XPAG Chevy Rear Seal Conversion

Notes on a Successful 4th Attempt

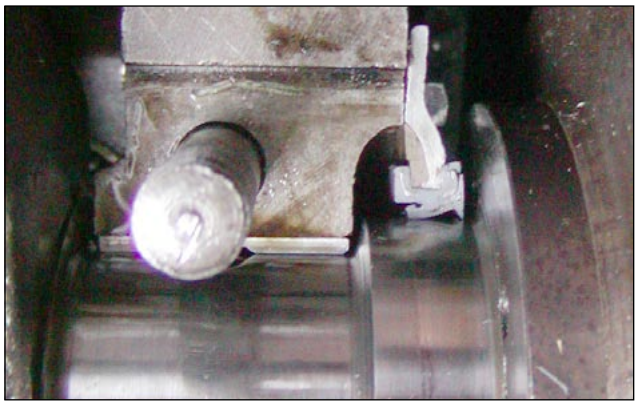
by David Edgar, TC 5108

tcmotoringguild.org

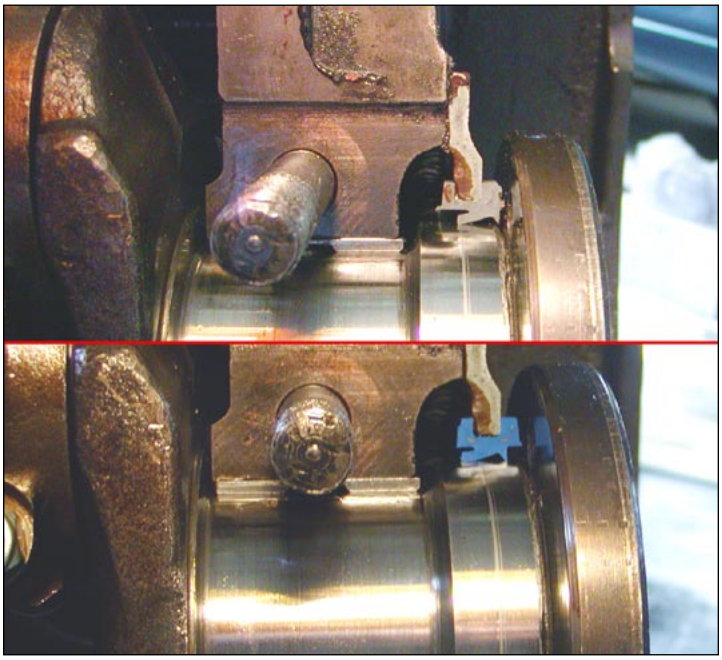
The theory of putting a Chevy rear seal into an XPAG engine to solve the leak at the rear main as pioneered by Andrew Bradley seemed pretty straight forward and so I made the decision to do the conversion on my XPAG many years ago. I went through the process on two different engines and finally succeeded stopping the leak back there after a few attempts. Here is what I learned.

Crank Welding and Flywheel bolts

When you have the crank welded up specify where laterally the new journal should be. The crank I had taken to Mike Goodman is optimal. The welder Mike took it to brought the journal very close to the rear flange. Another engine I had gotten with the conversion already done on it had the crank weld fall short of the flange just a bit and I then had to get a special offset seal for it to ride on correctly. The off-set seal was developed for the Chevy engine to allow the seal to ride on a new portion of the crank when rebuilding. You just have to ask for the off-set seal.



This weld comes right up to the flange and a regular seal rides completely on it.



This shows my second crank with the short journal. Front lip of regular seal does not ride on the journal. Buying an off-set seal solved the problem as shown in the lower half of the picture.

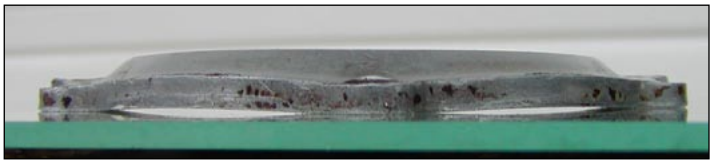
Now the front lip is really only a dust seal. The oil is actually held back by the rear lip. It is nice to not have dust get in though.

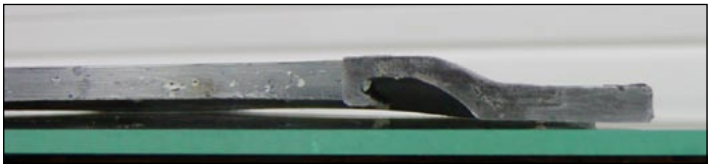
It may be hard to see in the pictures but the flywheel bolt holes actually overlap the new journal just a bit. Be sure the bolts don't bottom out and give you a false torque reading before seating all the way home. In the case of the crank with the short journal, it would even be possible for the bolts to come in contact with the seal itself. Watch for clearance problems here.

