ACCU-LUBE™

Micro-Lubrication

ACCU-LUBE™

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Why Micro-Lubrication

Economy

- The production costs per workpiece with conventional cooling emulsions are approximately 7-17% of the total costs. This percentage can be significantly reduced by the use of micro lubrication.
- The reduction of friction and the resulting increase of productivity will allow a more economical processing of workpieces.
- Shorter machine down time by increase of tool life.
- Reduction of disposal costs due to almost dry chips.
- No extra installation for the operation of coolants required - therefore additional saving of energy costs.

Cost effectiveness study

Consumption and cost analysis for the use of lubricant and lubricating system other than ***Accu-Lube***.	
Production of aluminium rims in 3 working shifts	appr. 360 rims
Oil consumption	appr. 13.320 ml
Consumption per rim	appr. 37 ml
Cost for oil (per litre)	€ 3,00
Cost for 13.320 ml	€ 39,96
Cost per day for 12 machines	€ 479,52
Cost for 12 machines (calculation based on 250 working days)	€ 119.880,00

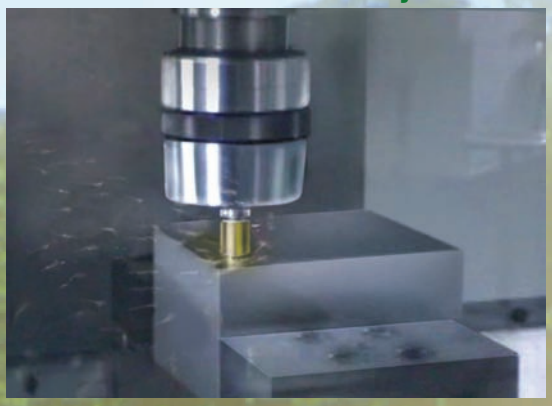
Consumption and cost analysis for the use of ACCU-LUBE LB-5000 in combination with ***Accu-Lube*** micro lubrication technology	
Production of aluminium rims in 3 working shifts	appr. 360 rims
Consumption of ACCU-LUBE LB-5000	appr. 1.332 ml
Consumption per rim	appr. 3,7 ml
Cost for ACCU-LUBE LB-5000 (per litre)	€ 20,20
Cost for 1.332 ml	€ 26,91
Cost per day for 12 machines	€ 322,92
Cost for 12 machines (calculation based on 250 working days)	€ 80.730,00

Savings with the use of *Accu-Lube* **€ 39.150,00**

Why Micro Lubrication
Environmental Friendliness

Conventional way using coolants

***Accu-Lube* Minimum Quantity Lubrication**



Accu-Lube **lubricants harm neither operators nor the environment:**

- **biologically decomposable**
- **non-toxic**
- **free of EP-additives, chlorine, nitrite, sulphur, phenol, biocides**
- **based on natural, renewable resources**
- **odourless**
- **valuable economy of potable water**

The use of *Accu-Lube* lubricants will stop:

- **high energy costs**
- **delays due to machine down time**
- **absence of operators on grounds of allergies**
- **slippery floors**
- **dirty work places**

Accu-Lube **Micro lubrication technology – Assuring economy**

Accu-Lube **– Your contribution to environmental protection**

Accu-Lube applicators - assuring economy and precise application of lubricants

The ***Accu-Lube*** applicators enable an exact dosage of lubricant supplied to the cutting edge of the tool. Consumption is clearly measurable. Smallest droplets of the lubricant are transported by the air stream precisely to the cutting edge of the tool without producing any dangerous mists.
The approved modular system allows the ***Accu-Lube*** applicators to be tailor-made for every type of operation.

The use of *Accu-Lube* applicators results in:

- continuous moistening of cutting tools
- even application of lubricant
- lowest requirement of lubricant
- high cutting performance of tools by using ***Accu-Lube*** lubricants
- dry workpiece and tool as well as dry machine

Accu-Lube applicators for outside lubrication

A small quantity of lubricant makes the great difference between dry machining and minimum quantity lubrication. With dry machining there is moistening of the workpiece or tool, there is no protection from heat generation and there is no great potential of increasing tool life. These issues are solved by minimum quantity lubrication with the help of a minute quantity of lubricant and the precise application of lubricant droplets to the cutting edge of the tool.

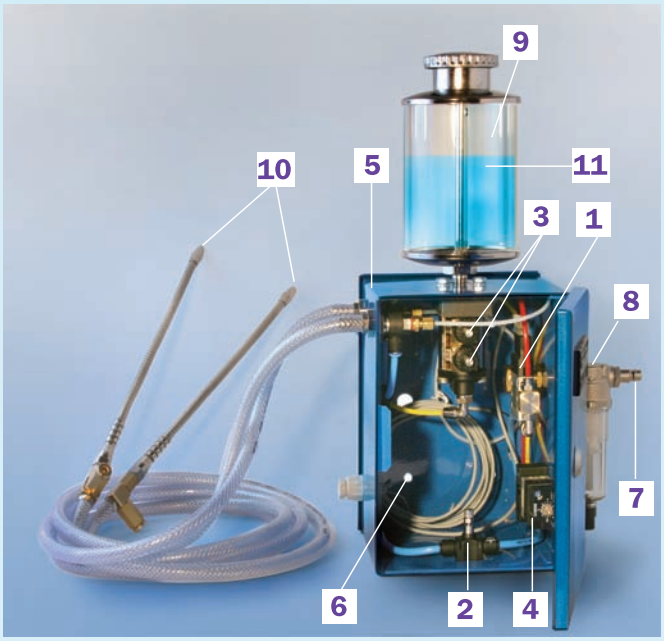
The ***Accu-Lube*** pump has been specially designed to ensure a continuous flow of lubricant from the moment the applicator is switched on until it is switched off. The piston pump works with a continuous precision, to supply the lubricant smoothly and continuously to the cutting edge. **Warranty is four years** on condition that ***Accu-Lube*** lubricants are being used.

The ***Accu-Lube*** piston pump requires compressed air to activate the pump cycle. With the return stroke a precisely defined quantity of lubricant is drawn into the pump chamber. The following fore stroke supplies the lubricant into the capillary tube in the inside of the air tube.

