Softail Oil Change

From time to time I see question on the forum regarding doing an oil change on a Harley and more specifically about doing a scavenging oil change on a Softail. Since there didn't seem to be a good thread on doing an oil change with pictures, I thought I would write something up. This oil change was done on a 2001 Fat Boy. So, some of the tools and procedure may be different for your specific application.

Tools

Motorcycle lift
1/4" Allen head socket or long Allen head tool (for engine oil and transmission oil drain plugs)
3/8" Allen head socket or Allen head tool (transmission oil fill plug)
3/8" drive ratchet wrench
6" long 3/8" drive extension
3/8" drive universal joint (may or may not need depending on bike location on lift)
1/4" drive ratchet wrench
T27 Torx head socket or torx head tool (primary cover screws)
T40 Torx head socket or torx head tool (primary oil drain plug)
Oil filter wrench
Oil catch tool for filter (optional)
Oil drain pan (preferably 2)
Flashlight
3/8" Fuel / Oil line removal tool (Scavenging oil change ONLY)
Clear tygon tubing (Scavenging oil change ONLY)

Supplies

Oil for engine (3-4 quarts)
Oil for transmission (~ 1 quart)
Oil for primary (~ 1 quart)
O-rings for transmission and engine oil drain plugs (available from dealer for about $1 each)
Primary cover o-ring
Thread sealant for primary oil drain plug

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Procedure

1. First raise the bike on a motorcycle lift. My bike was significantly lowered by a previous owner. In order to get a motorcycle jack to slide under the bike, I first have to ride the front and rear wheels up on a 2x6 to get enough clearance for the jack (Figure 1).

Figure 1.

2. Next, remove the engine oil (oil tank) fill plug. This will make draining the oil tank go a little faster. (Figure 2)

Figure 2.

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3. The oil drain plug for the oil tank is located under the bike on the frame cross-member just in front of the rear wheels. Do NOT remove the drain plug directly on the bottom of the engine crankcase. Place an oil pan underneath the oil tank drain plug and remove the plug. (Figure 3/4)

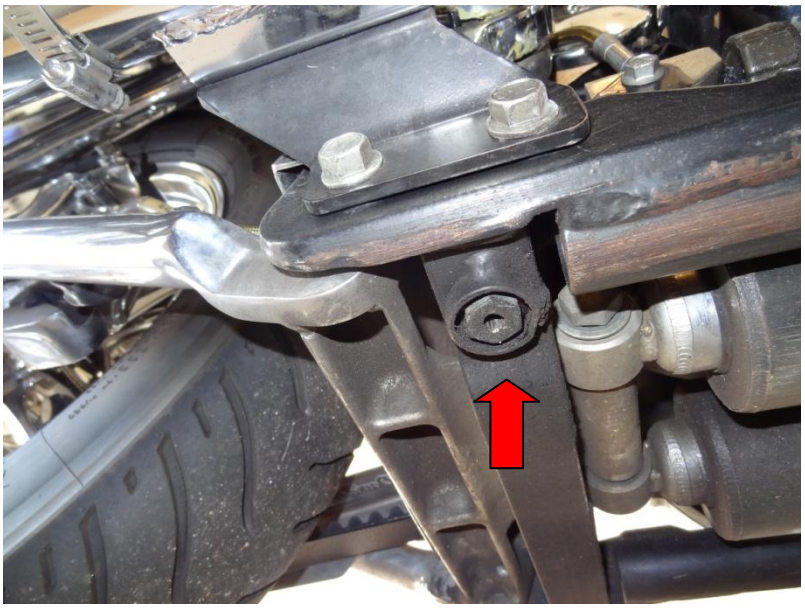

Figure 3.

NOTE

On my bike the oil tank drain plug uses a 1/4" Allen head socket or Allen head tool. However, this may be different on your bike.

Figure 4.

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4. Inspect the magnetic plug insert on the drain plug for metal shavings. It is normal to find a small amount of fine powdery material on the plug. However, larger slivers of metal similar to wood splinters could be indicative of a more serious problem that should be investigated. (Figure 5)

Figure 5.

Install a new o-ring on the oil tank drain plug and after the oil has stopped draining, install the drain plug.

5. If you have a second drain pan available, remove the oil filter. Generally, removing the oil filter is going to make a huge mess. However, you can improvise a tool to divert the oil away from the engine and to the drain pan thus minimizing the mess. I made mine out of an old 2-liter soda bottle with the bottom cut off and a slot to get the oil filter wrench to the oil filter. Pretty much anything that will divert the oil away from the engine and still allow you to get the filter off will work. (Figure 6, 7, and 8)

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Figure 6

Figure 7.

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Figure 8.

When you replace the oil filter, make sure that you lubricate the rubber seal on the new filter with engine oil. This will prevent the filter from binding against the engine case and make for easier filter removal during the next oil change.

