

Highlights on Biolubricants in the Netherlands and EU

ActClean workshop:

“Cleaner Production as a tool for Higher Competitiveness for
SME's – an Eco-efficient Way to Material and Energy Savings”

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**Ckees van Oijen
& Hildo Krop**

www.ivam.uva.nl

research and consultancy on sustainability







Biolubricants in the Netherlands and EU

- Why focussing on biolubricants
- European Ecolabel lubricants
- Marketing and promotion policies for 'biolubes'
- CP aspects of lubricants (and lubrication)
 - Impact related: environmental; occupational health; energy/climate
 - Lubricant type related: hydraulic fluids; greases; concrete release agents; metal working; etc.






The need of lubricants (and lubrication)

<h3>Sectors</h3> <ul style="list-style-type: none"> ■ Rail and road transport ■ Shipping and fishing ■ Agriculture ■ Industry ■ Building ■ Other... 	<h3>Some applications</h3> <ul style="list-style-type: none"> ■ Central lubrication systems for trucks/busses ■ Hydraulic systems ■ Two stroke engines ■ Production machines and transport systems ■ Open gear boxes ■ Release agents ■ Chain saws ■ Drive chains ■ Steel cables ■ Stern tubes
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As the world turns on lubricants ! ... What is the problem ?

<h3>Composition</h3> <ul style="list-style-type: none"> ■ Base oils <ul style="list-style-type: none"> ■ Mineral sources ■ Renewable sources ■ Synthetic (Min. / Ren.) ■ Additives <ul style="list-style-type: none"> ■ Corrosion inhibitors ■ Extreme pressure add. ■ Emulsifiers ■ Anti-oxidants ■ Thickeners 	<h3>Loss and lost lubricants</h3> <ul style="list-style-type: none"> ■ Environmental impacts <ul style="list-style-type: none"> ■ Resource depletion ■ Soil and water pollution ■ Energy / Climate impacts <ul style="list-style-type: none"> ■ Lubricants production ■ Lubricants use ■ Health impacts <ul style="list-style-type: none"> ■ Drinking water ■ Agricultural crops ■ Occupational health ■ Food and beverages industry
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What are „Biolubes“?

Many different perceptions:

- Company owned labels & ideas
- Country specific labels

Biolube definitions based on:

- Product or components?
- Renewability?
- (Eco)toxicity?
- Biodegradability?
- Bioaccumulation?
- CO₂-balance?
- Life Cycle Analysis?

Lubricant Ecolabels in EU

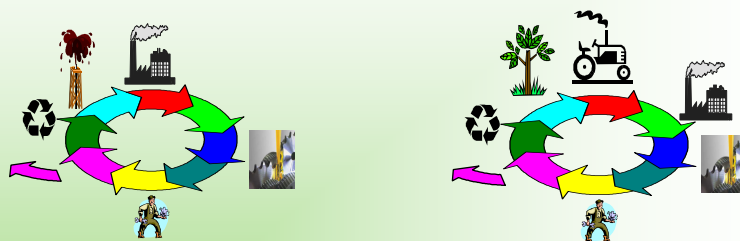


Since April 2005...
One label for the EU

A Life Cycle Approach

Lubricants based on renewable resources:

- Environmentally favorable w.r.t. global warming (CO₂ reduction)



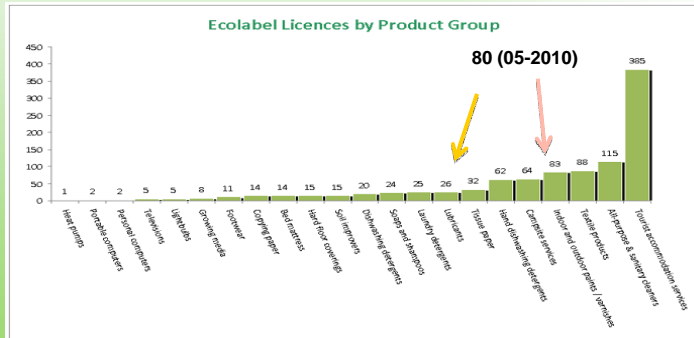
Adverse environmental impacts of vegetable oil based lubricants:

- Land use
- Water pollution associated with use of fertilizers and pesticides
- Emissions associated with the production of fertilizers

European Ecolabel since 1992

<http://www.eco-label.com/default.htm>

- Voluntary Scheme
- Applies to Product groups
- Reduction of Environmental effects in the Product Life Cycle



Most licenced products: It > Fr > Es > De

Comparison of some leading Biolube-schemes

	Renewability	Aquatic Toxicity	Biodegradation	Bioaccumulation	Content of dangerous comp.	CO ₂ -balance	Life Cycle Analysis
US-Farm Bill							
Blue Angel							
EU-Ecolabel							

- View was to develop the highest common denominator : EU Ecolabel for Lubricants
- CEN is developing a Technical Report using the lowest common denominator : What is a biolubricant?

European Ecolabel for Lubricants



Better for the environment...

- [text specified in with criteria]
- [text specified in with criteria]
- [text specified in with criteria]

...better for you.

- Since 2005 (2005/360/EC) for 4 years
- Revision to be finalised in June 2010
- Expected EUEB approval in October 2010

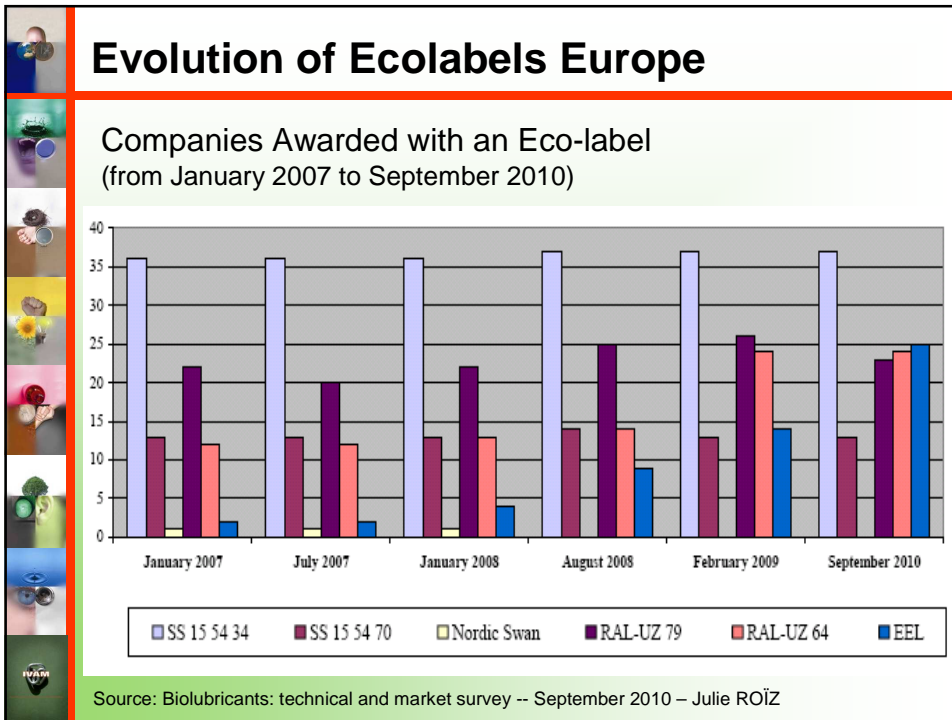
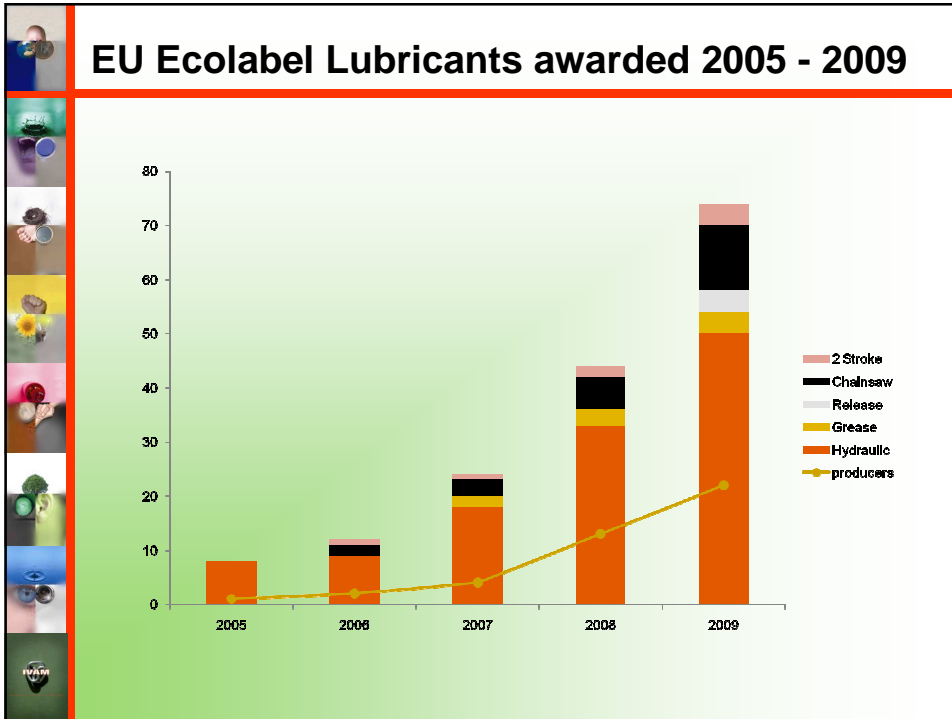
Summary EEL criteria

