

How to change the oil in a late model PCM engine

I have seen an increase in the number of posts from newer members asking how to properly change the oil in their new Nautique. I recently changed the oil in my 2020 G23 ZZ6 and thought I would document the process I have developed after more than 20 oil changes across 5 G23s.

1. Prepare your oil extractor

Changing the oil in PCM engines requires the use of an oil extractor. It is not practical to drain the oil from the engine into a pan because the oil drain hose does not reach the drain plug in the hull. While it is possible to use an oil extractor to drain oil from the engine oil dip stick this can be problematic because the oil extractor hose can become lodged in the dipstick resulting in an expensive repair. Even if the hose does not become lodged it will be highly likely that you don't extract all of the oil. In my view the optimal approach is to create a hose that can attach to the engine drain hose on one end and to your oil extractor on the other end. This allows the extractor to vacuum all engine oil from the oil pan resulting in almost no spent oil remaining in the engine. This also reduces the chance of overfilling the engine oil level because spent oil remaining in the engine will add to the total volume of oil in the engine.

I have learned that it is helpful to use an oil extractor that has a capacity of at least 8 quarts because while the engine has a capacity of about 6.5 - 7 quarts at room temperature, engine oil can expand to as much as 7.5 quarts when hot. And oil changes are best done with the engine at operating temperature (about 150 to 165 degrees).

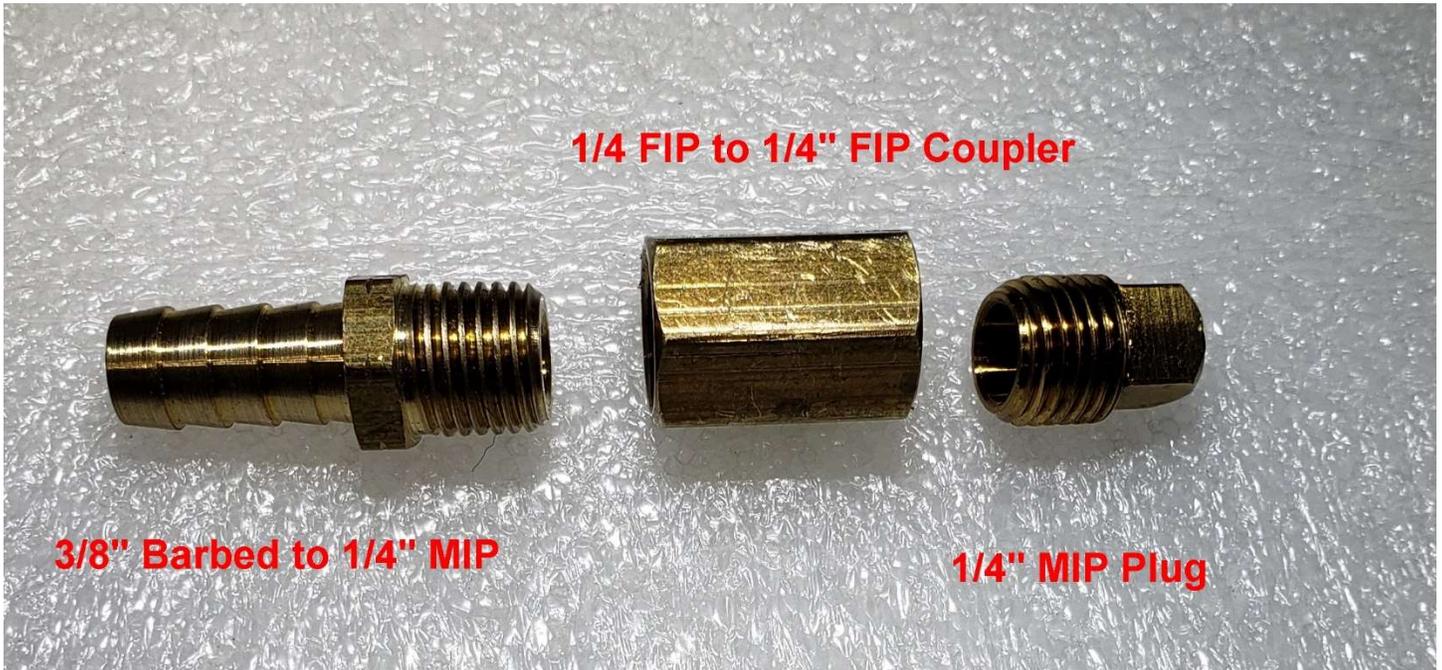
After using a few different oil extractors, I have found the Mityvac MV7201 model to be ideal because of its robust design, 8 Liter capacity and dispense / extract capability. The image below shows the extractor with my modified hose to attach to the PCM Oil drain hose.