6. The next step is to drain the transmission oil. First, remove the transmission oil fill plug. This will make the transmission oil drain faster and ensures that you don't get caught with no oil in the tranny should the fill plug be difficult to remove. On my bike, to remove the plug I needed a 3/8" Allen head socket or Allen head tool. I use a 3/8" drive universal joint and 6" extension along with a 3/8" Allen head socket to clear the rear exhaust pipe while removing the plug. (Figure 10 - not yet available)

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7. The transmission drain plug on a Softail is located between the shocks on the bottom of the tranny. On my bike it too uses a 1/4" Allen head socket or Allen head tool. I will say that it's almost impossible to remove the plug without an Allen head socket and 6" extension. However, you may be able to remove it with a long Allen key and a pair of Vice grips (to turn the key). Depending on how the bike is located on the motorcycle lift, the back ramp on the lift may interfere with removal of the transmission drain plug. It may be necessary to relocate the bike on the lift or use a universal joint with the socket to remove the plug. Place a drain pan underneath the bike and remove the transmission drain plug. (Figure 11)

Figure 11.

Inspect the transmission oil drain plug for metal shavings just like you did with the engine oil plug. Like the engine oil drain plug, it is normal to find a small amount of powdery material on the plug. After all the transmission oil is drained install a new o-ring on the drain plug and install the transmission oil drain plug.

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8. Next, remove the primary (derby) cover. This is normally held in place by five (5) screws that require a T27 Torx head tool to remove. It essential to make sure that your Torx bit is in good condition. The derby cover screws typically take a lot of force to initially break free. If your Torx head tool is in poor condition, you'll end up stripping the heads on the screws. If that happens, you'll have to drill the heads off of the screws to remove the cover. Apparently this is a fairly common occurrence because the derby cover screws are one of the few parts my local Harley dealer keeps in stock. (Figure 12)

Figure 12.

9. Locate the primary drain plug on the bottom of the primary housing, place a drain pan under the primary, and remove the plug. On my bike, this requires a T40 Torx head tool. (Figure 13)

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Figure 13.

After all of the primary oil has drained, apply a thread sealant to the primary drain plug and install the plug. I use a Teflon tape sealant on the threads but, a liquid sealant will work also.

10. Next, refill the bike with the appropriate oil for each location. If you ask for opinions on what oil to use, you'll get about a million different choices. Here's what I recommend:

    Engine Oil / Oil Tank - 20W50 Synthetic
    Transmission - 75W90 Synthetic
    Primary - 20W50 Non-Synthetic (recommend by folks who installed my 6-speed gear set)

    Again, this is just what I use. Folks have use many other (different) oils than this with equal success. My only hard and fast recommendation is that you use synthetic oil in the engine. Unlike most automobile engines, the oil in a Harley engine can sometimes see temperatures of 250°F or higher. Most non-synthetic oils will start to experience some viscosity breakdown above 180°F and significant breakdown above 240°F. One of the primary reasons synthetic oil was developed was because of oil breakdown related failures of aircraft engines during WWII. Beyond that, the key is not WHAT oil you choose but rather making sure that you change your oil and filter religiously at regular intervals. It is my opinion that you should never go more than 7500 miles on an oil change (regardless of what type oil you're running). Personally, I change mine every 5000 miles.

    I will say that I did use 15W40 non-synthetic oil in my engine during break-in after engine modifications. However, I wasn't running the engine like I normally would (i.e. beating it like it owes me money) so the oil temperatures never got all that high.

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11. For this oil change, I started by refilling the primary first. You'll need a flashlight to see down in the bottom of the primary housing. Before you start filling, look into the housing to see what it looks like with no oil in it. Your reference point is going to be the bottom of the clutch disc hub. When you fill, you're going to fill until the oil level just reaches the bottom of the hub. I use a funnel with a small diameter tip to fill the primary. Normally, it takes right at 1 quart to fill the primary. For me on this oil change, it took slightly over a quart to reach the bottom of the clutch hub. I'm not saying I recommend it but, I know folks that simply add a quart of oil to the primary and button it up without ever checking the level. And, I've never heard anyone complain that it resulted in a problem.
12. After you've filled the primary housing, it's time to install the primary cover. Harley recommends replacing the primary cover o-ring (the huge one) every time the cover is removed. I'm usually too lazy to drive to the dealer to get a new o-ring so, I normally replace it every other oil change. To date, I've had zero problems with the primary cover leaking (knock on wood). When you tighten the primary cover screws, make sure you tighten them in an alternating pattern. First tighten all of the screws finger tight. Then, tighten one screw fully. You don't need to torque them too tight (not even one grunt tight). For the next screw, choose the one that's furthest away from the screw you just tightened. Repeat this until you have all five screws tight.
13. Next, fill the transmission with the appropriate oil. The Harley service manual says it will take 20-24 oz. On mine it's closer to 20 oz. You'll just have to fill until you've used a little less than a full quart, check the level and adjust accordingly.
14. Now it's almost time to fill the oil tank. Before we do, let's talk for a second about doing a scavenging oil change. A lot of folks, especially those doing their first oil change, are unaware that due to the design of the oiling system, if you simply drain and refill the oil tank and change the filter, there is still dirty oil left in the engine. That's because they use a dry sump system and a two stage oil pump (for lack of a better term). The primary stage of the oil pump supplies all of the engine's oil needs. The second stage (scavenging stage) draws oil from the sump and returns it back to the oil tank. At any given time, there's only a very small amount of oil in the sump. Hence the term "dry sump".

