LUBETECH

NO.2

# REDUCED EMISSIONS AND EXTENDED DRAIN INTERVALS - A NEW DEVELOPMENT?

We are all aware of the advances in lubricant and engine technology which have resulted in substantial improvements in emission levels and engine longevity, together with extended lubricant drain intervals. Tighter engineering tolerances, improved materials of construction, the introduction of engine management systems to better control the combustion process are all factors which have resulted in cleaner-running engines, with the consequently reduced contamination of the lubricant. However, and possibly as a direct result of the reduced lubricant contamination levels, the process of the filtration of engine oil gas has been largely unchanged for decades, in contrast to the technical advances in lubricants and engine design. Last November, an article in the 'Economist' described an accessory which claimed to dramatically reduce emission levels from diesels and increase lubricant operating life by a factor of 6, obviously an issue of extreme interest to lubricant marketers. Although the article itself appeared to contain factual errors and inconsistencies, understandable as it was written by a non-technical journalist for a non-specialist publication, there appeared to be sufficient merit in the claims made for the device to warrant further attention.

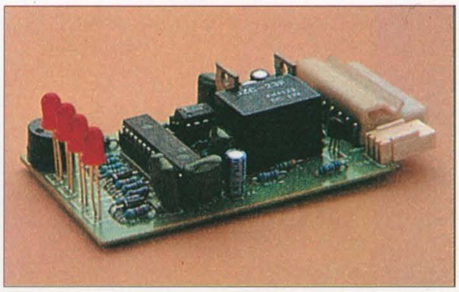

The device, known as the 'Pinmore Electronic Oil Recycler', now marketed through Platinum EOR, is a by-pass oil treatment unit which can be added to any engine and which complements the normal filtration system. Lubricant flow through the device is limited to around 1/3 litre per minute in contrast to the normal 40-50 litres per minute for a conventional full-flow filter. It consists of a 5 micron filter (as opposed to the more conventional 25 micron filter used in full-flow filters) together with a heated chamber containing a plate evaporation system. The oil feed is pre-heated to 120/125 deg. C; the released vapours from the plate evaporator contain water and light hydrocarbons. These are fed back into the combustion chamber in a similar manner to a positive crankcase ventilation system. However, in this case, removal of light ends from the engine oil is far more exhaustive due to the design of the device.

The device has been evaluated by Professor Gordon Andrews, of the Department of Fuel and Energy, Leeds University, and lubricant analyses have been carried out by Dr. Mervyn Jones, of Swansea University. It has been trailled by bus operators in London and Liverpool, who have confirmed apparent extensions to engine longevity in vehicles fitted with the device, and who are extending the numbers of buses so fitted.

Apart from the need to overcome problems associated with fuel dilution, it is unclear as to why else the device was originally developed since there seems to be little in the literature to describe the theoretical justification for the design. It is suspected that the associated marked reductions in emission levels were an unexpected bonus, and could considerably outweigh the original benefits of the device, in view of the current controls on exhaust emission levels. This is supported by statements from Professor Andrews to the effect that they have not as yet developed a satisfactory explanation as to why the device appears to work as well as it does. However, on the basis of the information obtained from carefully-controlled laboratory engine tests carried out by Professor Andrews, the evidence appears to confirm the emission reductions claimed.

The typical emission pattern from a diesel engine filled with fresh oil, but without the device, is that the emission levels are comparatively high at the beginning of the trial, falling to a minimum after some 50 hours running, after which they begin to rise steadily up to the end of the test period at 120 hours. The initial high emission rates are attributed to a loss of lubricant light ends, since it is claimed that the lubricants can contribute significantly to emission levels. However, this is much less the case in a modern low-emission engine. When fitted with the device, the initial high emissions are significantly lower, again falling to a minimum at some 50 hours. At this point, there is however a pronounced increase in emission levels up to values which can exceed the initial levels, but then, and in contrast to the findings without the device, the emissions then steadily declined, continuing to do so up to the end of the test period at 130 hours.

This 'hump' in the emission levels at 50 hours was subsequently seen to be a characteristic in all tests associated with the device, and has as yet not been satisfactorily explained. It is thought to be indicative of a cleaning out of combustion chamber deposits, with subsequently improved combustion conditions. The improvement in combustion performance would understandably result in a reduction in emissions and improved fuel efficiency. The fact that these effects are observed in practice adds weight to the improved



combustion theory, since the insulation effect of deposits leads to increased combustion temperatures resulting in higher NOx levels. Deposits also tend to absorb fuel, which is subsequently desorbed too late to burn efficiently.

