

EXPERIENCES WITH THE GERMAN MARKET INTRODUCTION PROGRAM FOR BIOLUBRICANTS

Dr.-Ing. Heinrich Theissen, IFAS Aachen

+49-173-7232232

h.theissen@ifas.rwth-aachen.de

-
1. Political Intentions
 2. Organization of Market Introduction Program
 3. Public Resonance & Marketing Hints
 4. Technical Experience
 5. Conclusions
-

1. Political Intentions

The following political intentions of the German Federal Government led to the creation of the market introduction program for biogene oils:

- Increase usage of vegetable oil for lubrication
- Promote environmentally friendly technologies
- Use renewable resources, CO₂-neutral production
- Create Additional income for agricultural producers

The program attempts to reduce the existing market barriers for bio-lubricants through:

- communication of high technical performance level
- compensation for higher price and changeover cost
- long term increased volume
- long term reduced price difference

The funding of the market introduction program is as follows:

- funded by German federal government, ministry of agriculture
- annual funding is 10 million €
- program running since end of year 2000

2. Organization of Market Introduction Program

The organizations supporting the program are:

- FNR – project management, distribution of funds (www.fnr.de)
- WPR and AFC – public relations, communication, hot-line (www.bioschmierstoffe.de)
- IFAS at Aachen university – scientific research and technical consulting (www.rwth-aachen.de/ifas/)

Users willing to take advantage of the funding must fulfill the following conditions of participation:

- usage of bio-lubricant as a changeover or OEM
- bio-lubricant must be selected from *Positivliste*
- application must be on German territory
- machinery in determined applications like agriculture, forestry, environmentally sensitive areas, waterway installations
- reimbursement of changeover cost up to 100% (flushing, first fill)
- reimbursement of additional maintenance cost for 3 years (leakage, oil change)
- max. reimbursement is 100.000 €per applicant

Only lubricants listed in the *Positivliste* are eligible for funding! The conditions for manufacturers to put their products into the *Positivliste* are:

- renewable mass content = 50%
- water pollution class = 1 (German WGK classes 0 to 3)
- biodegradability = 80% (CEC standard) or = 60% (OECD standard)
- manufacturer must supply additional technical information
- motor, gear, hydraulic and other lubricants admitted
- chainsaw oils and mold release agents are not admitted

3. Public Resonance & Marketing Hints

Size of activities so far:

- approx. 1700 projects have been supported in three years
- more than 7000 vehicles and machines have been changed over
- information of users via leaflets, magazine articles, internet, workshops, telephone

Reaction in the market:

- slow reaction during first 9 months of program, as PR activities were just being started
- strong response after 12 months
- budget exceeded after 18 months

Motivation for users to change over:

- Main motivation is public pressure to use biodegradable lubricants in certain applications.
- However, there is no legislation requiring bio-oils. Pressure may come from water authorities, forest owners, (public) customers.
- In some cases, applicants are self-motivated: "green" corporate image, reduce cost of spills.
- Success is largely dependent on sales force of bio-lubricant dealers, who search for customers, inform about financial incentives, and try to sell higher value lubricants.

What types of lubricants were being sold?

- Hydraulic fluid – mostly in mobile equipment – represents more than 90% of sold bio-lubricant volume.
- Most fluids sold are HEES type, very little HETG.

Why so much hydraulic oil? Hydraulic equipment has the highest contamination risk, compared with other lubrication circuits:

- large oil volumes on vehicles – several 100 liters
- high pressures – up to 400 bar
- long pipes, flexible hoses, many connections

The typical applications (% oil volume) in the program are:

- construction equipment (excavators, loaders, ...) – 60%
- forestry equipment (harvesters, forwarders, ...) – 15%
- agricultural equipment – 5%
- others (water and wind turbines, metal working, ...) – 20%

Projects show strong geographic unbalance within Germany:

- 60% of volume in two southern states, which have only 20% of population
- large areas in Germany without significant sales

