

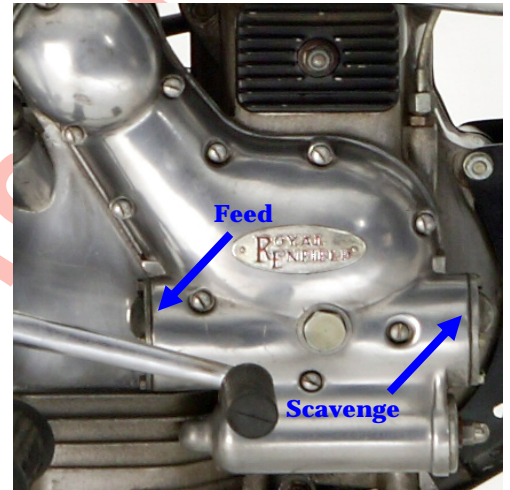
Royal Enfield Bullet Engines and Wet Sumping

Wet sumping is probably the most frequently occurring lubrication problem with Bullet engines. Wet sumping refers to the problem of too much oil accumulating in the sump. It will be most noticeable when the engine is started after standing for a period, with clouds of smoke being a sign that the engine is burning oil.

Description

In the majority of traditional British motorcycles the oil tank was located below the seat and attached to the frame. Royal Enfield had a different arrangement, locating the oil tank in a discrete compartment within the engine crankcase.

Oil is pumped from the oil tank around the engine by the unique double-ended eccentric plunger type oil pump assembly, located in the right-hand crankcase cover, just above the oil filter housing. The pump plungers are driven by a spindle, which itself is driven by the crankshaft worm gear. The oil pump features two main compartments, one at the front and one at the rear. The rear compartment is a feed pump. This draws oil from the oil tank, pumps it through the oil filter and timing shaft and along the internally drilled crankshaft directly to the big-end bearing. Oil is then flung from the rotating flywheels, splash-lubricating the main bearings, cylinder walls, the underside of the piston and the small-end bearing. The front compartment is a scavenging pump, with a greater flow rate than the feed pump. The scavenging pump sucks oil from the sump, where it gathers after lubricating the big-end bearing, sending oil to the rockers through the external oil pipe. Under gravity, oil drains down through the push rod tubes to the timing chest. From the timing chest, oil finds its way back into the oil tank through a strategically placed drilling, leaving the timing chest about $\frac{3}{4}$ full.



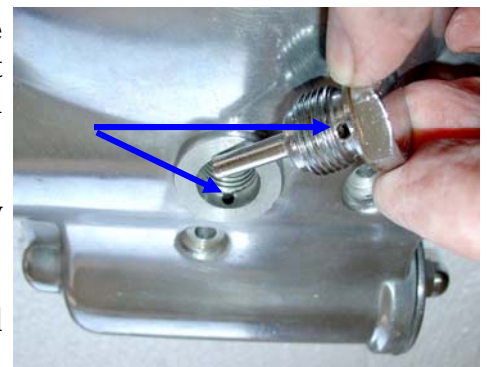
When the engine is running, and if the pump is functioning correctly, only a very small quantity of oil should collect in the sump, just about 30 cc's (less than an egg-cup full).

Diagnosis

On a Bullet engine, the lowest point is the sump. If you imagine the oil tank as one 'section' of a U-bend and the sump as the other, oil will try to fill both sections of the 'bend' equally. If it can, oil will find a way to settle in the sump. Normally the scavenge pump will clear the sump, but when the pump fails to do so, wet sumping occurs.

A number of features of the Bullet engine may contribute to wet sumping:

1. a worn crankshaft oil seal may leak, allowing oil into the sump from the big-end bearing (remember, the timing chest is about $\frac{3}{4}$ full of oil). In this case oil will pass through the oil ways from the filter, through the 'quill' to the big-end
2. the scavenge pump or oil ways may be inefficient, badly worn or partially blocked
3. a leaking crankcase joint will allow oil to seep from the oil tank to the sump
4. if the pumps are fitted the wrong way round, the larger scavenge pump in place of the feed pump, oil will not be effectively cleared from the sump.



There are three likely consequences from wet sumping: 1. the flywheels may splash so much oil onto the cylinder walls that the piston rings will not be able to wipe the oil away. This allows oil to reach the combustion chamber, burning off in clouds of bluish-white smoke to annoy your neighbours. 2. in extreme cases, oil in the combustion chamber may foul the spark plug. 3. excess oil will be forced through the crankcase breathers – over the back end of your bike.

Prescription

All that most owners will need to do to ensure long trouble free service is to change the oil and filter at regular intervals. At the same time clean the filter plugs and replace the cork oil feed seal (in the pump worm). On later Bullets, the oil feed seal is bonded neoprene in the oil pump worm. This type of seal only needs to be replaced if there are signs of wear. (The earlier, cork seal and worm, may be replaced with the neoprene sealed worm part number 144452).

