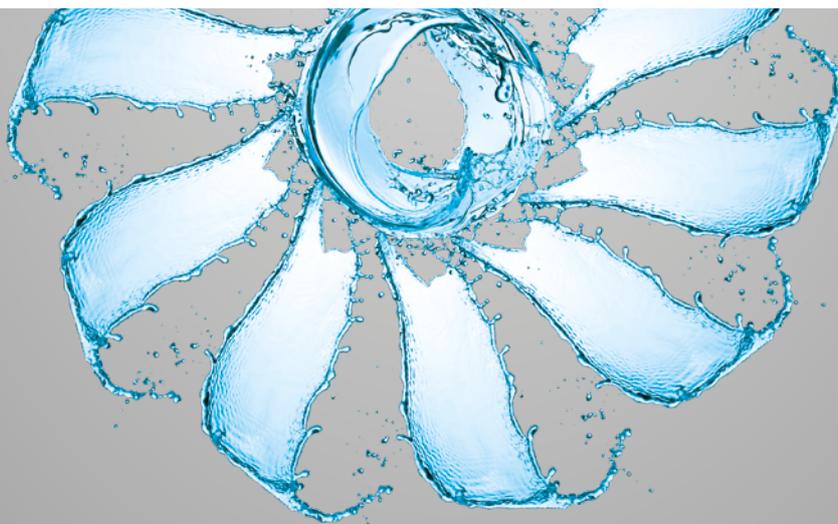




Thermal systems for automotive manufacturing



PLANETELF
PAG K

COOLELF
SUPRA

FOLIA
B 7000

MARTOL
LVG 25 AQ



TOTAL
TIG 6



OILS

HYDRAULIC
OILS

AZOLLA RANGE

Mineral fluids with good oxidation stability ensuring **anticorrosion and anti-wear protection** of the equipment used in hydraulic systems under various operation conditions.

GEAR
OILS

CARTER RANGE

Oils designed for the lubrication of gears operating under various conditions. It offers **longer drain intervals**, superior protection of equipment and reinforced **resistance against corrosion and wear**.



GREASES

LITHIUM
GREASES

MULTIS RANGE

High performing multipurpose grease based on Lithium/Calcium thickener for automotive and industrial applications, allowing **longer service-life of equipment and ease maintenance operations** while rationalizing stocks.

CALCIUM
SULFONATE
COMPLEX
GREASES

CERAN RANGE

High technology grease suitable for heavy loaded application over a wide range of temperature. Based on Calcium Sulfonate Complex thickener, it allows outstanding **resistance to water, wear, load and mechanical stability**.



ANAC INDUS, customize the monitoring of your gearbox

Full range of lube oil analysis, to allow you to anticipate and diagnose anomalies in the equipment. Thanks to ANAC INDUS, you:



Reduce your operating costs.



Anticipate and plan maintenance operations to perform them at the **best time**.



Optimize drain intervals and **extend the lifetime** of your equipment.



Improve the reliability and performance of your equipment.



Optimize your oil change strategy

Built on the expertise of our engineers, TIG 6 offers you to:



Increase efficiency and savings of your maintenance management.



Monitor lubricant parameters and analyses with a single tool.



Assert your quality and safety management through management of lubricant documentation and critical points.



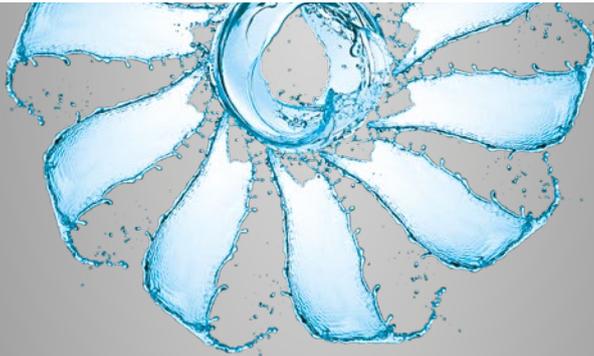
Total Lubrificants, here for you!

Our application engineers are ready to assist anytime and help you put products into use. Total Lubrificants will also put you in contact with independent and innovative partners.



Your challenges

- Maximum level of **productivity** with little down
- Reduce failure risks to maximize **quality** of outp
- Maximize **lifetime of equipment**.
- Reduce **Total Cost of Ownership (TCO)**.



THERMAL SYSTEMS MANUFACTURING

For more than 20 years, Total Lubrifiants has been supporting thermal systems manufacturers, developing innovative and clean solutions.

Reliability, performance and customer proximity is our DNA.



