ANDERSON

HAVE YOU EVER NOT-iced, *writes Bruce Anderson*, how it often takes only a little apparently favourable publicity to render some automotive products seemingly invincible in the eyes of the average car enthusiast?

I'm referring, of course, to silicone brake fluid, which over the last decade has come to be regarded by many as a sort of universal panacea for all of the ills that can affect old-car braking systems – and, by implication, many of those affecting modern high-performance braking systems, too.

I was particularly interested, therefore, to read Philip Raby's recent interview with Ray Smith of Automec (*Fluid movement*, October 1998 issue, page 20). Mr Smith, as you might expect of someone who sells the stuff, suggests that silicone-based fluid could be the solution to all our braking problems – which I certainly don't feel is the case. He also claims that changing from an older, polyglycol fluid to silicone fluid is straightforward. Once again, I would suggest, it is not.

The key to our differences on this matter lies in the narrative within the feature that silicone fluid is, and I quote, 'remarkably incompressible'. Wrong! It is compressible (albeit only slightly) and, as a result, gives what I (and many others) consider to be an unacceptably spongey feel to the brake pedal.

Now I would certainly agree that conventional polyglycol brake fluids absorb moisture (which under certain circumstances can result in a pedal that's not just spongey, but which goes all the way to the floor!), but in my view the feel of the brake pedal when using silicone fluid is unacceptable – even when it's brand new. I would much prefer to renew my polyglycol brake fluid at the manufacturer's recommended intervals, in other words, than to have a 'fit and forget' product that leaves me feeling that the car might not stop when I want it to.

Don't get me wrong. I'm certainly not against silicone fluid (indeed, I strongly recommend it for cars that are intended to be primarily static displays in museums and the like, and we used to install it in all manner of Porsches as far back as the 1970s), but, as I say, I feel it's simply not acceptable for cars that are actually driven – and especially those, such as many Porsches, that tend to be driven fairly hard.

Porsche currently recommends that its cars' brake fluid should be replaced every two years. The company also says that we should use only polyglycol fluids made to DOT3 and DOT4 standards, and not DOT5 silicone fluid. It also says that one should not mix DOT5 silicone fluid with DOT3 or DOT4 polyglycol fluids, since this may result in serious damage to certain components within the system. And such damage could lead to brake-system failure.

In fact, from the 1993 model year the hydraulic systems of all Porsches have been filled at the factory with an improved type of polyglycol brake fluid, ATE's so-called 200. Basically, this is a significantly uprated DOT4 fluid with higher 'dry' and 'wet' boiling points (more on this below) which extend the useful working life of the product to three years. This fluid is now readily available on the after-market, by the way, as ATE Blue.

The above DOT standards for brake fluid were established in 1972 by the US government's Department of Transportation. Under its auspices the National Highway Traffic Safety Administration (NHTSA) decided that there was a need for two grades of hydraulic fluid until a so-called all-weather fluid was developed which had both the viscosity and boiling-point characteristics suitable for all climatic conditions.

What this means in practice is that where added protection is required against vapour lock and fade in high ambient temperatures (such as those likely to be encountered in the southern part of the US), DOT4 fluid is recommended be-cause of its higher boiling point. Conversely, the conditions routinely encountered throughout northern areas during the winter demand the use of a DOT3 fluid, which even at very low temperatures has a relatively low viscosity.

The corollary to all this, of course, is that (ideally) one should neither mix DOT3 and DOT4 fluids, nor use them outside the broad climatic conditions for which they were formulated. Use DOT3 in, say, Nevada in high summer, for example, and you could run into problems of vapour lock and fade; use DOT4 in Alaska in the winter, and you'll probably notice a significantly slower response from the system – and possibly a pedal that takes a lot longer than normal to return to its 'rest' position.

For obvious safety reasons, all three grades of brake fluid have to meet certain requirements, arguably the most important of which are dry and wet boiling points, and also what is known as kinematic viscosity (which, as with engine oils, basically refers to how thick the fluid is at certain temperatures).