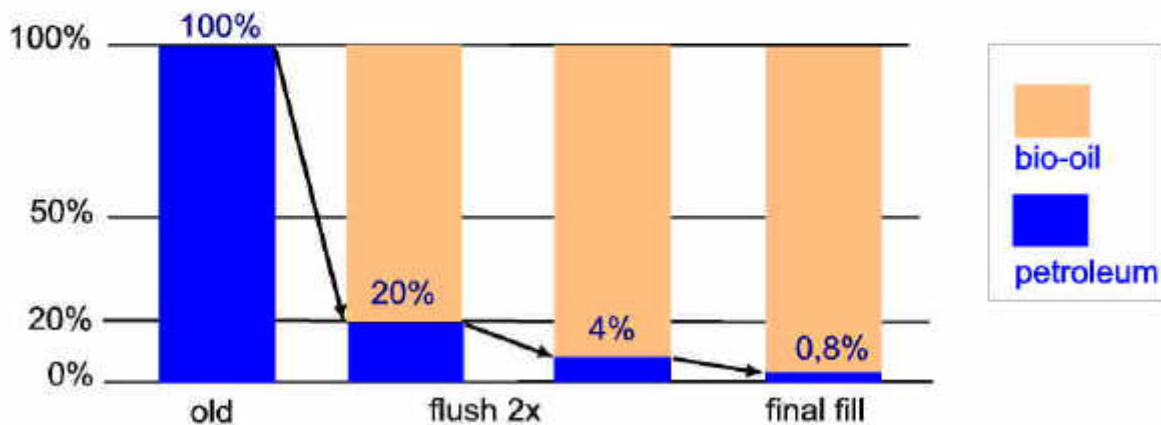
4. Technical Experience

The mixing problem:

- Petroleum based fluids must never be mixed with bio-oils!!!
- In hydraulic systems, the German VDMA standard of max. 2% petroleum can only be achieved through careful flushing.
- Depending on residual quantity of petroleum, flushing may have to be repeated several times. Examples:
 - 20% residue – flush twice (see diagram example 1)
 - 10% residue – flush once (see diagram example 2)
- Incomplete flushing is the main cause of complications during and after the changeover phase.
- During the draining process, air enters the hydraulic system. This results in foaming during the first hours after the completion of the changeover.
- High residues of petroleum and its additives, and water, cause a higher risk of foam generation and subsequent cavitation and pump damage.

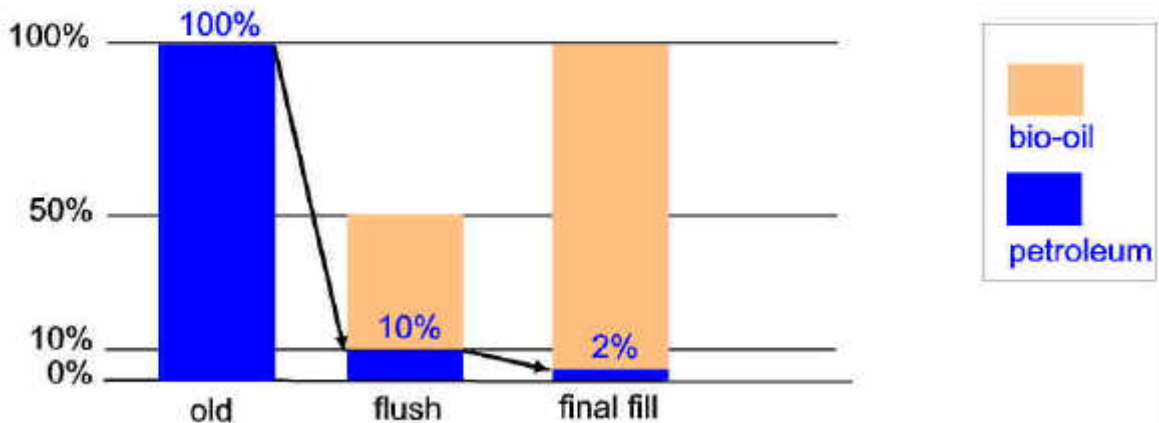
Flushing: Example 1

residual oil in system:	20%
fill level for flushing:	100%
target petroleum residue:	max. 2%
bio-oil consumption:	2,4 x system volume



