CASTROL TECHNICLEAN® XBC

EXTERNAL VERSION

Source: Ecoclean GmbH

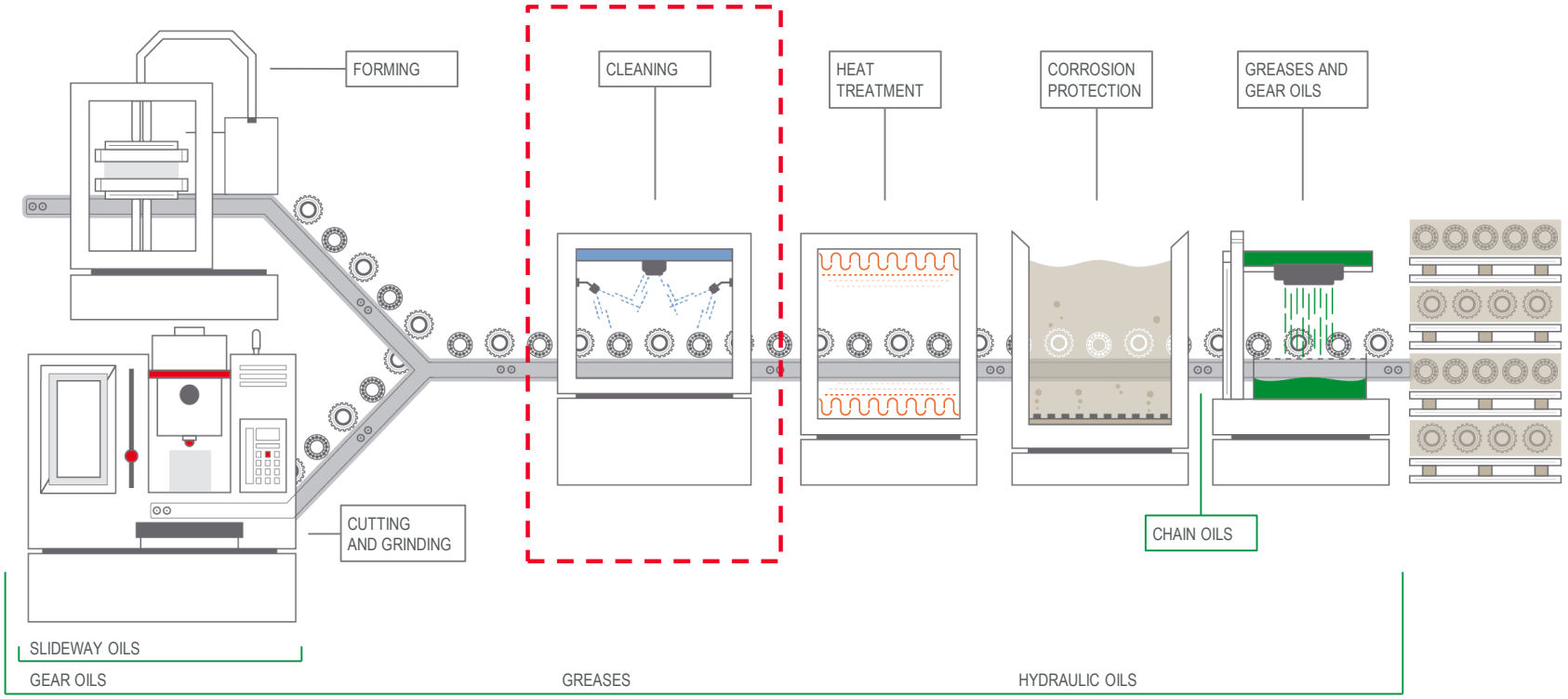
IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.