Aluminum Arched Cover

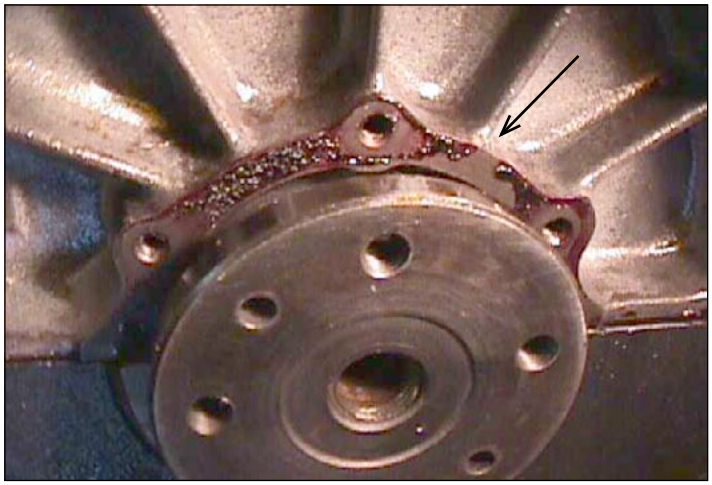
This is a fairly weak piece and after machining down is even weaker. It can be easily distorted. I was told after the fact that I should have gotten a new piece to start with so it would be straight and that having it flat was a necessity. I know of several people who have even made up their own blanks which would even be stronger. That didn't help me since mine was already machined (cover and bearing cap are usually machined together). As mine was slightly warped I carefully worked it so it was less warped and relied on RTV to fill in gaps. That seemed to work. To make it stronger, I filled in the rear groove with JB Weld. In addition to being a little stiffer now I also doubled the area where the aluminum cover met the bearing cap and thus provided a wider area for sealant to attach as this is one place oil could leak past.

You may note in the photos that the aluminum cover bolt holes look a little strange. The person who had build up this engine

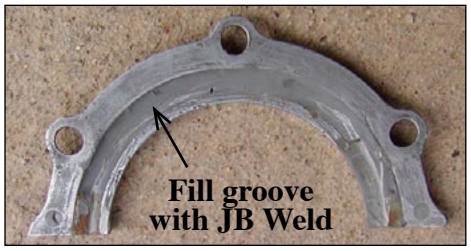




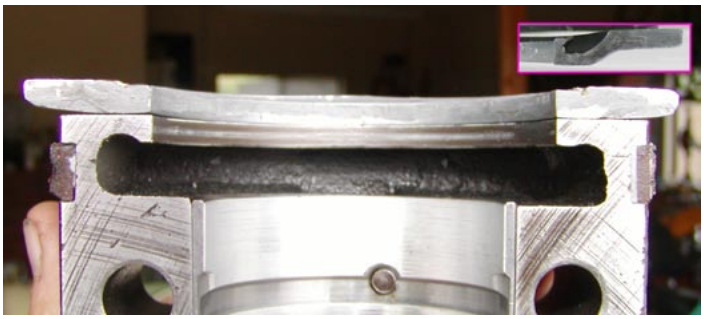
These two photos show my aluminum cover laying on a flat piece of glass to show warpage.



Note gap where oil could leak past when warped cover and not enough RTV was used.



Lower edge on front also built up



Another view of the aluminum cover showing bottom edge after filling in front and back with JB Weld. Inset shows surface area before filling in. Wider surface would butt up against the bearing cap (not in this position though).

opted to use countersunk allen head screws which pretty much locked the plate into postition. I was told by others to both remove the two dowel locating pins as well as to ovalize the bolt holes. Doing this would allow you to push the cover down tight against the bearing cap to ensure a tight seal. Since I had the countersunk screws locating the cover, I added JB Weld to the bottom edge, Bolted cover and bearing cap to the engine briefly and then removed the cover. Once set, the JB Weld took up any gap that there may have been.

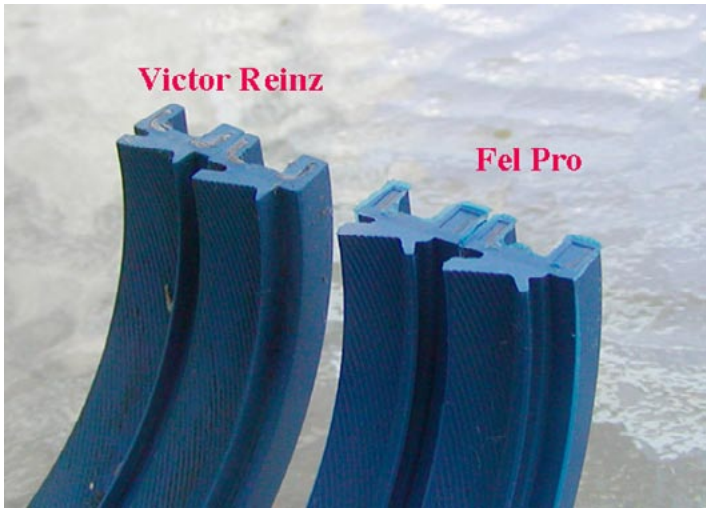
Lastly, no need for a paper gasket behind the cover. Just use RTV.

