AIRHEAD FORK OIL MEASUREMENT by Tom Cutter

Posted to the Airlist on 04-18-2018 by Tom Cutter <rubberchickenracing@gmail.com>

<< Isn't it more usual to measure the level from the bottom expressed as mm above the damper piston top with the forks at full extension. I'm sure Haynes says 50mm which sounds about right.>>

That is great 1965 technology. That procedure was a rule-of-thumb, used to ensure that the damper assembly in the fork was fully submerged in oil at all times.

Since then, we've learned that suspension can be tuned at no cost by adjusting the fork oil level, as a way to change the volume of the trapped air column OVER the fork oil, which is an effective secondary fork spring. More oil means a smaller volume air column, which gives more rapid rise in spring rate when the metal and air spring effects are taken together.

It's at the point now that racing suspension tuners change oil LEVEL by 10mm to improve traction and fork response.

NOTE: There is definitely a finite limit to the amount of “air spring” one can use on a fork that doesn’t have positive fork seal retention. Any 1970-84 Airhead has no retaining clips on the fork seals, and the seals can get blown right out of the fork if the oil level is too high AND a sharp bump or pothole is struck. The resulting oil loss would most likely contaminate both the brake pads, and tires.

I don't think many Airheads are riding their motorcycles on the hair edge of traction of the skinny front tire, but the technology is certainly there.

This is the reason that many MODERN fork and suspension manufacturers specify the oil LEVEL as measured in a repeatable fashion. (Yes, I know that it is a giant pain in the ass, but it does give consistency.) This is done by removing each fork leg from the motorcycle, removing the fork spring, and inverting the fork to drain ALL trapped oil. Then the fork is fully compressed (no spring) and filled to within 3-4" of the top of the compressed fork tube with the specified fork oil brand and viscosity*.The fork tube is then gently pumped up and down to free any trapped air bubbles in the damper mechanism, then fully compressed again. Now a device is set to the correct oil level (measured in millimeters from the top of the fixed tube) and inserted into the fork, then the excess oil is sucked out until the desired final level is obtained.

It is a bit of a PITA the first time, but subsequently you can assemble the fork and use the conventional welding rod-style "dipstick" measuring method to determine the corresponding level for future maintenance oil changes. The important part is to get the spring out and pump the new oil enough to clear the trapped bubbles before setting the final level.

Please don't bother to post up "I don't race my motorcycle, so I don't need to do all that work!", because street/touring motorcycles encounter a far greater range of conditions than closed-course racing bikes, so accurate tuning is every bit as important. ;)

* "specified fork oil brand and viscosity" is incredibly important. Understand that there is no regulated standard for suspension fluid manufacturers, so viscosity, "cling", and thermal stability are all over the map, and the "weight" printed on the bottle is seldom useful. When using a suspension valving SYSTEM, like the RaceTech or YSS PD Valve setups, the specified fork oil brand and viscosity is critical to having consistent adjustability.

Temperature is also a large factor in fork and shock oil behavior. This is where street bikes are far more sensitive, because folks often jump onto a very cold motorcycle and ride on cold roads at 35-40F, where traction is already compromised. Some fork oils are very consistent across a very wide temperature range. Others are not.

There was useful comparison chart of suspension fluids available on the net under the location http://www.peterverdone.com/suspension-fluids/ Careful perusal of that chart will show one HOW much the manufacturers take liberties with their ratings.

If the spec calls for (as example) BMW 7.5W fork oil, which is a product manufactured by Intercontinental Lubricants in the USA under the SPECTRO brand name carrying the BMW label, you should stick with that manufacturer (BMW or SPECTRO) and go up to 10W or down to 5W as your needs dictate. Mixing different viscosity oils, even from the same manufacturer, to get a "half-way" viscosity can give you reasonably accurate results. The late Russ Butler did a lot of home-brewed fork oil viscosity measurement, some of which he posted on the Airlist years ago, before he passed.

There's much more to know and learn here, but I have to get to the shop and try to earn enough to keep the lights on. ;)

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Tom Cutter

Yardley, PA

www.RubberChickenRacingGarage.com

"Don't accept your dog's admiration as conclusive evidence that you are wonderful." - Ann Landers