A DOT3 fluid, for example, must have a boiling point of at least 401 degrees Fahrenheit when it is brand new (before it has had a chance to absorb moisture from the atmosphere), and 284 degrees Fahrenheit when 'wet' (after it has been exposed to the atmosphere for a certain period of time, in other words.) The comparable figures for a DOT4 fluid are 446 degrees Fahrenheit and 311 degrees.

A DOT5 silicone fluid, on the other hand, is required to boil at no less than 500 degrees Fahrenheit when new, and (reflecting the undisputed fact that it doesn't absorb moisture) a commensurately high 356 degrees when 'wet'. All of the above figures are minimum requirements, re-member, and many of the brake fluids available today exceed them by quite a considerable margin.

Just as interesting are the viscosity requirements for the various grades of fluid. All three must show a reading of at least 1.5 centestokes at 212 degrees Fahrenheit, and at –40 degrees Fahrenheit (which is colder than you can probably imagine) a DOT3 fluid must read no more than 1500 centestokes, a DOT4 fluid no more than 1800 centestokes, and, finally, a DOT5 fluid no more than 900 centestokes.

In order to gain maximum benefit from using silicone brake fluid the entire hydraulic system should be completely disassembled and cleaned out before any such fluid is added. This is primarily because although silicone is certainly not incompatible with polyglycol fluids, it certainly doesn't mix with

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So you think silicone fluid is the answer to your braking problems? Not according to our US correspondent, it isn't!

In fact, one driver, Bobby Rahal, told us that it scared him to death, and that if we didn't take the stuff out of the system we would have to drive the car ourselves

them. (And any polyglycol fluid remaining within the system will, of course, continue to absorb moisture.) And then, because silicone fluid has a much greater affinity for air than polyglycol fluid, it is recommended that a pressurised bleeding device is used to expel the air from the fluid in the pipework.

I have, as I said earlier, had considerable personal experience of silicone brake fluid in both street and track cars. On many occasions we experienced considerable difficulty in expelling all the air from the system, and on others the brake pedal always seemed to have a strangely 'soft' feel to it – even when we were absolutely convinced that we had satisfactorily bled out all the air.

We attempted, for example, to use silicone brake fluid in a 935 race car in the 24-hour race at Daytona in 1981; this was mainly because of the problems we had earlier encountered with the high humidity in Florida lowering the boiling point of even relatively fresh polyglycol fluid. And I have to say that, given sufficient time to prove itself, it probably would have achieved our objective.

The trouble was, though, that the drivers simply hated the feel of the brake pedal, and immediately asked us to change back to polyglycol fluid. In fact, one driver, Bobby Rahal, told us that it scared him to death, and that if we didn't take the stuff out of the system we would have to drive the car ourselves.

At that time there was no chicane on the back straight, and the car would enter the braking area for turn one at about 200mph. By this time the driver would, of course, be committed to turn one, and the 'soft' brake pedal must have been unsettling to say the least. Indeed, Rahal said that the pedal feel became worse with each lap as the brakes got hotter. We switched back to conventional brake fluid and won that year's 24-hour race... I rest my case! ■

● *Bruce Anderson has a website at www.911handbook.com.*

Editor's note

This is one of those highly contentious issues over which, I suspect, the various factions will ultimately have to agree to differ.

I have to say, however, that my own experience of using silicone brake fluid, over a number of years and in a number of widely differing vehicles (BMW 520i, Range Rover, Rover 3500, Volkswagen Golf and Volvo 244GLT…) has shown it to be a viable alternative to what I now consider to be old-fashioned polyglycol fluids.

In none of the above cars did I notice the slightest deterioration in pedal feel (not that I've driven any of them at 200mph at Daytona, mind you…), and I always took considerable comfort from the fact that (almost) regardless of any future neglect, each braking system's performance could well be as good in 10 years' time as it was the day the fluid was first installed.

As for filling the above systems, by the way, I simply pumped new fluid through from the master cylinder until clean, non-aerated silicone emerged from each of the bleed screws. I certainly had no trouble expelling all the air; nor did I feel that the fluid which emerged was particularly aerated in the first place.

In a couple of instances this procedure coincided with the fitting of one or more new wheel cylinders or calipers, in which case (in order to prevent any traces of the old fluid contaminating the new seals) I first bled the system through with the relevant component temporarily disconnected. ■