CONTENTS

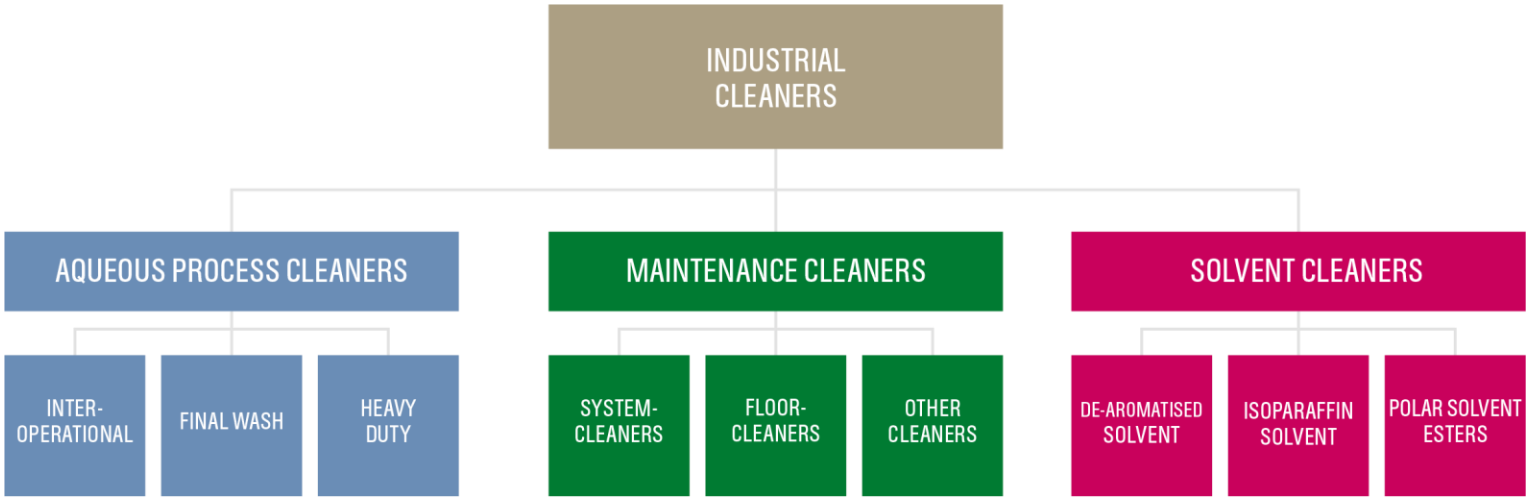
SECTION 1
INDUSTRIAL CLEANERS - INTRO

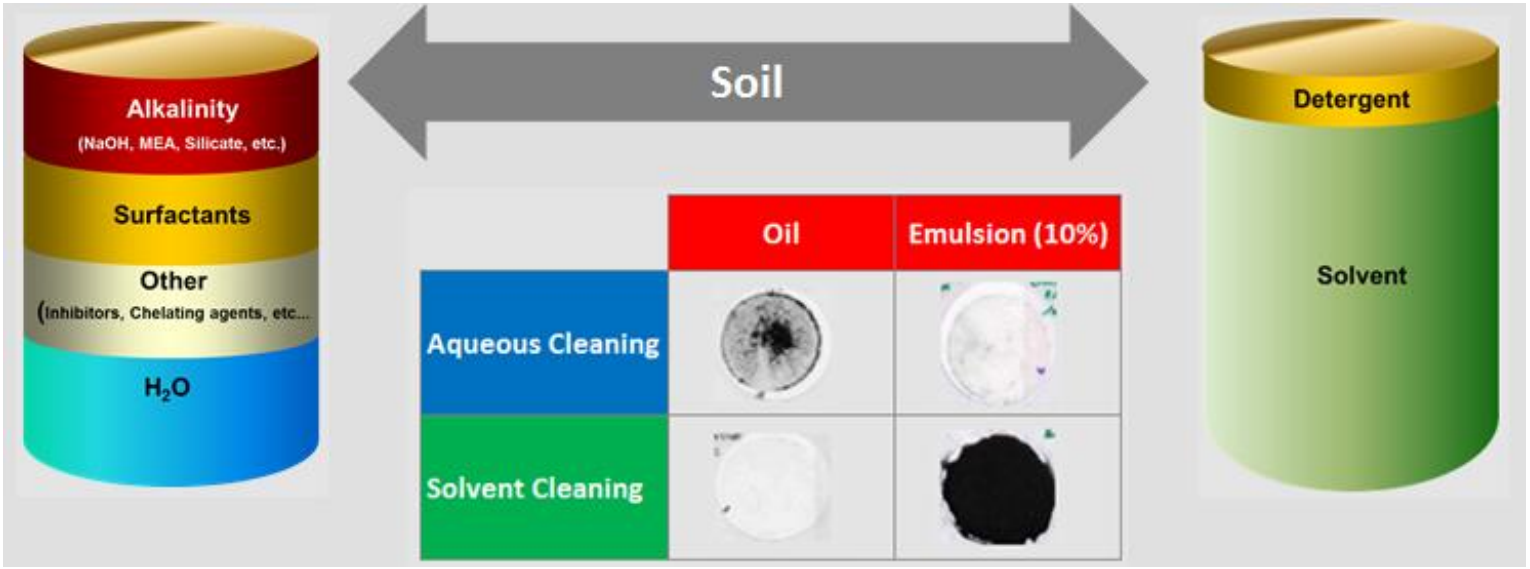
Source: Ecoclean GmbH

INDUSTRIAL CLEANING
AN INTEGRAL PART OF THE METALWORKING PROCESS



INDUSTRIAL CLEANERS CLASSIFICATION





INDUSTRIAL MEGATRENDS & INDUSTRIAL CLEANING

MANUFACTURING TECHNOLOGY ADVANCES

- Increasing cleanliness requirements
- Extreme pressure applications
- Robot technology supports high level of flexibility

SUSTAINABILITY

- Low temperature cleaning reduces energy cost and helps to improve CO_2 footprint
- Extended bath life to minimize maintenance and waste disposal cost
  Challenge i.e. compatibility with MWF, particularly ester based coolants

ENVIRONMENTAL & LEGISLATIVE

concerns (i.e. REACh) are placing pressure to minimize workplace and disposal hazards. i.e.:

Boron / Formaldehyde releasing biocides / Strong complexing agents (i.e. ETDA, NTA), Secondary Amines / MEA / High aromatics solvents / Low flash point solvents (VOC!)

INDUSTRY 4.0 & DIGITALIZATION

SECTION 2
CASTROL'S UNIQUE SOLUTION

Source: Ecoclean GmbH

SCOPE

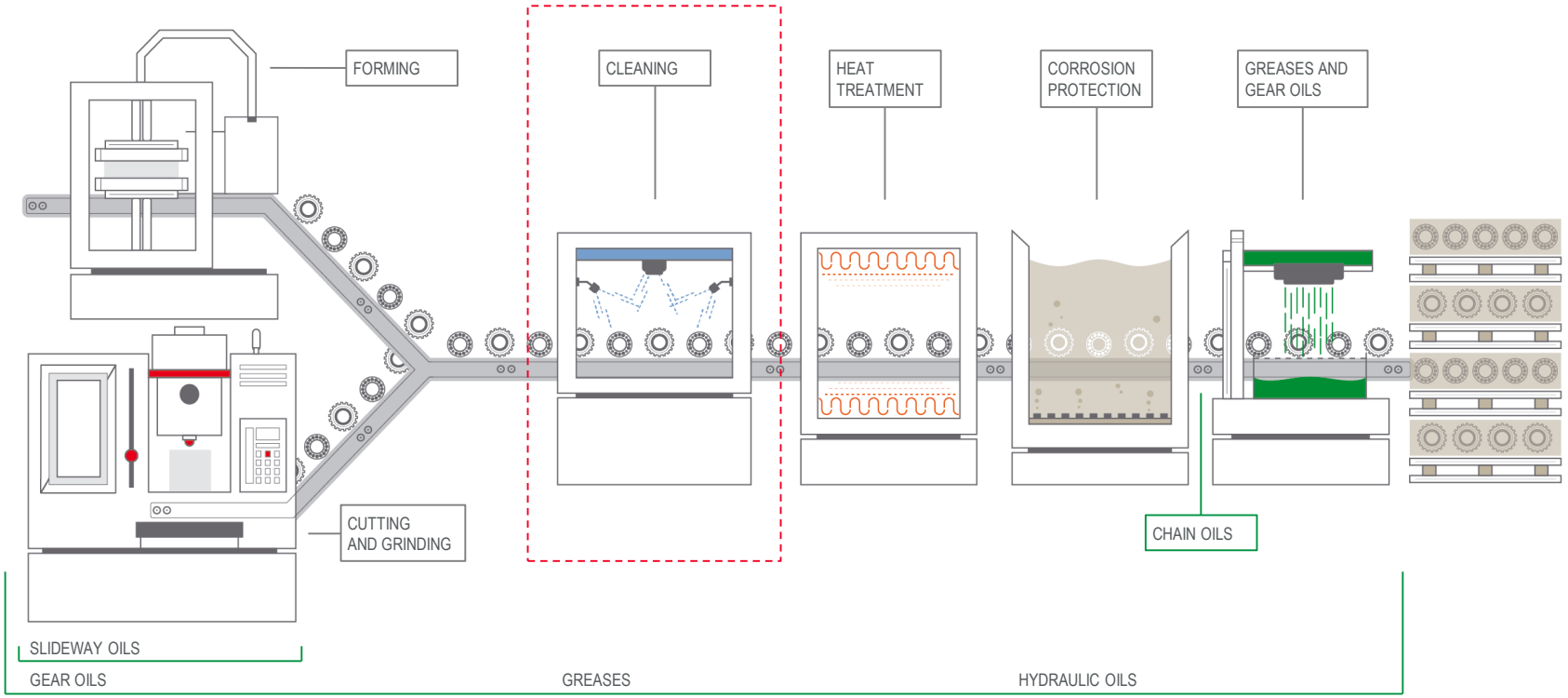
Industrial customers, where machining and cleaning are integral parts of the manufacturing process chain.

