



## **European Lubricating Grease Institute Position Paper on MOSH and MOAH**

### **About the European Lubricating Grease Institute (ELGI)**

The main objective of the organization is to promote the understanding of all matters concerning lubricating grease and its associated products, to disseminate information that can lead to the development of better products for the consumer and also provide improved lubrication service to the industry. In addition, the ELGI facilitates the exchange of information concerning design, manufacture and use, handling and sale of lubricating grease between all interested organizations and individuals.

The ELGI is a not-for-profit technical institute, funded by its members primarily composed of grease manufacturers and marketers, raw material and equipment suppliers, end users and other technical and trade associated bodies.

One way that some of these objectives are met is through active working groups. The ELGI continuously works to strengthen their association with the industry by rendering services to the end user as well as those on the manufacturing and supply side.

### **Food Grade Lubricants Working Group (FGLWG)**

Food grade lubricants are among the most crucial products in the food chain, small volumes with high impact. As food safety is more and more in the center of the news, we as an industry must continue to react and be proactive. It is in the industry's interest to cooperate with decision makers to define and meet global standards. The Food Grade Lubricants Working Group is the platform where future developments on standards and legislation are reviewed.

In this paper, the reference to the food industry includes food, beverage preparation and filling, animal feed and foods, personal care and the pharmaceutical industry. This can be extended to cover any production facility that wishes to operate in or supply to the food chain, for example a mineral preparation company supplying to the food supplement sector. For simplicity throughout, reference is made to the food industry.

The ELGI supports the concerns of the FGLWG members and underwrites the attached position paper on MOSH and MOAH clarification.

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All interested parties are encouraged to distribute this document as a whole to any interested or affected party.

## Definitions:

**MOH Mineral Oil Hydrocarbon.** A very complex product that can be gas, fuel, lubricant base oil, wax, tar and so on. Mineral oil consists of a complex mixture of hydrocarbons. The main composition is aliphatic hydrocarbons (MOSH) and aromatic hydrocarbons (MOAH). In general about 80% is aliphatic and about 20% is aromatic. Mineral Oils are derived substances, produced by refining crude oils. It is the black stuff coming from natural source and as such is also present in nature in other compositions than “oil”. A definition of mineral oil is not possible as the product is too complex so it will require to specify which fraction is under consideration.

It all starts with crude oil refining which is carried out using two main distillation processes, first atmospheric and then vacuum distillation at temperatures between ~300°C and ~700°C. Vacuum distillation is necessary to prevent hydrocracking at temperatures around 300°C at which the so called “long residue” from atmospheric distillation is processed. The long residue entering the vacuum distillation unit is the starting material used for the manufacturing of “mineral oils”. Because the mineral oils’ feedstock contains unwanted carcinogenic compounds, these must be eliminated by further, specific refining processes.

**MOSH Mineral Oil Saturate Hydrocarbon (in lubricants).** The main component after the various refining stages. Present for 97% or more in the lubricant base oil and has a relation to the viscosity of the product.

**MOAH Mineral Oil Aromatic Hydrocarbon (in lubricants).** A small remaining fraction in the base oil after the various refining stages. Present below 3% to nearly nil, however always a remaining fraction is present. All base oils are tested for the effectiveness of the refining process.

**PAH Polycyclic Aromatic Hydrocarbons.** These are present in 1 to 7 rings. An extensive database has been generated over the last 40 years with evidence of the health effects and possible cancer potential. Now the accepted status is that 3 to 7 ring PAH represent a health risk due to its cancer potential. The 1 and 2 ring PAH are proven free of this potential. For that reason the refining process of lubricant base oils (also the basis for grease) will have the 3 and higher number of PAH rings removed.

**Highly refined mineral base oils.** The base material that is used to produce food grade lubricating oils, food grade greases and pharmaceutical products. These base oils are virtually free of 3 to 7 ring PAH. The main part is MOSH and a small part is MOAH of the safe 1 and 2 ring PAH. All base oil leaving a refinery is, by law, tested for the effective refining stage where the 3 to 7 ring PAH are removed.

