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Oils ain't Oils
Selection of lubricants

With apologies for reuse of the headline from those brilliant commercials of the 80's, the manufacture of lubrication oils is serious science. This article is not intended to be an exhaustive examination of lubrication technology, but rather a guide to selecting and using lubricants that best suit your vehicle and driving habits. Local expert knowledge is actually important to achieving optimum performance because of the need to keep up to date with changing product specifications, plus actual experience of what works best in specific driving conditions and for particular vehicle models. However, care should be exercised in accepting advice unless the source has proven expertise. The Graeme Cooper Automotive team, for example, has the qualifications to offer better advice than virtually any general service provider.

Even for fully synthethic oils, crude oil will be the base material that typically comprises around 70% to 85% of the total volume. However, that is about where the simple part of the process ends. Every lubricating material is actually a blend of many components, acting alone, or in combination with others. Before concluding that the cost of your selected lubricant is excessive, it is worth considering the billions of dollars spent by the automotive industry on research and development. That said, price is always a factor for manufacturers when marketing any product, so the original brand used in your vehicle may be a compromise because in practice, strategic alliances between manufacturers and the imposition of financial constraints to maximise profit will affect what is actually used when the vehicle leaves the factory. However, this is a very different matter to the essential specifications relating to viscosity and *type* of lubricant. Or, or put it another way, one must follow the specifications, but not necessarily the recommended brand.

What is a lubricant?

A lubricant actually has several fundamental uses, namely to minimise wear between closely fitted metal surfaces, to help dissipate heat and to help remove impurities. It should have a long operating life, capable of performing effectively across the full range of the recommended service periods and for general consumer items (like motor vehicles) it should be readilly available at reasonable cost. As simple as this may sound, the reality is far more complex, with several aspects that must be considered.

Synthetic versus mineral oils

Synthetic oils have come a long way in terms of compatibility with older engines. While manufacturer recommendations will generally be correct, it pays to check with the experts before using fully synthetic oil in engines designed and built for mineral oils to avoid potential problems of seal leakage caused by chemical incompatibility.

Viscosity

The measure of resistance to thinning with increasing temperature is called the viscosity index, established by the Society of Automotive Engineers (SAE). The scale itself is arbitrary, based on Fahrenheit temperatures but in practical terms, oils with the highest VI maintain farly consistent viscosity over the widest temperature range.

The real-world application is an important factor in selecting a suitable VI range. At very low temperatures, a thick oil will be more difficult to circulate and may increase the operating temperature. Conversely, an oil with greater viscosity than actually needed may not provide adequate load bearing properties. Although a high secondary VI number is generally desirable, if it loses viscosity at normal operating temperatures, it may not provide adequate sliding motion between the moving parts. For these reasons, reference

to the vehicle's user manual will be the best guide, again with special care to select the appropriate driving conditions and above all, the likely temperature ranges over which the vehicle will be used.

Oil Additives

It is important to differentiate between those additives that are part of the manufacturer's formulation, versus the after-market additives readily available in auto supply stores. The manufacturer of the lubricant will have formulated it to perform specific functions relative to stated characteristics. One of the most important additions to the lubricant creates a barrier in the form of a sacrificial coating on the metal surfaces. This coating will wear before damage is done to the primary surface. Friction modifiers are not the same thing as antiwear agents. Typically, the former will be Molybdenum, graphite or Teflon.

Wax that is naturally contained in oil can cause flow problems, especially at low operating temperatures so additives are included to control this process. Antioxidants and foam inhibitors prevent thickening and foaming of the lubricant .

The selection of detergent versus non-detergent oil is mainly based on myth, due to detergent oils simply not having been available beyond 20 or so years ago, but some die-hard mechanics swear they should continue to be used in older vehicles. In practice most commercial oils today contain some form of detergent to help eliminate moisture and combustion byproducts that will include unburned fuel, rust, engine wear particles, sludge and varnish and these oils offer far superior protection from sludge buildup. Several additives in modern oils act both as detergents and as dispersants, the latter to keep solids in solution.

DIY solutions are to be avoided

Unless circumstances demand some special remedy (like sticking valves), it is wise NOT to perform DIY technology by adding components oneself. Additives may actually spoil, not enhance the performance of the lubricant because they may upset the careful balance formulated by the manufacturer. The result may be reduced fuel economy and problems with catalyst performance.

Different oils for different purposes

As inferred by the descriptions above, both the base product and the additives will vary considerably depending upon the intended application. One type most certainly does not suit all applications. Diesel fuel is not as refined as petrol and tends to get dirty faster so an oil formulated for diesel use will tend to have a higher percentage of detergents.

Gear oils should never be substituted for engine oils. The former are not designed to reach the temperatures to which engine oils are subjected. Differential oils are generally different again, because they have to be far more robust to cope with the heavier loads and the surface coatings (see above) are also more critical to provide a sacrificial coating on parts.

At the "thin" end of the oil range, flushing oils are virtually never needed in normal use, unless the engine has suffered serious water ingress from a blown gasket or worse. ATF (Auto Transmission Fluid) is exclusively for highly specialised applications in transmissions and power steering systems and must not be used in engines, or vice versa.

Shelf Life

Most commercial auto shops turn over their stock so regularly that shelf life is rarely a problem. However, the home mechanic needs to be aware that some degradation over time is inevitable. As a general guide, oil stored for longer than 3 years should be replaced.

Vehicle selection guide

There are just too many models, both diesel and petrol to permit a generalised chart to be constructed and although most major manufacturers provide on-line selectors, the experience of a specialist workshop will prove to be invaluable. The reasons are numerous, but include ever-changing engine and oil specifications, sometimes causing confusion over viscosity, load bearing and heat resistance characteristics. It pays not to experiment when the skilled mechanics will most likely have identified and resolved any disparities.