Lead sectors:

Automotive: engine, transmission and component manufacturing

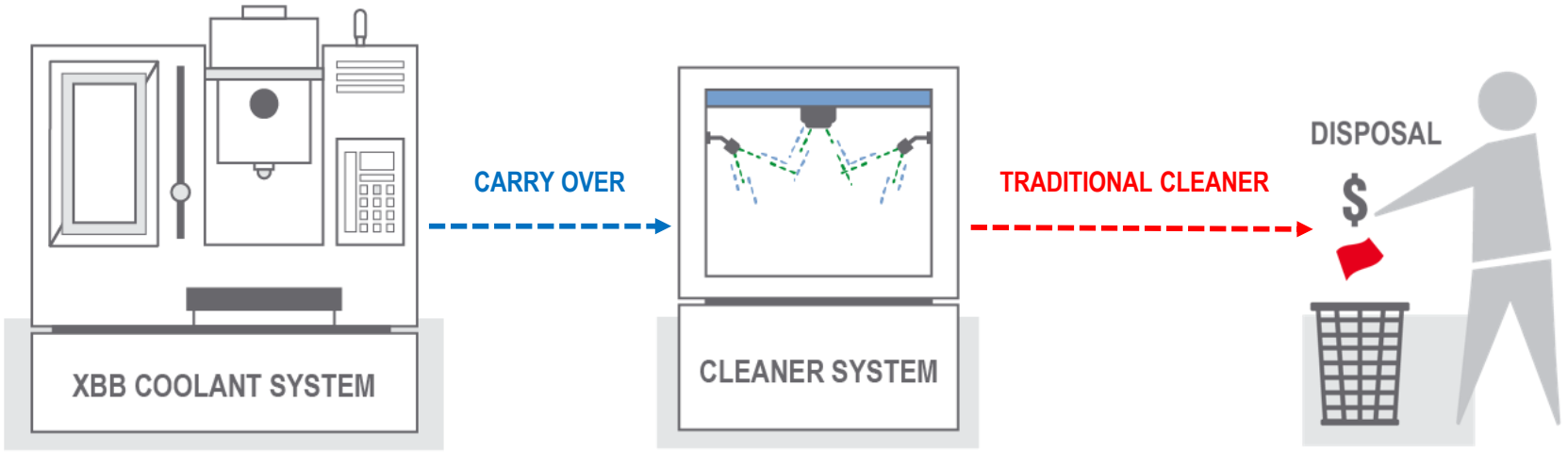
Machinery: gears, electronics, pumps and compressors

INDUSTRIAL CLEANING
AN INTEGRAL PART OF THE METALWORKING PROCESS



WHY COMPATIBLE PROCESS CLEANER?

- The difficulty in removing certain coolant components from the cleaning fluid can compromise part cleanliness
- This results in more residue, causing issues in downstream processes such as camera inspection
- This is why cleaning fluids are traditionally disposed of when soil loading reaches a critical level
- This forces the customer to reduce bath life, resulting in higher maintenance and disposal costs

