Morgan Front Suspension Bushes
Experiences and Testing of Vesconite Hi Lube

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1. Introduction.

This report to the Morgan community has been prepared to provide some practical information and experiences with Vesconite Hi Lube bushes for the Morgan front suspension.

The report has been prepared using a test report received from a Morgan owner who carried out a comparative trial, supplementary information received from another Morgan owner, an adverse experience by yet another Morgan owner together with my own personal experiences and references.

A summary comment from all parties, even where there has been a problem experienced, is that Vesconite Hi Lube as a replacement bush appears to be a suitable material that overcomes problems experienced with bronze bushes and with Devlon Nylon bushes.

2. Why Vesconite Hi Lube?

My own car is a 1950 Series 1, 4/4 4 seater that I commenced restoring at the beginning of 2000 and finished at the end of 2005. During this time I learnt a lot and one of the things I discovered was the widespread use of engineered plastics in modern cars. As a result I have installed the following plastic materials in 3 locations in my own car.

a. Vesconite Hi Lube as front suspension bushes combined with chrome king pins.
b. Nylon spacer blocks between the rear leaf springs and chassis rails to limit side sway when cornering.
c. Hard machined nylon rear mounts for the leaf springs. These consist of sliding bearings that rotate inside machined nylon housings that are in turn fitted inside the rear tubular cross member.

At that time I had no knowledge of Devlon or other similar materials. I was led to the Hi Lube material by the owner of ‘Axtrack’ a small company that is the designer and manufacturer of tracked vehicles used in the snow and other surfaces where tank type tracks are required. Vesconite has been used in these tracked vehicle suspension bushes for almost 20 years and in that time, there has not been a single failure. A large number of the original bushes are still in use even after this extended period.

I have tried the Hi Lube for the bushes based on the successful experience outlined above together with an examination of the material properties that showed the material was just the thing for my situation. I do not have any association with the manufacturer of Vesconite but I have had previous industrial experience with plastics and fibre reinforced plastics with good results in the right conditions.

I used the nylon spacer blocks in the rear suspension only because of the non critical application and the price of the Vesconite. I would also have used Vesconite Hi Lube for the rear spring mounts but the stock sizes for machining were not available at the time. If I had used the sizes available, there would have been a lot of waste and a very high cost.

Even though lubrication is not theoretically required with Vesconite Hi Lube, I have greased my front suspension and rear bushes on the 'belt and braces' principle. I believe this is not essential however I can't help myself. Lubrication will not harm the materials and also provides a seal to limit dust and grit lodging between the king pin and bush.

3. MMC, Devrol and Vesconite.

I found out some time after fitting the Vesconite Hi Lube material that MMC had introduced Devrol front bushes to their new vehicles several years ago. Devrol is an Ultra High Molecular Weight Polyethylene with unknown filler that is probably nylon. I believe there has been mixed results from these bushes and MMC ceased using the bushes after several years and about 2,000 cars. I also understand that a number of these cars fitted with the Devrol bushes have achieved very high trouble free mileage. If the bushes are fitted correctly and occasionally lubricated, there is no reason to believe they will not work perfectly and be far superior to the original phosphor bronze bushes.

Vesconite, unfortunately not Hi Lube, was also introduced to MMC several years ago and I believe that they tested the material as bushes. Vesconite was seen at the time as a better replacement for the Devrol material. I do not know why Hi Lube was not used or why MMC did not pursue these investigations further. I assume that the negative experiences with Devrol and possibly the use of the wrong Vesconite material led to a dead end for them. The bronze bushes have worked for a very long time and I suppose this was the default position for MMC.

In spite of these issues, Vesconite Hi Lube has been used successfully in an increasing number of Morgans in several countries and continues to prove its worth and suitability as bush material. The material reduces the need for obsessive lubrication of the front bushes that is required with bronze bushes and extends the life of the bushes. It can be used in all Morgans with a sliding pillar suspension including the +8's and it is especially good for cars that are stored over winter or for long periods.

