**Graham T's (from S2Forum)**

**Power Steering Pump Strip down, inspection and seal kit replacement.**

**http://www.s2forum.com/forum/showthread.php?t=8634**

## The pulley

1) Remove all 3 bolts on the pulley, the pulley is seized/sweated onto the hub of the triangular coupling, DO NOT try to press it off cold, you WILL destroy the pulley. Apply a short intense flame to the pulley and at the same time a very small amount of pressure in a press/ Hub puller. And the pulley will come off (I will be removing the hub later to service the gland and High pressure pump).

## High pressure side (Brake assistance)

2) With the pulley off this gives you access to the bracket bolts and High pressure pump. Remove the bracket taking note exactly where each bolt goes.

3) Use a Metal marker and mark lines across the body of the unit so it goes back together in exactly the same orientation. (this is important as oil galleries line up inside

4) Remove the 4 x bolts on the end of the pump behind the triangular pulley (see pic)

This will separate the high pressure pump away from the low pressure pump, the galleries in the low pressure side on the left line up with the little hole which feeds the high pressure pump on the right. The galleries feed both high and low pressure parts to the unit.

5) Now the thrust washer can be seen. I will measure end float this week and work out what size should be in there. This pump had a 0.98mm washer in with a small amount of float, also look at what material it is made from as it is a friction device. (LATER ON I WILL WORK OUT EXACTLY WHAT SIZES SHOULD BE IN THERE) The rotating cam which consists of a sweated on brass lobe with a High tensile ring which is free to spin on the brass lobe and push the pistons of the high pressure pump.

Here is a view into the high pressure side:

6)  Now remove the 4 M8 bolts on the low pressure side and carefully split the end plate off the low pressure pump this plate contains a speedy sleeve type plain bearing pressed in to control shaft movement. Now you will see the low pressure vane pump.:

7) With the vane pump exposed (see photo below) you need to mark up the components so they go back exactly the same using a PERMANENT MARKER not a metal marker as a permanent marker leaves a 0.0001mm layer on the metal (which wont affect anything) where as Metal marker leaves a thick paint (Which could seize it up) - Clearance and tolerances are a real issue here.

8)  The 2 pegs on the rotor housing are loose but if you hold them right they will help in lifting out the rotor housing. Now the rotor with the 10 vanes can be lifted out.- SOME OF THE VANES WILL FALL OUT- make sure they go back in the right way with straight edge out, and the edge with the notch cut facing into the rotor. So you should now have components looking like them in this pic:

9) Now the far end plate with the ports can be lifted out of the main body, when out and turned around you can see the set shape seal which consists of 2 parts the rubber seal and a plastic anti extrusion ring. Make sure you get these the right way around, as the seal will not work if they are the wrong way around, see pic below:

10) Following on from STEP 9 of the you will see a small cap which if you squeeze down will feel the tension of the spring, with your finger on top of the cap carefully prise out the cap which is only held in by friction (4 tangs).

11) Now you will have a spool with a high pressure relief valve inside. (for when your on full lock). This is as far as I advise going, as the relief valve might be calibrated, and stripping down could alter its setting. Your components should look like those in photo below:

12)  Re fit the relief valve and press the cap back in. It doesn't look like it has a good hold but is captive by the vane pump end plate.

13) Replace all o-rings and seals in the vane pump and re build this unit making sure that it is spotlessly clean with a bit of Goo200 fluid on build up. Make sure when you re-fit the rotor that none of the vanes fall out. (Oil will help hold them in place), and the rotor lines up with the shaft. Loose vanes will spell "hasta la vista" to the pump as it will just crunch up. And either snap a belt or shear the shaft inside, or strip the splines off the shaft.

**High pressure side and gland**

14) Following the previous procedure to split the high pressure unit from the low pressure unit.

15) Using an Impact screw driver undo the 2 cross head plugs on the outer casing, (see Photo in step 1) these will be very tight, so make sure the unit is clamped in a vice (with soft jaws). Take care when removing the plugs as there is a spring underneath and it could fire the spring guide, which is inside the spring, away.

16) Once the spring and spring guide is out, the piston should fall out of the bore underneath the spring, it might need a gentle tap on a wooden block to get the piston to slide out as the oil can hold it (repeat this procedure for both sides). Remove the O-Ring from each end. (I believe these are B.S. 016-Viton- About 3p each). Now you should have two lots of components like the ones below (ignoring the shaft and components on the left):

17) Set up the triangular shaped coupling up like picture Below or use a suitable hub puller with the unit clamped in a vice, and apply a sustained heat from a oxy propane/acetylene torch, the heat needs to get into the hub faster than the heat getting from the hub into the shaft so the hub will expand quicker than the shaft releasing its 0.001” interference nip so the press/hub puller will be easier. Allow the hub to cool naturally, do not quench it, as it may warp, or crack.