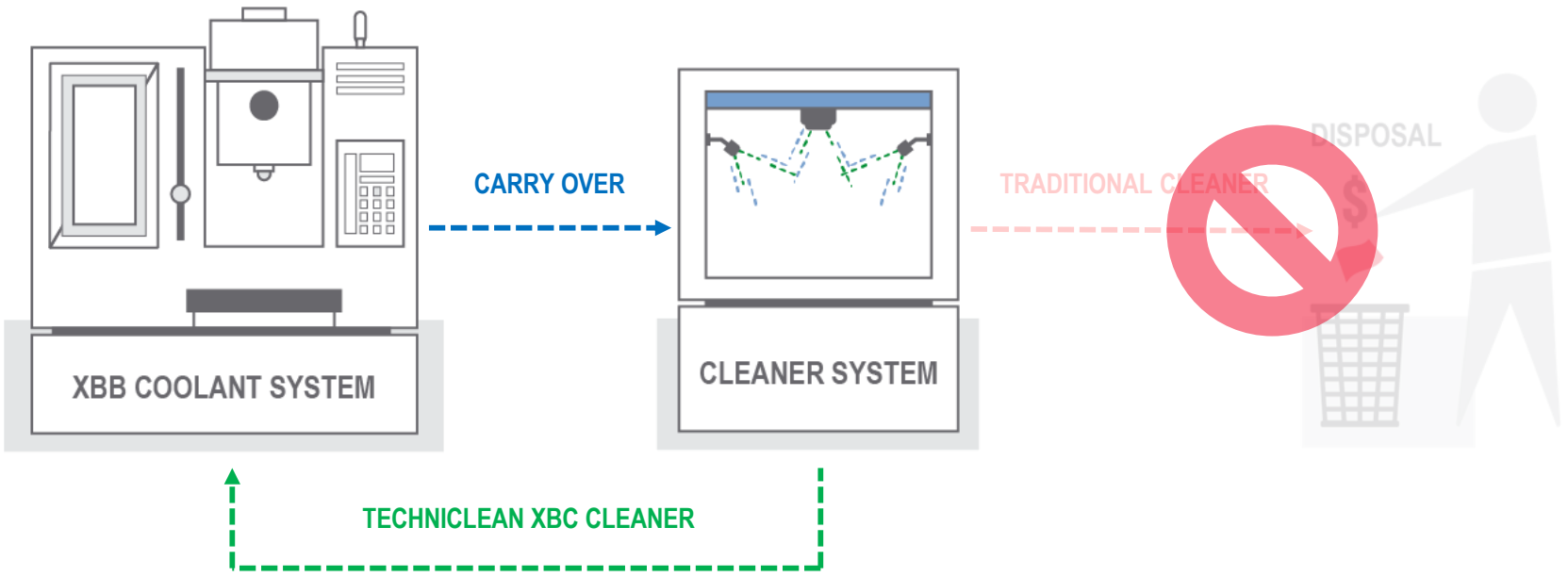


DISCOVER NEW ADVANTAGES

XBB Technology Emulsion ⟷ XBC Technology Cleaner

HOW TECHNICLEAN XBC WORKS
THE CASTROL SOLUTION

The used cleaner fluid that would normally have to be discarded can be added to coolant fluid without any performance issues or other adverse effects.



WHAT YOU GET FROM TECHNICLEAN XBC
THE CUSTOMER BENEFIT

WASTE

Lower waste volume
due to cleaners being reused.

WATER

Less water consumption
thanks to using low-value spent cleaner instead of high-value clean water.

OPERATING COST

Cost savings
from processing less waste and using less clean water.

THE TECHNICLEAN XBC VARIANTS

Local legislation and customer requirements regarding the use of monoethanolamine (MEA) have steered our development into two directions:

Techniclean® 80 XBC:

Classic MEA-containing variant for markets where the use of MEA is not an issue

Techniclean® 90 XBC:

MEA-free variant for markets and customers that are affected by MEA-restrictions, such as Germany, Japan and South Korea

RELATIVE PERFORMANCE

With Americas top selling TECHNICLEANs

PROPERTY		TECHNICLEAN 80 XBC	TECHNICLEAN 90 XBC	TECHNICLEAN S 5001	TECHNICLEAN XHP	TECHNICLEAN MP 2	TECHNICLEAN 3602
TECHNICAL PERFORMANCE	DETERGENCY POWER	☺	☺	☺	😐	☺	😐
	MULTI-METAL	☺	☺	😐	☺	☺	☺
	CAST IRON CORR. PROTECTION	☺	☺	☺	☺	😐	☺
	HIGH PRESSURE	☺	☺	😐	☺	😐	☺
	LOW TEMPERATURE	☺	☺	☺	☺	☺	☺
	HARD WATER	☺	☺	☺	😐	☺	😐
	RECYCLABLE IN XBB	☺	☺	☹	☹	☹	☹
FORMULATED WITHOUT	BORON	☺	☺	☺	☹	☺	☺
	FORMALDEHYDE RELEASING BIOCIDES	☺	☺	☺	☺	☺	☺
	MEA	☹	☺	☹	☺	☹	☺

SECTION 3
LAB TEST RESULTS

Techniclean XBC: Formulation

Formulation contains	Techniclean 80 XBC	Techniclean 90 XBC
Silicones	No	No
Phosphates	No	No
Borates	No	No
Sulphates	No	No
Formaldehyde-Releasing Biocides	No	No
Secondary Amines	No	No
Phenol	No	No
MEA	Yes	No
TEA	Yes	No

Techniclean XBC: Aluminum Compatibility

2% Techniclean XBC in 100 ppm water
Results after 90 minutes at 50°C

Vapor phase

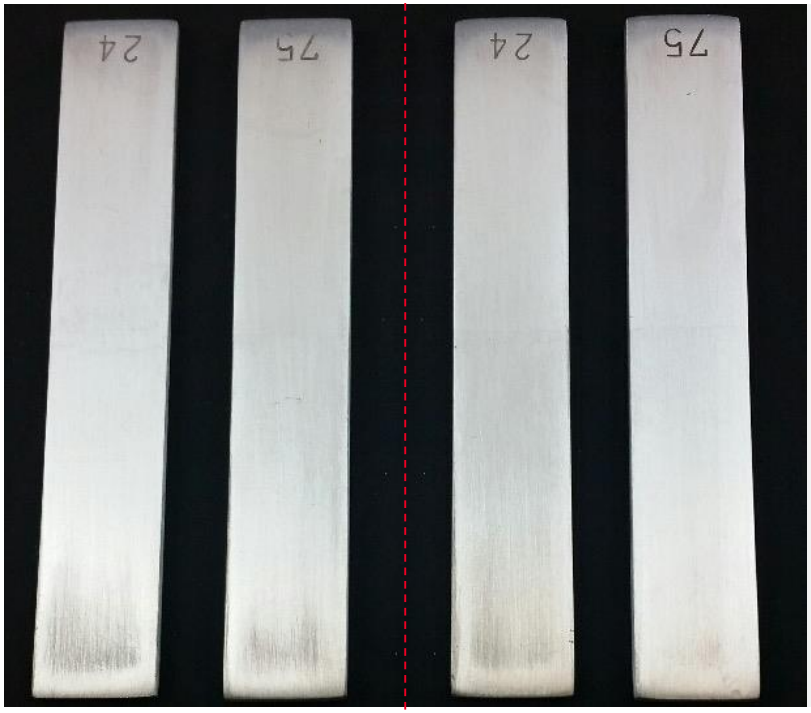
Immersed

Staining	7075	2024
Vapor phase	No staining	No staining
Interphase	Slight staining	Slight staining
Immersed	No staining	No staining

