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RESEARCH

# The Growing Importance of Ecotoxically Clean Lubricants

*The usual line of importance in the industry used to be Machine --> Technology --> Human. In modern industry the health factor has led to drastic changes and a new line of importance: Human-->Machine-->Technology. These changes resulted in a number of new measurements and procedures in the selection of lubricants. Initiated by the US Department of Agriculture (USDA) and now followed by its successor NSF, lubricants for the food, drug and beverage industry were classified in accordance with the USDA H1 and H2 specification. Due to the outstanding ecotoxic characteristics of the "food lubricants" more and more companies outside the food and drug industry start using these "poisonless" lubricants.*

## 1. INTRODUCTION

Long before the industrial revolution lubricants were used for the reduction of friction. The first proof was the discovery of bitumen in potter's wheels during the time of the Sumerians and Egyptians around 3000 b. C. It is believed that in those days in many applications plant/animal oils and greases were used for lubrication[1]. To find a proof of these lubricants should be very difficult due to the biodegradability of these products.The breakthrough towards mineral oil based lubricants only took place in the 19th century. The first pa-tents and distillation units dealing with mineral oil based lubricants can also be dated in this era.. Du-ring the beginning of the 20th century the first additives were introduced to the lubricants industry. The toxicological aspect of those additives was never a subject and the possibility of inven-ting harmless products had never been tried.

## 2. TOXICOLOGICAL ASPECTS IN THE HISTORY OF LUBRICANTS

Until late in the second half of the 20th century the following equation could be applied:

**Increase in Performance =**
**Increase of Toxicological Problems**

Due to different factors today this equation has become invalid.

- By modern refining technologies mineral oils can be freed from their toxic substances.

A good example are the medicinal white oils or Group III oils which have meanwhile been approved as base oils for food contact lubricants.

- For the development of new additives the toxicological parameters have become a major subject.
- Triggered by local or global oilshortages the development of synthetic base oils (PAOs, Polyglycols, Siliconoils, Esters) has been granted high priority status. These base are contrary to mineral oils not a multi-product-mix. Their toxic characteristics are more uniform and –in most cases- also less critical..
- The determination of toxic characteristics has been enormously improved by modern analysing techniques and not at least by new legal rules. When in the past only points like LD50-figures and irritating characteristics were required, today the mutagenic potential, sensitisation, Fortpflanzungsgefährdung ect. have become important, too. This new awareness led to mumerous changes in the classification of certain products. A well known example is for instance the new classification for Dibutylphthalate: Change from "harmless" to => poisonous".

All of the before mentioned facts resulted in the development to of a new generation of high-performance lubricants which can best be described with the following summary:

**Increase in Performance**
**PLUS!**
**Decrease of Toxicological Problems**

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Normally a lubricant is used to lubricate either a component or a complete machine. Besides this there are also points of contact with humans:

- Food contact with lubricants
- Introduction into the food chain for example by accidents
- People using lubricants or whose workplaces are contaminated by lubricants

## 3. INTERNATIONAL FOOD CONTACT LEGISLATION

### 3.1 Germany

In Germany the contact of lubricants with food is regulated by the LMBG. In § 31 [2] it has been specified, that no substance might pass onto food unless it is unavoidable from a technical point of view and that they have to be toxicologically harmless, odourless and tasteless. The question:

"What is *harmless*"

is not definitely answered.

### 3.2 The World Standard USA

Die US Federal Food and Drug Administration standardizes and controls everything concerning food and drugs. Due to the lack of similar extensive regulations (including positive lists) in other countries, all serious standards for food lubricants refer to the FDA. The FDA regulates, which ingredients may be included in such a lubricant and which specifications with regards to purity have to be fulfilled.
The relevant Paragraph is 21CFR178.3570 and bears the title:

“Lubricants with incidental food contact”

This paragraph was the basis for product approvals by the USDA. The USDA regulates everything for the American food processing industry, also which lubricants may be used for the various applications. Although this standard referred to non-food compounds accepted for use in plants operating under the USDA inspection programs, it was internationally accepted.

The most important classes were H1 and H2. The approvals were published in the so called „White Book". The procedure for granting approvals was terminated in September 1998 and during that year the last "White Book" has been published.

The class H1 contained lubricants with incidental food contact, H2 was the category for lubricants with no food contact [3]

### 3.3 "September 1998" and Ensuing Activities

The USDA decided to entirely eliminate the approval system for all non-food compounds with the hint of HACCP Systems. This system named Hazard Analysis and Critical Control Point System can be used to assure a food production free from contaminations. As a result, lubricants with incidental contact are classified as CCP's but HACCP’s make no statement about what kind of lubricants can be used.

In Germany few companies decided to create a DIN-Norm with ambitions to become an international norm. The guidelines are mostly the same as the USDA-Guidelines for H1-Lubricants. Nearly at the same time the NSF decided to continue the disbanded USDA program.

## 4. NSF -THE NEW WORLD STANDARD

The National Sanitation Foundation (NSF) was founded in 1944 as a not-profit organisation. They are known for the development of standards, pro-duct testing and certification services. The activities of the NSF include the departments Public Health, Safety, and Protection of the Environment. Due to the fact that the NSF approval procedure fulfills the requirements of the DIN V 10517, the NSF meanhile has been acknowledged as the new international Standard.

The NSF not only continues the USDA-Program but has introduced various improvements:

- The Internet page http://www.nsf.org/usda includes a searchtool wherby all NSF White Book listings can be identified online. The approvals are visible ant printable as pdf-file.

- Since the symbol

*"NSF REGISTERED"*

has to appear on the label of approved products, the identification of H1-products has been simplified..

- The NSF has established new lubricant related product categories. Examples are NSF HT-1 for heat transfer fluids and NSF H1-X for additives for H1 lubricants. With "TUNADD AW" TUNAP has registered the first complete Additive-Package for high-performance H1-lubricants in this category [4].

## 5. PROTECTION OF PEOPLE APPLYING LUBRICANTS

The usual line of importance in the industrial middle age used to be

Machine => Technology =>Human.

In modern industry the health factor has led to drastic changes and a new line of importance:

Human => Machine =>Technology.

These changes resulted in a number of new measurements and procedures in the selection of lubricants.

The main reasons for this development are the increase of costs for ill employees and the change in legislation in terms of occupational safety. For example the occupational dermatological disease causes enormous costs for the community and also for the affected companies.

In many companies also a change in management strategies can be recognized. Motivation and contentedness of the employees has become a major issue. Another point in this regard is the cleanliness and toxicological harmlessness of the workplace.

Due to the outstanding ecotoxicological characteristics of “Food Lubricants" more and more companies outside the food and drug industry start using these "poisonless" lubricants.

This has led TUNAP to the development of a new Lubricant-Series for FOOD- and HUMAN contact. As a criteria they all have to be NSF-H1 registered and have highest performance. They do not have to be labelled with R-Phrases or symbols and the aerosols of this series are -if possible- outside the classification R10, R11 and R12.

### *REFERENCES*


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[2.] Bekanntmachung der Neufassung des Lebensmittel- und Bedarfsgegenständegesetzes, 9.9.1997

[3.] List of Proprietary Substances and Nonfood Compounds, USDA, 1997.

[4.] http//www.nsf.org/usda