- No data – No label
- Lubricant No R-phrase for health or environment
- No Substances of very high concern
- Substance approach (In line with EU Chemicals Policy)
- Stricter than REACH (Ecolabel is NOT a REACH label)
- Sufficient Renewable material
- Sufficient Technical performance

Bio-lubricants Market

Consumption (1000 tones/a) in Europe					
Application	All Lubricants	Vegetable oils	Synthetic esters	Total BioLubricants	% BioLubricants
Automotive Engine oils	1680	0	22	22	1.3
Two-stroke Engine oils	30	1	1	2	6.7
Aviation Turbine oils	10	0	10	10	100
Automotive gear oil	300	0	4	4	1.3
Industrial gear oils	100	1	2	3	3
Hydraulic fluids	660	17	22	39	5.9
Compressor oil	40	0	15	15	37.5
Metalworking fluids	400	5	20	25	6.3
Textile oils	15	1	2	3	20
Chain saw oils	41	17	3	20	48.8
Mould release oils	100	12	3	15	15
Grease	132	2	3	5	3.8
other Lubricants	1242	2	7	9	0.7
Total	4750	58	114	172	3.6

Source: Pathmaster Marketing 2004



European Standard for Biolubricants The Lead Market Initiative: (Sept 2010)

Minimum requirements for biolubricant definition:

- Content of renewable raw material $\geq 25\%$ (ASTM D-6866 Radiocarbon Analysis; or equivalent CEN version)
- Biodegradability (OECD 301) :
 - $\geq 60\%$ for oils
 - $\geq 50\%$ for lubricating greases
- Toxicity: not to be labeled as "Dangerous to the environment" (Preparation Directive 1999/45/EC) for fully formulated product (OECD 201 / 202 / 203 : EC50/LC50/IC50 > 100mg/l)
- Performance: "fit for purpose" or "fit for use"
- Any lubricant with the EU Marguerite is a "bio-lubricant" per definition



Core elements of the EEL criteria revision

EEL defines 4 (→ 5) Lubricant categories:

- Hydraulic fluids;
- Greases;
- Total loss lubs (chain saw, concrete release agents, wire rope);
- 2-stroke oil;
- Industrial + maritime gear oils

Equal for all categories:

1. Lubricant product no health or environmental R-phrase
2. Fraction of any substance < 0.1% (to 0.01%)
 - ✓ OSPAR-listed, WFD-listed,
 - ✓ Metals (except Na, K, Mg, Ca (Al, Li-greases)
 - ✓ CMR 1,2 and REACH Annex IV
 - ✓ Not biodegradable and bioaccumulative
3. Total fraction of substances not assessed on ecotox and biodeg. / bioacc. < 0.5%



Different for each category:

1. Renewability (Carbon) sufficient (e.g. > 50% for hydraulic fluids)
2. Minimum technical performance (e.g. Table 2 to 5 ISO 15380 for hydr. fl.)
3. Varying fraction of ecotoxic and not ultimately biodegradable substances allowed (but never exceeding the potential classification limit of the lubricant product!)

Data requirement also compliant with OSPAR and IMO (GESAMP)

Performance Level ISO 15380

Characteristic of test	Test Method	selected Requirements			
		Tri-Glycerides (HETG)	Esters (HEES)	Polyglycols (HEPG)	Polyalphaolefins (HEPR)
Copper Corrosion	ISO 2160	Rating 2	Rating 2	Rating 2	Rating 2
Rust A	ISO 7120	pass	pass	pass	pass
Air release	ISO 9120	7 min	7 min	7 min	7 min
Foam	ISO 6247	150/0; 75/0; 150/0	150/0; 75/0; 150/0	150/0; 75/0; 150/0	150/0; 75/0; 150/0
Elastomer compatibility	ISO 6072	Stable at 60-80°C Stable at 60-80°C Stable at 60-80°C Stable at 60-80°C +/- 10 grade -3 to 10 % 30% 30%	Stable at 60-80°C Stable at 60-100°C Stable at 60-100°C Stable at 60-100°C +/- 10 grade -3 to 10 % 30% 30%	Stable at 60-80°C Stable at 60-100°C Stable at 60-100°C Stable at 60-100°C not defined +/- 10 grade -3 to 10 % 30% 30%	Stable at 60-80°C Stable at 60-100°C Stable at 60-100°C Stable at 60-100°C not defined +/- 10 grade -3 to 10 % 30% 30%
Oxidation Stability (TOST)	ASTM D943	report (alternatively to Dry TOST)	report (alternatively to Dry TOST)	1000 h	1000 h
Oxidation Stability (Dry TOST)	ASTM D943 mod.	report (alternatively to TOST)	report	not required	not required
Baader Test (95°C, 72 h)	DIN 51554-3	20%	20%	not required	not required
Viscosity Increase max	DIN 51354-2	10	10	10	10
FZG	DIN 51354-2	10	10	10	10
Vane Pump (V 104-C-10)	IP 281	120 mg 30 mg	120 mg 30 mg	120 mg 30 mg	120 mg 30 mg

Confidentiality vs. Assessment

Lubricant

- Biodegradability and renewability - In general related to base fluids
- Aquatic toxicity related to additives used
- Additives are the fine tuning of the lubricant for its specific application
- Additive suppliers are willing to have their packages assessed
- Additive suppliers do not wish to send the relevant data to each CB

Solution

- Assessment reports based on exact composition sent to CB
- CB issues a valid letter of compliance
- Necessary information for any applicant but not disclosing the confidential part
- Assessment appears on a Lubricant Substance Classification – list (LuSC – list)
- LuSC-list contains (special) substances and additives and additive packages
- LuSC-list will be accessible via the EU ecolabel website