Aluminum compatibility:
Techniclean XBC / Castrol XBB soluble Coolants Mix

8% Alusol 51 XBB
in 100 ppm water

8% Alusol 51 XBB +
0.5% Techniclean XBC
in 100 ppm water



Vapor phase

Immersed

Test duration 48 hours
at room temperature

Techniclean XBC:
Ferrous corrosion according DIN 51360 PART 2

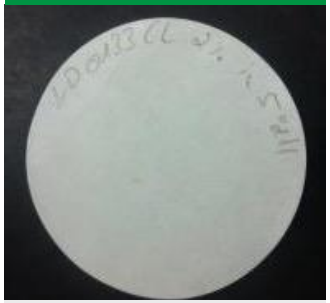
2% Techniclean S 20 in 100 ppm water

Note 0

2% Techniclean HP in 100 ppm water

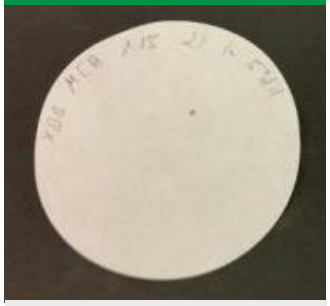
Note 3

2% Techniclean 90 XBC in 100 ppm water



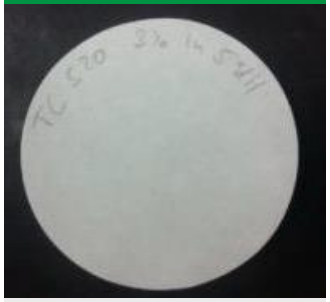
Note 1

2% Techniclean 80 XBC in 100 ppm water



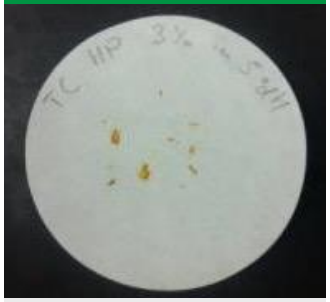
Note 1

3% Techniclean S 20 in 100 ppm water



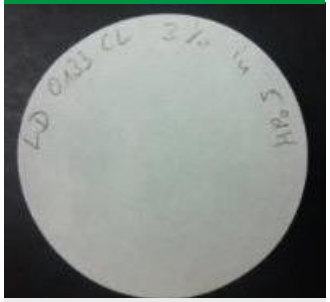
Note 0

3% Techniclean HP in 100 ppm water



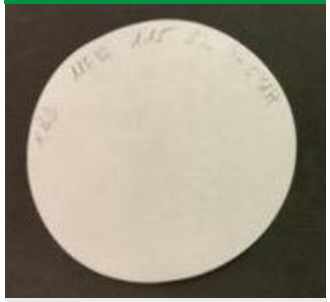
Note 3

3% Techniclean 90 XBC in 100 ppm water



Note 0

3% Techniclean 80 XBC in 100 ppm water



Note 0

Techniclean XBC: Naperville
Ferrous Corrosion (CIC) and Aluminum Stain

	Techniclean S 5001	Techniclean 80 XBC	Techniclean 90 XBC
CIC break point	3%	3%	2%
Al Stain 6061	Heavy	Slight	Slight
Al Stain 7075	Heavy	Light	Slight

Techniclean 90 XBC (=Product LD 0133 CL) - Skin Compatibility Testing -

Determined to be Non-irritating at a 20% concentration

SKIN COMPATIBILITY THE BUS* SKIN MODEL

Dr. Wolfgang F. Pittermann, Certified Veterinary Pathologist

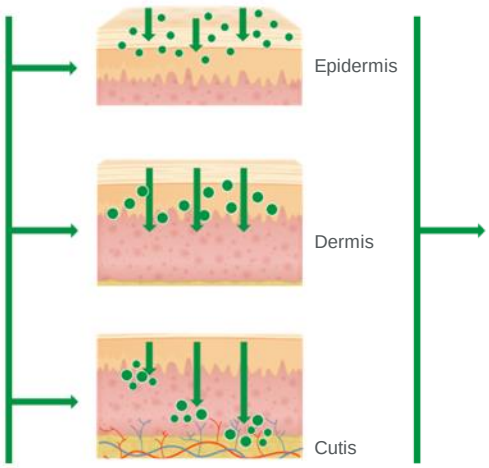
TEST MATERIAL

Pharma, cosmetics, household/industry chemicals, working materials, medical devices

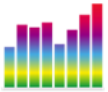
APPLICATION

Open/occlusive
2 x 600-800cm²

PENETRATION, PERMEATION, ABSORPTION



INVESTIGATIVE METHODS



Analytical Method
Skin biopsy, Histoshaver (skin sections), Horny layer strippings, Dermatome cuts, Perfusion liquid

Biochemical Method
Cytotoxicity: e.g. MTT, Inflammatory mediators: e.g. PGE, enzymes: e.g. LDH, SDH (V-max)

Morphological Method
Histology, scanning electron microscopy, electron microscopy, V-max method

* **B**ovine **U**dder **S**kin (isolated perfused udder skin) (Kietsmann et al. 1993)

1 / 7 — **BUS-Model: Skin Compatibility: Product LD 0133 CL (SC1026)**

Method

BUS-SKIN COMPATIBILITY TEST (*in-vitro*)

a) Pittermann et al. (2003): *Systematic in-vitro studies of skin compatibility of cutting fluids:* Occupational and Environmental Dermatology; 51 2/2003; D51-D56 >http://www.precoderm.com/D/s_information_fach.php<

b) Pittermann W. Hopfgarten F. and M. Kietzmann (2009*): The Skin Compatibility of Distilled Tall Oils: Evaluation with the Bovine Udder Skin In Vitro Model System.* ATLA 37, 69 – 76 >http://www.atla.org.uk/the-skin-compatibility-of-distilled-tall-oils-evaluation-with-the-bovine-udder-skin-in-vitro-model-system/<

c) Raak Chr., Molsberger F., Pittermann W., Bertram M., Robens S. and Th. (2017 Sept*): Use of the Bovine Udder Skin Model to Evaluate the Tolerability of Mesem Cosmetic Cream.* Altern Lab Anim. ; 45(4):191-200 >http://www.atla.org.uk/use-of-the-bovine-udder-skin-model-to-evaluate-the-tolerability-of-mesem-cosmetic-cream/<

d) Pittermann W. et al. (2013*): Comparative study of the skin tolerability of hand disinfectants using the BUS model.* Hyg Med 2013; 38 (4):134–141. >http://www.mhp-verlag.de/en/journals/hygiene-medizin-infection-control-and-healthcare/open-access/<

Product Testarticle (description)	**Product LD 0133 CL** Cleaner (20%, fresh)
Application	topical, open, single application
Sponsor	BP Europa SE / Industrieschmierstoffe Erkelenzer Str. 20 D- 41179 Mönchengladbach
Test period	**NOV./DEC. 2017**
Conclusion	**Based on the score-evaluation after an open, topical application (exposure period: 0,5h, 1,0h, 5,0hrs, unstripped skin) it can be concluded, that the product Product LD 0133 CL is *non-irritant* to the skin, even after repeated skin contact.**