THEY TRUST US

TIER 1

Hutchinson
Cooper Standard
Delphi
Hanon System
Valeo
Faurecia
Denso

OEMS

PSA Group
Renault Nissan
Hyundai Kia Motors
Volkswagen
General Motors
Ford

AND MORE

COMPRESSOR



High performance lubricants for compressor manufacturing & lubricating.

PLANETELF PAG K

High performance synthetic lubricant designed for vehicle air conditioning systems using HFO-1234yf and HFC-134a refrigerants.

VALONA MS

Chlorine-free neat cutting oil.

VALONA GR

Neat grinding oil.

SPIRIT

Water based fluid for general machining.

FOLIA B

Biosourced water based fluid for general machining.

COOLING FLUIDS



Premium quality coolants based on the latest organic technology.

COOLELF & GLACELF RANGES

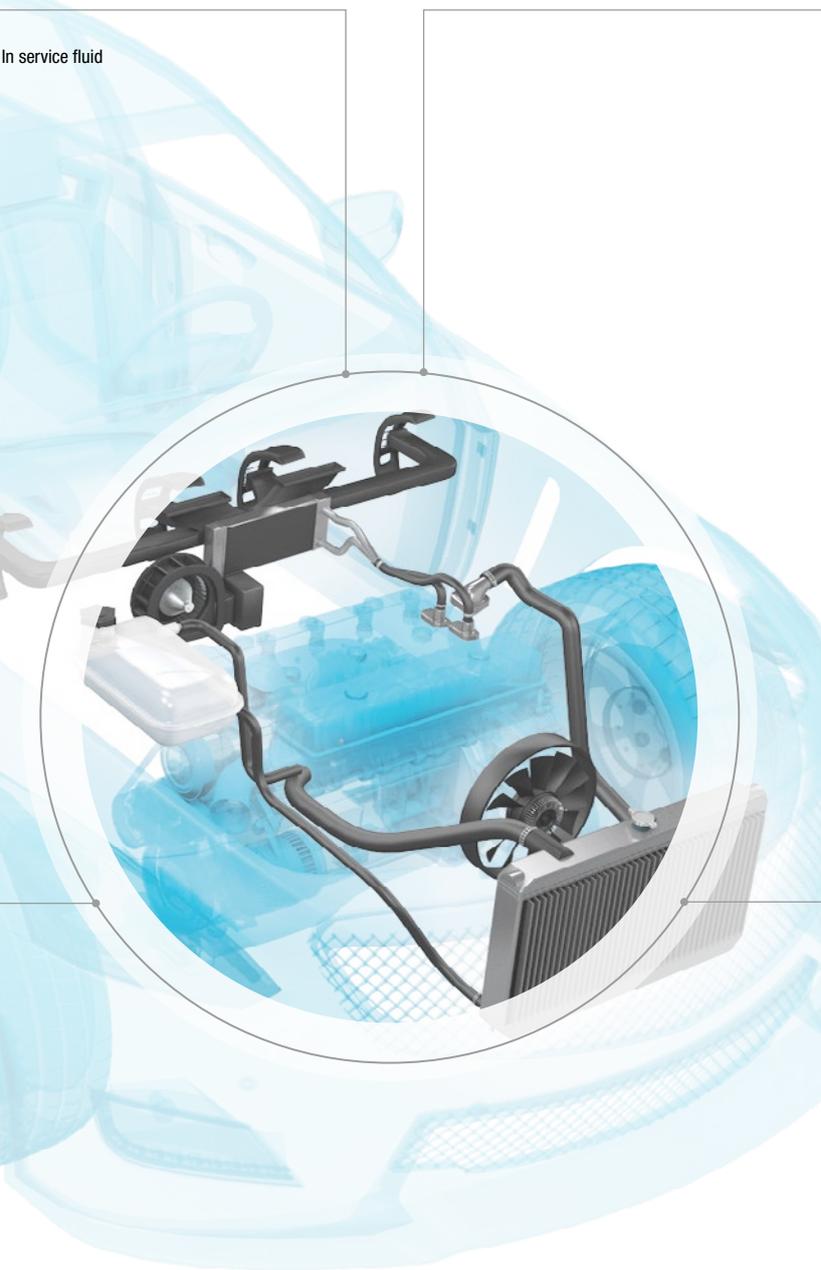
- Excellent heat transfer for the engine cooling.
- Reinforced freezing and boiling protection.
- Very high protection of the cylinders at high temperature.
- Excellent protection of the engine materials against corrosion and cavitation.
- Exceptional service-life of the coolant.