The PCM Oil drain hose uses a 1/4" MIP (male iron pipe) pipe fitting. To connect to the MIP fitting you must configure a suitable hose with the opposite 1/4" FIP (female iron pipe) connector. In my case the inside diameter of the hose I used was 3/8" so a 3/8" ID barbed fitting was required. The simplest way to achieve this is with this part:

<https://www.grainger.com/product/GRAINGER-APPROVED-Barbed-Hose-Fitting-6AFP1>

But this part was not available at my Home Depot, so I configured a similar configuration with these parts:



Here is what the final hose to connect between my oil extractor and the PCM drain hose looks like:



End to attached to PCM Oil Drain Hose with plug to prevent spills.

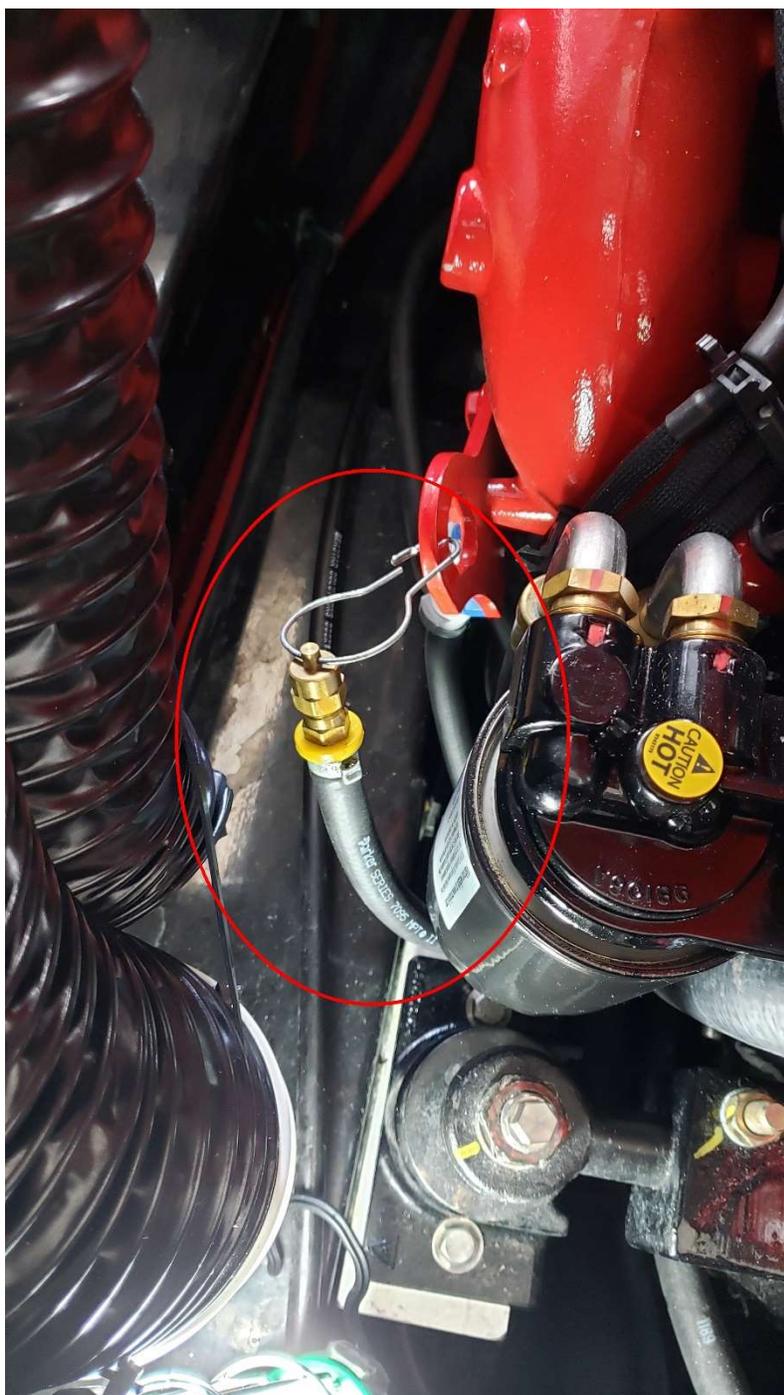


End to attached to Oil Extractor

With your Oil Extractor properly configured now proceed with the oil change

Prepare the boat.