Dr. Wolfgang Pittermann,
Certified Veterinary Pathologist

Duesseldorf, Jan 22, 2018

Signature

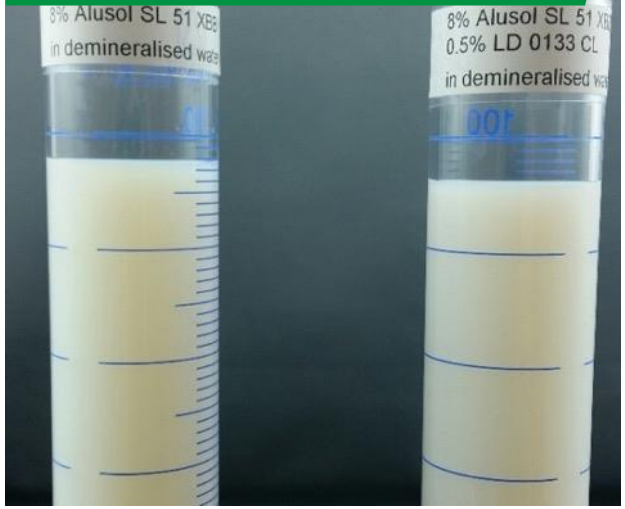
Same Result for Techniclean 80 XBC

Emulsion compatibility:
Techniclean XBC / Castrol XBB soluble Coolants Mix

Left cylinder in the picture below:
8% Alusol SL 51 XBB in DI-water

Right cylinder in the picture below:
8% Alusol SL 51 XBB +
0.5% Techniclean XBC in DI-water

After one week at room temperature:
no signs of instability.



Left cylinder in the picture below:
8% Alusol SL 61 XBB in DI-water

Right cylinder in the picture below:
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After one week at room temperature:
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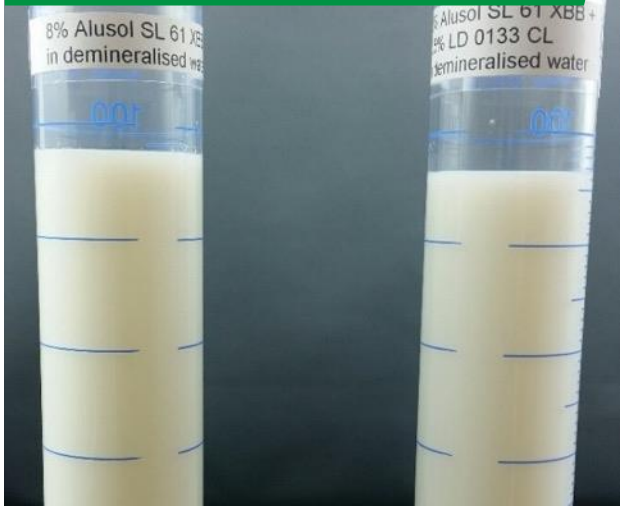


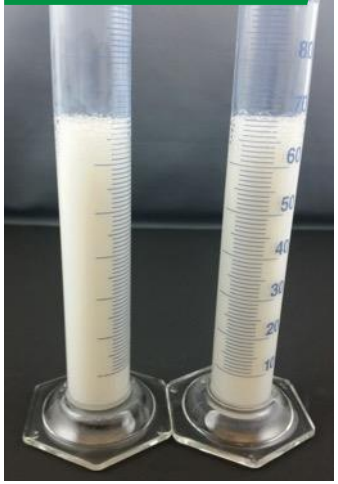
FOAM CYLINDER SHAKE TEST:
Techniclean XBC / Castrol XBB soluble Coolants Mix

50ml emulsion is shaken thoroughly for 10 seconds in a 100ml cylinder.
Foam height and foam collapse are then observed.

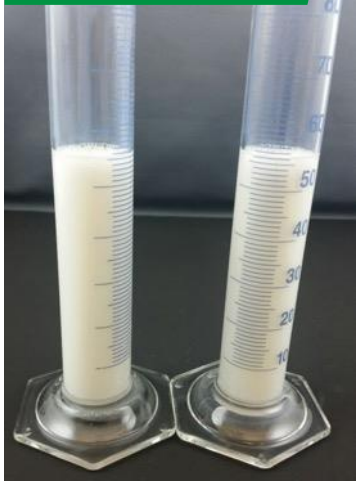
Left cylinder in the pictures below:
8% Alusol SL 51 XBB
in 100 ppm water

Right cylinder in the pictures below:
8% Alusol SL 51 XBB + 0.5% Techniclean XBC
in 100 ppm water

t = 5 seconds



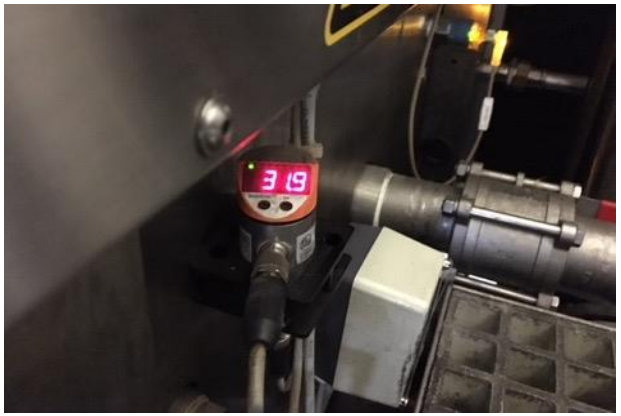
t = 10 seconds



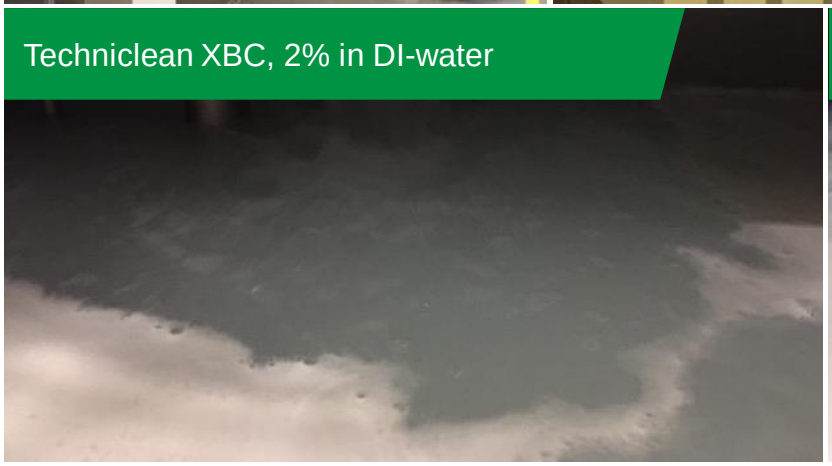
t = 30 seconds

No significant difference
in foam height and foam
collapse could be observed.

