

THE SEARCH FOR OIL

The eternal question.....what oil should I use ?? Salad oil ?? Nope, too smelly. Hair oil ?? Nope, too hard to find. Car oil ?? Nope, my bike only has two wheels. How about bike oil ?? Welllllll.....it MIGHT work.....

We'll only discuss two stroke oils here, as that's what you're interested in.

Two stroke engines, because of their design, require 2 separate and distinctly different oils. These oils do 2 very different jobs because of the operational conditions of the mechanical components they are required to lubricate.

- 1) Gearbox/clutch assembly: Note that there are **GEARS** involved. Whether they are worm gears, spur gears, hypoid gears, whatever, they **are** gears. Gears have a bunch of lube problems all their own, compared to engine bearings. Gears have high specific torque loading on their faces, especially spur gears in trannys and primary drives. Wet clutches (which you have) also have unique problems all their own.
- 2) Crankshaft bearings(ball/roller)/pistons/rings. This subject will be discussed separately. It is very complex.

Gearbox/clutch lubricants

Incorrect tranny/clutch oils have 3 problems:

- A) poor "film" strength: the gear faces, which are a thin, specially hardened and ground layer on the surface of the much larger gear tooth, will actually weld themselves together momentarily and then tear semi-microscopic chunks of material out of the faces as they pull apart, if unlubricated. This effect is caused by a momentary steel-to-steel contact when the lube "film" on the gear tooth face fails and is pushed out of the way, allowing the steel-to-steel contact. The action of two unlubricated steel gear faces sliding across each other generates localized high temperatures actually causing the faces to "weld" together. The faces then move apart causing the weld to break by tearing the metal apart. Eventually, enough of the hardened layer of the gear faces will disappear, leaving only the parent unhardened metal showing through. This is the point where you get that ugly grinding sound from the tranny.
- B) poor shear strength: in addition, the sliding of one gear tooth face across the other will actually "shear" or tear apart the long-chain molecules in the oil. These molecules are then different from what was originally created when the oil was manufactured and thus do not have the same properties as was originally intended. Left in the transmission long enough, the incorrect lube will turn to sludge and will be incapable of ANY kind of lubrication.
- C) wrong additives: there are different types of additive "packages" added to the base oil, depending on the job the lubricant will be required to do. This is a very complex subject on its own and is best left to the oil manufacturers' product manuals to explain. Needless to say, the makeup of the additive package for a relatively low speed plain bearing crankshaft in a four stroke car engine is **NOT** suitable for the gears in a tranny. The additive package in any given lubricant is specifically tailored to the job that the lubricant is required to do. You wouldn't, I hope, run gear oil in your car engine.....so why would you run engine oil in your tranny ??

Cont'd on 2/4

To combat problem “A” above, EP (extreme pressure) additives are put in the additive package. This is the first thing that manufacturers do when making a gear oil. These additives are various chemical compounds which I won't detail here as it would take too long. Each manufacturer has his own ideas and experience as to exactly what works, but they are all similar. You have to trust the manufacturers here. As long as the oil says that it has EP additives, you are going in the right direction.

To combat problem “B”, the base oil is specially selected because it has lots of long-chain molecules with proven high shear-strength properties. These long chain molecules have certain chemical radicals added to their chains to improve the shear strength as well. VII's (viscosity index improvers) are also added to improve the shear strength as well as the film strength. VII's help the oil to retain its original viscosity or "to stay in grade" as it's sometimes called.

Problem “C” is really an outgrowth of A and B. If the manufacturer can solve A and B, then C solves itself. Gearboxes also do not NORMALLY experience the same severity of heat, oxidation, piston ring blowby/acid formation and water loading problems found in engines, but additives to combat these problems are also present in smaller amounts. Another additive is an anti-foaming agent. This prevents air from being entrained in the gear oil because, as we all know, air is a poor lubricant.

There are 6 classes of API (American Petroleum Institute) gear oils: GL1 through GL6. The only two we are concerned with are GL4 and GL5 (GL6 is obsolete) and the others are very seldom found as the demand for them is very small and they are unsuitable for motorcycle transmission usage.

GL4 is the minimum modern requirement for an automotive gear lube today. It has all the necessary qualities for proper lubrication of gears in an "automotive" environment. GL5 is the same, only it is formulated with more severe service in mind and includes "shock loading" additives that GL4 does not have. I am going to use Torco MTF 75 weight oil in the tranny of my current project. This stuff is only rated for GL4 service, but should do the job as Torco knows bikes and their lubrication requirements AND it is a semi-syn. Time will tell. Why I want to try it is it's the only tranny lube that comes in a straight SAE 75 weight which is equivalent to about an SAE10W engine oil in viscosity. This will give less drag on the tranny and will flow better when it's cold. It does get cold in Calgary on those spring and fall mornings sometimes. LOLLOL It will be interesting to see if the VII's will keep the viscosity “in grade”.

What about ATF ?? It's for transmissions isn't it ?? Yes, but AUTOMATIC transmissions, where the main requirement is movement or flow of the lubricant, *similar to a HYDRAULIC oil*, NOT a gear oil. Because automatic trannys have a torque convertor to absorb engine firing pulses, shock loading is much less or non-existent when compared to a motorcycle tranny or primary drive gearset. The additive package in ATF does have similarities to a gear oil but the required additives are not usually found in sufficient quantities required by a tranny or primary drive. The viscosity is also much lighter than normal gear oils as well (equivalent to a 5W20 engine oil) so is really too light to serve as a proper gear oil. Empirical evidence also says that there are less VII's in ATF, so “thinning out” at higher temperatures could cause additional problems.

