

Lubrication and Model Trains

“What should I use to oil my favourite locos and rolling stock?”

This is a recurring question, with a variety of answers and opinions. The following thoughts reflect lessons and experience including over 20 years as a professional chemist in the NSWGR labs, looking at such materials as paints, alloys, fuels, lubricants, cleaning chemicals, and occupational health issues associated with the use of chemicals, fumes and dusts. They also include over 60 years of railway modelling and maintenance. However, the following paragraphs are just one man’s musings: they are not the last words on the subject, by any means.

Background

First, one has to understand what lubricants do:

- They separate moving parts to minimise wear
- They provide a slippery interface between moving parts to minimise friction and facilitate movement.
- Some lubricants also have anti-oxidising agents to minimise corrosion and/or conserve mechanisms during storage

Historically, lubricants were based on natural oils and greases, such as lard, tallow and vegetable oils. These had several disadvantages:

- They oxidise easily, forming sticky gums
- They become less viscous (ie, they become thinner) when heated, permitting them to escape from bearings and so allowing metal-to-metal contact, resulting in seizure or excessive wear

From the late 19th century, most lubricants have been based on mineral oils and (later) their synthetic derivatives. In automotive oils, they also contain additives which:

- Resist oxidation
- Keep contaminant particles in suspension, to eliminate blockages of oil passages
- Maintain viscosity (“thickness”) over a wide range of operating temperatures, so the oils are not too thick when cold or too thin when hot
- May contain special additives for extreme pressure applications (such as the odorous sulphur compounds in gearbox and differential oils)

Some of these additives and the base oils may be incompatible with materials found in model trains.

Modern industrial and automotive greases typically contain a mineral oil mixed with a water-insoluble soap, such as those based on lithium. It is unlikely that the mineral oil component is “plastic friendly”.

Materials in Model Trains

Model train locos and rolling stock make use of a wide variety of materials, which include:

- Brass
- Copper
- Bronze
- Zinc-based die-cast alloys
- Aluminium
- Lead-based white metals
- Pewter
- Steel
- Polystyrene
- ABS
- Polypropylene
- Rubber
- Nylon
- Card
- Modellers' timbers
- Alkyd resin enamel paints
- Acrylic paints

Not all of the above are compatible with all lubricants (or the potential cleaners that may be used before re-oiling our models).

For example, ethanol ("methylated spirit") will attack acrylic paints. "EP" grade lubricating oils, although great for car gearboxes, will attack bronze or brass gears, causing them to wear out rapidly. Acetone will attack cyanoacrylate ("super glue") adhesives. Most white spirit solvents, including "mineral turpentine" will attack polystyrene and ABS, due to their aromatic hydrocarbon content.

In the same way, many common lubricants, such as WD40 and sewing machine oils, will degrade some components of our models. I had the sad experience of writing off two NWSL gearboxes due to the use of the wrong lubricants. Similarly, the plastic axle centres of some Mainline loco axles embrittled, cracked and fell apart after using the wrong oils. Expensive lessons!

Isopropyl alcohol can be used as a general purpose cleaner. It is relatively safe to use, with minimal health issues, but is still flammable, with a flash point of just 13 degrees C. It should be used with plenty of ventilation. It is relatively benign to most plastics, but may affect some paint finishes. Applied with a syringe fitted with a 25 gauge needle, it can even flush out the driving wheel bearings of Hornby live steamers.

Lubricating Tips

1. Don't over-oil. Excess oil may contaminate the rails and degrade traction tyres, cause poor electrical conductivity and cause your locos to slip.
2. Don't over-oil. Excess oil will attract dirt and dust, which will build up to a thick sludge that will cause bearings to seize.

3. Don't over-oil. Excess oil will be thrown off rapidly rotating parts to contaminate areas that should remain clean. In some cases such oils may cause embrittlement of plastics and their eventual collapse.
4. Use oil that is fit for purpose. For example, Hornby steam cylinder oil is too thick for use elsewhere. Fleischmann wagon bearing oil is too thin for use in Hornby live steam cylinders.

Suitable Lubricants

My experience has led me to use the following:

- Fleischmann 6599 oil: coach, wagon and loco axle & armature bearings
- Labelle 102 gear oil: metal locomotive gears and gearboxes
- Hob-E-Lube HL657 white grease: plastic/nylon gears
- Hornby steam cylinder oil: Steam passages of Hornby live steamers

Servicing tips

1. Test your models periodically to verify that they still roll freely. Those that don't will be straining your locos and causing avoidable damage, especially to their motors.
2. Vehicles that show resistance to free rolling should be inspected. Any sludge in the bearings should be cleaned with isopropyl alcohol, while ensuring that no excess solvent goes where it is not wanted. Fine cotton buds may prove useful here, particularly to dry away all solvent when cleaning is complete. Look out also for wads of hairy sludge that may need to be removed with tweezers.
3. Use a fine applicator to place just enough oil to where it is needed. The Fleischmann oil has one supplied with it. Such applicators can be easily made from a cork and an old sewing needle.
4. Check that the model is rolling freely again. If not, check for other issues, such as misaligned axles, tight bearings, foreign matter, etc.