



The Solid SCOOP Newsletter - September 2020

USING SILICONE BRAKE FLUID

Tech article submitted by member Larry Pearson Editors note: As background for Larry's article, I wanted to provide these definitions, as there is some understandable confusion around them. Brake fluid Types DOT 3 is the most common type of brake fluid used in most cars and trucks. It is polyglycol based, so it will damage painted surfaces, as well as absorb moisture over time. According to the SAE (Society of Automotive Engineers), it can absorb 2 percent of its volume in water every year. So by the 5th year, your brake fluid is as much as 10 percent water. It has a rated boiling point of 284 F/140 C. DOT 4: is also formulated for use in all vehicles, as it is also polyglycol-based, but offers a higher rated boiling point (311 F, 155 C). It also absorbs moisture, but claims to be at a slower rate than DOT 3, however, I could not find any documented specs on this. It will also damage painted surfaces. DOT 5: is silicone-based; it does not absorb moisture, nor does it damage painted surfaces. It has a wet boiling point of 356 F/180 C. This is the fluid Larry is describing in his article below. DOT 5.1: THIS IS CONFUSING, but 5.1 is NOT silicone-based like DOT 5! It is polyglycol-based (the same as DOT 3 and DOT 4), but offers the highest boiling point (374 F/ 190 C). It will damage painted surfaces.

My name is Larry Pearson. I first became aware of DOT 5 Silicone Brake Fluid in 1975 when it started to be advertised in car publications as a better replacement for traditional (DOT 3) brake fluid. Specifically, traditional brake fluids (DOT 3, DOT 4, and DOT 5.1) are glycol-based and therefore readily absorb water from humidity in the atmosphere. This water causes rusting of the iron and aluminum components in every brake system and leads to fluid leakage and a frequent need to overhaul these brake systems. Moisture in the fluid also reduces its boiling point. DOT 5 is silicone based and, therefore, does not absorb the water that causes rusting of brake system components as well as reduces the boiling point of the fluid. It is completely compatible with all rubber components used in yesterdays and today's brake systems, and, unlike polyglycol fluids, does not absorb moisture over time, nor does it damage painted services. In my experience over the past 45 years DOT 5, when properly installed in a properly rebuilt brake system, is "forever". Over the past 45 years, I have installed DOT 5 in the following vehicles: 1949 Plymouth, 1951 Oldsmobile, 1955 Cadillac, 1956 Chevrolet, 1960 Corvette, 1962 Corvette (2), 1968 Caprice, 1972 Chevrolet C-20 truck, 1975 Chevy Monza (V8), 1977 Cadillac Seville, 1984 Oldsmobile, 1992 Camaro Z-28. I have not experienced failure of the hydraulic systems in any of these cars. All I have had to do is replace brake shoes or pads in these vehicles when they wore out.

I also wish to point out that the US Military initiated the development of DOT 5 and uses it in all its vehicles. The US Military has thousands of military vehicles in long term storage and discovered frequent brake failure using DOT 3 when these vehicles were activated. These vehicles must be ready to go at a moment's notice and brake failure is not acceptable. Despite its advantages, DOT 5 does have its "issues":

- It is much more expensive than DOT 3 fluids.
- It is not easy to find in automotive parts stores.
- Most mechanics are not familiar with it and how to properly install it.
- DOT 5 absorbs air in the form of micro bubbles when agitated in the presence of air, making it difficult to bleed, as well as making it incompatible with ABS braking systems..
- None of the automobile manufacturers that I know of use it in their new vehicles, or recommend it in their products.
- If you have your DOT 5 equipped vehicle serviced in a dealership or garage, despite whatever you tell them, they will "top off" your reservoir with DOT 3 fluid.
- Some DOT 3 formulations (not all DOT 3 is the same) will react with DOT 5 and turn everything to "jello" and cause brake failure.
- DOT 5 will contaminate surfaces and they will be almost impossible to paint over.
- DOT 5 is not petroleum based, and therefore petroleum based solvents will not dissolve it. The solvents that could remove it have all been banned by the EPA.
- If you spill DOT 5 onto concrete surfaces, they turn white when wetted with water.
- I know of no environmentally safe way to dispose of waste DOT 5 fluid. Why does the automotive industry not use DOT 5? DOT 5 is incompatible with the ABS braking systems found in the vast majority of modern cars. It is expensive and time consuming to install. And besides, the automotive repair industry makes a whole lot of money repairing the frequent brake failures caused by DOT 3.