1. Clear out the starboard rear locker so that you have access to the engine oil filter area. Also remove the engine separation panel and store in a safe space.
2. Remove the rear bench seat and store in a safe location. I put mine upside down on the front passenger seat area.
3. I place a large plastic sheet down on the entire floor of the boat to prevent oil stains on the SeaDeck.
4. Lift the engine cover and locate the engine oil drain hose. It is on the starboard side of the engine and is usually attached with a shower curtain clip to the engine lift point. See image below.



5. Using a 5/8" and 9/16" open-end wrenches loosen the oil drain plug fitting.



6. Thread the oil extractor hose fitting onto the engine oil drain hose and snug down the connection with the same open-end wrenches.



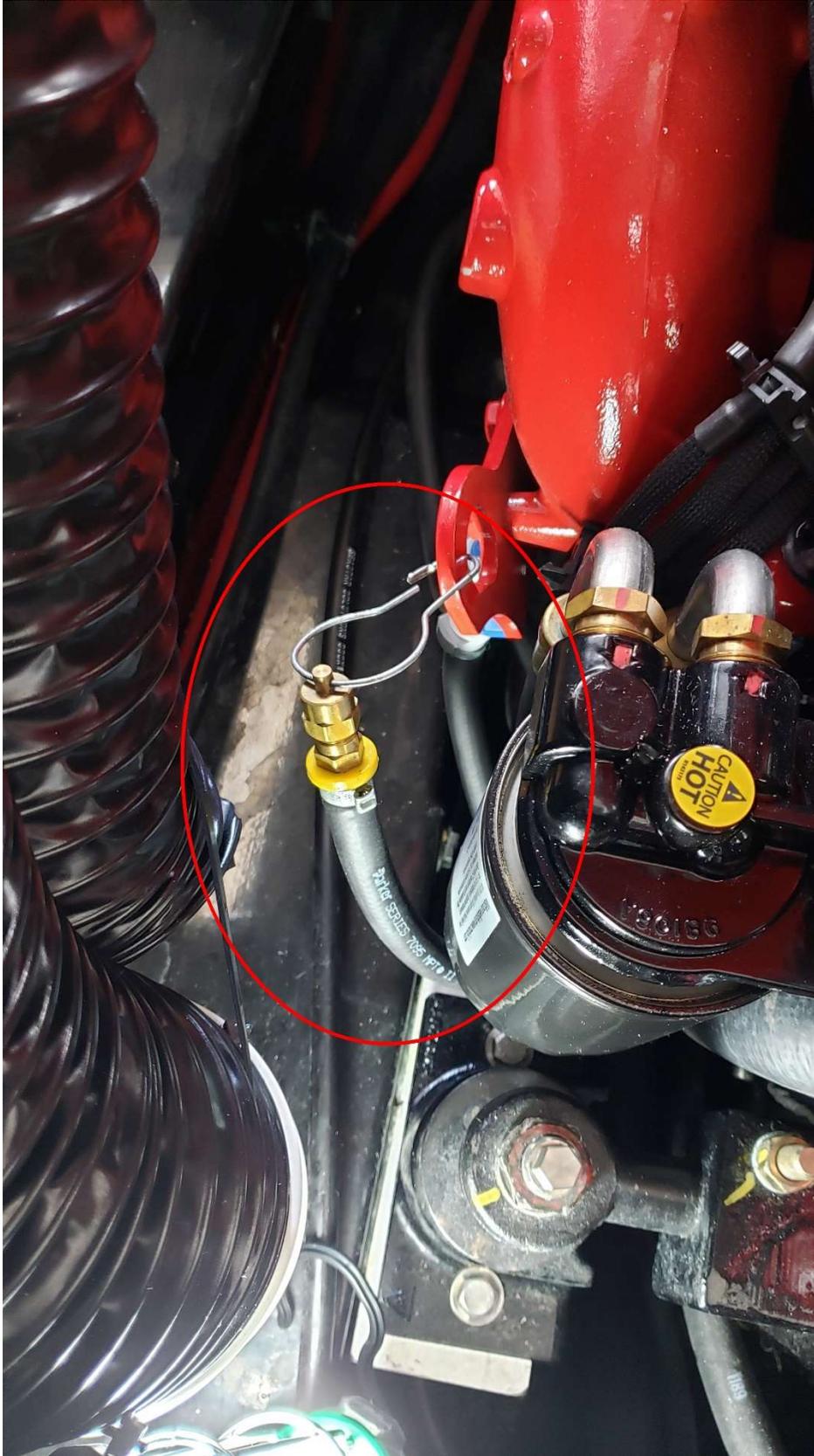
7. Connect the other end to your oil extractor and proceed to pump the extractor to remove ALL of the oil.