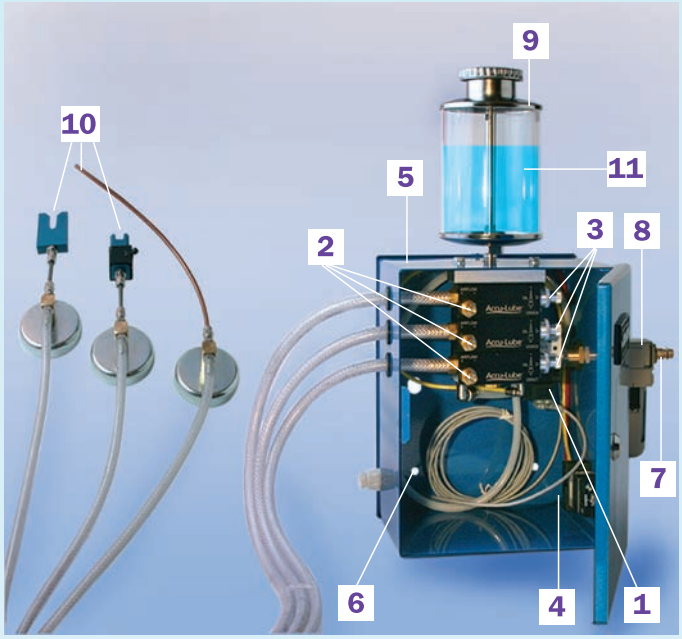
Thus all ***Accu-Lube*** lubricants are supplied to the cutting edge of the tool with the same performance.

Outside Lubrication

Applicator equipped with brass pumps



Applicator equipped with aluminium pumps



Components of *Accu-Lube* Applicator

1 Actuator
ON/OFF switch
Options: solenoid valve, toggle switch, roller valve, slide valve, foot pedal, air-actuated

2 Air flow valve
Regulates the air output at the nozzle. Each aluminium pump has its own air flow valve that can be operated independently

3 Adjusting scale for lubricant quantity
The adjusting screw regulates the required quantity of lubricant

4 Frequency generator
Controls the frequency at which the pump cycles
Pneumatic frequency generator: 5-180 strokes/min
Electric frequency generator: 1-128 strokes/min
Solenoid valve: freely programmable

5 Metal box

6 Mounting system
Pre-drilled holes for permanent mounting of applicator to machine tool or to fix magnetic mounts to the metal box

7 Air supply
Input pressure: min. 4 bar, max. 10 bar

8 Air filter

9 Reservoir
Sizes: 0.3 L ; 1.0 L, 2.0 L, 3.0 L also available with level indicator

10 Nozzles
Circular and band sawing nozzles, copper, steel and loc-line nozzles, flexible metal nozzles, rotative and special nozzles

11 ACCU-LUBE lubricant

Accu-Lube applicator on setting angle

This simple applicator is equipped with a 0.3 litre reservoir, 1 pump, 1 coax tube with a loc-line nozzle and can easily be fitted to any kind of metal surface with the help of a magnet.

Being connected to compressed air supply it can be operated immediately.

Operation areas: simple drilling, milling and sawing operations

Outside Lubrication

Lubricant consumption ml/h
Aluminium Pump

Revolutions

Frequency generator	0,5	1	1,5	2	2,5	3	3,5	4
0,25	2	9	19	27	34	47	54	66
0,5	2	6	12	15	21,5	30	33	41
0,75	1,5	4	7	10	14	18	20,5	24
1	1,5	2	4	6,5	8,5	9,5	12	14
1,25	0,8	1,5	3	3	5	6	7	8
1,5	0,7	0,8	1	2	2	3	3	5
1,75	0,6	0,7	0,8	1,5	1,5	2	2,5	3
2	0,6	0,6	0,7	1,5	1,5	2	2,5	2,5

Brass pumps are used for lubricants other than ***Accu-Lube*** or for larger volumes of lubricant.

Lubricant consumption ml/h
Brass Pump

Clicks

Frequency generator	38	33	28	23	18	13	8
0,25	34	39	56	65	84	96	109
0,5	18	25,5	35	38	48	61	65
0,75	12,5	16	21	26	31	37	38,5
1	8	9	12,5	15	18	20	24
1,25	4	5	7	8,5	11	12	13
1,5	2	3	3	4	5	7	7,5
1,75	1,5	2	2,5	3	3	4	4,5
2	1,5	2	2,5	2,5	3	4	4

Nozzles and Special Nozzles

Band sawing nozzles

Circular sawing nozzles

Flexible Nozzles
Loc-line Nozzles


Copper / steel nozzles with adjusting block

Nozzle tips

Wide angle nozzle No. 1

Brass nozzle 3,4mm

Brass nozzle 1,5mm

Wide angle nozzle No. 2

Full cone nozzle

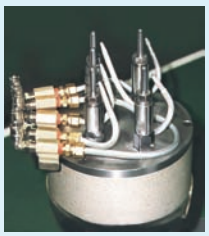
Hollow cone nozzle

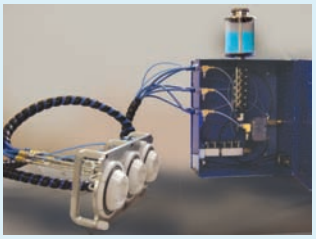
Point nozzle

Round jet nozzle

Rotative nozzles

Special nozzles





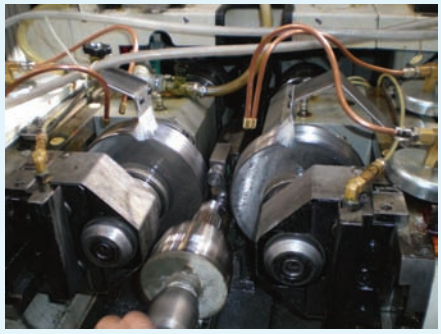
The selection of appropriate nozzle will ensure a precise and correctly dosed application to the cutting edge.

Operating areas for *Accu-Lube* Applicators:

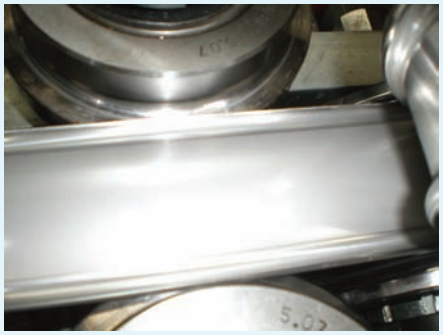
- band sawing
- circular nozzles
- milling
- drilling
- thread cutting
- punching
- broaching
- thread rolling
- chamfering
- stamping
- cold roll forming
- grooving
- bending
- knurling
- forming

