TROUBLESHOOTING TABLE

TROUBLESHOOTING GUIDE
GLOSARY OF TERMS

NO FLOW, NO PRESSURE

A) Is the pump rotating?

a-1) Check if the coupling is rotating. If not, check the rotation of the electric motor.
a-2) Check the keys of the pump and E motor shaft.
a-3) Check if the shaft is not broken.

B) Is the rotation in the correct direction?

b-1) Check if the rotation of the pump corresponds to the arrow on the name plate.
b-2) Check if the wiring of the electric motor is correct.

C) Is the air bleed-off done?

c-1) Check that no air is still located in the pressure line. Loosen a connector

D) How are the inlet conditions?

d-1) Check if the inlet gate valve is not closed.
d-2) Check the oil level.
d-3) Checks if the inlet hose in the tank is under the oil tank level.
d-4) Checks if an air intake is not disturbing the inlet (missing inlet flange seal, air trapped in suction line as examples).
d-5) Check if the pump is not located too high above the oil level.
d-6) Check if the tank is not completely sealed. Then the lack of atmospheric pressure will not allow the pump to prime.
d-7) Check if all connections and seals are air-tight.

E) Is the Viscosity not too high?

e-1) Check if the oil characteristics are not incompatible with the temperature and the pumps requirements. Too high Viscosity will "stick" the vein fluid and enable the pump to suck the oil correctly.

F) Is the pump flow not going somewhere else?

f-1) Check the hydraulic circuit and the main sequences. Doing so, you will check if all the valves are set or work properly.
f-2) Check if the main relief valve is not set at an extremely low pressure and therefore bringing all the flow back to the tank.
f-3) Checks if in the directional valves the spools are not sticking in a position that brings the flow back to the tank.
f-4) checks if the check valve is not mounted "upside down".

G) Is the receptor working correctly?

g-1) Check if the motor does not let the entire flow leak internally.
g-2) Check if the cylinder inner seals are not ruined.

H) Is the speed high enough?

h-1) Check if the minimum speed is reached. Mobile pumps require 400 rpm and industrial pumps require 600 rpm.

C/ Joaquín Costa, 10. 1º dcha. B 50001 Zaragoza (Spain) T.: +34 976 233 062 F: +34 976 235 557
www.tdz.com sales@tdz.com

NOT ENOUGH FLOW (OR NOT THE FLOW REQUIRED)

A) Are the components OK?

a-1) Check the displacement of the pump.
a-2) Check if the speed of the pump is not too low or too high (E motor or thermal engine sized too small so dropping the speed too low...).
a-3) Check if the main relief valve is not set at an extremely low pressure and, therefore, venting some flow back to the tank.
a-4) Check if in the directional valves the spools are not sticking in a position that brings part of the flow back to the tank.
a-5) Check if the hydraulic motor is not leaking internally due to a bad efficiency, low viscosity...
a-6) Check if the cylinder inner seals are not ruined and, therefore, allow internal leakage.

B) Is the connection from the tank to the pump correct?

b-1) Check if there is no air intake between the pump and the inlet pipe (bad seals for example).
b-2) Check if the inlet hose is convenient for the required velocity (0,5 < V < 1,9 mls).
b-3) Checks if the pump is not too high compared to the oil level or if the pump is not too far from the tank (checks the inlet absolute pressure with the catalogue values).
b-4) Check if the gate valve is not semi-open.
b-5) Checks if the inlet strainer is sized correctly (250 m mesh mini) or not clogged.

C) Is the tank design correct?

c-1) Check if the oil level is correct.
c-2) Check if the suction pipe is under the oil level during the complete cycle of the machine.
c-3) Checks if the inlet hose fitted in the tank is cut with an angle wider than 45°.
c-4) Check if this inlet hose is not too close to the tank wall or to the bottom of the tank and therefore limits the "vein flow".
c-5) Check if the suction hose is not located near the return line and therefore sucking a lot of air coming from these turbulences.
c-6) Check if baffles are required to allow correct deareation of the fluid.
c-7) Check if the air filter is not clogged or under seized (not well dimensioned).
c-8) Check if the tank is not fully tight, not allowing the atmospheric pressure to apply.