Techniclean XBC:
FOAM: High-Pressure Testing @ CEM Silberhorn



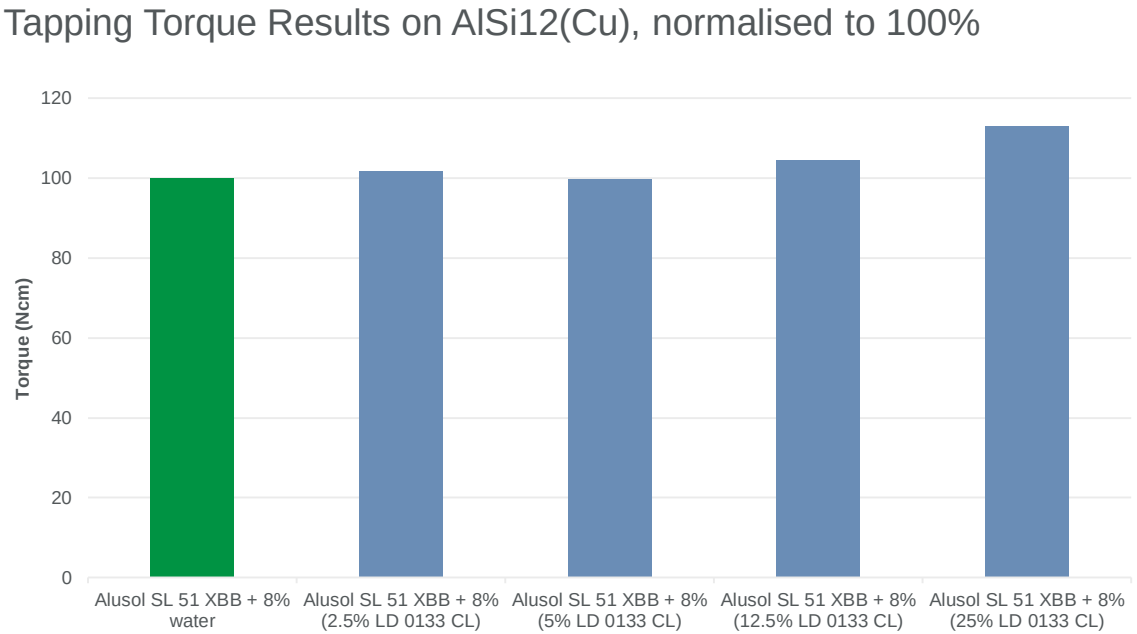
Techniclean XBC, 2% in DI-water



Contamination: + 1.6% Alusol SL 51 XBB

INFLUENCE ON LUBRICATION

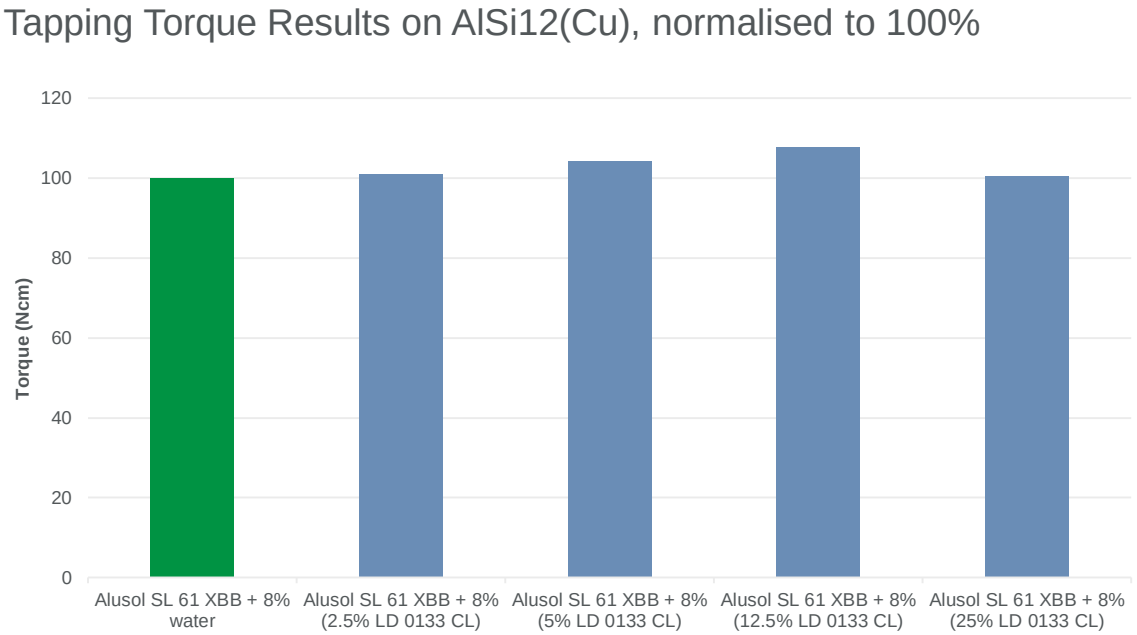
TECHNICLEAN 90 XBC / CASTROL XBB SOLUBLE COOLANTS MIX (ALUSOL SL 51 XBB @ 8%)



SL 51 XBB, 8%	100%	92%	92%	92%	92%
Techniclean 90 XBC	-	8% (2.5% TC XBC)	8% (5% TC XBC)	8% (12.5% TC XBC)	8% (25% TC XBC)

INFLUENCE ON LUBRICATION

TECHNICLEAN 90 XBC / CASTROL XBB SOLUBLE COOLANTS MIX (ALUSOL SL 61 XBB @ 8%)



SL 61 XBB, 8%	100%	92%	92%	92%	92%
Techniclean 90 XBC	-	8% (2.5% TC XBC)	8% (5% TC XBC)	8% (12.5% TC XBC)	8% (25% TC XBC)

Use standard MWF concentration measures: XBC does not significantly impact XBB concentration determination

Process Control

Controlling coolant concentration (with recycled cleaner):

ON SITE:

- With a **refractometer**, the influence of the cleaner on the final refractometer reading is very low and can be disregarded when the concentration of the cleaner is less than 0.2%.