The Actual Seal

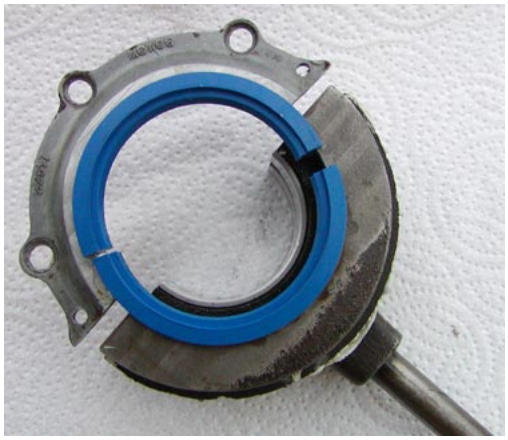
I mentioned the off-set seal earlier so use that if you need it. I had used Victor Reinz brand seals for my projects at first. One thing that bothered me was that the metal reinforcement inside the seals actually protruded at the ends to where I could hear the metal click together if it tapped the seal ends together. I just figured seal crush would come into play and the seal ends would butt up and actually seal. Upon closer inspection I discovered this was not happening. A switch to Fel-Pro brand seals seems to have solved this.

You may want to buy a seal made for marine applications. Supposedly they are designed for higher revving engines (up to 6000 RPM). I learned of this later but my automotive seal seems to be doing fine. I usually stay at around 4300 RPM but do go to 5000 occasionally and briefly.

The Fel-Pro seal came with instructions to rotate the seal about 3/8" when installing to avoid seal end misalignment problems. This could happen if the aluminum cover and the bearing cap are not perfectly aligned (although installation is trickier if also using RTV in the seal groove). I also used Hylomar HPF sealant where the seals butted together per advice from Andrew Bradley.



Note generous seal material at ends on Fel-Pro while metal support on Victor Reinz is prominent.



Note how seal is rotated slightly to keep seal ends aligned.

Note - This shows aluminum cover before JB Weld was added.

Be sure to lightly coat the seal lip with lubricant to avoid dry burn on start up.

Drain Tube

I elected to completely remove the drain tube coming out of the bearing cap but I am not sure that is necessary. If you do leave the tube in, at least cut a notch about half way up on the back side (away from the rotating crank counterweight). There is some theory that if the end of the tube is submerged in oil, that oil may not drain fast enough and fill the area behind the seal. Cutting a notch would eliminate this possibility. Removing the tube completely is an option as well. I heard the tube was suppose to prevent oil foaming from oil being hit by the counterweight. I don't seem to experience any foaming with tube removed. In fact MG removed the tube part way through the MGA engine run to reduce leakage as well. Do what you feel most comfortable with here.

Block and Bearing Cap

Here is a trick Bill Traill told me about. Look carefully at where the rear main bearing cap mounting studs enter the block. In some instances the block immediately around the studs could deform and pull down slightly thus causing a raised spot. This of course would not allow the bearing cap to seat down properly. If you can, pull the studs out and run a flat file lightly over the area. High spots would easily show up. Bill says he heard racers even doing a relief cut around stud holes about the width of the threads.

Now I had my engine still mostly together with crank and pistons in it. Even if I got my stud out I would not have had room to run a file over. I did take a straight edge and did the best I could to determine if there was any distortion and I found at least to my

satisfaction I had none. However to be on the safe side I chose to do a relief of the bearing cap. Even if there was any distortion once stud was torqued down, hopefully this would take care of it.

Other Suggestions

Use a good RTV. I chose Permatex Ultra Grey but there are other good ones as well. The Hylomar sealant used where the seal butts together is a non hardening material. Just a light smear will do.

Bench Testing

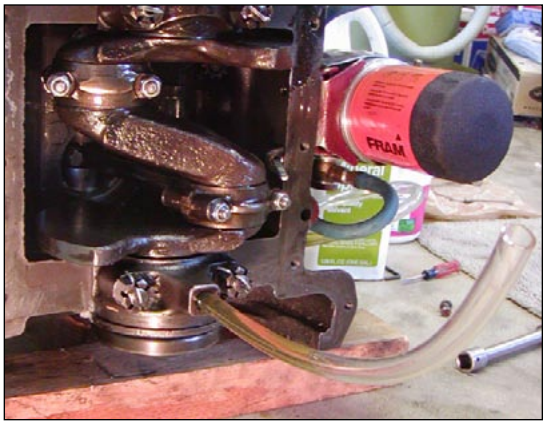
On my earlier attempts my final test was with engine in the TC and running. What a disappointment when it would leak. Alternatives were to pull the engine and start again or just put up with it. I had done both, not liking it either way.