After my first engine oil change with the factory oil fill on a new H6Di / ZZ6 engines I measured 6.2 L of oil removed from the engine (after the engine oil had cooled in the extractor. 6.2 L = 6.5 Quarts. This is the amount of oil to refill the engine to properly reach the optimal oil level.



8. Once all of the engine oil is extracted detach the oil extractor hose and reinstall the cap on the engine drain hose. Finally secure the drain hose back onto the engine mount.



9. Now proceed to change the engine oil filter. In the 2020 ZZ6 PCM engines the oil filter has been relocated to the front of the engine making access much easier. In earlier PCM engines the oil filter is in the rear requiring one to climb into the starboard storage locker to access the filter. In either case the process to change is the same.
1. Place a large rag under the oil filter.
 2. Use an oil filter wrench to loosen the oil filter so it can be rotated by hand but do not unscrew it yet.



10. Place about 4 or 5 plastic shopping bags inside one another and wrap them around the oil filter before removing. This will prevent any oil from leaking into the bilge. Unscrew the filter by hand and catch the filter inside the layered plastic bags. You may want to wear gloves because the oil can be extremely hot and dropping the filter will potentially spill oil into the bilge making a mess. Remove the filter and dispose of properly.



11. With the filter removed use a clean rag to clean the oil filter mounting surfaces.



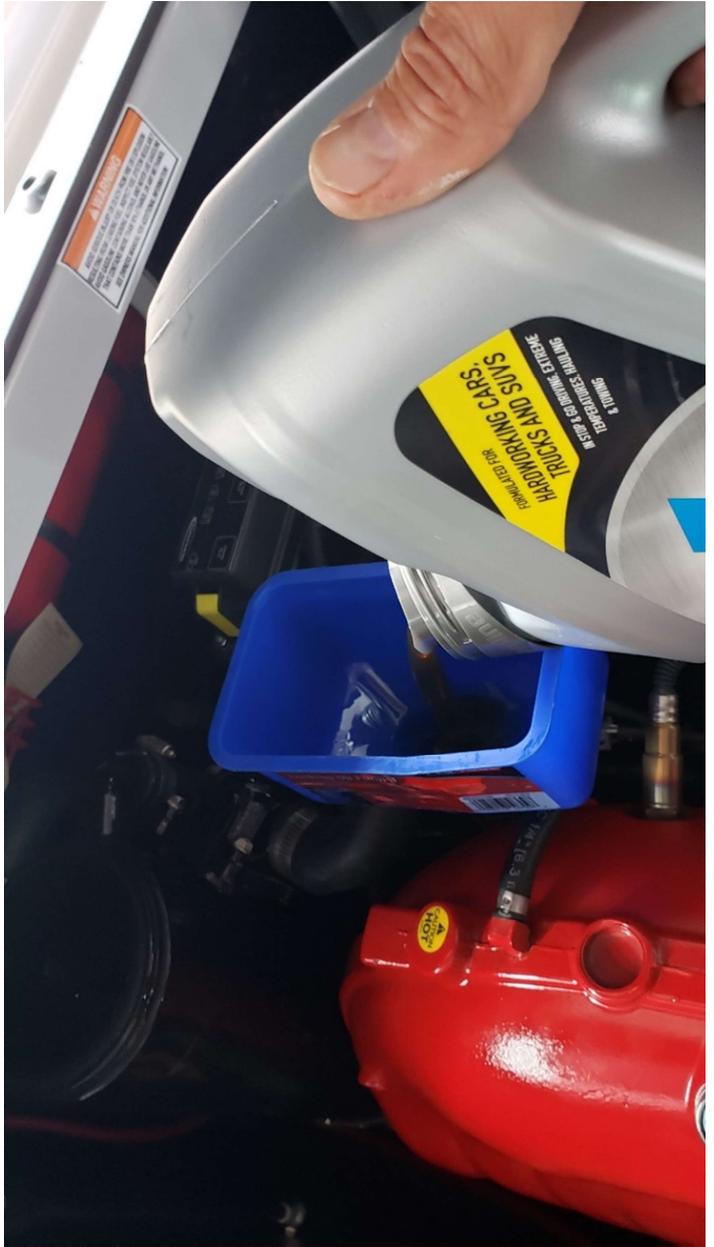
12. Prime the oil filter with oil. This usually takes about 1 quart of oil. Fill slowly because the filter material will be slow to absorb the oil to avoid spilling oil over the filter. I use the Mobil 1 M1-301 filter because of its availability at Walmart and its filter performance. See end of document for filter performance tests.