    When you drain the oil tank and change the oil filter, some dirty oil still remains in the scavenging part of the oil system. Also, if you have an external oil cooler, there is dirty oil left in there that doesn't get removed by just draining the oil tank.

    As a result, some folks will choose to do a scavenging oil change to remove all of the dirty oil. Because the amount of oil left in the scavenging system is small, a scavenging oil change is not required. In fact, the procedure for performing a scavenging oil change is not even described in the Harley service manual. Personally, I always do a scavenging oil change and I'll describe it here but, it's optional and completely up to you as to whether you want to do one.

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15. If you're going to perform a **scavenging oil change**, proceed to the next step.

    If you're **NOT** performing a scavenging oil change, fill the oil tank to just below the oil tank filler neck. Install the filler cap/dipstick, start the engine and run it until the engine oil is at normal operating temperature. You'll normally need to run the engine at least 5-10 minutes at idle to get the oil up to normal operating temperature. Stop the engine and check the oil level making sure it is within the band on the dipstick. Adjust the oil level as necessary until it is within the band. The service manual or the owner's manual will specify whether you should check the oil with the bike on the kickstand or standing upright. However, if you're dipstick is hinged (i.e. flops around when you pull the dipstick) you check the oil with the bike on the kickstand. If the dipstick comes straight out of the filler cap and is not hinged, you check the oil level with the bike upright.
16. If you're performing a scavenging oil change, fill the oil tank to just below the oil tank filler neck. Then you'll need to disconnect the scavenging return line from the oil tank. First, slide the oil line collar away from the oil tank. (Figure 14 and 15)

Figure 14.

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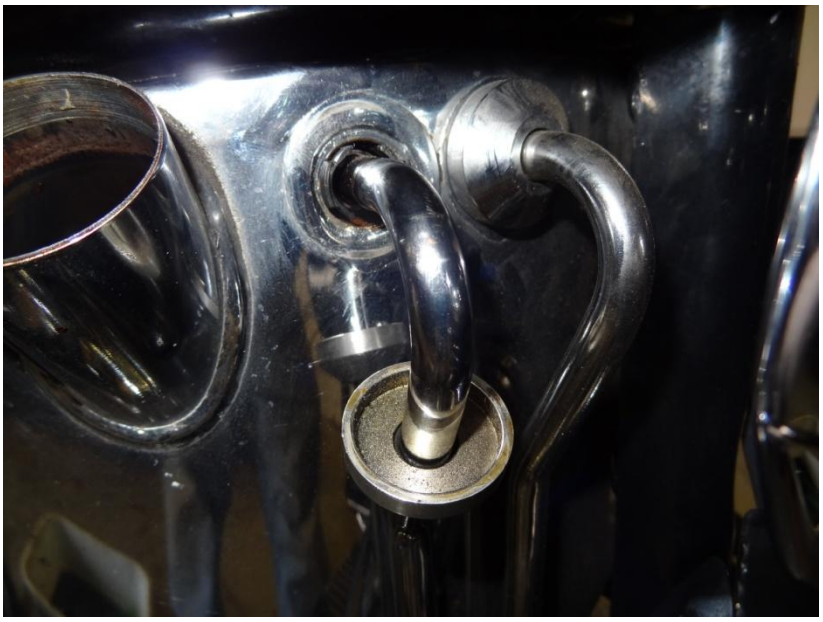

Figure 15.

Insert a 3/8" Fuel/Oil line removal tool around the oil line into the space between the plastic insert fitting and the oil line. (Figure 16 and 17)

Figure 16.