D) Is the oil convenient?

d-1) Check if the oil characteristics are not incompatible with the pumps requirements.
d-2) Check if the viscosity is not too high, therefore “sticking” some vanes in the rotor or blocking the vein fluid.
d-3) Check if the high temperature does not destroy the viscosity of the fluid. Doing so, the internal leakage will “consume” the flow.

NO PRESSURE

A) Is the hydraulic circuit correctly designed?

a-1) Check the hydraulic circuit schematic.

B) Is the circuit correctly piped?

b-1) Compare the schematic to the piped circuit.

C) Are the components working correctly?

c-1) Check the main sequences. Doing so, you will check if all the valves are set or work properly.
c-2) Check if the main relief valve is not set at an extremely low pressure and therefore bringing all the flow back to the tank.
c-3) Check if in the directional valves the spools are not sticking in a position that brings the flow back to the tank.

NOT ENOUGH PRESSURE

A) Check as when "no pressure"

B) Is the system well dimensioned?

b-1) Check if the flow required is not over the available flow and therefore cannot build-up pressure.

C) Is there an internal leakage somewhere that maintains a certain pressure?

c-1) Check all the possible faulty components, from the pump to all the receptors and intermediates (high pressure seals, mechanical wear…).

UNCOMMON NOISE LEVEL

A) Is the noise coming from the pump?

a-1) Check the mechanical link of the shaft pump : alignment, balancing of the coupling or Universal joint, key properly fastened, ...
a-2) Check if the air bleed has been done correctly.
a-3) Check if there is no air intake from the tank to the pump (not through the shaft seal).
a-5) Check if the hose strain force does not create this noise.
a-6) Check if the oil level is correct.
a-7) Check if the oil in the tank is not aerated.
a-8) Check if the strainer is not clogged or under dimensioned.
a-9) Check if the inlet pipe is under the oil level.
a-10) Check if the air filter is not clogged or too small.
a-11) Check if the speed is not incompatible with the catalogue values.
a-12) Check if the oil is compatible with the catalogue recommendations.
a-13) Check if the inlet pressure is not higher than the outlet pressure.

B) Is the noise coming from the surroundings?

b-1) Check the hoses and see if the noise in not corning back to the pump this way.
b-2) Check the pressure piping and see if its length dumps or amplifies the noise.
b-3) Check if the structure of the tank is stiff enough to avoid amplification/resonance.
b-4) Check the E motor fan.
b-5) Check the balancing of the E motor.
b-6) Check the water cooler and its theoretical limits.
b-7) Check the filtration unit, its capacity and if the noise does not come from the opened by-pass valve.

C/ Joaquín Costa, 10. 1º dcha. B 50001 Zaragoza (Spain) T.: +34 976 233 062 F: +34 976 235 557
www.tdz.com sales@tdz.com

UNUSUAL HEAT LEVEL

A) Does the heat appear when the pump is running without pressure?

a-1) Check the oil level and the suction pipe. Is the oil coming to the pump (check the length of the pipe, its internal diameter, all that could influence the inlet pressure)?
a-2) Check if the air bleed has been done correctly. a-3) Check if the flow versus the volume of oil in the tank is correct to obtain a good cooling effect.
a-4) Check if a cooler is required or, if there is one, if it is well dimensioned.
a-5) If there is a cooler, check if it is working (example for water cooler: is the water flow open or sufficient).
a-6) Check if the hydraulic circuit is not bringing back the flow directly to the inlet port. Doing so, it would create a very small closed circuit not able to cool down the fluid.
a-7) Check the quality of the fluid.
a-8) Check the velocity of the fluid.
a-9) Check the filtration unit, its capacity and if the heat does not come from the open by-pass valve or if it is under-dimensioned (bigger delta P).