Examples of applications

Milling



Thread rolling



Forming

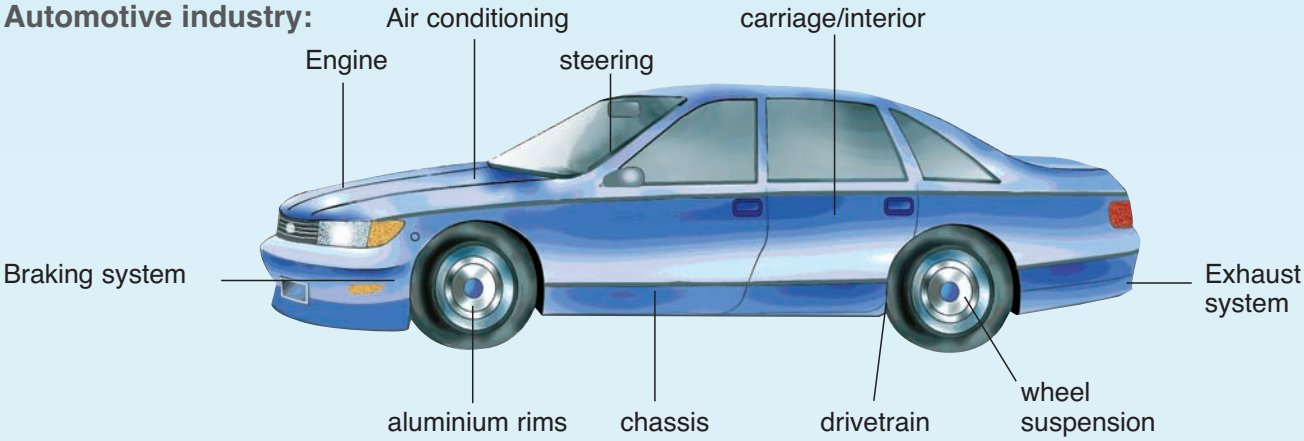
Drilling

Knurling

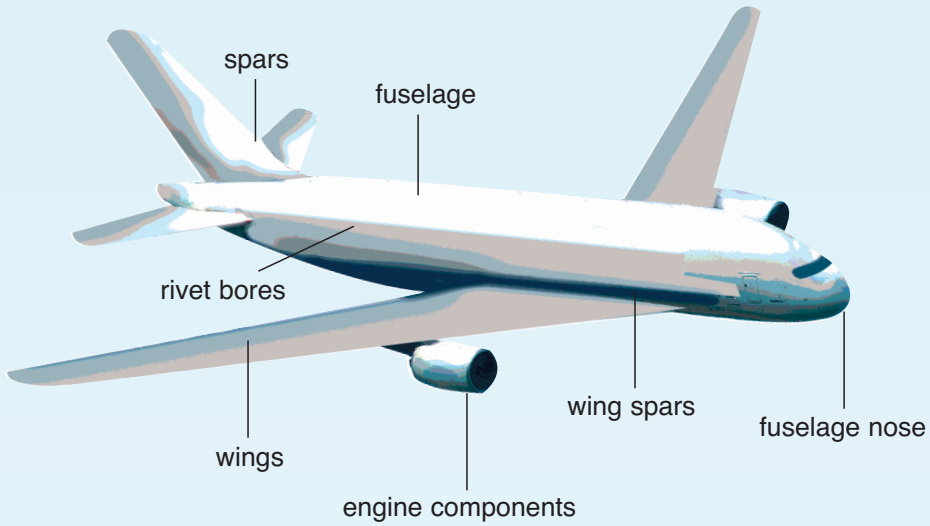
Forming

Accu-Lube Micro Lubrication is used for the production of the following components:

Automotive industry:



Aircraft industry:



And many more industries…

Some references:

- AIRBUS
- Rolls Royce
- GE
- PSA
- Adige S.p.A.
- Bisiach & Carru
- EADS
- Prowin
- Porsche
- Audi
- ZF Lemförder Fahrtechnik
- Mercedes
- ASL Lemwerder
- MT Aerospace
- RUAG

Accu-Lube MiniBooster and EcoBooster for CNC machining centres

Micro-lubrication is provided when an air and lubricant mixture is transported through the machine-tool-spindle ensuring the ACCU-LUBE lubricant is delivered precisely to the cutting edge.

The ***Accu-Lube* MiniBooster** consists of the following essential parts:

- ***Accu-Lube* precision controlled volume pumps**
- ***Accu-Lube* frequency generator**
- ***Accu-Lube* MiniBooster chamber = the essential part of the system**
- **Electronic control system for automatic adjustment to different tool diameters (only with "SR" versions)**

In the MiniBooster chamber a lubricant-air mixture with droplets of ≤ 1µm is produced.

Accu-Lube MiniBooster MB II

- **Turning lathes with rotating tools**
- **CNC-machines with different tools and different tool diameters**
- **Tool diameter 3 - ≤ 8 mm**

Technical data:

Operating current:	24 V DC 2W (optional 110 V, 220 V)
Operating pressure:	6 – 8 bar
Reservoir:	500 – 750 ml (optional 950 – 1.400 ml)

Components:

- 2 Booster chambers
- 1 precision controlled volume pump
- 1 frequency generator (optional: solenoid valves freely programmable; 40-50 strokes / min)

The machines of the following machine tool manufacturers are equipped with this *Accu-Lube* system among others:

- Depo
- Matec
- EMAG
- Fill
- Reis Robotics
- Index

Accu-Lube Double MiniBooster MB II

For coolant fed tools with a diameter of
3 - ≤ 8 mm

Technical Data:

Operating current:	24 V DC 2W (optional 110 V, 220 V)
Operating pressure:	6 – 8 bar
Reservoir:	500 – 750 ml (optional 950 – 1.400 ml)

Components:

- 4 Booster chambers
- 2 precision controlled volume pumps
- 2 frequency generators
  (optional: solenoid valves freely programmable;
  40-50 strokes / min)

This **Double-MiniBooster MB II** consists of two separate systems, which are united in one box.

This **Double-MiniBooster MB II** was developed for multi spindle heads.

Optionally available with electric control.

This system is used

- on drilling units with different tools
- for threading lugs
- for milling of parts for the automotive industry

Accu-Lube MiniBooster MB II HD SR

For coolant fed tools with a diameter of
1 - ≤ 25 mm

Technical Data:

Operating current:	24 V DC 2W (optional 110 V, 220 V)
Operating pressure:	6 – 8 bar
Reservoir:	500 – 750 ml (optional 950 – 1.400 ml)

Components:

- 2 Booster chambers
- 2 precision controlled volume pumps
- 2 frequency generators
  (optional: solenoid valves freely programmable;
  40-50 strokes / min)

The ***Accu-Lube*** **MiniBooster MB II HD SR** is appropriate for coolant fed tools in CNC-machining centres and CNC-turning lathes.

The ***Accu-Lube*** **MiniBooster MB II HD SR** allows for a safe production process.