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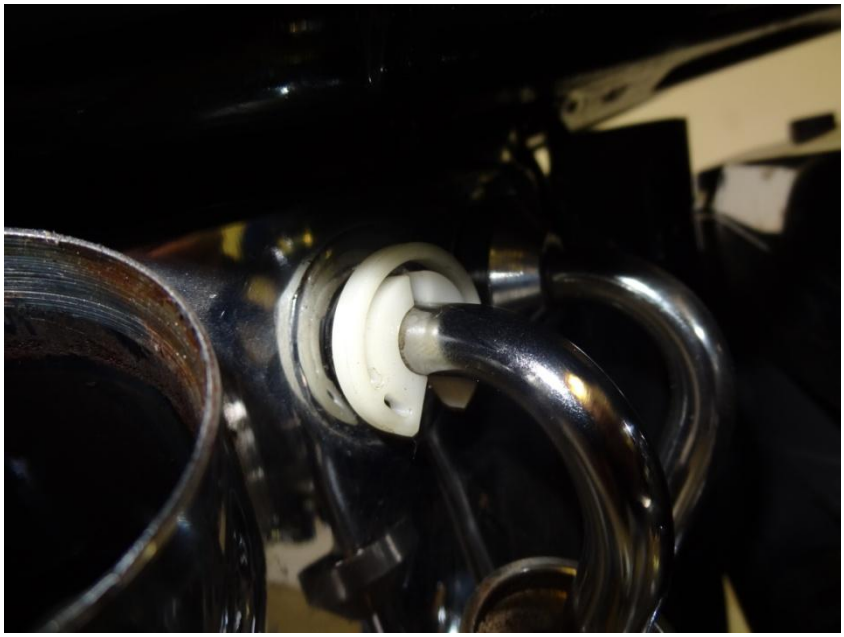

Figure 17.

While holding the Oil line removal tool against the oil tank with one hand, use the other hand to pull the oil line out of the oil tank. After you have pulled outward on the line about 1", the collar on the oil line with hit that back of the removal tool. You can then stop holding the tool and pull the line the rest of the way out of the oil tank. (Figure 18)

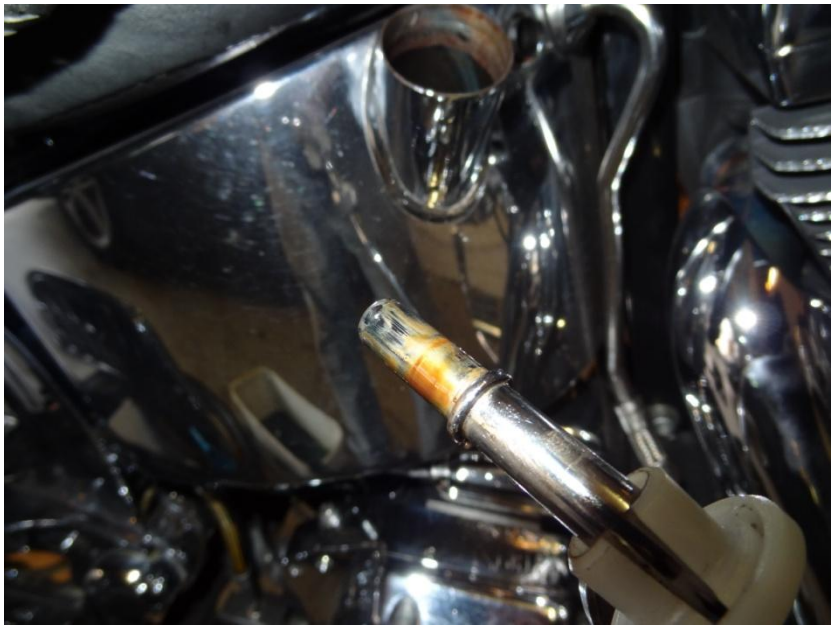

Figure 18.

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Connect a piece of clear tubing to the end of the oil line and route it to your oil drain pan. If you don't use a hose clamp to hold the tubing on the oil line it will likely blow off and create a huge mess. Start the engine. When you first start the engine the oil going through the tube into the drain pan will be dirty. When you see it change to clean oil, you can stop the engine. If the oil isn't clean before the oil level in the tank drops several inches, stop the engine, refill the oil tank, and restart the engine. Repeat this until you get clean oil out of the scavenging line.

After you get clean oil out of the scavenging line, stop the engine and reconnect the scavenging line to the oil tank. Add oil to the tank until the level is just below the oil tank filler neck. Install the filler cap/dipstick, start the engine and run it until the engine oil is at normal operating temperature. You'll normally need to run the engine at least 5-10 minutes at idle to get the oil up to normal operating temperature. Stop the engine and check the oil level making sure it is within the band on the dipstick. Adjust the oil level as necessary until it is within the band. A service manual or the owner's manual will specify whether you should check the oil with the bike on the kickstand or standing upright. However, if you're dipstick is hinged (i.e. flops around when you pull the dipstick) you check the oil with the bike on the kickstand. If the dipstick comes straight out of the filler cap and is not hinged, you check the oil level with the bike upright.

17. If possible, after you've changed the oil, take it for a ride (preferably 15 minutes or longer) and then check for oil leaks.