B) Does the heat appear when the pump is running with pressure?

b-1) Check the viscosity.
b-2) Check the pressure rating.
b-3) Check if the cooler is working correctly or well dimensioned.
b-4) Check if the relief valve is not creating this heat because always opens.
b-5) Check if any other component in the system is not creating this heat due to an internal defect.
b-6) Check if there is a big temperature differential between the inlet and the outlet.

SHAFT SEAL LEAKAGE

A) Is the seal destroyed?

a-1) Check the alignment and the correct power transmission (non homokinetic movement, high radial force as examples).
a-2) Check the inlet pressure and compare it to the catalogue values.
a-3) Check if the bad suction conditions do not create a vacuum that could even reverse the seal lip.
a-4) Check if the external environment is not too dirty and therefore ruining the seal.

B) Is the seal only leaking?

b-1) Check the alignment of the front shaft and check if there is not any radial load.
b-2) Check if seal lip has not been cut during a maintenance operation.
b-3) Check if the inlet pressure is not over or under the catalogue values. This has to be done for the whole cycle because the inlet pressure can vary from time to time. b-4) Check if the seal material has not been modified due to a too warm environment. The seal can vulcanize and stop sealing correctly.
b-5) Check the acidity of the oil that can "bum" the seals material. It will therefore destroy the elasticity of the sealing.
b-6) Check if the chosen seal (high pressure seal for example) is not too stiff for the use. If the environment requires some elasticity due to a gentle misalignment, a high pressure seal will not be able to follow the movement and therefore leak.

NO ROTATION

A) Is the flow coming to the motor?

a-1) Check the circuit and the hydraulic schematic. Is the piping OK?
a-2) Check the setting of the main pressure relief valve. Check if it not settled at an extremely low pressure.
a-3) Check if the pump is giving a flow.
a-4) Check if the directional valve(s) allowing the flow to go to the motor is energized. If it is, check if the spool is in its correct position and not sticking in a position that would deviate the flow somewhere else.
a-5) Check if a check valve would not have been improperly mounted.

B) Is the torque required higher than the system settings?

b-1) Check if the pressure settings are correct.
b-2) Check if the load is not superior to the torque capabilities of the motor.

C) Is the pump OK?

c-1) Check if the pump is working correctly.

D) Are the motors internal drain check valves working properly?

d-1) Check if a failing check valve would not allow some flow to go back to the tank and therefore limit the flow to the motor.

E) How is the motor piped?

e-1) Check the nature of the connectors. If, for example, the "self sealing couplings" type connectors are well fitted into each other.

STALLS EASILY

A) Is the load near the limits of the system?

a-1) Check the relief valve setting and compare it to the theoretical pressure required to deliver the convenient torque.

B) Are the motors internal drain check valves working properly?

b-1) Check if a failing check valve would not allow some flow to go back to the tank and therefore limit the flow to the motor.

C) Is the flow going to the motor sufficient?

c-1) Check the minimum flow required by the motor.
c-2) Check the flow of the pump or the valve feeding the motor.

NOT ENOUGH SPEED

A) Is the speed lower than desired?

a-1) Check the theoretical displacement of the motor versus the theoretical flow of the pump.
a-2) Check that the flow of the pump is really coming to the motor.
a-3) Check that the working pressure & speed are not incompatible with the catalogue values of the motor.
a-4) Check the oil temperature. Check then that the low viscosity of the oil is not having a big effect on the internal leakage of the motor.
a-5) Check the air bleed-off.

C/ Joaquín Costa, 10. 1º dcha. B 50001 Zaragoza (Spain) T.: +34 976 233 062 F: +34 976 235 557
www.tdz.com sales@tdz.com

ERRATIC SPEED

A) Is the motor loosing speed erratically?

a-1) Check if the limit of the allowable torque is not reached once a while.
a-2) Check if the driven load does not transmit some inconstant load (high pressure piston water pumps with an unbalanced technology).
a-3) Check if the flow coming from the pump is constant.