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What about synthetic gear oils, you ask ?? Aren't they great ?? Yes they are. "Syns" will give you that extra protection in situations where a mineral based gear oil might fail. Syns also have a much higher percentage of long-chain molecules than mineral oils as syns are "man-made" and all the molecules in the base lube are "identical" replicas of the originally chosen molecule. Thus, the lubricant is more uniform in its characteristics. The problems here are:

- 1) seal material compatibility: some seals in older bikes may not be chemically compatible with all syns and may degrade and fail over time. This is TYPICALLY not a problem, in my experience, with seals from the 1970's, although I have not tried syns in enough different makes of bikes to be absolutely sure of this. Suzuki's seals in their 1970's bikes are compatible with syns, in my experience. However.....
- 2) "dirt washout": if your particular bike has been run since, say, 1973 and has never had the engine dismantled and cleaned, you could have problems. Dirt (meaning all kinds of contaminants, including degraded lubricant as a "varnish" and clutch friction plate material) in the tranny lube will build up behind the seal sealing lip(s) as well as on the actual rubbing/sealing surface of the seal lip itself and the seal collar/shaft surface, especially if previous owners have been negligent in changing the oil regularly or used the wrong lube which has left behind lots of contaminants when it broke down. The seal appears to be sealing OK because it's not leaking. In actual fact, the "dirt" is doing the "sealing", not the seal/collar or seal/shaft. Many syns typically have very aggressive "detergents" (cleaners) in their additive package for suspension of dirt particles in the oil so these particles can be drained off at oil change intervals. These detergents will dissolve/remove all this accumulation of "dirt" from the seal lip(s) and you will quickly find out if you have any seals that should have been replaced a long time ago. The newer syn gear oils appear to have modified the amount/type of detergents so this is less of a problem today than it was 10 years ago BUT your results may vary from manufacturer to manufacturer of gear lubes.
Incidentally, "washout" was a serious problem with synthetic engine oils when they were first introduced in the mid '70's. Owners tended to use syns as an "overhaul-in-a-can" solution in older/poorly maintained vehicles. Bad idea !!
- 3) clutch plate action: the first syns were engine oils and did not have the additives required to prevent clutch plate slipping. In fact, the first syns were designed specifically to REDUCE friction between ALL rubbing surfaces. A clutch is one gigantic rubbing surface and depends on friction to work properly. You can guess what happened next. No, or very poor, "lock-up" or gripping of the clutch plates and thus "no go" of the motorcycle. Modern syn gear oils have the proper additives to prevent this problem, so this is a non-issue today. GL5 rated syn gear oils are formulated with the clutch packs of positraction locking axles in mind. Those clutch packs are very similar to a motorcycle clutch, so....no problem. Syn engine oils are a whole different story as they still have large quantities of friction reducers in their additive packages. I, personally, would stay away from them for gearbox use, although some riders have claimed to use certain syn engine oils in their trannys with no problems.

Well, you say, "My original owners manual from (insert your year/manufacturer here) says to use 10W40 engine oil in the transmission of my two stroke. Are you sure this gear oil stuff is OK to use instead ??"

This is a question/problem that really confuses a lot of people who are new to motorcycles in general and two strokes in particular. There are probably various reasons the manufacturer of your bike recommended car engine oil for the tranny way back when your bike was built but here are two that come immediately to mind:

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A) car engine oil was the “least bad” or minimum acceptable choice for a gear box lubricant. What the manufacturer did NOT want to happen was the bike owner putting injector oil in the gearbox. They figured that most people were at least smart enough to go to the corner service station and buy some 10W40 engine oil, which was widely available in most parts of the world. Car engine oil was/is not a great choice for lubricating gears but it’s far better than injector oil. What did/does end up happening is a lot of confused/lazy people (read: “morons”) end up using engine oil in both the gearbox and the injection system. Another Bad Idea !!! These are the guys you usually see riding their two stroke bikes and laying down a SERIOUS smokescreen. They give all responsible/knowledgeable two stroke riders a very bad name because the general public (and lawmakers) lump us all together. Don’t run anything but proper injector oil in your injection system.

B) car engine oil will not give the longevity to trannys that gear lube will, however, none of the bike manufacturers expected (or wanted) the bikes of the 1970's to last more than 10 years anyway. They’re in the business of selling new bikes, not making/helping bikes to last for 20 or 30 or 40 years. Car engine oil will allow a bike tranny to last just long enough for the owner to be satisfied with the manufacturer’s build-quality so that he’ll buy another bike from the same manufacturer...provided he doesn’t abuse the tranny/clutch/primary drive at the dragstrip or stop lights too often. In lightly loaded, non-abusive service, engine oil will work with very little problem....but that’s not the way that many people ride their bikes, is it ??

Whew....what a story. Say...are you still with me ?? This barely scratches the surface of a very complex subject, (and I haven't even discussed injection oils for the power side of the engine yet) but this stuff should get you pointed in the right direction at least. Email me with any questions you have. You can get very detailed lubricant manuals from the "national" brand oil companies like Shell, Esso (Exxon-Mobil / Amoco / Chevron in the US) Castrol, etc etc. I have an older Esso manual from 1983 which is very informative, more so than the current Shell "Helps" handbook, which is what they send out normally to consumers who, Shell, I think believes, don't “need to be burdened with too much technical detail”. The current Esso handbook is better than the current Shell one but not as informative as the 1983 Esso book. I hope this little dissertation will help you in your “Search For Oil”.

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