CASTOR-CURSED

Large or small, model engines are susceptible to the ravages of castor oil – Brian Winch researches and cures

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A number of readers have asked me questions relating to castor oil - why I don't recommend it, and why is it still included in some engine instructions? I've also heard from owners of small glow engines (eg. the Cox range of super-screamers, of which there appears to be a rising interest), who are experiencing running problems.

At the other end of the capacity scale I've also received a couple of questions relating to the running of an O.S 1.20 Gemini and an O.S. Pegasus - a beautiful four-cylinder engine. I would guess that these engines were purchased some years back as treasures for the future, and have recently been bought out from their hiding place for use. Such jewels require careful attention, and that includes reading every word of the instruction book. This would state that the fuel mixture is methanol (maybe nitromethane) and castor oil.

There are several reasons why castor oil was the preferred lubricant, the first being that when these engines were produced (1970 - 80) castor was (generally) of suitable quality and whilst synthetic oils were very good and starting to be accepted as an alternative to castor, availability was limited; castor, on the other hand, could be sourced from any chemist.

It was during the 1980s that I first encountered running problems with castor in small capacity two-strokes and also - strangely - O.S. twins. I later found problems with all four-stroke engines running on castor due to lack of after-run and flushing treatment after operation. I still get many engines sent to me for repair with the same problem - seriously gummed-up and internally corroded.

FIRST PRESS

The production of castor oil begins with pressing the fruit (bean) of the deadly poisonous Ricinus Communis, the leaves of which are used for the deadly Ricin gas. The liquid pressed from the fruit is a fine mixture of ricinoleic acid, linoleic acid, oleic acid, a-linololenic

acid, stearic acid and palmitic acid – aka castor oil.

When it comes to pressing, the 'first pressing' classification is of great interest when talking about castor oil. In days past, the castor for your model diesel engine would have been purchased from a chemist - BP (British Pharmacopoeia) grade, indicating that it was of the purest quality suitable for human consumption - first pressing castor oil. First pressing meant that the castor beans were pressed until the internal seed was contacted. After all the oil was collected the pressing process then continued until the seeds and skin were squeezed dry; chemicals from the seed and skin plus bits of seed casing would be in this second pressing, which would be strained and then offered up for use in the production of cosmetics (lipstick for example), linoleum, paint and other industrial uses. It wasn't really suitable for model engines.

Apart from the issues of gumming, varnish and carbon deposits, first pressing castor was nevertheless a good lubricant for model engine use, and is still used currently for pylon racing engines. The reason for this is that pylon racing is competitive worldwide and whilst castor oil is freely available on a global scale, the same can't be said for suitable synthetic oil - all competitors must be on a level footing using the same FAI fuel, which is 20% pale press (first pressing) castor oil and 80% methanol.

PROBLEMS

During my castor days I initially used BP castor from the chemist until I discovered Castrol M - a commercially available first pressing castor oil that had been degummed, had low acid content etc., and the 'M' stood for Modified - modified to be used with methanol fuels. The common misconception was that it was modified to mix with petrol, however all castor will mix with petrol. I used to add a bit of castor to the fuel tank of my two-stroke motorcycle so the exhaust smelt like racing fuel.

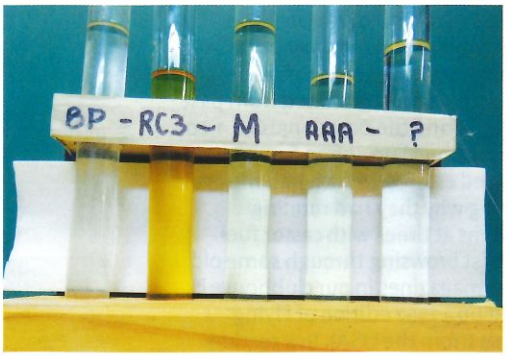
Later I was able to obtain some Bakers AAA first pressing castor, which was very big in the USA and touted as the premium lubricant for model fuels. These were all good and worked well, but varnished pistons & liners and gummed them something horrid if they were left - particularly four-strokes. The O.S. 120 Gemini twin suffered terribly if run on castor and was left for a while without after-run or flushing. I had a couple for service and heard of several others that had broken crankshafts due to being gummed almost solid; if an attempt was made to start the engine in this state and it fired, the crankshaft would break due to the terrible strain imposed by the gumming and drag in the cylinders. This was such a common problem that there was good sales potential for kits of de-varnishing brushes, of which I still have many.

It was around this time that news was creeping in about smaller engines (Cox and the like) having tuning and heating problems when run on some castor-based fuels. Of a great mystery was that the O.S. Geminis and Pegasus engines also had a problem – they'd start up but then peter out and no manner of tuning could induce them to keep running. Very strange.

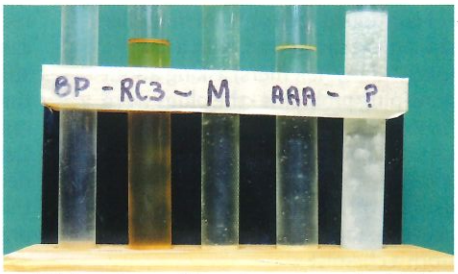
Purest of the pure. Suitable for human consumption and perfectly suitable for engine fuels if you choose to use castor.

