valve outlet. Hold the open end of this hose over the tank filler opening where the rate of oil flow can be observed. Start the pump and run the relief valve adjustment up and down while observing the relief valve discharge flow. If the pump is bad, a full stream of oil may possibly be observed when the relief valve is backed off and this stream will greatly diminish or stop as the relief setting is increased. If a flowmeter is available, the flow rate can be measured and compared with the catalog rating for the pump. If a flowmeter is not available, the flow can be measured by discharging the stream into a measuring container while timing with the sweep hand on a watch. Or, if the relief valve tank return line cannot be disconnected, the mechanic can place his hand in the discharge stream under the oil level in the tank to detect a drop-off in flow velocity. During this test if the gauge pressure does not rise above a low value, say PSI, and if the flow does not substantially decrease as the relief valve setting is increased, the relief valve is at fault and should be cleaned or replaced as instructed in Step 5. If the flow decreases as the relief setting is raised, and only a moderate, but not full pressure can be developed, this indicates pump trouble. Proceed to Step 4. Assuming that the inlet strainer has been cleaned and the inlet plumbing has been examined for air leaks or collapsed hose, the oil is slipping internally from outlet back to inlet. The pump may be worn out or the oil may be too thin. Excessively high temperature in the oil causes the oil to thin out and to slip excessively in the pump. High slippage in the pump will cause it to run much hotter than the oil in the tank. If greater than this, excessive pump slippage may be the cause. Check also for slipping belts, sheared shaft key, broken shaft, broken coupling, loosened set screw, and other possible troubles listed in Design Data Sheet Step 5 - Relief Valve If Step 3 has indicated the relief valve to be at fault, the quickest remedy is to replace it with one known to be good. The faulty valve may later be disassembled and cleaned. Pilot-operated relief valves have small internal orifices which may become blocked with dirt. Blow out all passages with an air hose and run a small wire through orifices. Check also for free movement of the spool. Pipe thread connections in the body may distort the body and cause the spool to bind. If possible, check for spool bind before removing threaded line connections, or while testing on the bench, screw pipe fittings tightly into the port threads. Step 6 - Cylinder If the pump will develop full pressure while operating across the relief valve in Step 2, both of these components can be assumed to be good. Step 7 - Directional 4-Way Valve If the cylinder has been tested for piston leakage and found to have a reasonably tight piston, the 4-way directional valve may be checked for excessive spool leakage. It is rare that a valve becomes worn so badly that the pump cannot build up full pressure but it can happen. Symptoms of excessive leakage are a loss of cylinder speed -together with difficulty in building up to full pressure even with the relief valve adjusted to a high setting. This condition would be more likely to happen when using a pump with small displacement operating at very high pressure, and might have developed gradually over a long period of time. See Design Data Sheet 18 for solenoid valve problems. Other Components If the above procedure does not pinpoint the trouble, check other components individually. Usually the quickest and best troubleshooting procedure is to replace these components one at a time with similar components known to be good. Pilot-operated solenoid valves which will not shift out of center position may have insufficient pilot pressure.

DOWNLOAD PDF HYDRAULIC SYSTEM TROUBLESHOOTING GUIDE

Chapter 6 : Hydraulic System Troubleshooting Tips | Cross Mfg.

Downloads & Tools Hydraulic System Troubleshooting and Maintenance. Hydraulic System Troubleshooting Guide - This comprehensive and easy to use guide for troubleshooting hydraulic systems offers both a condensed and expanded set of tables that show "trouble" - "cause" - "remedy".

Mitsubishi Tractor Hydraulics Troubleshooting by Wesley Tucker Mitsubishi tractors have hydraulic assist systems to operate raising, lowering, moving or operating a variety of equipment installations. It does not matter what type of machine your Mitsubishi tractor operates hydraulically, they all share the same basic components: Troubleshooting problems means knowing these vitals parts of the Mitsubishi tractor hydraulic system. Lack of Power If the hydraulic-powered apparatus is not at full power, the first thing to check is the pump and the fluid pressure. Make sure the hydraulic pump power supply and drive belt are working as specified. A slipping belt can cause pumps to not achieve full pressure. Add fluid if necessary but do not overfill. A dirty filter not allowing free flow of fluid from the reservoir to the pump can also be affect power. Replace the filter if necessary. Finally, examine the hydraulic-actuated pistons. Make sure they are not binding or have any dents or other obstructions preventing a full range of extension and retraction. Fluid leaks If the system is repeatedly in need of more fluid, or you see fluid puddles on the ground or on the machine, check all the fittings attached to the pump, reservoir, filter housing, hoses and pistons. Check rubber or other elastic hydraulic lines for pinhole leaks. A small pinhole under pressure can spray a lot of fluid. Also, check the reservoir drain plug for a tight fight. Make sure the pump is not leaking from any seals when pressurized. Excessive vibration If your Mitsubishi tractor is vibrating excessively when the hydraulic system is activated, check all the clamps and mounts. Whether a stainless steel bracket mount or a plastic insert clamp, go around and tighten all the fasteners. Also, check the clamps and mounts when the system is under pressure. Many loose fasteners and clamps are not noticeable unless the system is pressurized and operating. Sluggish control response If your control response seems sluggish, check all the connections and control valves operating the system. Make sure the actuated valves than open and close to allow fluid into the system react within proper specifications. A slow valve means the fluid is delayed to the system will not respond quickly to your control. Valves also need to be properly sealed and all fittings leak free. Getting the Correct Diagnosis - The First Time About the Author Wesley Tucker is a lifelong southerner whose politics are objective, whose sports are many and whose avocations range from aviation to anthropology to history and all forms of media.

Chapter 7 : Ford Tractor Hydraulic System Troubleshooting | It Still Runs

Air usually enters the hydraulic system through the pump's inlet. For this reason, it is important to make sure pump intake lines are in good condition and all clamps and fittings are tight. Flexible intake lines can become porous with age; therefore, replace old or suspect intake lines.

Chapter 8 : Mitsubishi Tractor Hydraulics Troubleshooting | It Still Runs

Troubleshooting Hydraulic System Problems Introduction to Hydraulic Systems In , French scientist, mathematician and philosopher Blaise Pascal discovered the fundamental law of physics that forms the basis.

Chapter 9 : Troubleshooting Tips for Hydraulic Systems - Womack Machine Supply Company

Hydraulic Maintenance & Troubleshooting PRESENTED BY -Try to isolate the hydraulic system from the This guide cannot cover all details or all variations in.