Advantages:

- Initiated by the electronic control, the system adjusts itself automatically to the different tool diameters of coolant fed tools.
- After a tool change it is not necessary to program an M-function for each tool.
- The existing CNC-programs need not be changed for a special M-function for the micro lubricating system.
- Simple installation! This system requires an air supply of 6-8 bar and an electrical output of 24 V on the CNC-machine tool (M-function cooling-lubricant ON/OFF).
- This system is easy to operate and offers process safety especially during high volume batch production.
- The consumption of air is reduced by 20% because the system switches on only when more oil-air mixture is needed, as the lubricant is always present in the reservoir.
- The consumption of lubricant is approximately 8-14 ml/h. This depends on the size of the tools used and the time of use of the tool.

Operating areas: Bending, drilling, deep hole drilling, milling, turning, reaming

This system is used for the production of:

- cooler tubes
- exhaust pipes
- machine components
- hydrants
- compressor engine blocks
- drive train

The machine tools of the following manufacturers are equipped with this *Accu-Lube* system among others:

- Crippa
- Fill
- Homag
- EMAG
- Ex-Cello
- Reis Robotics
- Weeke
- Chiron
- Matec
- Kaltenbach
- Suhner
- Zayer
- Schwarze-Robitec

Accu-Lube MiniBooster MB II HDC

This MiniBooster consists of two systems (inside and outside lubrication) in one box.

Inside lubrication

- 2 Booster chambers
- 3 precision controlled volume pumps
- 3 frequency generators
  (optional: solenoid valves freely programmable; 40-50 strokes / min)

For coolant fed tools with a diameter of **3 - ≤ 25 mm** (**1 - ≤ 25 mm** with ***Accu-Lube*** **MiniBooster MB II HDC SR**)

Outside lubrication

- 3 precision controlled volume pumps
- 3 frequency generators
  (optional: solenoid valves freely programmable; 40-50 strokes / min)

With no limits as far as the tool diameter is concerned, provided that the positioning of the nozzle can be optimised and the lubricant will reach the cutting edge of the tool.

Technical Data:

Operating current: 24 V DC 2W (optional 110 V, 220 V)
Operating pressure: 6 – 8 bar
Reservoir **inside lubrication**: 500 – 750 ml
(optional 950 - 1.400 ml)
Reservoir **outside lubrication**: 1.000 ml
(optional 2.000 ml)

Outside lubrication for non coolant fed tools
Inside lubrication for coolant fed tools

Advantages:

- It is not necessary to replace all tools which are not coolant fed.
- During heavy duty cutting operations outside and inside lubrication can be used.

Optionally available with electronic control.

This system covers all cutting operations on a CNC machining centre.

This system is used for the production of:

- forged aluminium rims
- hinges
- cast aluminium crankcases
- threaded pins
- transverse links for F1

The machine tools of the following manufacturers are equipped with this *Accu-Lube* system among others:

- Matec
- Chiron
- EMAG
- Homag
- Kaltenbach
- Suhner
- Fill

Accu-Lube EcoBooster EB7 VP

For coolant fed tools with a diameter of
3 - ≤ 16 mm

Technical Data:

Operating current:	24 V DC 2W (optional 110 V, 220 V)
Operating pressure:	4 – 8 bar
Reservoir:	1.200 ml

Components:

- 1 precision controlled volume pump
- 1 frequency generator
  (optional: solenoid valve freely programmable;
  40-50 strokes / min)
- 2 solenoid valves controlled by pressure sensor

The *Accu-Lube* EcoBooster EB7 VP can be refilled during operation.

This *Accu-Lube* system is operated by the following companies / machine tool manufacturers:

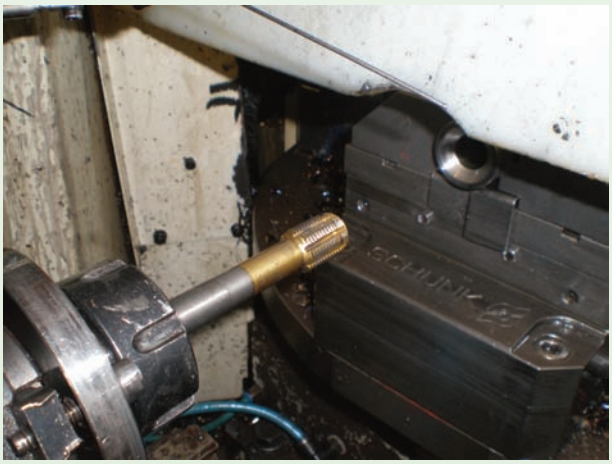
Automotive industry:

- Toyota
- Honda
- Yamaha
- Daihatsu
- Mitsubishi Motors

Machine tool manufacturers:

- Nachi-Fujikoshi
- Nippei Toyama
- Mori Seiki
- Okuma
- Yasda
- Takamatsu Machinery