Excerpt from the LuSC-list

Substance	CAS no	EINECS no	Biodegradability	Aquatic toxicity	Remarks
Calcium distearate, pure C ₁₈ H ₃₆ O ₂ .1/2Ca	1592-23-0	216-472-8	Ultimately (A)	Not toxic (D)	Organic substance listed in Annex I of Regulation 987/2008
Rape oil Extractives and their physically modified derivatives. It consists primarily of the glycerides of the fatty acids erucic, linoleic and oleic (Brassica napus, Cruciferae)	8002-13-9	232-299-0	Ultimately (A)	Not toxic (D)	Organic substance removed from Annex IV to Annex V of Regulation 1907/2006 (REACH) by Regulation 987/2008
Lithium 12-hydroxystearate, pure, C ₁₉ H ₃₈ O ₃ L ₄	7620-77-9	231-536-5	Inherently aerobically (B)	Harmful (E)	Assessed by the Dutch CB

Brand name	Proposed maximum treat rate %				Based on 100% treat rate			Remarks	Assessed by
	Cat 1	Cat 2	Cat 3	Cat 4	EEL Biodegradation	EEL Aquatic Toxicity	Renewability		
					A/B/C/X/-	D/E/F/G/M'			
Base fluids									
Uniflex 146LAN	Not limited by biodegradation and aquatic toxicity				100% A	100% D	69.2%		Dutch CB
Synative ES 3157	Not limited by biodegradation and aquatic toxicity				100% A	100% D	64%		Dutch CB
Additives									
Ingalube® 349	2.5%	1%	0.5%	1%	100% C	100% F	0%	Limited by R51/53	Dutch CB
Ingalube® 353	1%	1%	1%	1%	100% C	100% E	0%	Limited by R43	Dutch CB
Additin RC2415	12.5%	2.5%	1.25%	2.5%	100% C	60% E 40% F	95%		Dutch CB

Can my lubricant get an ecolabel?

Easier steps

- Does my lubricant have any health or environmental R-phrase?
Yes? No label
- Can I fulfill the technical requirements?
No? No label (additional testing?)
- Is the fraction of renewable C-atoms sufficient?
No? No label

More difficult steps (Contact also the ecolabel helpdesk, the CB of application and possibly IVAM (consultant))

- Establish list of intentionally added substances present above 0.1% (**0.01%**)
- Are they found on the exclusion lists?
Yes? No Label
- Establish the EEL ecotox and biodegradation classification.
Any classification exceeding the limit? Yes? No label?

Sustainability and the Ecolabel

http://ec.europa.eu/environment/eussd/escp_en.htm

2008 - Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan

EU: 9 Building blocks defined:

- European Ecolabel
- Green Public Procurement (GPP; Training Toolkit)
 - Module 1: Managing GPP Implementation
 - GPP and the European Ecolabel

Netherlands:

- VAMIL: increased depreciation on investments in biolubricants running machines (since 2008: EEL for Hydraulic oil & Blue Angel for greases)
- Water Management Agency: EEL / biolubricants for hydraulic applications
- 'Duurzaam Inkopen': Implementation of preferable purchasing policy for sustainable goods and services
- www.biosmeermiddelen.nl



Direct & indirect policy incentives for the EEL

Belgium:

- Compulsory use of biolubricants near / in non-navigable waters

Germany, Austria & Switzerland

- Biolubricants use on lakes and environmentally sensitive areas

France:

- Obligated use of EU Ecolabel Lubricants in environmentally sensitive zones

Italy:

- Tax on mineral oil based lubricants promoting use of naturally derived lubricants

Portugal:

- Compulsory use of bio 2-stroke engine oils

Biolubricants in pilot projects

Ms Audri (inland marine container vessel),
The Netherlands



Canal des Deux Mers, Toulouse,
France



Potential advantages of biolubricants

Environment and health

- By using biolubricants pollution can be reduced
- High biodegradability
- Low bioaccumulation
- Low toxicity for humans and aquatic organisms
- Safer for workers