Flushing: Example 2

residual oil in system:	10%
fill level for flushing:	50%
target petroleum residue:	max. 2%
bio-oil consumption:	1,3 x system volume



Only very few damages have been reported from the experience of more than 3000 hydraulic and other systems:

- one damaged hydraulic pump due to overheating
- one flexible hose failure resulting from incompatible hose material and oil overheating
- one case of valve malfunction

Viscosity advantage is not being understood (see also V-T-diagram):

- One of the advantages of bio-oils, its high viscosity index, allows to use low viscosity oils over a wide range of temperature, and reduce wear and energy consumption.
- This feature is not being understood in the public.
- In most cases, HLP 46 is replaced by HEES 46, where HEES 32 would be a better choice.

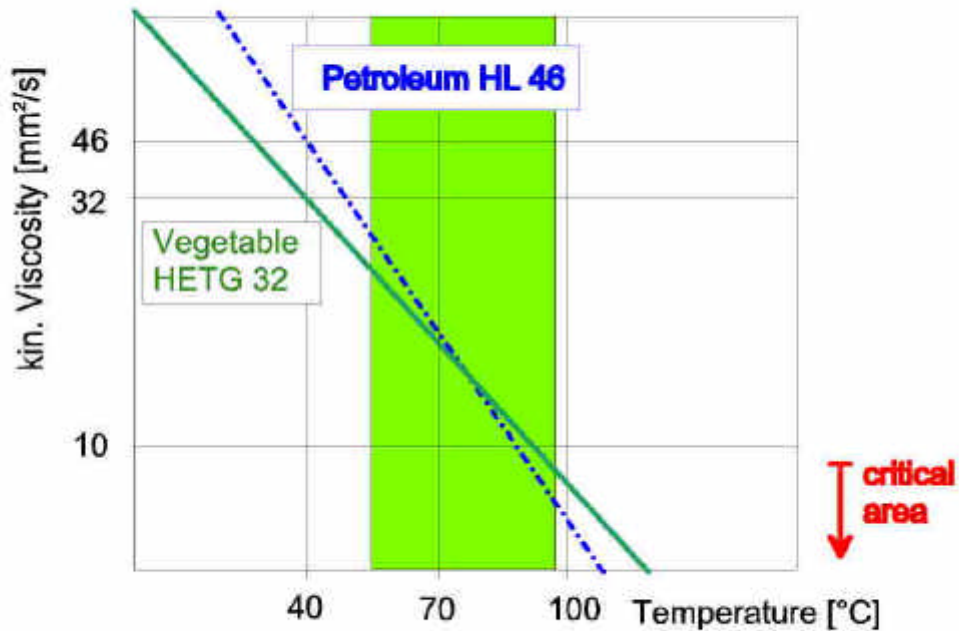
Water is a major risk factor for bio-oils (esters):

- water in hydraulic fluids leads to hydrolysis, early deterioration of fluid, and corrosion of materials
- in a normal, well maintained machine, water will evaporate through normal heat and air exchange in the reservoir
- excess water is a result of uncontrolled water access (see picture) [1]