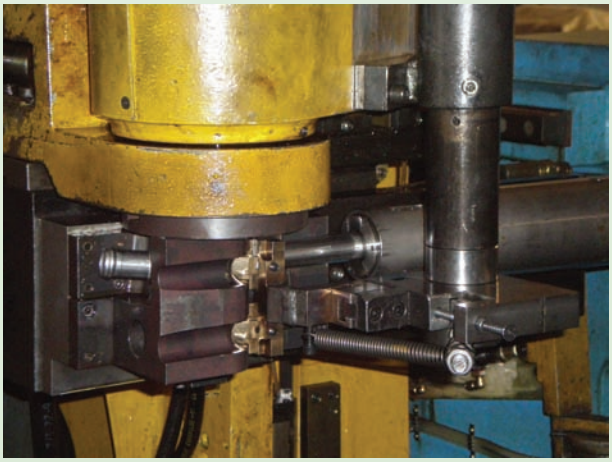
Applications using Inside Lubrication



Thread moulding

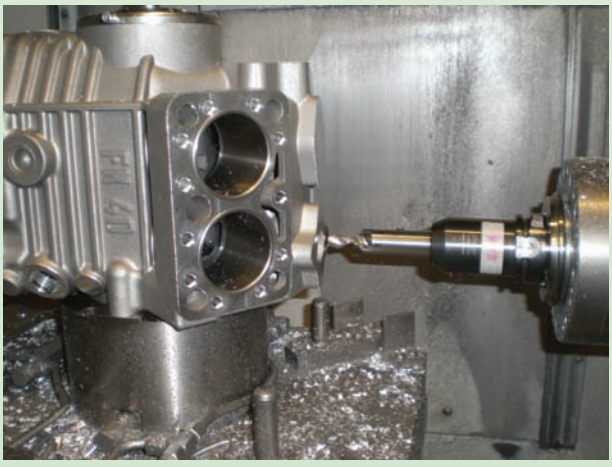
Drilling

Drilling



Bending

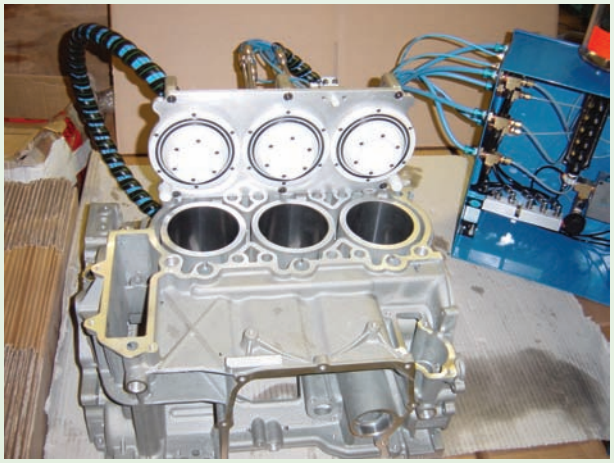
Milling



Drilling

Accu-Lube Applicators and *Accu-Lube* MiniBooster for special applications

8 pumps for outside lubrication
8 pumps for inside lubrication
8 pumps for additional lubrication

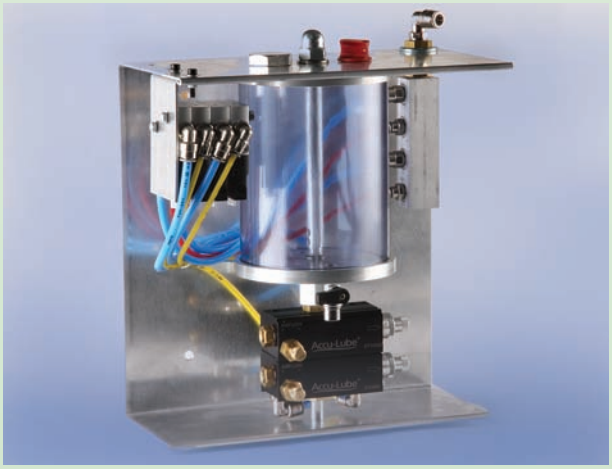


6 pumps for outside lubrication
timer valve

6 pumps for outside lubrication
4 pumps for inside lubrication

2 pumps for inside lubrication

6 pumps for outside lubrication
6 pumps for inside lubrication
6 pumps for additional lubrication



2 pumps for outside lubrication

Accu-Lube **Lubricants – harm neither operators nor the environment**

Accu-Lube **lubricants** are manufactured of non-toxic, renewable, vegetable resources. They are environmentally friendly and biologically decomposable. In addition to the environmental aspects these lubricants can be used for safe processing of all metallic materials.

Improvement of machining processes

In comparison with conventional coolants ***Accu-Lube*** **lubricants** show a clear improvement of lubricity leading to a reduction of friction in metal processing. This results in an increase of both tool life as well as surface quality.

Economy as well is increased by the use of ***Accu-Lube*** **lubricants**. Maintenance and cleaning costs are reduced, costs for monitoring the water mixable coolants are completely dropped.

Water saved – no disposal required

Within a period of 6 months an average ***Accu-Lube*** customer can replace 220 litres of coolant concentrate – this is equivalent to approximately 4000 litres of cooling emulsion – by only 20 litres of ***Accu-Lube*** **lubricant**.

4000 litres of cooling emulsion

20 litres of ***Accu-Lube***

Accu-Lube **lubricants** are used up during the cutting process, disposal is not necessary and any possible post treatment is significantly facilitated.

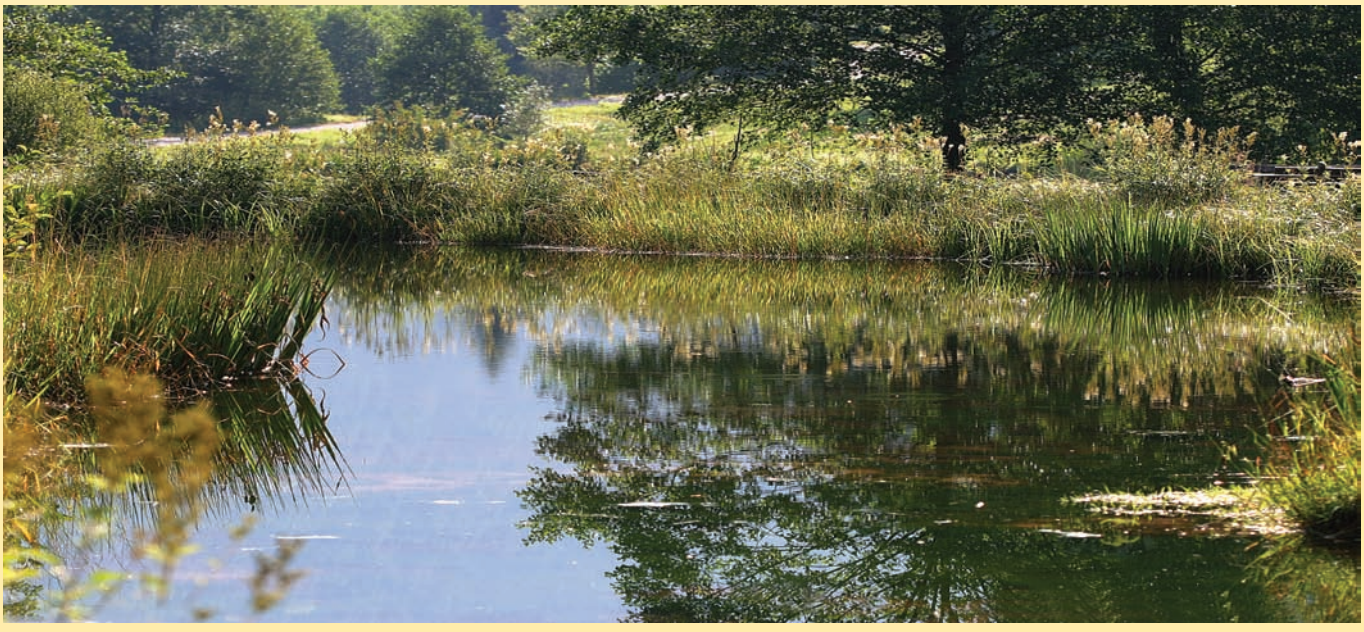
Accu-Lube Lubricants – harm neither operators nor the environment