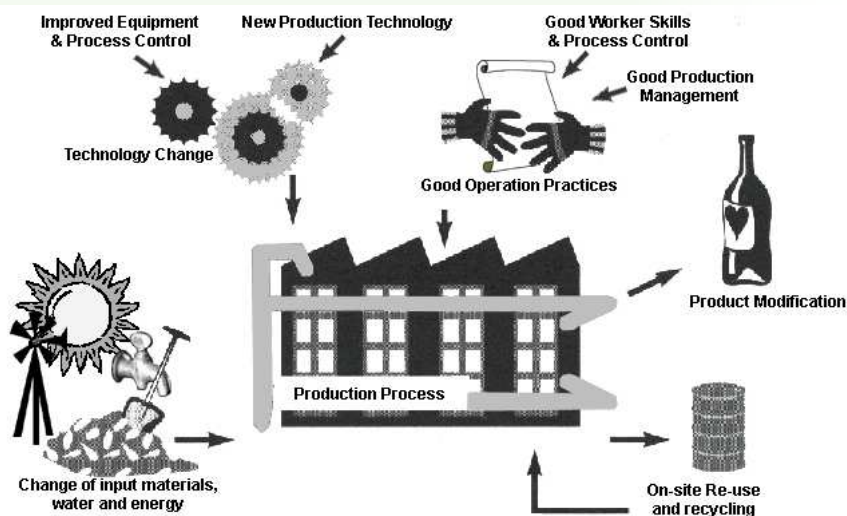
Technical and economic

- Good lubrication properties
- High viscosity index
- Longer tool life (less friction / wear)
- High flash point
- Good adhesion to metal surfaces
- Up to 5 times less evaporative loss
- Reduced spill liability and costs of spill clean-up

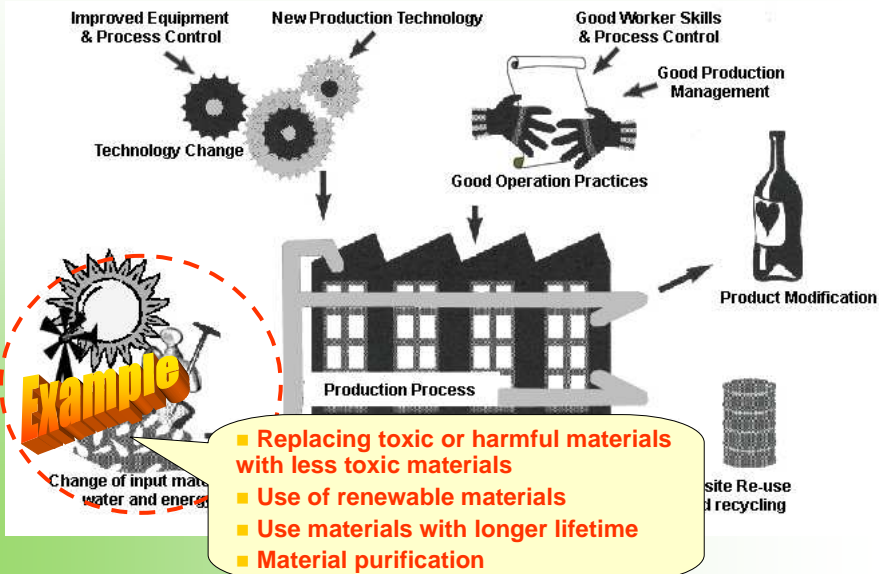
- **Note:** Precautions should be taken into account when changing over to biolubricants in existing equipment
- **Points of attention are:** Oxidation and thermal stability; Behavior at low temperatures; Compatibility with system components (coatings, seals, filters); hydraulic behavior; foaming and residues of mineral oil

Cleaner Production and (bio)lubricants

Options and opportunities for SME's?



