Chapter VIII – References


Chapter VIII – References


Chapter VIII – References

University of Pretoria etd - Opperman, T (2005)


Appendix A – Bilateral Patient

The lubricity tests results shown in this section of the report are for a 54-year-old patient that had undergone a bilateral hip replacement.

Sample 145 Left Side
Test done at 50Hz and 1mm stoke

Figure A.1 – The lubricity test results for the left side of the bilateral patient. The loads at failures found were 650N, 550N and 750N for 38°C, 50°C and 60°C respectively.

Sample 145 Right Side
Test done at 50Hz and 1mm stoke

Figure A.2 – The lubricity test results for the right side of the bilateral patient. The loads at failures found were 1200N, 800N and 850N for 38°C, 50°C and 60°C respectively.
## Appendix B – Poloxamer 188

### BASF South Africa (Pty.) Ltd.

**Head Office:** P.O. Box 3031, Halfway House 1685. Telephone: (011) 254-2400 Fax: (011) 254-2431

**BASF**

---

**Despatch Note/Packing Slip**

**No:** 19220

<table>
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<th>CONDITION</th>
<th>DATE OF DESPATCH</th>
<th>FREIGHT/METHOD OF TRANSPORT</th>
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<td>Torsius Opperman University of Pretoria 084 744 0911</td>
<td>20-06-03</td>
<td>Collection</td>
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**No. & Type of Packages**

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<th>WEIGHT</th>
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<td>1x white plastic bottle</td>
<td>Lot 090001</td>
<td>500g</td>
</tr>
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**Ordered By:**

R. Meacher

**Date:** 28/5

**Dept.:** M.E

**Dangerous Codes:**

**Signature:**

R. Meacher

---

**Date:**

**Packed By:**

T. Opperman

**Receipt No.:** UP

**Costs:**
BASF Aktiengesellschaft

Safety data sheet
according to 91/155/EEC

BASF Safety data sheet
Date / Revised: 28.05.2001
Product: LUTROL* F 68

(Print date: 26.09.2002)

1. Substance/preparation and company name

LUTROL* F 68

Company:
BASF Aktiengesellschaft
Unternehmensbereich Polymere
67056 Ludwigshafen
Telephone: 6221-40-46037
Telefax number: 0621-40-4607439

Emergency Information:
BASF safety data sheet BASF Ludwigshafen
Telephone: 6221-40-43225
Telefax number: 0621-40-90664

2. Composition/information on ingredients

Chemical nature
Block copolymer, based on: polyoxyethylene, polycaprolactone

CAS-No. 9003-11-6

SINCG No. - I Polymer, starting materials listed in KLBES 1

INCI-name: Poloxamer 166

3. Possible hazards

Advice on critical hazards to man and the environment: none

4. First aid measures

No special measures necessary.

5. Fire fighting measures

Suitable extinguishing media: water, dry extinguishing media, foam, carbon dioxide (CO2)

Special protective equipment: In case of fire, wear a self contained breathing apparatus

Further information: Diagnosis of fire debris and contaminated extinguishing water in accordance with local regulations

6. Accidental release measures

Personal precautions: No special measures necessary.

Methods for cleaning up: Sweep/shovel up.

7. Handling and storage

Handling:
PROTECTION against fire and explosion: Handle in accordance with good industrial hygiene and safety practice.
Appendix B – Poloxamer 188

University of Pretoria etc - Opperman, T (2005)

8. Exposure controls and personal protection

Additional information on the lay-out of technical plant
(see 7)

Components with workplace control parameters
None

Personal protective equipment
Not necessary.

General safety and hygiene measures: The usual precautions for the handling of chemicals must be observed.

9. Physical and chemical properties

Form: beads, wax-like
Colour: white
Odour: faint specific odour

Change in physical state
Melting point/melting range: 52 °C
Flash point: 260 °C
Bulk density: 1055 kg/m³ (approx.)
Solubility in water: > 100 g/l

pH Value: 5-7.5 (at 10 g/l H2O)

10. Stability and reactivity

Hazardous reactions: None provided product is correctly processed.

Hazardous decomposition products: None provided product is correctly processed.