As to why the lubricant life is extended is also not clear. Comprehensive analyses of oil samples from two series of extended trials in two Merseyside Transport buses show little evidence of any consistent change in lubricant composition or characteristics. The trials extended to nearly 40,000 miles, and involved a Cummins L10 and a Gardner 6LXB. The only trend observed was the expected increase in wear element content. However, combustion by-products such as acidic compounds are generated on a continuous basis, and would eventually overcome the inherent basicity of the lubricant, unless a purpose-designed extended drain lubricant were in use.

One may well ask why the light ends, etc., burn so much more efficiently following extraction by the Pinmore device and re-injection into the combustion chamber compared with the normal migration route into the combustion chamber.

The theory which has been proposed by Dr. Andrews is that the light ends, when stripped from the lubricant in this fashion and fed back in with the combustion air, burn much more efficiently and without the production of particulates which occurs when combustion takes place at the cylinder wall. We understand these tests are still continuing, and we await the results of long term trials with interest. Also, although it is possible that the device may well extend the useful life of old and out-dated engines, we would be interested in seeing the results of trials carried out in conjunction with modern low-emission engines.

When used with an older engine, we would suggest that the Pinmore-equipped engine would benefit even more from a purpose-designed lubricant.

Further details may be obtained from the BLF Secretariat.

***David Margaroni***

# FURTHER DEVELOPMENTS IN SPECIALIST OILSEEDS FOR LUBRICANTS

BLF members will be aware of previous articles in 'LUBE' describing exciting developments in the field of 'designer oil-seeds' with the prospects of genetically engineering certain plant varieties to produce vegetable oils more suited to the requirements of lubricant basestocks than the naturally-occurring varieties. The development of these so-called 'transgenic' crop varieties involved three critical stages:

1. The identification and isolation of genes imparting the desired properties.
2. The introduction of the isolated 'foreign' gene into the host plant's DNA in order to implant the new property.
3. Satisfactory regeneration of the whole plant.


Initial developments have shown promise, with the modified oils showing oil the normal advantages of low toxicity and high biodegradability coupled with improved oxidation stability, better resistance to hydrolysis and improved temperature range of operation.

One of the major drawbacks which was anticipated in the early stages of marketing such products was the cost associated with cleaning out the pressing machinery before and after the processing of the modified varieties to prevent the possibility of any cross-contamination with the conventional oilseed products which would normally be handled by the extraction plant.

This situation is now about to change with the opening of the Statfold Seed Oil Developments unique cold-pressing facility at a farm and processing plant.

Since the farm and processing unit are completely autonomous, there is the capacity to grow, crush and process a wide range of oilseeds, including transgenically-modified varieties.