CP Options: change of input materials



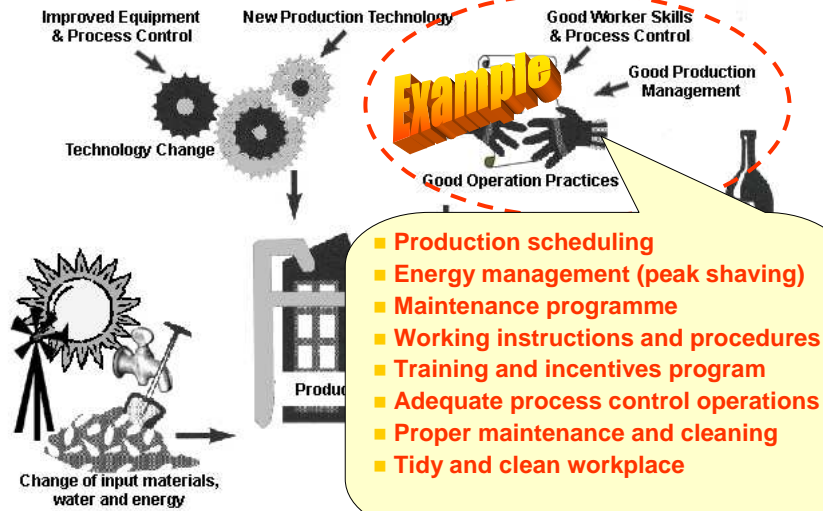
Example: Change of Input Materials

USPS



Focus area	Oil consumption and waste
CP option	Change from virgin oil to re-refined oil in 4.500 vehicles
Results	Savings on resources: 18.000 litres Savings: \$1.300/year

CP Options: good operation practises



- Production scheduling
- Energy management (peak shaving)
- Maintenance programme
- Working instructions and procedures
- Training and incentives program
- Adequate process control operations
- Proper maintenance and cleaning
- Tidy and clean workplace

Good Operation Practises

B&S



Focus area	Lubricating oil waste
CP option	Recording oil consumption Prolonging periods between oil changes from 240 to 400 hours
Results	Savings on resourses: 30% Savings: \$3.000/year

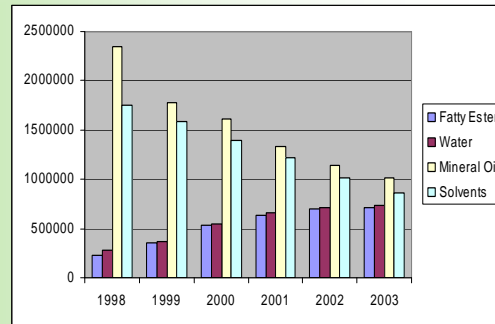
Example: Release agents (SUMOVERA)

- Concrete release agents (RA) are total loss lubricants
- Dutch construction and prefab concrete industry use > 5.000 m³ RA / year
- RA consist of: fatty esters, water, mineral oil and solvents
- Volatile organic solvents (VOC) have adverse impacts on occupational health and environment



Progress since 1998 due to:

- Environmental and health classification system
- Awareness raising (a.o via Sumovera project)
- Announced legislation on exposure to VOC
- Autonomous developments



Challenges for CP innovation with biolubricants

Reduced environmental risks

- Increased resource efficiency
- Decreased soil and water pollution, and ecosystem degradation

Reduced energy use and climate change

- Saving mineral oil resources by using renewables
- Lower CO₂ emission and greenhouse effect

Reduced health risks

- Less occupational exposure and health effects
- Less pollution to sensitive / drinking water areas
- Less damage to agricultural crops due to soil contamination
- Less contamination in food and beverages industry by using food grade lubricants

Opportunities for production and use of biolubricants by SME in Czech Republic

To overcome possible barriers:

- Taking away negative perceptions due to past experience and lack of knowledge
- Applying Life Cycle Cost Accounting to cope with price differences
- Balancing supply and demand to cope with restricted stock, availability and promotion at point of sale
- Proactive and stable governmental sustainable purchasing policies (Green Public Procurement)
- Communication and negotiation on technical performance requirements
- Financial incentives for innovation and pilot/demo projects between producers of lubricants and OEM.

Thank you for your attention!



www.ivam.uva.nl
coijen@ivam.uva.nl