11. Toxicological information

Acute toxicity
LD50/oral/rat: > 15000 mg/kg
LD50/dermal/rabbit: > 20000 mg/kg

Primary skin irritation/rabbit/OECD test: non-irritant
Primary mucous membrane irritation/rabbits’ eyes/OECD test: non-irritant

Other information
Ames-test: no mutagenic effect

12. Ecological information
Appendix B – Poloxamer 188

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Elimination information

Test method: adsorption test on activated sludge (BASF test)
Method of analysis: DOC reduction
Degree of elimination: 38% (DOC reduction)
Evaluation: hard to eliminate

Behaviour and environmental fate

Inhibition of degradation activity in activated sludge is not to be anticipated during correct introduction of low concentrations.

Ecotoxic effects

Toxicity to fish (acute):
Test method: OECD 203/ ISO 7746/ EC 84/449/VE, C.1
LC50/Brachydanio rerio/: >10000 mg/l/56h
LC3 (48 h): 160000 mg/l

Toxicity to bacteria: Pseudomonas putida
Test method: DIN 38412 Part 8
EC10 (16 h): >10000 mg/l
EC50 (16 h): >100000 mg/l

Further ecological information

No negative ecological effects are expected according to the present state of knowledge.

13. Disposal considerations

Product: Must be dumped or incinerated in accordance with local regulations

14. Transport information

Not classified as hazardous under transport regulations.

15. Regulatory information

Labelling according to ESC Directives

Not subject to labelling.

National legislation/regulations

Water hazard class: 1 UwWv2 (Germany) of 17.8.1999, Annex 1

16. Other information

A backslash in the left hand margin indicates an amendment from the previous version.

The information contained herein is based on the present state of our knowledge and does not therefore guarantee certain properties. Recipients of our product must take responsibility for observing existing laws and regulations.
Appendix B – Poloxamer 188

University of Pretoria etd - Opperman, T (2005)

QZ-System - CoA-Show  
Page 1 of 3

**BASF Aktiengesellschaft**

**Certificate of Analysis**

---

**BASF South Africa (PTY) Ltd**

**Certificate of Analysis**

---

**INSTRUCTION CERTIFICATE J.1 R ACCORDING TO EN 10204**

---

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<tr>
<td>Purchase Order/Customer Product#</td>
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<td>221 2372</td>
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<td></td>
<td>LOT/NO</td>
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<td>LOT/QTY</td>
<td>1.000 KSE</td>
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<tr>
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<th>1,4-Dioxan / 1,4-Dioxane (CCG)</th>
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<th>Entsprechend / conforms</th>
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</table>

<table>
<thead>
<tr>
<th>Identität / Identification (Hydroxyzahl / hydroxyl value)</th>
<th>Entsprechend / conforms</th>
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<tr>
<th>Restlosemittel / residual solvents</th>
<th>0.2 g/100g</th>
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</table>

<table>
<thead>
<tr>
<th>Ungesättigkeit / Unsaturation (Hy-säure-Meth.)</th>
<th>0.026 mg/g</th>
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</table>

| Molmasse / Average Molecular weight | 9640 g/mol |

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BASF Aktiengesellschaft

**Certificate of Analysis**

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05/20/2003 10:21:52
Appendix B – Poloxamers 188

University of Pretoria etc - Opperman, T (2005)

BASF South Africa (PTY) Ltd  
FAX NO 002727112542602

P.O.BOX 2801  
2002-02-05  
GKA/M320

1685 MIDRAND  
0621-60-45308

South Africa  
CERTIFICATE NO 1773

INSPCTION CERTIFICATE 3.1 B ACCORDING TO EN 10204

<table>
<thead>
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<td>PRODUCT NO</td>
<td>010293 01</td>
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0.60kg 30-Bottle  
CO1T11N 44  971 7977

Purchase Order/Customer Product#  
LOT/ND 09000101

50001260  
LOT/QTY 1.000 KGE

TOTAL 1.000 KGE

pH-Wert / pH-value  
6.7

25 °C in Wasser / in water

Wasser / Water  
0.16 g/l

(Weiβer- Titrations)

Trübungspunkt / Cloud point  
>100 Grad Celsius

100g/l in Wasser/ in water

Butylhydroxytoluol /  
Butylhydroxytoluene

110 mg/kg

Polyvinylpyrrolidon-Gehalt /  
Weight percent oxyethylene

R9.0 g/100g

Asche / total ash  
0.1 g/100g

Restlosenmittel / Residual solvents  
<50 mg/kg

(Ethylene glycol / Ethyleneglycol)  
Ph.Eur., Class 2

Andere im USP/NF genannte fluchtige organische Verunreinigungen  
(Benzol, Chloroform, Methylene chloride, Trichloroethylene) sind

synthesebedingt nicht enthalten.