***Accu-Lube* lubricants** which do not leave any stains on the material after post heat treatment.

Lubricant / Processing areas	LB 5000	LB 6000	LB 2500	LB 5500	LB 4500	LB 4000
All metallic materials	✓	✓	✓	✓	✓	✓
Pin+V-Block lubricity test	1.000	1.250			900	1.250
Flash point	190°C	214°C	>180°C	>160°C	168°C	214°C
Pour point	5°C	-40°C	<-20°C	<-40°C	4°C	-40°C
Viscosity at 40°C	18,0	8,9	27	20	7,3	8,9
Suitable for Booster system	✓	✓	✓	✓	-	✓
Item-no. / Quantity	Item-no. LB 5000	Item-no. LB 6000	Item-no. LB 2500	Item-no. LB 5500	Item-no. LB 4500	Item-no. LB 4000
1 litre	805001	805130	805190	805170	805400	805110
5 litres	805006	805135	805195	805175	805405	805115
20 litres	805011	805140	805200	805180	805410	805120
205 litres	805016	805145	805205	805185	805415	805125

Characteristics of these lubricants:

LB 5000	**For medium to heavy cutting operations**
LB 6000	**For light to medium-heavy cutting operations** ***Accu-Lube* LB 6000** is manufactured out of natural, vegetable resources.
LB 2500	**For light to medium-heavy cutting operations**
LB 5500	**For light to medium-heavy cutting operations**
LB 4500	**For light cutting operations. *Accu-Lube* LB 4500** consists of natural ingredients. It is especially appropriate for working in aluminium. ***Accu-Lube* LB 4500** is conditionally suitable for post heat treatment.
LB 4000	**For light to medium-heavy cutting operations** ***Accu-Lube* LB 4000** is based on natural fatty acids.



Accu-Lube Lubricants – harm neither operators nor the environment

The following ***Accu-Lube* lubricants** are especially appropriate for processing of ferrous material. Should these ACCU-LUBE lubricants be used on non-ferrous material, it must be degreased prior to post heat treatment in order to avoid stains on the material.

Lubricant / Processing areas	LB 2000	LB 8000	LB 10000
All metallic materials	✓	✓	✓
Pin+V-Block lubricity test	1.750		1.750
Flash point	320°C	310°C	320°C
Pour point	-20°C	-17°C	-20°C
Viscosity at 40°C	37	37	37
Suitable for Booster system	-	(✓)	-
Item-no. / Quantity	Item-no. LB 2000	Item-no. LB 8000	Item-no. LB 10000
1 litre	805000	805240	805150
5 litres	805005	805245	805155
20 litres	805010	805250	805160
205 litres	805015	805255	805165

Characteristics of these lubricants:

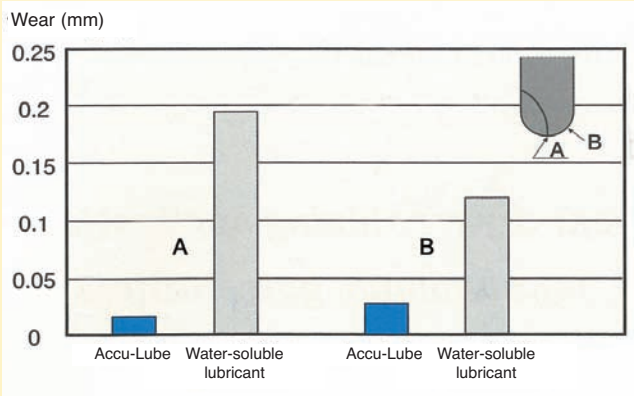
LB 2000	**For light to heavy cutting operations** ***Accu-Lube* LB 2000** - is manufactured out of natural, highly refined triglycerids.
LB 8000	**For light to medium-heavy cutting operations** ***Accu-Lube* LB 8000** - is a mixture of natural ingredients.
LB 10000	**For light to medium-heavy cutting operations** is manufactured out of natural, refined triglycerids.

The following *Accu-Lube* lubricants in solid and paste-like form are especially appropriate for manual application:

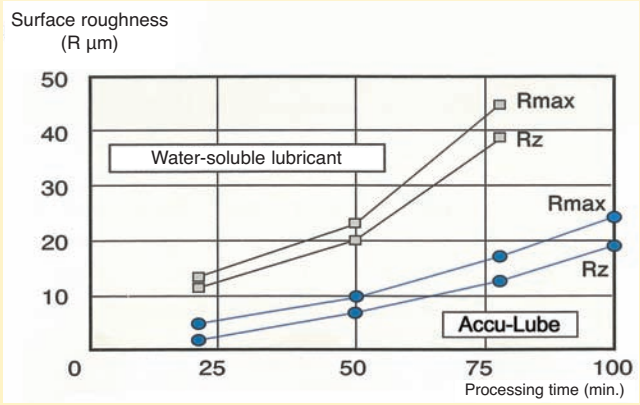
Item no.	Description
805 021	***ACCU-LUBE* LB 5000 Paste** (gel 255 g)
805 020	***ACCU-LUBE* LB 5000 Paste** (solid 255 g)
805 035	***ACCU-LUBE* LB 5000 Solid Block** (71 g)
805 040	***ACCU-LUBE* LB 5000 Solid Stick** (62 g)
805 041	***ACCU-LUBE* LB 5000 Solid Stick** (368 g)
805 076	***ACCU-LUBE* LB 2000 Spray** (222 g)
805 081	***ACCU-LUBE* LB 2500 Spray** (222 g)
805 078	***ACCU-LUBE* LB 4000 Spray** (222 g)
805 075	***ACCU-LUBE* LB 5000 Spray** (222 g)
805 082	***ACCU-LUBE* LB 5500 Spray** (222 g)
805 077	***ACCU-LUBE* LB 10000 Spray** (222 g)

Accu-Lube Micro Lubrication in comparison with conventional systems

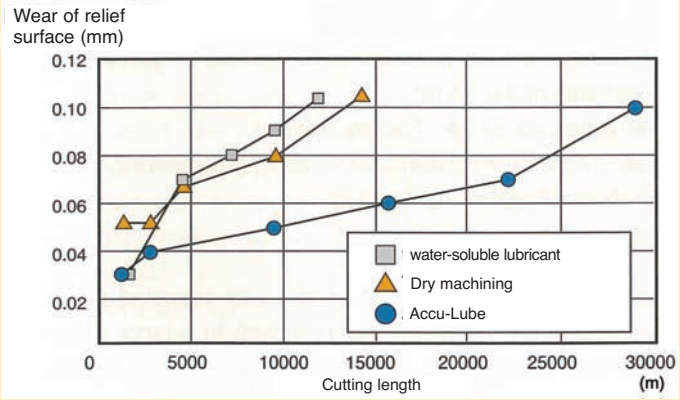
Milling



Wear with ball-end milling
Material: hardened steel 30-38 HRC
Tool: Solid carbide ball-end mill R3x6
Rotation speed: 10.000 rpm
vf= 2.000 mm/min.