18) Now push the shaft through the gland (into the pump) and remove the shaft from the backside.

19) Remove the steel ring off the brass ring, and remove the brass ring off the shaft-they should all be loose.

20) Now between the gland and the cam lobe there is a second thrust washer, this measured 1.00mm (other was 0.98mm) I will work out clearances later.

21) Using a blunt screwdriver flick out the gland seal which is only a single lip endless oil seal moulded around a reinforcing ring and should pop out easily. Now you should components which resemble the photo below:

22) The 2 plugs which can be seen in photo below (On top, either end of the cast) will house a ball bearing check valve underneath so each pistons discharge will be trapped in the outlet (small banjo fitting which bolts onto the port on top of the pump in picture in the first step) which leads to the bomb. As it is not my pump I did not want to put heat into the main cast of the body, and snapped 2 Alan keys and twisted one.

23) The housing on this pump (where the cam sits) was 23.32mm deep. There is 2 thrust washers/shims one 0.98mm, other 1.00mm. The widest part of the cam is 12.96 wide, and the spigot on the low pressure was 7.75mm proud. So the cam and thrust washers were 14.94mm plus the spigot which was 7.75 makes a 22.69. And the casing is 23.32 leaving 0.63mm of float in the shaft. So with clearance for expansion the new washers (which can be either cast steel or phosphor bronze) need to be no more than 1.25mm. This size will give 0.11mm of float (0.0028”). PLEASE TAKE NOTE YOUR HOUSING DIMENSIONS COULD BE DIFFERENT PLEASE CHECK YOUR OWN SIZES. Thrust washer dimensions were: 15mm (Inboard washer) 16mm (Outboard washer) ID and 27.75 OD by 1.25 wide.

24) Inspect the gland bearing for damage (there should be none) this is the metal sleeve inside the housing between the cam and the gland seal. Spin the shaft and wobble it about inside to see if there is play, if so I suspect a decent machinist could bore it out and press in a new one out of brass or white metal (preferable).

25) Using a suitable size socket press in the new gland seal. This can be done easily using a vice but don’t squeeze it too hard, as it might not seal if you crush it.

26) Reassemble the shaft components (Brass and steel ring) with the new front thrust washer and slide it back into the housing through the new seal.

27) I advise now that you re-fit the 2 pumps together with a new o-ring between the faces and the second thrust washer on the shaft. This just makes the shaft secure, and the unit easier to grip in a vice. (Using soft jaws of course).

28) Now slide in the pistons the same way they came out, re-fit the new o-rings (B.S. 016 I believe) ensuring that they sit in the groove, and oil/grease the o-ring so it doesn’t snag on the plug.

29) Refit the spring and spring guide then refit the plug and if the o-ring is the correct size the plug should seal with just a spanner and bit of strip in the cross head, there should be no need to re tighten using an impact screwdriver.

30) Apply anti scuffing paste, (or copper slip will do) to the shaft end where the coupling sits and heat up the coupling to 160-200 $^{\circ}$C, using either an oven or a gentle flame (No Oxygen, just gas).

31) Once hot using heat mitts (or riggers gloves, if your quick) re-slide the coupling/hub onto the shaft making sure it is the right way around and that the end of the coupling/hub is flush with the end of the shaft. Make sure you hold it in place till it nips on the shaft-this should only take up to 10 seconds.

32) Once nipped quickly apply an air supply to the shaft between the coupling/hub and cool the shaft to avoid putting un-necessary heat into the seal possibly damaging it. Try to avoid quenching it in water, if possible submerse the coupling/hub shaft and seal in a heavy mineral oil which will cool it slowly but prevent damage to the seal. It will smoke as you submerse it but this is the best quick way of achieving a good cool rate without damaging anything. Leave it for 5 minutes.

33) Re-bolt the pump bracket and re-bolt on the pulley and the unit should now be ready for use, or if storing the pump, fill it with oil and seal the ports with red caps. I also advise that you put some fresh oil into the inlet port and spin the pump by hand to work it through.

**Pros and cons of this unit**

The unit is a very good design with few flaws, the design was for long life and efficiency, with the spinning shell to reduce wear in the high pressure pump and a double sided action of the vane pump - both sides of the rotor, pump fluid so no side loading should be seen on the rotor, (even though there will be some but minimal) as the loads on either side will cancel each other out. The unit is very serviceable and the only problem I can see with the pump is the use of metal vanes which wear the housing out quicker than bakelite or Teflon. I do not know the working pressure of the low pressure pump so this might explain the use of metal vanes if the pressure is high enough.