Nur die Restlosenmittel Ethylen glykol und 1,4-Dioxan der Klasse 2 und

Restlosenmittel der Klasse 3 der Ph.Eur. 3.Ed Supplem.2000 koennen

enthalten sein. Die Konzentrationen der Klasse 2 liegen unterhalb der

im Ph.Eur., Kapitel 5.4 genannten Grenzwerte und der Gehalt an Klasse

3 liegt unterhalb 0.5 %.

Other organic volatile impurities cited in USP/NF (Benzene,  
Chloroform, Methylene Chloride, Trichloroethylene) are not present due

BASF Aktiengesellschaft  

Certificate of Analysis  05/20/2003 10:21:52

BASF South Africa (PTY) Ltd  
FAX NO 002727112542602

P.O.BOX 2801  
2002-02-05  
GKA/M320

Dr.Leyendecker

.../qzform.py?Vorgangsart=CoA-Show&Registriernummer=2002020501773&Formular... 20/05/2003
Appendix B – Poloxamer 188

University of Pretoria etd - Opperman, T (2005)

QZ-System - CoA-Show

1685 MIRDANSO
South Africa

INSPCTION CERTIFICATE 3.1 B ACCORDING TO EN 10204

LUTROL F 68
0.50 kg PP-Bottle
Purchase Order/Customer Product# 50001260

ARTICLE NO. 50001260
PRODUCT NO. 010293 01
COLLI NO. 321 2372
LOT/NO. 09000101
LOST/QTY. 1.000 KG

50001260
TOTAL 1.000 KG

to synthesis.
Only class 2 solvents ethylene glycol and 1,4-dioxane and class 3 solvents of EP 3.Ed Supplm.2008 are likely to be present. The concentrations of class 2 solvents are below the limits given in EP, chapter 5.4. and class 3 solvents are below 0.5 %.

Das Produkt erfüllt die Anforderungen der Monographie Poloxamer
The product meets the requirements of the monograph poloxamer

QZ-Referenz-Nr. / QC-Reference-No. 010000077
Analysiert an / Analyzed on 27.07.2003
Mindestens haltbar bis / Best before 07.2003

BASF Aktiengesellschaft
GKA Analytik
Qualitätskontrolle / Quality Control
geo. / eig. R. Fischer

Dieses Abnahmezeugnis wurde maschinell erstellt und ist ohne
Unterschrift gültig.
This Certificate of Analysis has been produced electronically and
is valid without signature.
Appendix C – Lube-Booster II

University of Pretoria etd - Opperman, T (2005)

LUBE-BOOSTER® II

I. PRODUCT DESCRIPTION

LUBE-BOOSTER® II is a water soluble, polymer based lubricity additive for formulating synthetic and semi-synthetic fluids for ferrous and non-ferrous applications. It is used in diversified operations including general purpose machining, multi-metal machining, and especially in combination with EM-706 in drawing, stamping and machining of aluminum alloys.

II. TYPICAL PROPERTIES

<table>
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<tr>
<th>PROPERTY</th>
<th>TYPICAL VALUE</th>
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<td>Active, %</td>
<td>95</td>
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<tr>
<td>Water, %</td>
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<tr>
<td>Appearance, 77°F (25°C)</td>
<td>Clear</td>
</tr>
<tr>
<td>Appearance, 36°F (2°C)</td>
<td>Opaque</td>
</tr>
<tr>
<td>Viscosity, SUS (at 100°F (37.8°C))</td>
<td>2,300</td>
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<tr>
<td>Color, ASTM</td>
<td>4</td>
</tr>
<tr>
<td>Specific Gravity, 77°F (25°C)</td>
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<tr>
<td>Flash Point, COC, °F (°C)</td>
<td>&gt;375 (&gt;191)</td>
</tr>
<tr>
<td>Acid Number, mg KOH/g</td>
<td>65</td>
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<tr>
<td>Base Number, mg KOH/g eq.</td>
<td>76</td>
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<tr>
<td>pH, 2.5% (Buffer 7.0)</td>
<td>8.1</td>
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<tr>
<td>Temperature Stability (26°F, 130°F)</td>
<td>Reconstitutes itself at R.T.</td>
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<tr>
<td>Refractive Index, 77°F (25°C)</td>
<td>1.4734</td>
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</table>

Ferro Corporation - Petroleum Additives, 3000 Sheffield Avenue, Hammond, Indiana 46327 (219) 931-2650 - FAX (219) 931-5095

The data is based on tests performed on the actual product and is intended to give typical values of the product. The data may vary due to variation in product formulation. The data is intended for informational purposes only and Ferro Corporation assumes no responsibility for the accuracy of such data. The data is not intended to be used for specification purposes. The use of the product is at the user's own risk. The product is distributed without representations or warranties of any kind, express or implied. Ferro Corporation shall not be liable for any damages arising from the use of this data.