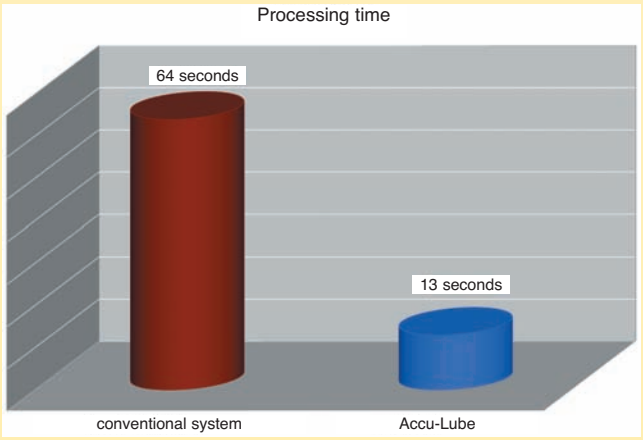


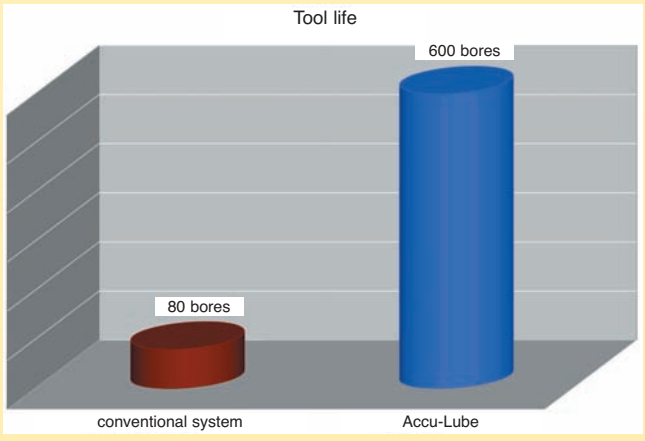
Surface quality with ball-end milling
Material: hardened steel 29-30 HRC
Tool: Solid carbide ball-end mill Ø 12 mm



Wear of relief surface
Material: hardened steel 62,5 HRC
Tool: Solid carbide end mill Ø 10mm, 6 blades
vc=30 m/min.
vf= 214 mm/min
Wear limit= 0,1 mm

Drilling





conventional system:
HSS drill and water-soluble coolant, 13 steps, vc=18 m/min, fn=0,095 mm

***Accu-Lube*:**
Solid carbide drill and Accu-Lube, no steps, vc=100 m/min, fn=0,08 mm

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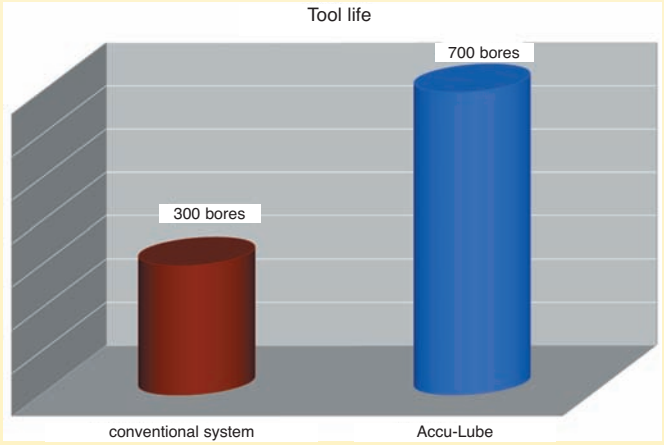
Deep hole drilling



Conventional system:
Solid carbide drill and water-soluble coolant, vc=80m/min, fn=0,05mm

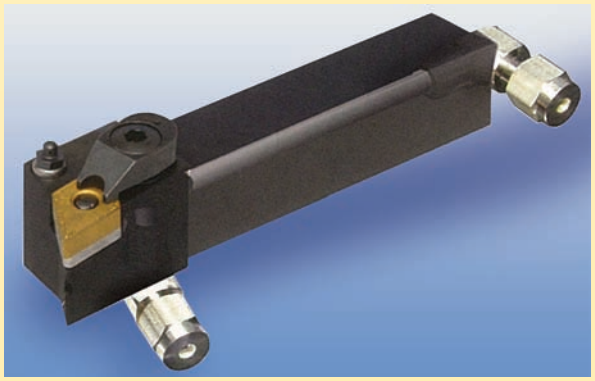
***Accu-Lube*:**
Solid carbide drill and ACCU-LUBE lubricant, vc=80m/min, fn=0,15mm

fn= 0,2mm fn= 0,3mm fn= 0,4mm fn= 0,5mm fn= 0,6mm fn= 0,7mm fn= 0,8mm

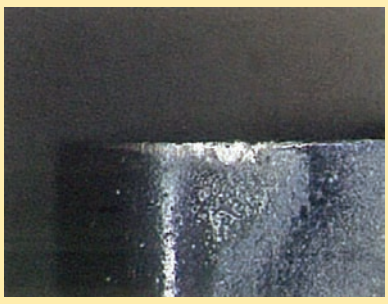
Different chip shapes with the change of feed of a solid carbide slot drill operated with minimum quantity lubrication.

Turning

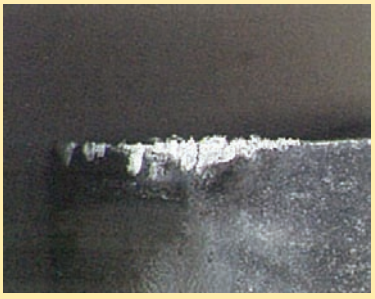
Material: Steel St 44-2
Operation time of insert: 53 min
Cutting speed: 200m/min
Feed: 0,25mm/rev
Infeed: 1,5 mm



Toolholder: Mircona MDJNR2525-15-EB (toolholder with cooling channels)
Cutting insert: DNMG150412



Micro lubrication



Coolant

Result: With the help of minimum quantity lubrication tool life of the cutting insert was increased by 1,5 times (wear mark 0,194 mm) in comparison with the use of cooling emulsion (wear mark 0,302mm).