Our solutions

- Outstanding quality products allowing longer **drain intervals**.
- High performance lubrication solutions maximizing the **lifetime of your equipment**.
- **OEMs approved** products.
- **Last technology** lubricants enabling for considerable savings.

time.
out.

In service fluid



HVAC MODULE



High quality hydraulic oils for plastic injection.

EQUIVIS HE

High-efficiency hydraulic lubricant that meets the demand needs for energy efficiency and durability. Extension of drain intervals due to an excellent thermal stability and resistance to oxidation.

AZOLLA ZS

Reinforced protection of equipment. Good thermal stability and oxidation resistance. Considerable service life for fluids, preventing the build-up deposits.

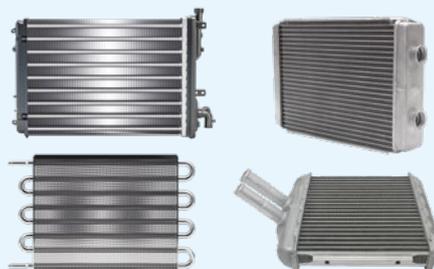
AZOLLA ECO2

Regenerated oil complying with ISO HM 46 standard contributing to reduce the environmental footprint of lubricants.

LUBRILOG PE 1657

Silicone-free grease for HVAC Flaps and mechanism.

HEAT EXCHANGER



Specific stamping oil range for mechanical and brazed heat exchanger.

MARTOL LVG 25 AQ

VOC free stamping oil, thermally degreasable.

MARTOL EV 10 CF

Fast evaporating vanishing oil for easy stamping operation.



— AIR CONDITIONING —

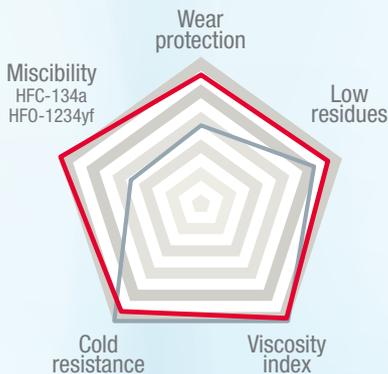
— CUTTING PRODUCT —

— STAMPING PRODUCT —

PLANETELF PAG K



High performance synthetic lubricant designed for vehicle air conditioning systems.



PLANETELF PAG K is a fully synthetic range which provides superior protection to the compressors and reduces wear.

PLANETELF PAG K range brings ultimate lubricity to moving parts.

- **PLANETELF PAG K 30**
- **PLANETELF PAG K 40**
- **PLANETELF PAG K 100**



BENEFITS

- > Miscible with refrigerants HFO-1234yf and R-134a.
- > Compatible with internal compressor materials made of elastomers
- > Strong protection against wear
- > Very stable against oxydation
- > Good thermal stability

Compliant with decreased Ozone-depletion Potential (ODP) and Global Warming Potential (GWP) regulations.

FOLIA B 7000



FOLIA B 7000 is a biosourced solution free of mineral oils and emulsifiers, with high cooling and lubricating properties.



Using advanced technologies, we bring to markets the first and only metalworking fluid, that replaces standard oils with biosourced polymers, providing the best performance for the operators and their environment:

- Longer tool lifetime and fluid timespan
- Less consumption
- Increased productivity
- Less hazardous components



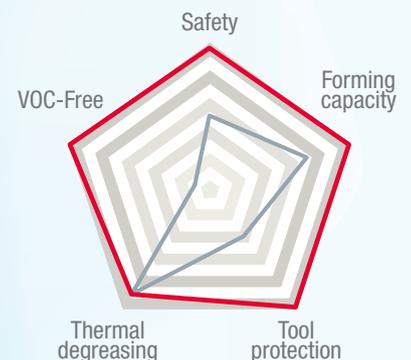
BENEFITS

- > Longer bath lifetime
- > Extended tool and fluid life
- > Productivity Increase
- > No more foaming issues
- > Cleaner Machines & Workshops
- > Less fluid drag out (dryer chips)
- > Reduced production costs (TCO)

MARTOL LVG 25 AQ



The **MARTOL** range is designed for stamping operations on ferrous and non-ferrous metals.



In order to protect the health of users and protect the environment, the formulas are chlorine free. It guarantees a very high level of lubrication and gains in productivity:

- Very good surface finish of stamped parts
- Reduction of maintenance shutdowns
- Good anticorrosion properties
- Easy to remove



BENEFITS

- > VOC free
- > High flash point (> 111° C)
- > Thermally degreasable
- > Excellent stamping performances

◆ TOTAL OIL
 ● COMPETING OIL

A major player

With our production, supply chain and commercial presence in more than 150 countries, we deliver a full range of lubricants.