The classification that tells all – BP (British Pharmacopoeia) indicates medicinal purity.

An excellent alternative, but only for mixing with fuels - not for human ingestion.

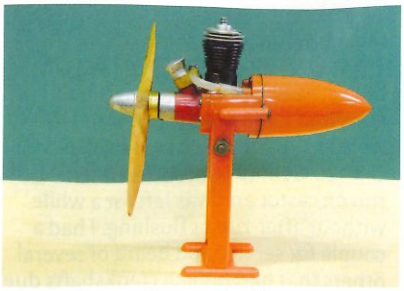


My rack of 4:1 fuel mix samples all look quite good in the warm spring (in Oz) weather...

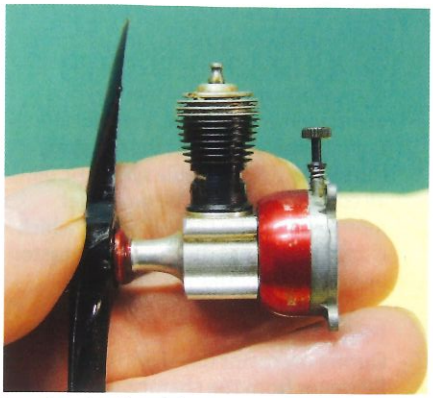


...Chill them down a bit and you can see the failing of the chemically extracted castor on the end and there are a few small flecks in the Castrol M and AAA grade first pressing. The BP grade and RC3 are absolutely clear - not a speck in sight.

On closer examination you can see the cloudiness on the bottom, and how the flakes have adhered to the cold wall of the test tube.

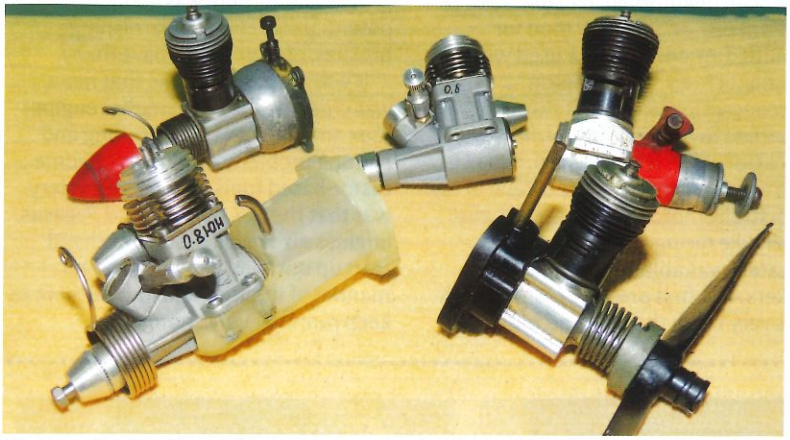


This engine stand was a 'fit all' type, held on with rubber bands. That Cox TD has peripheral induction, with super-tiny holes around the circle of the intake. The smallest foreign material - such as bad castor - would block the holes something fierce.



Imagine the size of the fuel jet hole in this little Cox .020 - the need for super- clean fuel is obvious.

Go down a size to the Cox .010 (0.163cc) and you'll need to strain the fuel through your handkerchief and then a paper coffee filter.



All these 1/2A (small capacity engines) require the absolute best and cleanest fuel in order for them to run correctly. All have super-fine fuel jets, for which bad castor is a disaster.

The Norvel range were real screamers - very high rpm, but the smallest foreign matter in the fuel feed cut them dead almost instantly.

I was at a float-fly event some time back. It was southerly cold, rainy and bleak, conditions that did nothing to lift the spirits of a fellow modeller who brought along a very nice biplane with an O.S. 1.20 Gemini that just wouldn't play ball. It would start but then coughed, barked, spat a few times, and stopped. This performance was repeated several times until the guy gave up and asked for my assistance. He told me he was using a new batch of castor-based fuel, so I filled his tank with my synthetic oil fuel and soon had the engine singing a fine song. When asked as to why his fuel wouldn't work, I had to resort to what was the common knowledge of the times about castor oil - an answer that really didn't gel well with me. It was well known that some castor-based fuel, if left for a while, would develop white flakes and a translucent sort of sediment for around 1/3 of the height of the container. Shaking it re-blended the fuel to some extent, but warming it was better. In some circles the culprit was deemed to be the methanol, as it probably came from a foreign country; the other theory was that the material seen was castor 'fatty acid' that formed for some reason or other, but was more common in cold weather. Whatever this fatty acid was, nobody knew, but it sounded good.

I delved into this castor problem and carried out several experiments as well as asking a few questions of fuel suppliers. One supplier told me the fuel he had exhibited the same residue problem, but shaking or warming fixed it and the only engines he had problems with were the small Cox types, which he put down to poor nitromethane in the fuel.