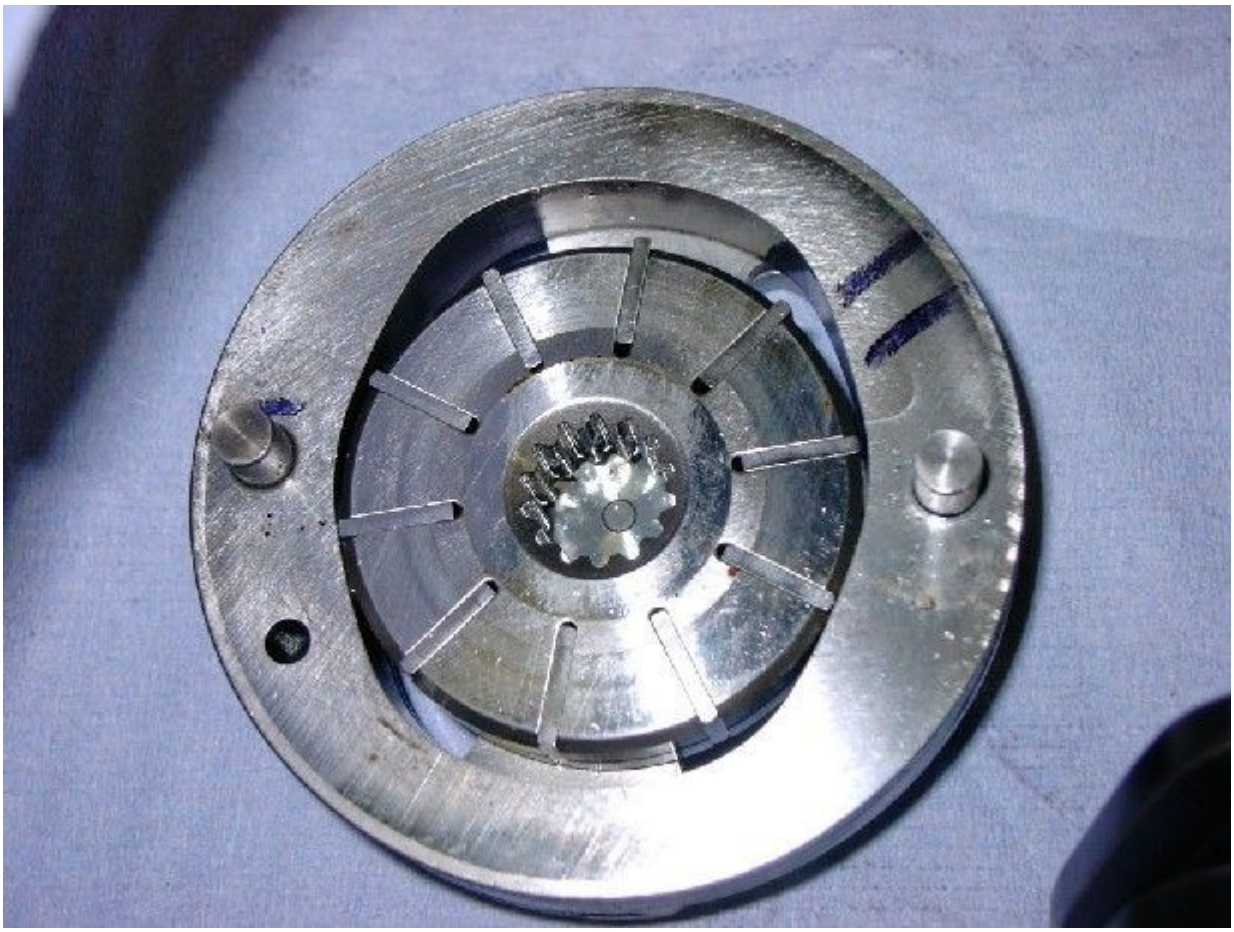
**I Hope these procedures helps people with pump problems. If in any doubt about doing this task leave it to someone who can do it, these pumps are expensive items and overlooked mistakes could cost you dearly. I wrote these as a guide only from my background as a hydraulics craftsman/engineer. And have tried my best to make the instruction clear, and simple. Any suggestions will be most appreciated, considered and replied with my views and opinions (with reasons).**

**Graham Tombling (Queensland, Oz)**

EXTRAS:

There is a seal kit what you can buy for very cheap-- 035 198 049 A for the aby/3b pump or there is 026 198 049 A for the KV/NG.

Here is a few more pics i took of the internals:



This plug is just a blanking plug to fill a drilling which was to gain access to drill the internal ports of the relief valve and doesnt need to be removed. I removed it to see why it was there.