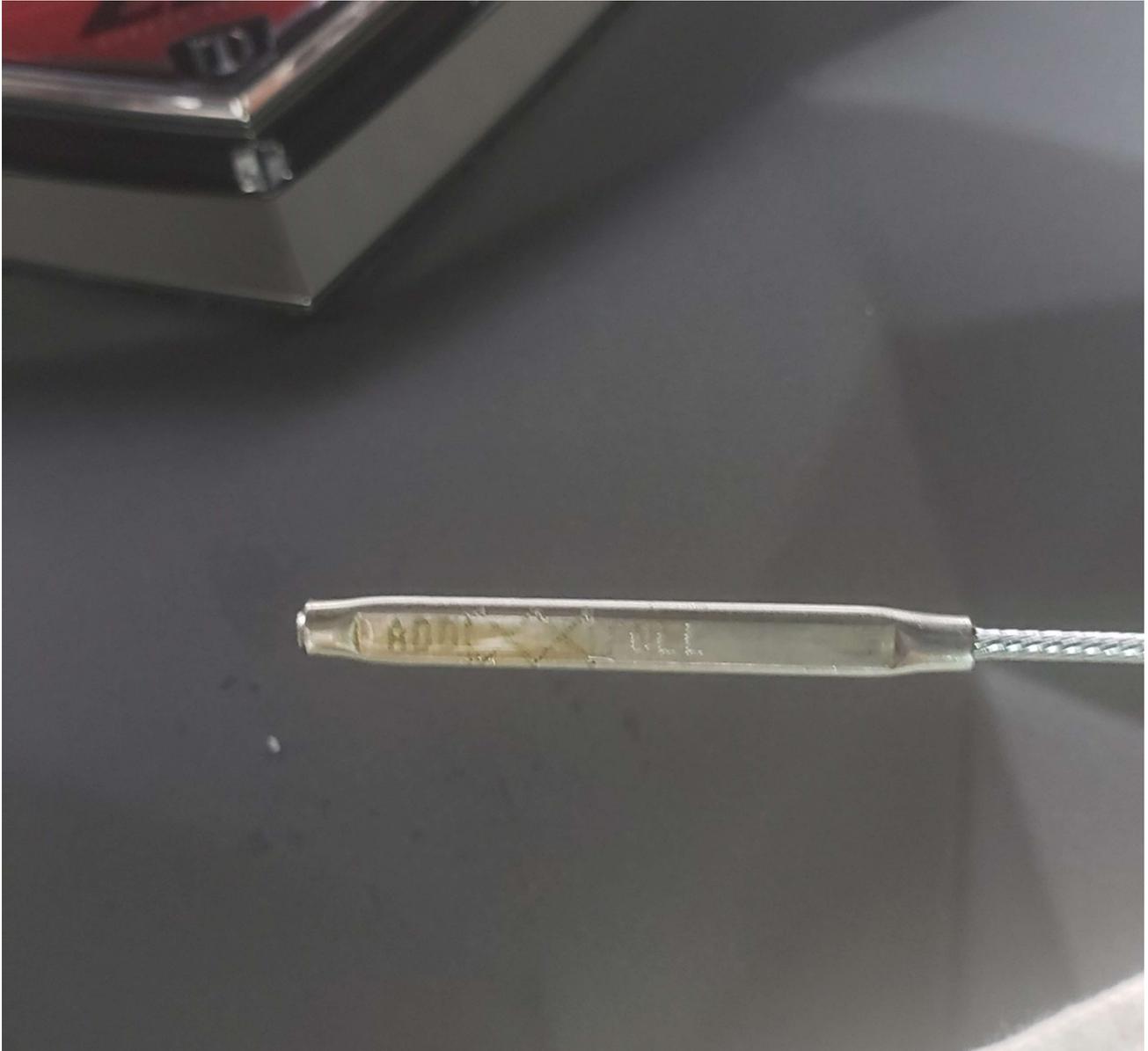
13. Carefully replace the full oil filter onto the filter mount and thread it onto the mount. Note the orientation of the filter when it first meets resistance as you are threading it on to the mount. Then hand tighten $\frac{1}{2}$ to $\frac{3}{4}$ of an additional turn. Do not over tighten the filter as it can be difficult to remove on the next oil change.
14. Remove all rags and equipment from the engine bay and prepare to fill the engine with oil
15. Next remove the engine cover by lifting it up. It is held in place by rubber grommets that simply snap off. Be careful not to exert excessive force on the electrical connection to the cover. (This is located on the port side and is used to power a light on the cover.