UNUSUAL NOISE LEVEL

A) Is the motor running?

a-1) Check if there is no air intake aerating the motor badly (through the front shaft seal for example).
a-2) Check if the motor is not cavitating. It could be that the inertia of the load is such that it drives the motor faster than the flow coming from the pump.
a-3) Check if the oil is not proper for the use.
a-4) Check if the air bleed has been done properly.

B) When the motor is breaking?

b-1) Check the back pressure to see if the replenishment pressure is not too low, leading to cavitation of the motor.

UNUSUAL HEAT

A) Is the oil arriving to the motor already hot?

a-1) Check if a cooler is required or if there is one if it is well dimensioned.
a-2) If there is a cooler, check if it is working (example for water cooler: is the water flow opened or sufficient).
a-3) Check if the hydraulic circuit is not bringing back the flow directly to the inlet port. Doing so, it would create a very small closed circuit not able to cool down the fluid.
a-4) Check the quality of the fluid.
a-5) Check the velocity of the fluid (5 to 6 meters/second max.).
a-6) Check the filtration unit, its capacity.
a-7) Check if the heat does not come from an open bypass valve.

B) Is the oil heating up when going through the motor?

b-1) Check the speed of rotation versus the catalogue values.
b-2) Check the pressure rating.
b-3) Check the fluid.
b-4) Check the viscosity.

TROUBLE-SHOOTING GUIDE

IDENTIFICATION	CAUSE	CHECK LIST
1. Gray (sandblasted) appearance of wearing surfaces, especially vane faces. 2. Worn rotor slots. 3. Blunt vane edges 4. Chopped/rippled cam ring, possible wear steps.	Abrasive wear-fine particles of dirt, not visible in the oil.	1. Inspect cylinder seals and rods. If seals are deteriorated, look for other evidence of high oil temperature and check for cause. If cylinder rods are damaged, check for cause of damage. 2. Check for clean oil supply. 3. Correct filter elements, change intervals and proper installation? 4. Was system flushed after previous failure?
1. Metal smearing on vane faces. 2. Schratching and scoring of wear plate and rotor. 3. Store marks on vane edgges and cam ring. 4. Vanes jammed in rotor slots. 5. Larger particles cause scoring of rotor and cam ring. 6. Rotor jammed by metal object.	Damage from metal particles or objects-50 microns or larger visible in the oil.	1. Was system properly flushed after previous failure? 2. Is another component in process of failure. 3. Are particles due to excessive pump wear? 4. Were metal pieces left in system after previous work?
1. Rippling and pitting of cam ring. 2. Erosion of end plates. 3. Severe vane wear. 4. Cracked or broken puma body, body bolts and/or cam ring.	Aeration-Air mixed with the oil, causing bubbles and lack of lubrication. Water-contaminated oil.	1. Low oil level. 2. Air leakage at pump suction line. 3. Air leakage at cylinder rod, seals, or cylinder line connections. 4. Bent, damaged or missing parts in tank, causing agitation. 5. Low pressure setting of relief valve, causing excessive bypassing. 6. Excessive operation of relief valve due to overloading poor operating practice, or other conditions.
	Cavitation: Resriction or limitation of oil supply to pump.	1. Oil viscosity. 2. Collapsed hose in pump suction line. 3. Clogged screen or other restriction of pump inlet.
1. Dark, discolored parts. 2. Excessive wear of vanes and cam ring.	Poor Lubrication -Wrong type of oil or high temperature. -Restricted engine or transmission oil supply to pump drive.	1. Check seals for evidence of high oil temperature. If found, check for cause, and inspect all seals for damage specially piston rod seals. 2. Quality, type and grade oil.
1. Worn splines on pump drive shaft.		1. Check. for closed oil passages in pump drive.
1. Severe scoring and heavy transfer of metal on end plates, rotor sides and vane ends. 2. No scoring or other damage to cam ring, vane edges or vane faces.	Rotor Seizure -Result of damage from other causes. -Lack of rotor clearance due to excessive pressure or tolerances.	1. Check for any indication of other types of damage. If found, refer to check list for that type of damage. 2. If no other damage can be identified, check relief valve operation and pressure setting.