This last time I devised a simple bench test to catch errors early. If your engine is in an engine stand, revolve the engine so bottom side is up. If you just put in the seal you probably have it sitting this way already. Now just fill up the tube with a light weight motor oil and look for leaks. What you just did was to fill up the area behind the seal with more oil than ever should be up there. You can even rotate the crank a few times if you like. My leak showed up in a few seconds. Do this with the flywheel off for better viewing. Some oil may work itself past the bearing and into the engine crankcase but that is normal.

If you are not using an engine stand you can merely stand the engine on it's end. To fill cap with oil you can adapt using vinyl tubing. If the drain tube is in the cap buy a couple feet of half inch ID vinyl tubing at your hardware store and slip it over the end of the tube. If you elected to remove the drain tube just buy half inch OD vinyl tubing and push into the drain hole. Fill with oil.

Now this test will only test the seal and area immediately around it and it sure doesn't imitate real running conditions but it did save my behind from another disappointment.

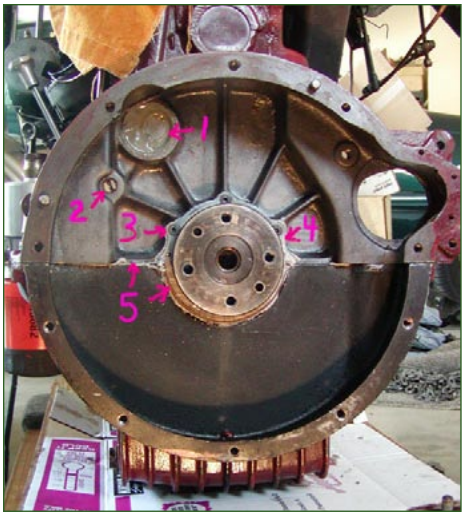
Other Leak Sources



Engine standing on end with vinyl hose into bearing cap.

The Chevy seal conversion is only one place a leak could come from. Perhaps the next most common place to leak would be from the where the sump seals around the bearing cap. Be sure to tuck the ears of the cork seal into the slots and that the sump gasket tucks into the cork properly. You can bench test this by installing the flywheel and sump. Put just one quart of oil in the engine and then tilt the engine up on end. With engine up on end, the oil will flood the area around the bearing cap. This will test the cork seal and sump gasket. Because the flywheel is blocking your view of the area now you might want to leave it this way overnight. If enough oil leaks out, it would drip off the flywheel. You might want to peer into the hole for the starter drive and revolve the crank once looking for evidence of oil on the back of the flywheel. Once satisfied you are leak free there you can then go ahead and fit the engine to the car then.

Though more rare, other oil leaks at the back of the engine could come from: 1) the cam shaft plug, 2) the oil gallery plug, or 3) screw for aluminum cover (reference numbers to photo). In the case of the cover screw, Mike Sherrell eludes to the fact that the threaded hole for this screw could in some instances penetrate into the oil line in the block running from the main oil gallery over to the rear main bearing. While you probably cannot give these points a valid bench test I did a cursory test. I took some Teflon tape and wrapped the threads of the fitting where the TC oil pressure gauge flex hose attaches to the engine. Take 20 foot of 5/16" ID vinyl tubing (again, available at a hardware store), and slide it over the Teflon wrapped threads. A hose clamp will help secure it there. Now fill up the tubing with a thin motor oil, and then force the oil into the engine with air pressure. I just held a hand nozzle to the tubing with 40 psi. Look for evidence of leaks from points 1, 2 and 3. To view those points you should do this test before installing the flywheel. You can temporarily attach the sump by resting the engine on the sump or just hold the sump up with a couple bolts to catch any oil that would drip from any bearings. Note that doing this fills your oil gallery lines and bearings with oil which helps upon initial engine start up to establish early oil pressure. Once you are satisfied you don't have any leaks at points 1, 2 and 3, you can then mount the flywheel and sump to test the sump cork and gasket (5 in the photo) as explained above.



Please note that the flywheel in the photo has been removed for display only. Flywheel is installed before the sump.

Number 4 points to the aluminum cover which was tested earlier.

Summery

When you can look under your TC and see no oil dripping from the split pin in the bell housing it is pure joy. But true to most MGs, you may suddenly discover other leaks you never realized you had. But those are usually easier to solve. Good luck in your endeavors.

Oil being forced into oil galleries

David

djedgar@pacbell.net