Support and partnership

Thanks to local technical presence, we provide a high level of service to optimize your Total cost of Ownership.

References & OEMs

Total Lubrifiants cooperates with equipment manufacturers to create high-technology products for optimal performance and production of your machinery.

5 good reasons for choosing TOTAL

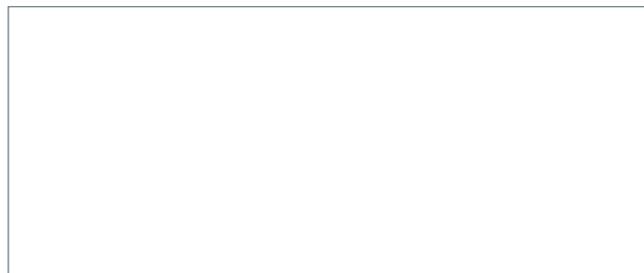
Innovation & Research

Total invests in biotechnologies to find the most suitable components to reach energy efficiency through formulations designed in our Research Centers.

Quality and environment

Total Lubrifiants ISO 9001 and 14001 certifications are the guarantee of a long term commitment to quality and environment. From the initial design stage, our R&D teams seek to develop products that minimize toxicity risks and environmental impact.

lubricants.total.com



Total Industry Solutions



Safety Data Sheets are available at sdstotalms.total.com

✉ ms.industry.lub@total.com

PLANETELF PAG K 40



A multifunctional solution for automotive air conditioning

Synthetic compressor oil PAG can be used in air conditioning systems for vehicles operating with refrigerants R134a and HFO-1234yf



APPLICATIONS

PLANETELF PAG K 40 can be used in most on-board air conditioning systems and provides superior protection while reducing wear.

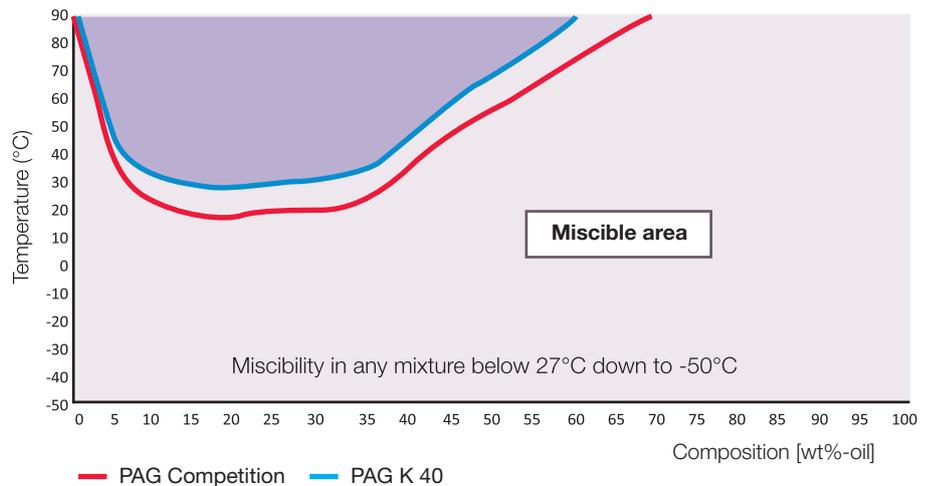


CUSTOMER BENEFITS

- ✓ High protection against wear
- ✓ Good thermal stability
- ✓ Compatibility with the internal materials of the compressors
- ✓ Good miscibility with HFO-1234yf and R-134a

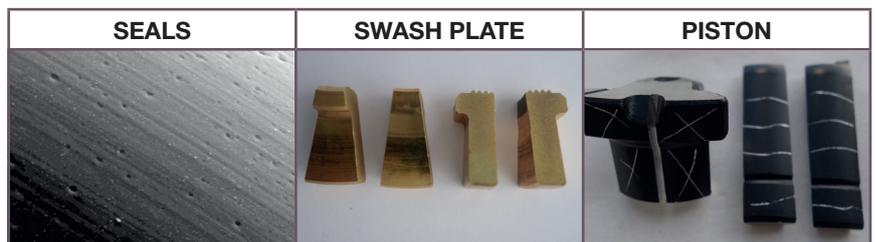
EXCELLENT MISCIBILITY

Miscibility behaviour of PLANETELF PAG K 40 with HFO-1234yf



PLANETELF PAG K 40 has an extended miscibility area with HFO-1234yf gas compare to competitors products : higher miscibility for a wider working area.

