

Use of Castor Oil and DOT 4 Brake Fluid

in the Blending of a Substitute for LHS2

in Black Hydraulic System Citroëns

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The Citroën DS/ID series automobile was first shown to the public in 1955 and sold until 1975, when production figures reached 1,330,755 (1996, Reynolds/de Lange, p.22). The car utilized a unique suspension and control system based upon hydropneumatic principles. This feature gave the car its singularly comfortable ride, and was a precursor to highly developed systems now used in military vehicles and cars.

Pneumatically damped hydraulic lifts replaced the traditional suspension springs. These were supplied by control valves in a closed system. Major components of the system included the pump, the regulator and the reservoir. These, along with related parts, were painted black. Besides the suspension, the system was used to enable power assisted steering, braking, and transmission declutching and shifting on various models.

Until 1964, all cars used a castor-based hydraulic fluid in this system that was red in color called CH12, when it was supplanted by synthetic LHS2 (Reynolds, p.22). In 1966, the use of LHS2 began to be phased out in favor of a mineral base fluid that was green in color. The older, LHS2 fluid cars used seals and other parts that were incompatible to the new LHM, and thus could not utilize the advantages of the new type of fluid. To protect against cross contamination of incompatible fluids, a potential disaster, the component color was changed to green.

Production of LHS2 has dwindled to almost nothing, and in many areas, it is not available at all. It is unknown at this time how many of the early, LHS2 fluid cars survive, but there are enough of them to make it a worthy effort to supply owners with some kind of substitute for unavailable fluids, or to find a blend of liquids that would copy the characteristics of the earlier CH12. As stated earlier, this fluid is known to be castor-based, so it will be easier to copy.

At this time, many owners use DOT 4 brake fluid. This works, but viscosity differences cause numerous system problems such as malfunctions of orifice controlled operations, excessive noise and deteriorated ride and handling. Lack of lubricity has caused excessive wear to critical parts and seals.

I have decided to rediscover the correct ratio to blend castor oil and DOT 4 brake fluid and thus simulate the characteristics of CH12. Trials performed during the summer of 1999 on my own car, a U.S. export specification 1968 ID 19, showed promising results. Cycle times improved as well as the sound level during pump operation. Ride characteristics improved and steering effort decreased as well as its associated noise. Seal leakage diminished considerably. No doubt, the added lubrication was a benefit. But the optimum ratio was not found. Excessive amounts of castor oil led to undesired behavior and cold weather caused more problems, most likely because of elevated viscosity.

In the near future, I will commence the second stage of my research by performing a series of tests on examples of LHS2 (I cannot find any CH12) and blends of commercially available brands of DOT 4 fluid and castor oil of the type purchased in hobby shops and used in model 2 stroke engines. These 2 components should be available to a majority of Citroën owners. The tests will include viscosity, specific gravity, acidity and road trials. A possible third stage will be to approximate the red color of the original fluid.

Before actual testing can begin, three temperatures must be selected to simulate those found in daily automobile use. 2 of the 3 are known at this time. The lowest temperature has been chosen at 0 F. The next is room temperature, 60-75 F. The highest temperature has yet to be ascertained. I will not be able to do this until warm weather, as my car is in storage.

If you would like to contribute information, or if you own a Citroën of any year and live in a warm climate, I would appreciate hearing from you. You could do this part of the test for me by inserting a thermometer into your reservoir after a long drive and recording the results. If anyone knows the whereabouts of a quantity of original CH12, please let

me know.

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Use of Castor Oil and DOT 4 Brake Fluid as a Substitute for LHS2 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.