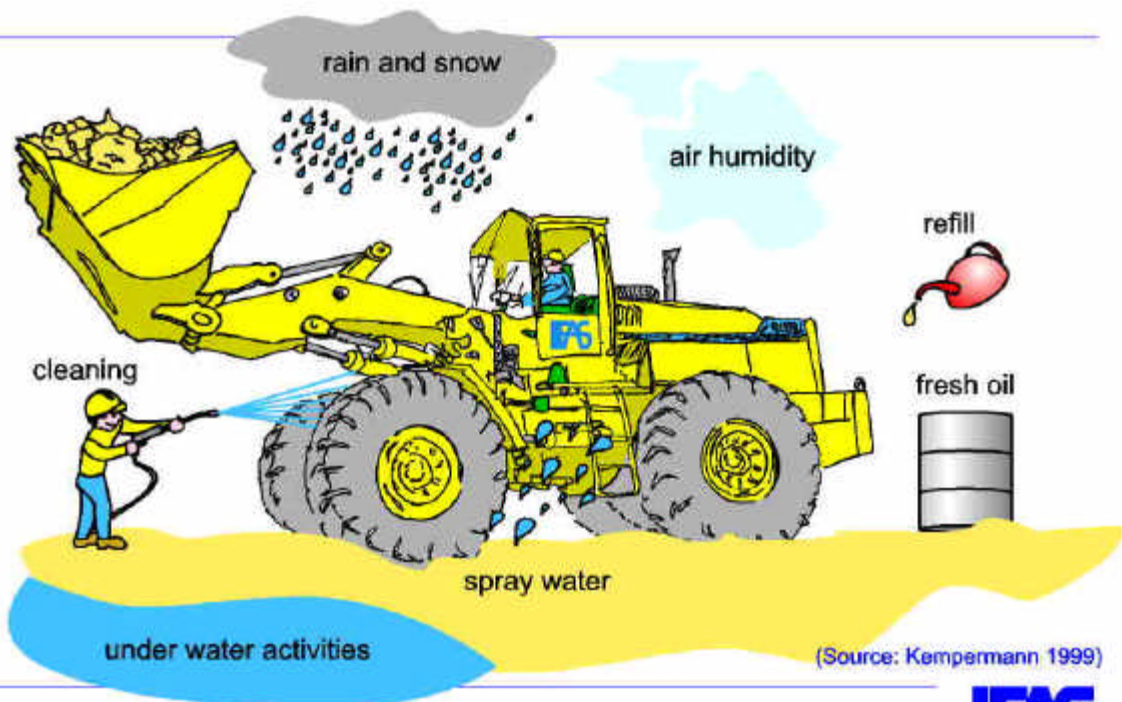
An economic paradigm may have to change:

- Synthetic esters, if treated well, can have a very long life expectation.
- The high price of bio-oil puts established practices in question. The hydraulic tank content of a medium sized excavator is valued more than 1000 €
- A combination of micro-filtering and regular laboratory checks is therefore less expensive than frequent oil changes.

Comparison Vegetable vs. Petroleum based Hydraulic Fluids Viscosity Behavior



Water Access Paths in Mobile Hydraulic Equipment



(Source: Kempermann 1999)

5. Conclusions

- After an initial communication phase, the marketing program has been widely accepted by the addressees.
- An annual quantity of one million liters of bio-lubricant has been supported.
- The knowledge and awareness of users has been increased.
- The combined sales force of the participating lubricant manufacturers is an essential requisite for success and has to be included into the communication process.

Some aspects of the procedure for the application for funds have shown to be inefficient and are presently being redesigned:

- The recording and verification of detailed cost data during the application process, necessary for the 100% reimbursement policy of incurred expenses, is unproductive.
- The 100% reimbursement policy leads applicants to buy more expensive lubricants than necessary, and not to negotiate lower prices.
- The price of bio-oils sold within the market introduction program is therefore very likely to be on the higher end of the market range, contradicting one of the intentions of the program, namely to find cheaper ways to use bio-oil.
- It is difficult to verify if a certain activity – e. g. change hoses in an older vehicle – is really bio-oil related and justified to be reimbursed, or if it is rather a hidden maintenance and repair activity. Many such cases are also induced by the 100% reimbursement policy.
- The budget for 2002 has been reached by May already, leading to the conclusion that the incentives may be more attractive than necessary.

Since the beginning of 2003, the determination of the individual reimbursement amount depends only on two data:

- quantity of bio-oil used
- size and type of hydraulic or other system.

It is the applicant's responsibility to use the money efficiently. This is expected to avoid endless discussions about justification of vehicle modifications, create an incentive for customers to act cost-consciously, and reduce the amount of administrative work.

The final conclusion is, that the program has been very successful on the German market, has attracted a lot of attention, and has helped to create awareness and knowledge of bio-oils among users in Germany. For a real breakthrough, however, the German market is probably too small, and there has to be a European initiative.

Literature

1. *Kempermann, Chr.*, 1999, Ausgewählte Maßnahmen zur Verbesserung der Einsatzbedingungen umweltschonender Druckübertragungsmedien, Diss. IFAS, RWTH Aachen.