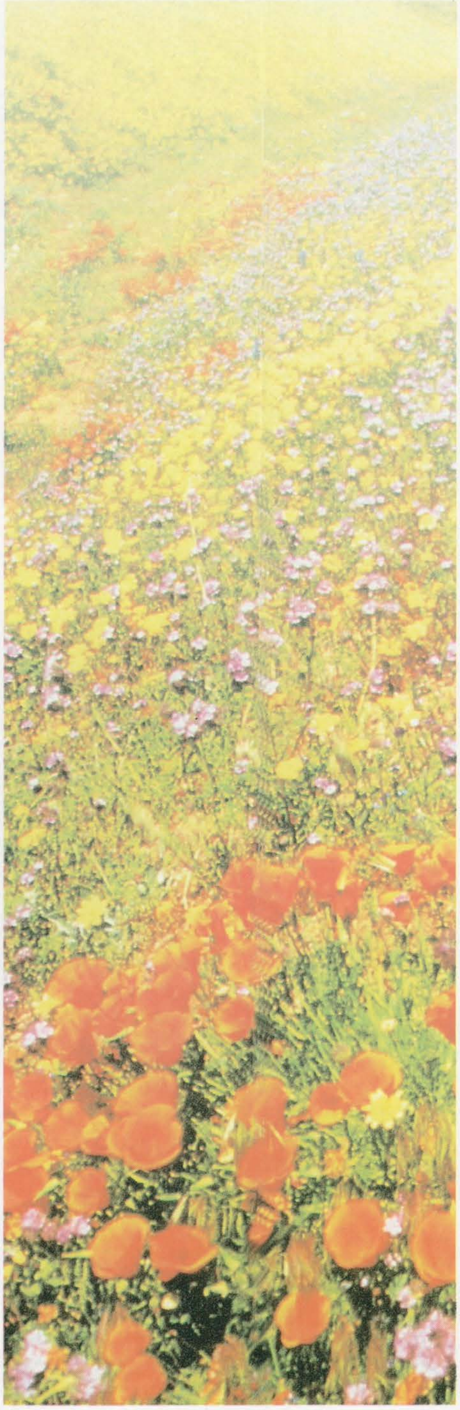
The extraction unit has been carefully designed so as to preserve all of the required characteristics of the oil. There is no need to preheat, boil or steam the raw materials before cold-pressing, and the maximum temperature reached during the operation is only 50 deg. C. In addition, there is the facility to provide 'blanketing' with carbon dioxide or nitrogen when processing particularly delicate varieties. The main plant has the capacity to process 5 tonnes of seed per day. Due to the design of the plant, it is possible to change seed variety within 30 minutes with cross-contamination. Approximately 90% of the oil in the seed can be extracted. The pressmeal by-product of the process can be used as a high protein supplement in animal feed or as a natural fertiliser. In addition, there is a smaller laboratory pilot plant where small special seed lots of 2 kg. to 100 kg. can be processed. A state-of-the-art storage can accommodate a total of 7,000 tonnes of seed awaiting processing.

The advantages claimed for this cold-pressing process of vegetable oil extraction compared with hot pressing or chemical extraction are as follows:

- No pretreatment such as roasting, flaking, steaming or extrusion is required.
- All natural vital components e.g. unsaturated fatty acids, vitamins, proteins, natural antioxidants/tocopherols remain undiminished in the vegetable oils.
- No treatment of extracted oils by e.g. refining, filtering, deodorising etc. is required.
- Suspended particles can be readily removed after standing for two days.
- The extracted oils have very long lifespans due to the presence of natural antioxidants/tocopherols.
- No drying/dehydrating is necessary since the moisture contents are below 0.5%.
- Presscake/pressmeal can be used for human nutrition, as animal feed or as a natural organic fertiliser since it is not degraded by heating, nor does it contain any chemical contaminants.

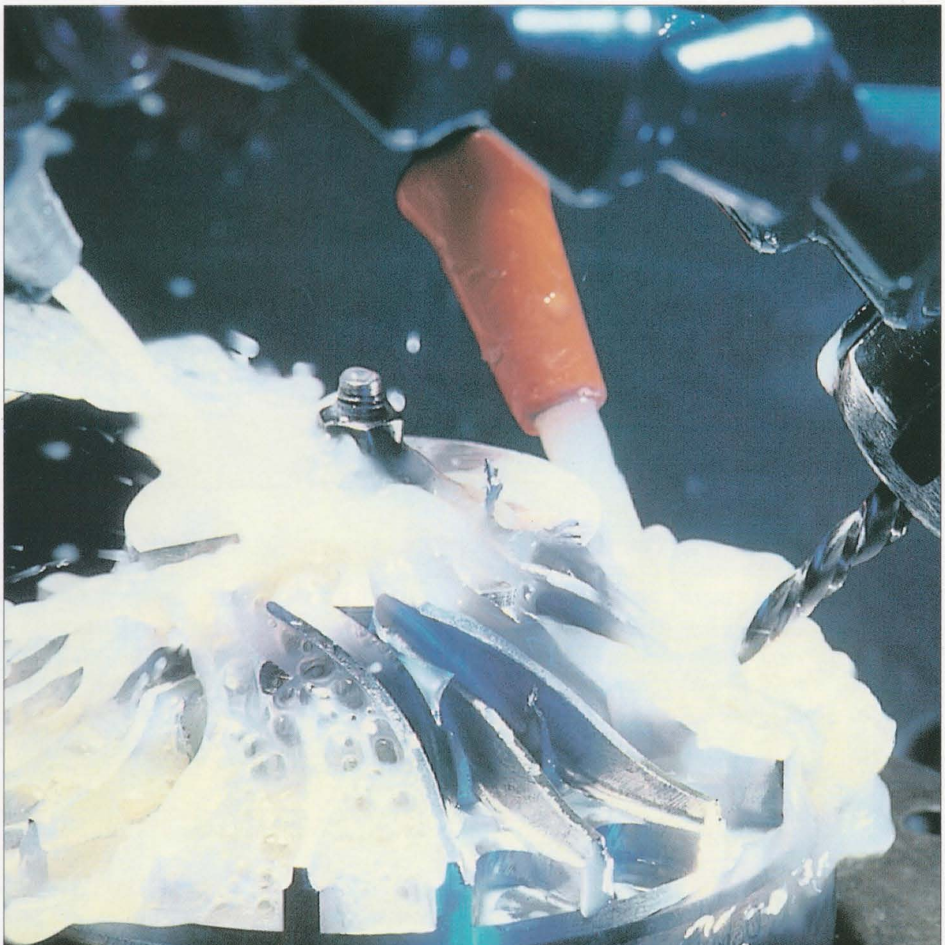
Further details of this development may be obtained from the BLF Secretariat.