16. Remove the oil fill cap, insert a funnel and fill the engine with 6 to 6.5 Qts of the proper oil.



17. Wait 10 minutes or so for engine oil to drain into the oil pan then check engine oil level using dipstick on port side of the engine. I have found that adding 6.5 Qts of oil into the engine fills the ZZ6 engine properly. Thus, the aggregate engine oil capacity required for an oil change is 7.5 Qts (6.5 in oil pan and 1 qt in the filter).



18. Once you have filled the engine to the proper oil level, replace the engine oil cap and engine cover. Wipe down any spilled oil and replace the engine side panel if removed and replace the bench seat.
19. Then proceed to run the engine and check for leaks around the oil filter. This completes the oil change process!

Oil Filter Sizes to Use and Performance Tests

| Oil Filter | 30um Filtering (wt 5) | Overall Build Quality (wt 5) | Media Surface Area (wt 1) | Media Volume (wt 1) | Grade Point Average | Final Grade | Filter to fit Ford 351W |
|--------------------|-----------------------|------------------------------|---------------------------|---------------------|---------------------|-------------|-------------------------|
| Fram Xtended Guard | A- | A | C | A | 3.69 | A- | XG8A |
| Mobil 1 | B | A | A- | A | 3.56 | A- | M1-301 |
| Royal Purple | A | A | C- | F | 3.47 | B+ | 30-8A |
| Amsoil | A | A- | D+ | D | 3.39 | B+ | EA015 |
| K&N | B | A- | B+ | A | 3.39 | B+ | HP-3001 |
| Napa Gold | C+ | A- | B- | C+ | 2.92 | B | 1515 |
| Wix | C | A- | B+ | B+ | 2.92 | B | 51515 |
| Napa Proselect | C+ | B+ | B- | C | 2.75 | B- | 21515 |
| Purolator Pure-one | C- | B+ | A- | B+ | 2.67 | B- | PL30001 |
| Purolator Classic | B | B- | C+ | D+ | 2.67 | B- | L30001 |
| Bosch | C | B- | A- | B- | 2.47 | C+ | 3500 |
| Mann | B- | C- | A | B | 2.39 | C+ | |
| Fram Racing | C- | C+ | A | B- | 2.22 | C+ | |
| Premium Guard | D+ | B+ | C | D | 2.19 | C+ | |
| Baldwin | D | B- | B- | A- | 2.06 | C | |
| Luberfiner | C- | C+ | C | C | 2.00 | C | |
| Fram Tough Guard | C- | C | C+ | B- | 1.94 | C | TG8A |
| Fram Double Guard | C+ | C- | C- | C- | 1.94 | C | |
| Full | D | C+ | A | C | 1.89 | C | |
| Fram Defense | C | C- | C- | C- | 1.81 | C- | |
| Carquest | D | C+ | C+ | C | 1.75 | C- | |
| Fram High Mileage | B- | D | D | C- | 1.75 | C- | HM8A |
| Microgard | B- | D | D | D+ | 1.72 | C- | |
| Motorcraft | D+ | C- | B | C+ | 1.69 | C- | FL1A |
| Fleetguard | C | D+ | D+ | D+ | 1.61 | C- | |
| Fram Extraguard | D+ | D | C- | C+ | 1.31 | D+ | PH8A |
| Proline | D | C- | F | D | 1.19 | D+ | |
| ACDelco | F | F | B | A- | 0.56 | D- | PF2 |
| STP | F | F | B | B | 0.50 | D- | S8A |
| Shell | F | F | F | F | 0.00 | F | |
| Pronto | C+ | C | n/a | n/a | n/a | n/a | |