INSTALLING DOT 5 BRAKE FLUID

Before installing DOT 5 you should completely rebuild all components of your brake system and flush out any "sludge" left over from DOT 3 corrosion. This sludge can cause the rubber seals to leak. When rebuilding the master cylinder, wheel cylinders and calipers, you must never use any sort of petroleum based solvents or lubricants. The rubber formulation used in brake components will be destroyed by petroleum based lubricants and solvents. Petroleum based lubricants coming in contact with brake system rubber components will cause the rubber to swell up and become unusable. Always use brake fluid when honing the bores, assembling the components and flushing the system. As noted in #4 above, DOT 5 absorbs air in the form of micro bubbles when agitated in the presence of air. DOT 3 does not have this problem. It takes about 24 hours for these micro bubbles to congeal into large bubbles that can be removed by bleeding. To avoid this problem, introducing DOT 5 to an air filled system must be done very slowly.

The Solid SCOOP September 2020 Page 7

Do not shake the container. Carefully pour DOT 5 into the master cylinder in such a way to avoid splashing. The traditional system of pumping the brake pedal three times and then having your helper at the farthest wheel cylinder/caliper open the bleeder screw will not work with DOT 5. It causes the DOT 5 to be "blasted" through the lines and results in micro air bubbles to form in the fluid. You will never get a hard pedal with these air bubbles in your system. Pressure bleeders cause an unacceptable agitation of DOT 5 and cannot be used. If the master cylinder is located higher than the wheel cylinders/calipers, you should gravity bleed the system. This means going to the farthest wheel cylinder/caliper from the master cylinder and opening the bleeder screw and wait for the DOT 5 to appear. When it starts to appear, you should rap the wheel cylinder/caliper with a rubber hammer to dislodge any air bubbles that are stuck inside. The advantage to this method is that it can be a one-man operation. The disadvantage is that it takes lots of time. Repeat this operation for each wheel cylinder/caliper, ending up with the one closest to the master cylinder. During the bleeding operation always make sure that there is brake fluid in the Master Cylinder reservoir. When done with one of

the above bleeding procedures, you need to check the operation out. The brake pedal operation should be hard with no sponginess. If it is at all soft, you have air in the system and you have to repeat the bleeding operation, looking for bubbles. Since the bubbles at this point could be the dreaded micro bubbles, you should wait 24 hours for these to congeal into large bubbles before attempting to repeat the bleeding operation. Remember, all brake fluids are liquids, and liquids do not compress in any measurable amount with the pressures encountered in our brake systems. If you have a soft pedal, you have air in your brake system, no matter what type of fluid you are using. Once you get the desired hard pedal, you need to test for leaks. Firmly depress the brake pedal and observe if the pedal slowly goes down to the floor. If it does, you have a leak somewhere and you have to find it and fix it. I had a troubling leak in a stainless steel sleeved master cylinder. The leak was between the stainless steel sleeve and the cast iron bore. It went back to the rebuilder to re-do it. This is a potential problem with any sleeved brake component. When I bought my 1992 Camaro Z-28 new, I immediately converted it to DOT 5 without draining or rebuilding it. It was new. I used a turkey baster to suck the DOT 3 fluid from the master cylinder. Then I carefully filled the reservoir with DOT 5 and bled each caliper, starting with the furthest one, until the purple DOT 5 appeared. This method did not assure that all of the DOT 3 was removed, but it has been 27 years and I never have had a leak or a problem. In conclusion, installing DOT 5 is a lot more trouble and expense to install in your car's brake system compared to DOT 3. But when successfully done, in my experience, it is "forever". You should never experience brake component failure ever again. If you do stay with traditional brake fluid (DOT 3, DOT 4, DOT 5.1), you should flush the fluid every few years to remove the moisture that the fluid has absorbed.

*** Thanks to SDC Member Bob Valeski for submitting this article and securing permission to post it.