From a toxicological point of view, the MOSH and MOAH fractions do not correspond to petroleum derived mineral oils and waxes that are placed on the market. Furthermore, these MOSH and MOAH fractions are also found in products of other than of mineral oil origin, further adding to the difficulty of tracing their origin and the health risk they pose. As an example, n-alkanes have been attributed as MOSH, but are ubiquitously present in nature and are natural components of fruits and vegetables. There are also many other products that would lead to false positives in a “MOSH/MOAH” analysis.

## Some questions answered, FAQ:

Q1. ***If I do not use a mineral oil-based lubricant will my final food product be free of MOSH/MOAH?***

A1. No, there is no such guarantee. The crops could have been exposed to MOH by pollution, as part of the agricultural process, it could have been added to the food in the production process and in nature these components occur.

Q2. ***Are all MOAH bad?***

A2. No, there are good and bad MOAH. In crude oil all these are present. In lubricating oils and greases the “bad” MOAH has been removed. Crude oil contains both, but highly refined mineral base oils contain only the “good” MOAH. (See definitions)

Q3. ***Is there a MOAH free mineral oil?***

A3. No, there will always be a small remaining fraction of MOAH.

Q4. ***Are the testing methods of the final food able to tell me if my lubricant is in the foodstuff?***

A4. No, it is highly unlikely to be able to determine where a MOSH and MOAH fraction come from when found in the final foodstuff. What we do know is that the lubricant when unforeseen entered the food is of the safe fraction.

Q5. ***Are test methods and results comparable between laboratories?***

A5. Unfortunately not yet. The extraction from the final food is difficult and this results in inconsistent repeatability, reproducibility and comparability.

Q6. ***If I use PAO or other based lubricants will there be no MOSH and MOAH in these lubricants?***

A6. No, this cannot generally be stated as all individual components must be tested. Additives can be, as example, be dissolved in mineral oil.

Q7. ***Mosh is found in our (foodstuff) product. What could be the source?***

A7. During the food production some processes are a cause for MOH to intentionally entering the food stuff. Possible sources could be anti-dusting oils, glazing oils, cutting oils etc. Contamination could be another possible source.

Q8. ***Is MOSH a hazardous substance for human health?***

A8. There is no current evidence that there is serious negative effect on human health, but studies are ongoing.

Q9. ***Do mineral oil based lubricants contain MOSH?***

A9. All mineral based lubricants contain MOSH to a certain extent; it is more important to know information about the viscosity of the lubricant used.

Q10. ***How can the lubricant industry ensure that mineral oils are safe to use in my production?***

A10. All mineral base oils are tested before leaving the refinery to meet the IP346 and must pass the requirements. That test guarantees the safety of the base oil.

Q11. ***I use H1 lubricants is it MOSH MOAH free?***

A11. H1 guarantees the formulation is according to the requirements based on the USA FDA 21 CFR and ISO 21469 have requirements linked to the production. All mineral oil-based lubricants can still contain traces of MOSH and MOAH.

Q12. ***What are the legal requirements of the limits MOSH and MOAH for lubricants within the EU?***

A12. Contrary to the USA there is no general legislation for lubricants in the EU. EFSA have in their scientific opinion defined limits for daily human consumption of MOSH. For the food stuff there are set limits for different purposes and markets.

## Conclusion:

Mineral based lubricants and greases are safe products developed to support the mechanized food production, animal feed production and pharmaceutical production. Highly refined mineral base oils are used as approved component of medicinal and pharmaceutical products. Important remains the avoidance of lubricants accidental entering the foodstuff. It is important to use products that have a H1 registration (NSF and 2Probioty) and are produced under ISO21469 certification, so in case of an incident the risks for the consumers are minimized.

Mineral oil-based food grade lubricants meet many technical requirements for economic food production and are safe to use.

## IMPORTANT NOTE

This paper is based on scientific studies and publications. The content of this paper is an extraction of those studies and as a result it aims to represent the spirit of the facts of those studies. The scientific explanation of this complex problem discussed in the position paper requires several 100 pages and for that reason an extremely condensed, but correct explanation is presented here based on those scientific studies. For more detailed information on MOSH and MOAH contact CONCAWE or the Food Grade Lubricants Working Group via the ELGI office.

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