

Use of Castor Oil and Brake Fluid as a Substitute for LHS-2 in Older Citroëns

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In my last page, I outlined my reasons for finding a reasonable substitute for LHS/LHS-2 hydraulic fluid as used in certain Citroën models. While the use of pure brake fluid has been in widespread in these automobiles for a long time, mostly out of necessity, ride, shifting, steering and longevity has suffered. Many owners of "red fluid" cars have never experienced correct performance.

After learning that the first fluids utilized in these cars contained castor oil, I have tried to determine whether this lubricant could again be employed as an additive. After some reading and probing, I found that there is already a small group of owners who use castor oil, but the amount needed seemed to be, at best, conjecture.

I determined to find the matching ratio of castor oil to brake fluid to match the viscosity of pure LHS-2. After running a series of tests, I found it to be 9.25%. Using that percentage, therefore, one would add 3 oz of castor oil to 1 U.S. quart. Using metrics, one would add 92.5 ml to 1 liter of brake fluid.

To arrive at this figure, I sent a set of 12 samples, each one of an increasing ratio of castor oil to brake fluid, to an independent professional tester, Geoff Byrnes, of [The Coatings Laboratory](#) in Houston, TX. The samples were of 400ml. each. 200ml was the minimum sample size, but I chose the larger quantity because it allowed more precise mixing. On July, 2000 I received this data from Geoff:

Mixture	Amount of castor oil added to 400 ml of brake fluid (ml)	Viscosity in millipascal-seconds (mPa. sec.)
Pure DOT 4 Brake Fluid		23
Pure LHS		34.6
Pure Castor Oil		657.6
2.5%	10	25.72
3.75%	15	26.4
5%	20	27.4
6.25%	25	29.8
7.5%	30	31
8.75%	35	33.1
10%	40	37.2 (Anomalous, should be ~35)
11.25%	45	37.5
12.5%	50	41.6

If you look over the above chart, you will find that the viscosity of LHS-2 matches that of a sample somewhere between 8.75% and 10% castor oil/brake fluid. This data was further examined by a designer/engineer of rheometers, Jint Nijman. He agreed in principle to the findings but offered a correction to account for some deviations caused by the testing equipment.

It has been determined that use of DOT 3 fluid is perfectly acceptable. It is slightly less hygroscopic and though its boiling point is higher when fresh, as it ages the boiling point of DOT 4 fluid drops more quickly.

The discovery of the correct ratio of castor oil to DOT 4 brake fluid is a significant find but ideally, more experiments should be done. It would be desirable to find the viscosities of the mixture at higher and lower temperatures to find the viscosity index.

If the specific gravity were known, it would be easier to maintain systems at optimum mix ratio. For now, it will be necessary to premix. I would advise keeping only as much of the premix on hand as readily needed because once brake fluid is exposed to the atmosphere, it begins to absorb moisture. However, it is possible that the mix may be less hygroscopic.

The recent discovery of original Citroen technical papers have revealed that cars issued with castor oil mix experienced clotting of fluid in cold weather. For this reason, it is very important that those who decide to use castor oil realize this. If you live in a cold climate, make sure you drain your reservoir in the fall, refilling it with pure brake fluid. Then run the car for awhile before driving or laying it up for storage. In the spring, you can drain again and refill with castor oil mix. In dry climates it is OK to reuse the fluid as long as it is kept in tightly closed uncontaminated containers, and only for one extra season. The entire system should be drained and fresh refilled every 2 years, annually in damp or humid conditions.

Please be aware that using this mixture in your car will be done strictly at your own risk.

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