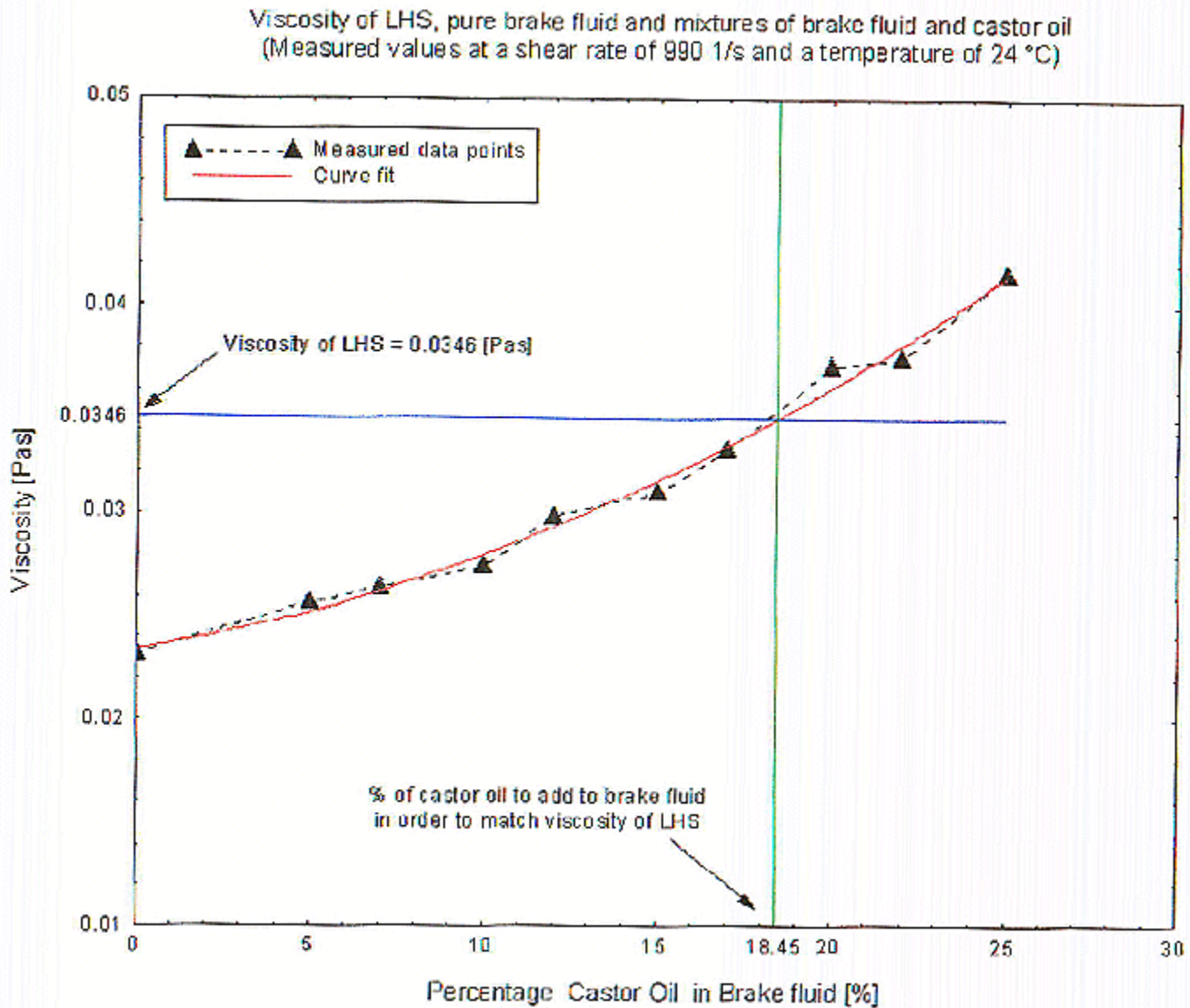
I determined to find the matching ratio of castor oil to DOT 4 brake fluid, to match the viscosity of pure LHS-2. After running a series of tests, I found it to be 18.5%. Using that percentage, therefore, to make one quart of fluid, you would put in 6 oz of castor oil. To bring one quart of brake fluid up to correct ratio, you would add 7-1/4 oz. If you are using metrics, you would add 93 ml to 1 liter of brake fluid.

To arrive at this figure, I sent a set of 12 samples, each one of an increased 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 Brake Fluid		23
Pure LHS		34.6
Pure Castor Oil		657.6
5%	10	25.72
7%	15	26.4
10%	20	27.4
12%	25	29.8
15%	30	31
17%	35	33.1
20%	40	37.2 (Anomalous, should be ~35)
22%	45	37.5
25%	50	41.6

[Viscosity Conversion Chart](#)

If you look over the above chart, you will find that the viscosity of LHS-2 matches that of a sample somewhere between 17% and 20% castor oil/brake fluid. This data was further examined by Jint Nijman, who agreed in principle to the findings but offered a correction of the data which he thought necessary to account for some deviations caused by the testing equipment. Mr. Nijman is a designer/engineer of rheometers.



Courtesy [Jint Nijman](#)

The discovery of the correct ratio of castor oil to DOT 4 brake fluid is a significant find, but before the mixture can be used in common practice, I feel that more experiments should be done. I would be desirable to find the viscosities of the mixture at a higher and lower temperatures to know 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 you will readily need, because once brake fluid is exposed to the atmosphere, it begins to absorb moisture. It is possible that the mix could be less hygroscopic.

I have received several testimonies from Citroën owners who have been using castor oil. So far, I have not found any incidences of trouble. One user claims to have used castor oil for over 15 years! He has says that he has enjoyed restored ride and performance and has never had a fluid related incident. **Please be aware, though that using this mixture in your car will be done strictly at your own risk.**

Many thanks to Geoff Byrnes, Jint Nijman, Stan George, Tony Jackson, Vincent Jammes, Robert Dircks, and many others, whose advice and encouragement has meant so much!

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<http://www.compufort.com/users/cando/lhs2.html>

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