4. Test Report - Bronze Bushes v Vesconite Hi Lube.

4.1 Set Up.

In May 2004, 2 Morgan owners installed new bushes, king pins and wheel bearings into two separate Morgans. It was felt this would serve as a good test comparison of the two products with the cars driving the same roads and conditions between May and November 2004. Greasing was done on the road and at service shops. The front suspension oiler was used in both examples. All measurements were taken by a charge hand machinist with 45 years experience.

Instruments used for measurements and assembly were: -

Moore &Wright - inside micrometer
Brown & Sharpe - micrometer
Summit - adjustable reamer with pilot extensions and tapers (original tool from Morgan Agent -G B Sterne Garage)
Cylinder Hone (ball type) and power drill
Hard Chrome thickness tester (magnetic)

4.2 Car 1 - 1969 4/4, 4 Seater with Phosphor Bronze Bushes.

New factory stock mild steel king pins, factory bronze bushes, CR lip seal on the bottom bush and new wheel bearings were installed.

Wear After 12, 478 miles		
Wear (inches)	**Left**	**Right**
Kingpins (bottoms only)	0.001	0.002
Bush - Top	None*	None*
Bush - Bottom	0.004	0.0055

*Honing marks on the top bushes were polished off by usage.

4.3 Car 2 - 1958 +4, 4 Seater with Vesconite Hi Lube Bushes.

New factory king pins hard chromed and cylindrical ground, new wheel bearings and bushes made from Vesconite Hi Lube bar stock. CR lip seal was also installed on the bottom of the lower bush.

Wear After 15, 569 miles		
Wear (inches)	**Left**	**Right**
Kingpins (bottoms only)	0.001	0.002**
Bush - Top	None*	None*
Bush - Bottom	0.0005	0.0005

*Top bushes still showed honing marks, no signs of wear.

**Chrome plate worn through in a 5/16" diameter patch. Tests showed the plating was thin at this point. Hard chrome plate was measured showing an average on the length of only .001” thickness.

4.4 Conclusion.

Bronze bushes showed 10 x more wear than the Vesconite Hi Lube bushes on the bottom in fewer miles. The king pin wear was the same on both.

This is not necessarily a conclusive test and the Devlon bushes would also have shown good results in a similar trial. Nonetheless, there is a clear indication that Morgans could significantly benefit from the use of nylon and in particular, Vesconite Hi Lube bushes.

5. Case Studies.

5.1 Bushes Seizing

Several years ago now, a Morgan owner had a problem with his front suspension and steering while touring in Europe. The car had been fitted with Vesconite bushes and new king pins. The bushes were confirmed as Vesconite but not Hi Lube by Vesco Plastics, the manufacturer of Vesconite. The suspension was not lubricated. The bushes seized after the car had been driven for some distance without any prior indications of impending problems. The reason for

the failure of the bushes was not determined at the time although several possibilities were reviewed.

Since that one and only reported failure of the bushes and bearing in mind that Hi Lube material was not used, there has been further discussion and review of the material that could shed more light on the possible reason for the bushes seizing. Refer to point 5.2 for further comments and details.

Even with this negative experience the Morgan owner confirmed "… there is too much evidence on the positive side … simply say that the Hi Lube has a great track record …"

This is a balanced response in my opinion as the cause of the problem had not been determined, had not been encountered by another car so could not be attributed with any certainty to the bushes or the bush material.

5.2 Heating of Bushes During Installation.

Yet another Morgan owner seized his Vesconite Hi Lube bush and king pin while installing them, most likely due to excess heat. A heat gun was used to speed up the loctite that was used on the lower cap screw that holds the bottom of the king pin. He was forced to drive the pin out with a lead hammer as it was in tight.

Two things happened when the king pin/stub axle/Vesconite was heated. The lower bush where the majority of heat was applied seized onto the king pin and had to be knocked off with a hammer and the lower bush slipped into the stub axle as a loose fit. It did not come back to its original shape when it cooled. The upper bush seemed ok. The king pin slips ok even though it could be a little tight.