NOTE: the thread on this worm nut is LEFT HANDED.



In most cases the oil pump will normally return the excess oil to the tank after a few miles of running. If the problem is more persistent, there are steps you can take to help minimise the annoying effects of wet sumping.

1. leave the engine with the piston near TDC when idle – this will leave the big-end higher in relation to the oil tank, making it less likely for oil to trickle into the sump through the big-end
2. don't overfill the oil tank – the lubrication system 'breathes' more easily if the oil level is not too high. Good advice is to refill with about 2 litres of oil at an oil change (rather than 2.25 litres some recommend). Checking the oil level by placing the oil filler cap on the filler neck (not screwed down) and keep the oil level midway on the dipstick. (For your peace of mind, even with oil below the low mark there may still be enough oil in the system. That is not, however, a reason to allow the oil level to drop so low!)
3. ride your Bullet more! – frequent use is often the best treatment for this problem, preventing the accumulation of oil that may occur where the bike is left standing for long periods
4. if you remove the sump drain/filter plug (the most forward of the drain plugs) take extreme care when refitting the plug that you do not obscure the oil way that is drilled only a little distance above the thread in the sump plug hole, (due to tolerances, some engines may need 2 washers to prevent this).

Intensive Care

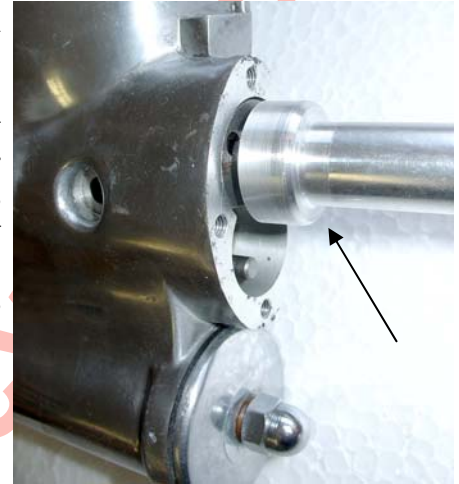
If you find that in your engine the primary cause of wet sumping is an inefficient timing shaft seal, (different to the oil feed seal), this will need to be replaced. Changing the timing shaft seal is a relatively easy job. Remove the timing cover and timing pinion to gain access to the seal. Ensure the seal has been fitted the correct way round. TIP – *an oil seal should always be fitted so that its spring is on the side you want to prevent oil escaping from.* Most Redditch Bullets featured a bronze bush for the timing side oil seal, calling for a complete engine strip down to replace. This bush requires very careful fitting, and must be reamed precisely, the flywheels must then be checked to run perfectly true. Early Indian models did not use this bush, and therefore no easy cure if the crankcase wears at this point. If the cause of wet sumping is a leaking crankcase joint, then again the only thorough solution is a complete engine strip.

An inefficient scavenge pump allows excess oil to remain in the sump. Check the pump's



efficiency by slackening off the rocker feed banjo bolts, one at a time. When all is well a steady, regular pulse of oil will flow from the banjo. If the pump is found to be defective, it will be necessary to dismantle the assembly and replace the discs. Using Hitchcock's high capacity return pump (200101, shown left) will improve scavenging. To service the

pump components, remove the end cover, spring, disc and plunger. Check that the oil ways are clear. If necessary remove obstructions with a length of wire and compressed air. Examine the pump; the plunger should be a good fit in the disc. Test by sealing off the oil ways with your finger and pulling the plunger out from the disc, the plunger should offer definite resistance as a vacuum is created. Check the face of the disc and if necessary lap it to the timing cover to create a smooth finish—metal polish, e.g. Solvol Autosol is sufficiently abrasive and Hitchcock's supply a special lapping tool for this job (part number 98168, shown in the picture to the right).



Even after all these attempts to remedy the fault have been made, wet sumping may continue to recur. It then becomes a very annoying problem. Thankfully, there is one additional measure that can be taken that has a proven track record: a breather modification unique to Hitchcock's Motorcycles who developed the modification and, in the first 4 years of its availability, have had over 1,000 satisfied users. The modification comprises an extension to the oil filler neck that accommodates 2 breather tubes and a filler cap with a suitably extended dip-stick.

Part number 90060 up to approx 2003 with push and turn oil filler cap;

Part number 90061 approx 2003-2004 with screw in oil filler cap and breather on left hand crankcase.



When fitted the kit will alleviate some of the most annoying symptoms of wet sumping. The modification will not stop engines from wet sumping, nor will it stop them smoking when wet sumping occurs. What it does is to prevent excess oil creating an oily mess.



Fitting is simple, the extended filler neck simply screws into the original filler neck. The principle of the breather is just as simple—the breather allows excess oil to be redirected back to the oil tank instead of being venting over the bike or onto the ground. This modification has the additional benefit of making it easier to pour oil into the engine.

Richard Ross

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