- By **alkalinity**, the influence of the cleaner on the final alkalinity is very low and can be disregarded when the concentration of the cleaner is less than 0.2%.

- With **acid split** (splitting the emulsion with acid in an oil and water phase), the cleaner is not affecting the oil phase of an acid split.
  Care must be taken with tramp oil, which is always a by-product, but can be removed. This occurs even if no XBC cleaning product is poured back into the coolant.

Alkalinity is the preferred method to determine XBC concentration

Process Control

Controlling cleaner concentration (contaminated with coolant):

ON SITE:

- With a **refractometer**, the influence of the coolant on the final refractometer reading is very high. Typically, this method is used with fresh cleaner solutions only.
- By **alkalinity**, the influence of the coolant on the final alkalinity is very low and can be disregarded when the concentration of the coolant is less than 1%.

Contamination control:

- With acid split (splitting the emulsion with acid in an oil and water phase), the coolant is not affecting the oil phase of an acid split.
- Care must be taken with tramp oil, which is always an influence, but can be corrected for. The acid split value will give an indication of the amount of contamination (coolant + tramp oil) in the cleaner.

Summary:
Overall Potential Benefits of Techniclean XBC

Cleaner

High Productivity

- Can help increase the average cleaning bath quality
- Suitable for high-pressure applications
- No two-pack or service additive approach for easier handling
- Good hard-water stability (water range 0–350 ppm $CaCO_3$)

Reduced Operational Cost

- Low foaming at low temperatures to help reduce energy cost and to enhance CO2 footprint
- Good demulsifying characteristic to support longer bath life

Sustainability (Compliance & Legislation)

- Compliance with latest legislation and requirements minimise workplace and disposal hazards. Formulated without:
  - Boron
  - Formaldehyde-releasing agents
  - Secondary amines
  - MEA (region-specific)
  - Strong complexing agents
  - Silicon-containing defoamer

Compatibility

Reliably cleaning off light neat oils and dried emulsified XBB, particulates, etc.

No negative impact on XBB coolant performance (lubrication, corrosion protection, emulsion stability)

Compatible with the Castrol XBB coolant range to allow recycling rates of up to min 10% of a 2% cleaner solution in an XBB coolant system to reduce waste disposal cost

SECTION 4
SUCCESSFUL CASES IN THE FIELD

Source: Ecoclean GmbH

REDUCING WATER CONSUMPTION & PRESERVING PART QUALITY
ENGINE PLANT, SPAIN

External Usage

CHALLENGES

The customer is demanding when it comes to manufacturing-quality specifications – and that includes the cleanliness of engine parts after process cleaning.

Cleaning processes must perform within a challenging specification range, with tramp oil levels below 0.4%.

Meeting this means cleaning baths must be regularly changed; this generates large volumes of waste water. This has a huge impact on the waste-treatment budget and risks compromising the customer's environmental policy.

SOLUTIONS

Castrol Techniclean 80 XBC was developed to meet tight quality specifications and reduce water consumption.

Castrol Techniclean 80 XBC maintains the same cleaning and corrosion protection properties of Castrol Techniclean S 20, but offers maximum compatibility with Castrol Alusol SL 61 XBB coolant.

This allows the used cleaning solution to be recycled into metalworking systems, reducing water consumption without compromising machining quality specifications.

BUSINESS BENEFITS

During an eight-month trial involving cleaning aluminium cylinder heads and blocks, the used Techniclean 80 XBC wash was drained several times into the Alusol SL 61 XBB metalworking system.

The metalworking system maintained its performance as usual, with no negative impact.

The Techniclean 80 XBC cleaning system also maintained a high level of cleanliness and corrosion protection, with a tramp oil level below 0.4%.

There has been no water waste –

100% of the wash system clean-outs was recycled.

ANNUAL SAVINGS

- Waste water reduction: 3,950,000 litres
- Total savings: € 102,700

> "Castrol Techniclean 80 XBC maintains our cleaning quality specifications, reduces our water consumption, and reduces machining and cleaning process costs."

CUSTOMER
Engine production plant
Spain

PRODUCT
Techniclean 80 XBC

CASTROL TECHNICLEAN 90 XBC

CUTTING COSTS BY REDUCING WASTE AND BACTERIAL ODOUR

AUTOMOTIVE OEM SUPPLIER

External Usage

CHALLENGES

This automotive OEM supplier runs around 150 single-sump coolant systems with Castrol Alusol SL 51 XBB (total circulation volume > 40,000L).

Annually the customer currently recycles 250kL coolant from the residual emulsion that drains from the chip-filtration system. Coolant is reused after being treated to maintain its concentration and pH, and to manage nitrite and bacteria content.

Machined parts are cleaned in dip-cleaning tanks filled with water or diluted coolant emulsion.
Once a week, the tanks are drained and the used cleaning fluid is fully disposed as waste of – in total around 400kL annually.

The cleaner systems suffer from bacterial growth and odour.

SOLUTIONS

Castrol Techniclean 90 XBC has been developed to help customers to reduce fresh water consumption and waste.

Techniclean 90 XBC not only meets high cleaning quality specifications, but also offers maximum compatibility with Castrol Alusol SL 51 XBB coolant.

This allows used cleaning solution to be recycled into metalworking systems, reducing water consumption without compromising machining quality specifications.

Techniclean 90 XBC is formulated without boron, formaldehyde-releasing biocides and MEA (Monoethanolamine).

BUSINESS BENEFITS

Since used Techniclean 90 XBC bath solution can be mixed with coolant from the filtration system to be re-used in the coolant emulsion system, unpleasant odours have been eliminated in the cleaning systems.

Approximately 5kL of 1% Techniclean 90 XBC solution is recycled each week – equivalent to 250kL each year.
Overall the disposal volume of cleaner has been reduced by 250,000L from 400,000L to 150,000L.

Assuming a waste disposal cost of 100€ per 1kL, Techniclean 90 XBC brings a potential annual cost reduction of € 25,000.

Automotive OEM supplier
Original and spare parts – engine mountings and chassis parts

PRODUCT
Techniclean 90 XBC

Q&A
THANK YOU

Source: Ecoclean GmbH

IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.

Castrol