This installation mishap together with comments by the Vesconite manufacturer leads to a possible explanation to the problem described in point 5.1 above. The theory is that the tolerances were too tight and heat developed while driving which led to the problem after a period of driving. There was also no grease or water lubrication which would have added to the problem.

At least there now seems to be an explanation for the one problem experienced with the Vesconite material. Until now there was a number of possibilities but the problems encountered with the heat gun support Vesco Plastics recommended tolerances which are noticeably more than for phosphor bronze.

As a general rule, steel expands at 1.1 mm per metre per 100 deg C. If the king pin is 1" (25.4 mm) diameter and was heated to, say 70 deg C, expected expansion of the diameter would be 0.02 mm (1.1*(25.4/1000)*(70/100)) or 0.0008 inches.

It was stated that the bushes were machined to the manufacturer's instructions but that might not have been the case. It is always possible for the machinist who, if experienced with metals only, would have used what he always used for metal clearances. This is the way things usually happen.

6. Summary.

6.1 The standard Morgan front suspension bush set up with phosphor bronze bushes will work as everyone who owns a Morgan knows and there is no reason to change from a good working set for an alternative no matter what the advantages.

6.2 The nylon Devrol bushes will work well and there is no need to change these over if they are working well. Nylon is a good material for this application however a major disadvantage is that it does swell with water. The simple way to overcome this is to regularly add grease to keep the moisture out, the same as done for the phosphor bronze really. If the Devrol absorbs moisture it could easily cause steering tightness until the moisture is released.

6.3 If Vesconite is used, only use Hi Lube Vesconite and fit it the same way that the bronze bushes are fitted. I recommend lubricating these bushes no matter what the manufacturer says. They will work with grease or without so there is a safety margin if grease is used. Follow the manufacturer's instructions for tolerances.

6.4 Both bronze and Devrol bushes can be replaced with Vesconite Hi Lube bushes without any other modification to the suspension.

6.5 Chrome or stainless steel king pins are preferred with all bush alternatives. If steel king pins are used, keep them greased so surface corrosion does not damage the softer bushes.

6.6 Hi Lube is more expensive than nylon or bronze but should last a hell of a lot longer. I hesitate to suggest a limit but if the bushes are greased and foreign material is kept out from between the bush and king pin, the bushes could last indefinitely and not need replacement for the life of the car.

6.7 Hi Lube Vesconite combined with chrome bushes, a regular dash of grease to keep particles from between the two surfaces should lead to more reliable use than either phosphor bronze or nylon. Scoring of the bush material will not necessarily lead to problems and the material is designed to operate in dirty and dusty conditions.

6.8 Nylon and/or Devrol will both give a longer life than the bronze although I have no direct experience with these materials as bushes. I have used nylon in my rear suspension where clearances or swelling are not important and I grease them. So far these are successful but the mileage is small.

Morgan owners should not be nervous about any of the 3 bush materials – phosphor bronze, Devlon/nylon or Vesconite Hi Lube. Normal maintenance and care is required with all materials. The long lasting wear properties of the Vesconite Hi Lube and successful trials are very difficult to ignore.

It is also possible that a problem can occur if chrome or stainless steel king pins are not used as rust can form as a result of condensation after the car is put up for the winter in a damp climate. It seems commonsense that this could be a real problem with soft bushes, no lubrication and long inaction. Fortunately this is not a problem in Australia but could be a problem in other countries or where the car is not used for long periods.

Where the manufacturer states that lubrication is not required, they are referring mainly to environments that are often water laden. Morgan suspensions are not water laden and it is for this reason that I used grease as a sealant and lubricant. I have added grease once since December 2005, admittedly the car was not used very much in 2006 but it has been since. I squirted in some grease when I had the grease gun in my hand anyway. No noticeable difference was detected after greasing though.