***David Margaroni***



Statfold
SEED OIL DEVELOPMENTS
*Suppliers of Cold Pressed Oils*

# SHORT CHAIN-LENGTH CHLOROPARAFFINS - RESULTS OF BLF SURVEY INDICATE THAT THE MOVE TO ELIMINATE THE USE OF SCCPs IS WELL UNDER WAY



The UK has the responsibility under the European Community Existing Substances Regulations (EEC793/32) to assess the risks associated with the use of short chain chlorinated paraffins (SCCPs) and to consider controls to reduce such risks. SCCPs are known to be toxic, persistent and bioaccumulative with regard to certain marine organisms, and therefore pose a potential environmental hazard.

One of the main recommendations of an external consultant engaged by the DoE was that the use of SCCPs should be restricted, with derogations only for those processes where the impact of such restrictions would compromise the viability of metalworking companies. However, the consultancy organisation was not able to obtain the detailed information necessary to identify candidate processes for derogation. The DoE requested the BLF to assist, and all members will be aware of the various communications from the BLF on the subject.

The exercise is now complete and the findings reported to the DoE.

In all, a total of 55 member companies and 2 non-member companies involved in the manufacture of metalworking fluids provided detailed information regarding their usage of chloroparaffins.

Of these, 13 were using SCCPs alone, which accounted for 36% of the tonnage of SCCPs. Of these, 11 announced their intention to move to the use of MCCPs within the next year. 9 were using both SCCPs and MCCPs, accounting for 64% of the SCCP tonnage and 13% of the MCCP tonnage. All announced their intention to move to the use of MCCPs within the next year.16 were using only MCCPs, accounting for 87% of the MCCP tonnage.19 were not using any CPs.

A total of 7 specific requests for derogation were received, the majority for neat oils, which amounted to only 3% of the SCCP tonnage. The processes involved were deep drawing of stainless steel, deep hole drilling of various steels, various forming operations involving difficult ferrous metals, arduous machining operations on tough alloy steels, cross drilling in a particularly sensitive operation, honing of stainless steel, and drilling and tapping of various steels. The reason cited for derogation included both technical/operational aspects and also contractual reasons.

Since MCCPs of equivalent chlorine content to a SCCP were much higher in viscosity, problems were experienced when a low viscosity product containing a high chlorine content was required. Flash point restrictions limited the possibility of diluting the MCCP with a low-viscosity oil to achieve the desired viscosity.

In the case of certain critical allocations, e.g. those involving the fabrication of components for the aerospace industry, lubricant suppliers were under strict contractual obligations to adhere to formulations which had been tried and tested. They were not at liberty to change from SCCP to an MCCP unless the new product had been thoroughly evaluated. In view of the very high costs associated with certain evaluations, the customer was not prepared to undertake re-evaluation unless the SCCP supply situation became critical.

However, these derogations will of necessity be only of a temporary nature, since all SCCP production is likely to be phased out by the year 2000. The price of SCCPs will no doubt begin to escalate before then due to the reduced volumes, so that products containing SCCPs may well become uncompetitive.