C/ Joaquín Costa, 10. 1º dcha. B 50001 Zaragoza (Spain) T.: +34 976 233 062 F: +34 976 235 557
www.tdz.com sales@tdz.com

GLOSARY OF TERMS

ABRASIVE WEAR	Wear caused by abrasive action of dirt and fine contaminants in the oil
AERATED OIL	Presence of air bubbles in hydraulic oil…gives oil a foamy appearance
CAVITATION	Formation and collapse of vapor bubbles in hydraulic oil.
DIRT OR FINE CONTAMINANTS	Very small particles of abrasive material suspended in hydraulic oil. Usually not visible to the naked eye.
EROSION	Renoval of metal particles form the surface of a part, leaving a rough, pitted area.
GALLING	To fret and wear away by friction or to become worn by rubbing.
GRAY VANES	Appearance of puma vanes scratched by dirt and fine contaminants. Rotor faces and end plates can have this same gray appearance.
HIGH OIL TEMPERATURE	Temperature above 200° F, when the oil film weakens and its lubricating ability is reduced.
INSERT VANE PUMPS	A hydraulic pump with vanes containing an insert. Pressure oil between the insert and the vane, in addition to centrifugal force, keeps the vane in contact with the cam ring.
INSUFFICIENT LUBRICATION	Inadequate oil film between vanes and cam ring, or between rotor, vanes and end plates.
LACK OF VANE CONTROL	Puma vanes become instable and cock in rotor spot. Wear on the cam ring results and also a milling of the en plates.
METAL CONTAMINANTS	Small particles of metal in the hydraulic oil. Probably have worn from components in the system and may or may not be visible to the eye.
OVERPRESSURE	Pressure in the system exceeds the specified relief valve pressure.
RING CHOP	Cam ring worn in a stairstep pattern. May be two or more steps 180° apart on the ring.
RING RIPPLE	Cam ring worn in a wavy pattern. Hills and valleys, typical of ring ripple, are about the same width and close together. May be five or more ripples per inch.
ROTOR SEIZURE	Galling between rotor and end plates with resulting transfer of metal from end plates to rotor.
ROTOR SLOT WEAR	Faces of rotor slot and vanes have worn until the rotor slot-vane clearance is greater than 0.05 mm.
WEAR AND PRESSURE PLATES	End plates on either side of the rotor. These and the cam ring form the pumping chamber and direct the oil in and out of the pump. Pressure oil on the outside of the pressure plate (usually thicker than the wear plate) holds the two plates and cam ring tightly together.

SHAFT SEAL LEAKAGE

A) Is the seal leaking when pressurized?

a-1) Check if the lips of the seal are not ruined (lack of lubricant leading to vulcanization of the rubber, external pollution...).
a-2) Check if the shaft is not marked by a groove in the usual seal lip contact area.
a-3) Check the shuttle valves.
a-4) Check the pressure in the drain line on the motor. Long piping, elbows, small diameter, too high oil viscosity, other common drain flows in the same pipe can lead to high drain pressures.
a-5) Check if there is no high overshoot at start-up that would create a high instant internal leakage.
a-6) Check, when using a "rapid connector", if it is well locked.
a-7) Check the alignment of the shafts.
a-8) Check if there is no unbalanced driven load that could create a gap between the shaft and the seal.
a-9) Check if the radial force is not too high (belt drives for example).

B) Is the seal leaking when standing still?

a-1) Check if the seal is not damaged.
a-2) Check if the shaft does not have any scratches.
a-3) Check if the ball bearing is not ruined.
a-4) Check if the drain line does not create a back pressure.

C/ Joaquín Costa, 10. 1º dcha. B 50001 Zaragoza (Spain) T.: +34 976 233 062 F: +34 976 235 557
www.tdz.com sales@tdz.com