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Appendix C – Lube-Booster II

University of Pretoria e.t. - Opperman, T (2005)

III. PERFORMANCE PROPERTIES

FOAMING

LUBE-BOOSTER® II at 1% in tap water (8 grains/gallon) exhibits low foaming properties; foam formed after shaking in a glass cylinder is unstable and breaks within 5 seconds.

COMPATIBILITY WITH VARIOUS METALS

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<th>Material</th>
<th>Compatibility</th>
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<tr>
<td>Cold rolled steel 28100</td>
<td>Pass</td>
</tr>
<tr>
<td>Aluminium 2024T4</td>
<td>Pass</td>
</tr>
<tr>
<td>Galvanized steel 1 1/2</td>
<td>Stain 4</td>
</tr>
<tr>
<td>Copper</td>
<td>Stain 4</td>
</tr>
</tbody>
</table>

1 1% LUBE-BOOSTER® II in tap water (8 grams/gal), 24 hrs @ 100°F
2 Q-Panel Co
3 1 1/2 hr dip galvanized O 60/AO1 Chrysler Control & Audit Panel, Advanced Coating Technology Co.
4 Likely to be caused by free amine present in the product; suitable inhibitor should be included in formulations intended for galvanized steel and copper applications.

RESIDUE

LUBE-BOOSTER® II, after 16 hours at 130°F (54.4°C), remains a smooth, flowable liquid.

HARD WATER STABILITY

LUBE-BOOSTER® II has moderate hard water stability.

Ferro Corporation - Petroleum Additives, 2000 Sheffield Avenue, Hammond, Indiana 46327 (219) 931-2830 • FAX (219) 931-6893

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### ENVIRONMENTAL DATA

<table>
<thead>
<tr>
<th>Effluent Concentration at:</th>
<th>0.1%</th>
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<tbody>
<tr>
<td>BOD (5 day, mg/l)</td>
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<td>9,860</td>
</tr>
<tr>
<td>COD (mg/l)</td>
<td>2,630</td>
<td>20,590</td>
</tr>
<tr>
<td>Ratio BOD:COD</td>
<td>1.3²</td>
<td>1.2²</td>
</tr>
<tr>
<td>TOC (mg/l)</td>
<td>340</td>
<td>1,270</td>
</tr>
<tr>
<td>Freen Extractables (mg/l)</td>
<td>250</td>
<td>1,270</td>
</tr>
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</table>

- Biodegradable

### ECOLOGICAL PROFILE

**LUBE-BOOSTER® II** utilizes straight-chain chemistry in order to preserve a biodegradable profile. BOD:COD ratios of less than 1:3 are generally preferred to achieve biodegradability. Use of double and triple bonded chemistries are minimal to oil in order to accommodate degradation. TOC values show a low organic load which minimizes impact on the industrial effluents' strength and improves the likelihood of compatibility with traditional waste-treatment schemes currently in place. **LUBE-BOOSTER® II** is compatible with most publicly-owned waste treatment (POWT) systems. Freen extractables indicate low values at typical effluent concentrations. **LUBE-BOOSTER® II** does not contain nitrate, chloride, sulfur, phosphorous, heavy metals or petroleum oil.

### IV. APPLICATION INFORMATION

#### IN FORMULATING PRODUCT

Lubricity additive for formulating machining fluids on ferrous and non-ferrous metals (4-8%); lubricity additive for synthetic grinding compounds on ferrous and non-ferrous metals (6-12%).

#### TANK-SIDE ADDITION

In heavy-duty applications, where high lubricity and excellent surface finish are required, **LUBE-BOOSTER® II** can be added directly to the machine tank, "tank side." The required amount should be determined experimentally.
V. HANDLING AND STORAGE

Store in closed, original container at 40°-100°F. Exposure to temperatures in excess of 150°F can cause darkening of the product.

VI. PACKAGING INFORMATION

Available in 440 lb (200 kg) net new, lined steel drums, bulk rail and truck quantities.