The BLF would like to thank all of its members involved in this exercise, all of whom willingly provided the necessary information.

***David Margaroni***

LUBE-TECH

# First Meeting of New Metalworking Fluid Technology Task Group

The initial meeting of the Metalworking Fluid Technology Task Group, a sub division of the BLF Technical Group headed by Vice President - Technical, Mr. David Neadle, was held recently at Polartech Ltd, Manchester.

The Group has been formed by invitation from co-ordinator, Mr. Robert Stubbs, Technical Director of Polartech Ltd, to initiate two key objectives. These are to ensure that member companies are advised of any impending technical requirements and health and safety legislation and to lobby, advise and provide opinion to governmental and legislative bodies where applicable with respect to the utilisation and advancement of metalworking fluid technology.

The members of the Group have been drawn from both metalworking fluids suppliers and end users and it is envisaged that representatives from the HSE, machine tool manufacturers and swarf processors could be invited for specific discussions at future meetings.

A number of topics were debated at the initial meeting and it was felt that biocides, mist formation, chloroparaffins and machine tool design were topics which still required immediate comment with respect to both manufacturers and end users. Other areas of interest included swarf processing, disposal, the utilisation of amines and cobalt leaching.

On the subject of cobalt leaching, it was reported, quite surprisingly, that few people were aware of the **BLF Publication "Exposure to Hardmetals in Metalworking Fluids During Machining Operations", (price £20) which is available to both suppliers and end users directly from BLF Headquarters in Hemel Hempstead** as this booklet answers many of the questions associated to this growing application problem. It also gave rise to an active discussion concerning the availability of this type of information to the end user and the Group consider that it should be proactive in its role to disseminate educational material to manufacturers, suppliers and end users alike.

It is hoped that longer term the Group will become a focal point for discussion relating to metalworking fluid technology in the UK and that its views may be representative of the industry as a whole. Whenever possible international contact will be established with Groups such as the TRGS In Germany and the MWFPSG in North America to provide a global flavour to its debates.

If you have any topics that you would like the Group to raise on your behalf as a member of the BLF, or if you would like to directly receive technical information generated by the Group, please contact Mr. Robert Stubbs at Polartech Ltd, Tel No. 0161 876 5673, or Mr. Rod Parker at the BLF Tel No. 01442 230589.

***Robert Stubbs, Co-ordinator, Metalworking Fluid Technology Group***

# DIESEL FUEL LUBRICITY– AGREEMENT ON LIMITS NOW REACHED

## Work continues on the development of an international standard

The previous issue of `LUBE' referred to the contentious issue of diesel fuel lubricity, since, with the introduction of low sulphur fuels, problems of catastrophic wear of key components of diesel injector pumps had been experienced which resulted in a high incidence of vehicle failure after only 20-30 hours operating with the fuels. Those vehicles most affected were cars and light vans indicating potential problem areas for the future, even though these units are fitted with separate lubricating systems.

Sulphur compounds in the fuel were initially thought to act as anti-wear agents and it was generally assumed that it was their removal which resulted in the reduced lubricity of the low-sulphur diesel fuels. However, research subsequently revealed that the real reason was not so simple, and probably involved an interaction between polar materials, polycyclic aromatics and oxygen-containing components acting together as boundary lubricants.

Although it is possible to overcome the lack of lubricity by suitably modifying the refining process, it appeared that most fuel companies were opting for the additived route to achieve the requirement improvement in lubricity.

Then followed the fundamental problem of endeavouring to achieve a consensus on what was an acceptable desirable range for fuel lubricity. In the US the engine manufacturers have agreed on a HFRR wear scar (the measure of the fuel's lubricity) of a maximum of 450 microns, but some members of the international oil industry have argued for a limit of 550 microns or higher. This spread made a consensus difficult to reach, but at a meeting of CEN/TC 19 WG 24 on 6 February in Vienna, a figure of 460 micron was finally agreed.

Having overcome this major hurdle, the next decision involved test choice and methodology. The only currently approved method of measuring diesel fuel lubricity is the European CEC F-06-A-96 HFRR test procedure. In the meantime, work has been continuing on the development of an International Standard, and the latest draft (ISO/DIS 12156-1.3b-February 1997) is currently being circulated for comment.

***David Margaroni***