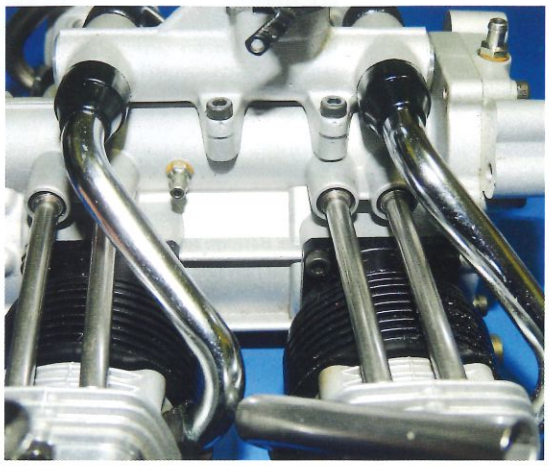
I continued to hear from modellers still on the castor trail, with a few (particularly heli fliers) asking about glow plug problems - the plugs were frosted over with a crystalline coating after just one flight. The problem was solved for most when I suggested using synthetic oil or, if they insisted on using castor, to purchase BP quality from a chemist.

Over time I sort of let the castor question slide into the background, as synthetic oils had come of age and there were several of excellent quality on offer. For those using castor in Cox engines, on many occasions I suggested that the pickup line in the tank was too short. If this was the case, unused fuel would evaporate and leave a residue of castor until the next use, when the refuelling would mix with the residue and thicken the fuel ad infinitum. This solved some engine problems, but not all. The only nagging problem I had was the O.S twins.

FROM HISTORY

As modellers increasingly turned to synthetic oils, any nagging castor questions I had slipped far into the rear recesses of my mind. Not that the castor problems went away; I was (and still am) receiving engines for service that were severely gummed from past castor use and the occasional O.S. 1.20 Gemini popped up - often from deceased estates – which had me again thinking why they had running problems at times with castor fuel.

Whilst browsing through some old model magazines in our clubhouse I picked up a 1997 edition of Flying Models (from the USA). In a section headed C/L Combat was a comprehensive article by Larry Driskill



Long induction tubes on the Pegasus and Gemini engines would 'chill up' when the engine was correctly tuned, causing waxy deposits in bad castor to form on the internal walls and flake away to block the fuel jet.; De-glazing brushes were very popular in the days when castor reigned supreme, due to the glazing effect on the liner. Spinning these at moderate speed with a Dremel or similar could bring the liner back to 'as new' finish and the engine wouldn't then run hot.; For a magnificent engine such as this you should consider only the absolute best fuel ingredients - a top-line synthetic oil, and certainly no castor.

about problems a team of competitive modellers were having with their 1/2A engines - proper screamers that had previously run perfectly but were now having real problems. They'd run for a couple of laps then begin to slow down, as if running lean. With a pooling of information many tests were made and sundry items changed, but the engines exhibited the same issue when test-run on the ground.

Larry spent a lot of thinking time on the problem and considered that castor in the fuel might be the culprit. He mixed some fuel using synthetic oil and the problem was solved. As he had a considerable amount of fuel that contained 15% synthetic and 5% castor, rather than waste it he tried filtering the castor out through paper coffee filters, which quickly clogged with a slimy coating. A friend then drew his attention to an article in the *Stunt News* publication wherein another modeller, Larry Cunningham, wrote about the same problem and made reference to the FHS fuel company. On consultation they said that they'd returned a very large order of castor to the supplier as it was causing the reported issues.

The simple answer was that the castor had been chemically extracted rather than being pressed and nothing they did could purify it or remove the harmful ingredients (harmful as in fuel use). The article then went on to describe how the oil went cloudy, formed a residue and fell out of suspension, which was made worse by the addition of methanol or nitromethane and also when it was cooled. Shaking or heating changed the appearance, but the problem came back after a couple of days. Depending on the quality of the castor it would go bad (when mixed as fuel) in anywhere from a few hours to a few weeks.

Well, there it was - the answer to my question about the twin engines. For small engines the problem lay with their super-fine jets, which the castor impurities would gradually block. In larger engines theses impurities often passed through but slowly killed the glow plug. But it was the test - cooling by putting it in the refrigerator - that gave me the answer. O.S. multi's have long, chrome plated, thin-walled copper induction tubes from the carburettor to the intake manifold. When these engines are correctly tuned the tubes get very cold and water droplets form on them like a simple refrigeration process. As the (bad) castor fuel flowed through the tubes (full of fuel / air mix all the time the engine's running), the cold tubes caused the impurities in the castor to semi-solidify on the inside surface and be washed along into the cylinder head. These lumpy bits and impurities upset the combustion process and greatly interfered with the glow plug - hence the engine ran rattly and stopped. When it stopped, with no fuel flow through the tubes, residual heat warmed them up, the castor coating went clear and the engine would start again – but only until the goop reformed in the chilled tubes.

Problem solved, after all that time. The answer, dear modeller, is that if you insist on using castor in your fuel, then make sure it's first pressing BP grade.

If you have any questions or comments please feel free to contact me at either beewun@bigpond.net.au or oilyhand@bigpond.net.au. Please keep the files short, and please try not to send high resolution photos.