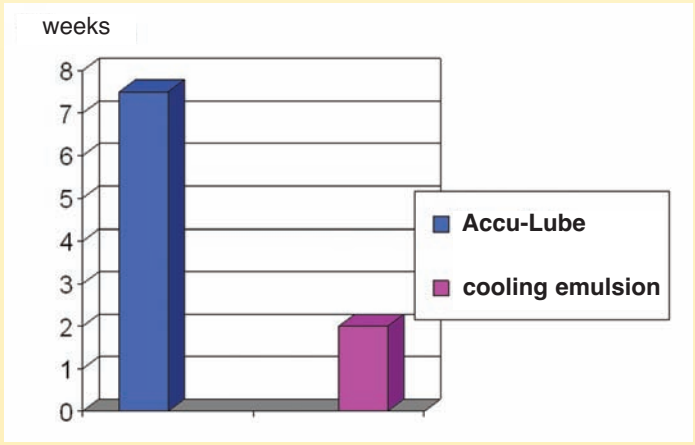
Accu-Lube Micro Lubrication in comparison with conventional systems

Band sawing

Band sawing machine: AMADA HK-800
Work piece: Tube
Material: Steel St52-3

Lubricating system: ***Accu-Lube*** **Applicator**
equipped with 3 pumps for outside lubrication
Lubricant: ***Accu-Lube*** **LB-2000**
Lubricant consumption: 16ml/h

Result: Tool life of band saw
7,5 weeks per band saw with ***Accu-Lube*** **lubricant**
2 weeks per band saw with **cooling emulsion**



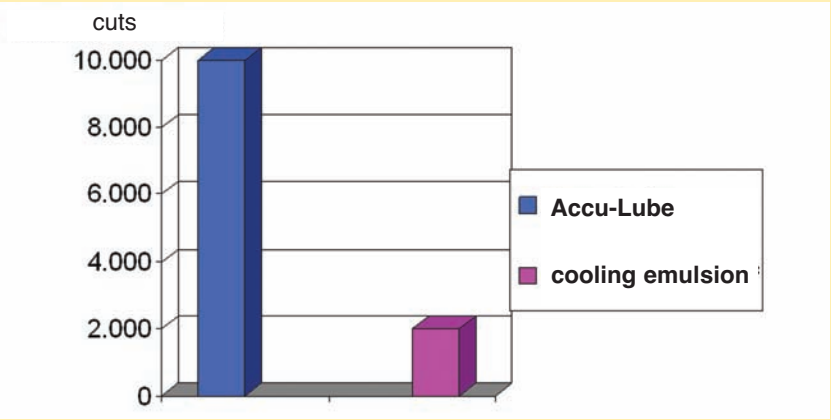
Circular sawing

Circular sawing machine
Tool: circular saw blade Ø 300mm
Work piece: piston
Material: aluminium

Lubricating system: ***Accu-Lube*** **Applicator**
equipped with 3 pumps for outside lubrication
Lubricant: ***Accu-Lube*** **LB-5000**
Lubricant consumption: 15 ml/h
vc= 30 m/min
vf= 214 mm/min

Result: Tool life of circular saw blade
appr. 10.000 cuts with ***Accu-Lube*** **lubricant**
appr. 2.000 cuts with **cooling emulsion**

Another advantage is that the chips can be re-melted immediately without any drying time (in the present case it was 2-3 days).



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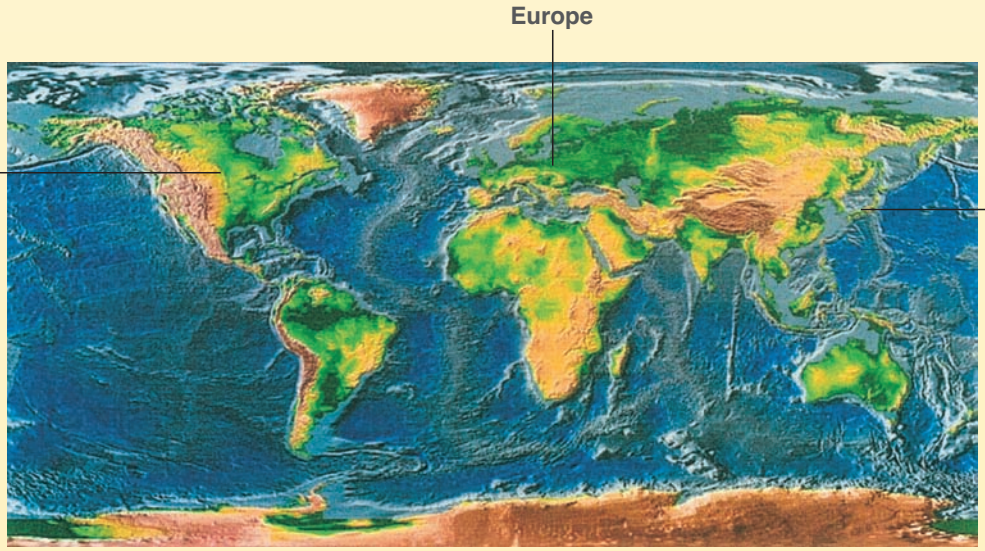
Three production plants world wide



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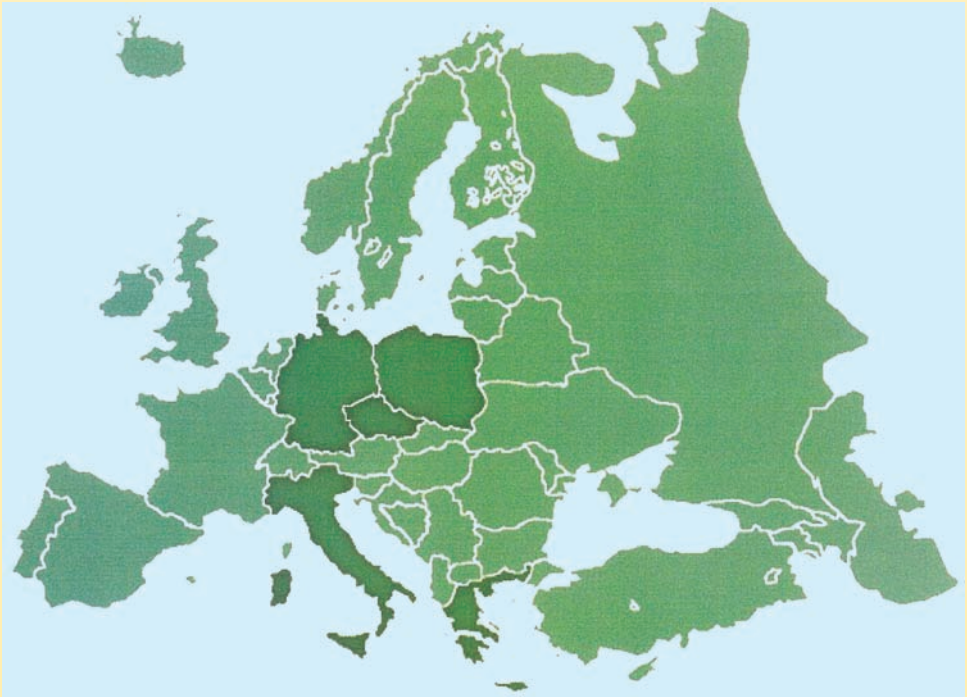

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