

A sticky situation

Context-based learning exercise

Extending the module

The material in these worksheets and tutor guides should be able to provide the basis of a challenging and (hopefully) interesting 5 credit module. For more advanced students, or for a longer (up to 10 credit) module, there are a number of ways to extend the material.

Lubricant chemistry

Here are some issues or questions that students (individuals or teams) might investigate as part of a longer module.

- What do oil companies do in real life to cope with fuels containing sulfur?
- How do oil companies try to disperse any gels and insoluble materials in oil in use?
- If it's the sulfur and phosphorus in ZDTP, that are mainly responsible for its antiwear and antioxidant properties, could oil companies use thiophosphate salts of other metals?
- If they don't use other metals, what does that tell us?
- If the zinc is important, how can we probe the chemistry of the metal centre in ZDTP in solution in real engine oils?
- The oxidation stability of NP SuperQ oil, blended in Northland, using hydrocracked base oil, appears to be slightly better than that of the oil blended in Australia using poly-alpha olefins – what does that imply?
- What components might there be in hydrocracked base oil that cause this effect?
- Can we explain the effect in terms of molecular orbital theory?

Lubricants in use

This module has mainly been about engine oils. Teams or individuals could then consider.

- What other types of internal combustion engine are there? How might their lubricant requirements be different from those of car engines?
- Where do you find internal combustion engines literally as large as a house, and how do you lubricate them?
- Outside of internal combustion engines, what other types of power plant are there and how might they be lubricated?
- Even more widely, what other types of machinery are there (in factories etc) that require lubrication and what unique requirements might they have?
- If there is indeed a proliferation of different types of lubricant, what challenges does this present to scientists and technical managers responsible for the running of machinery and factory operations?

Answers to all questions on this page are available from Kevin Parker

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