SEALS & MATERIALS COMPATIBILITY



- Good compatibility with HNBR seals and EPDM.
- Excellent protection of mechanical components (swashplate, pistons).

TECHNICAL DATA – PLANETELF PAG K 40

CHARACTERISTICS	METHODS	UNITS	TYPICAL VALUES*
Color	ASTM D1500	-	L0.5
Density at 15 °C	ASTM D4052	kg/m ³	999
Viscosity at 40 °C	ASTM D445	mm ² /s	40
Viscosity at 100°C	ASTM D445	mm ² /s	8
Pour Point	ASTM D97	°C	< -40
COC Flash Point	ASTM D92	°C	> 210

*Above characteristics are mean values given as an information.

SPECIFICATIONS AND APPROVALS

✓ Toward regulations requiring a reduction of greenhouse gases, the replacement of R-134a by HFO-1234yf gas is mandatory, and is now in place for all new A / C compressors sold in Europe.

✓ PLANETELF PAG K 40 is compatible with these two refrigerating fluids. It allows manufacturers to consider PLANETELF PAG K 40 as the single choice for both old and new compressor types.

ENHANCED PERFORMANCES

Excellent thermochemical stability, even in the presence of moisture or air.

		PLANETELF PAG K 40
THERMAL STABILITY	ASHRAE Modified sealed tube tests	Final TAN (mgKOH/g) Oil in delivery state
		Final TAN (mgKOH/g) Oil with 2000 ppm H ₂ O
TRIBOLOGICAL PROPERTIES	FALEX	Extreme pressure load (kN)
		Friction coefficient

WEAR RESISTANCE

The solution for better protection against wear.

Performance well above specifications.

REDUCE WATER CONTENT

We secure the industrial process to guarantee our customers an ultra low water content.

SPECIFICATIONS

Meets the main specifications of OEMs:

- SANDEN
- VALEO
- MAHLE

Total Lubrifiants
INDUSTRY & SPECIALITY
20-05-2019
PLANETELF PAG K 40

This lubricant used as recommended and for the application for which it has been designed does not present any particular risk.
A material safety data sheet conforming to the regulations in use in the E.C. is obtainable via your commercial adviser quick-fds.com.



TOTAL
Committed to Better Energy



TOTAL COOLANTS: FOR A WORRY-FREE DRIVE

Coolant brochure and product catalogue
2015-2016



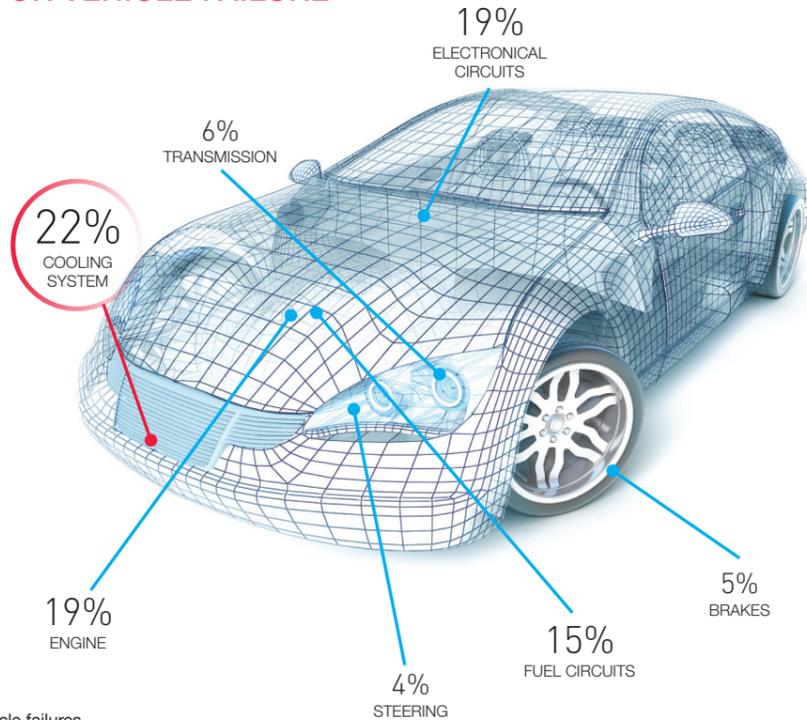
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WHY DO YOU NEED A COOLANT?

3 KEY REASONS TO USE A COOLANT:

#1 BECAUSE COOLING SYSTEM FAILURE IS THE NO.1 REASON FOR VEHICLE FAILURE

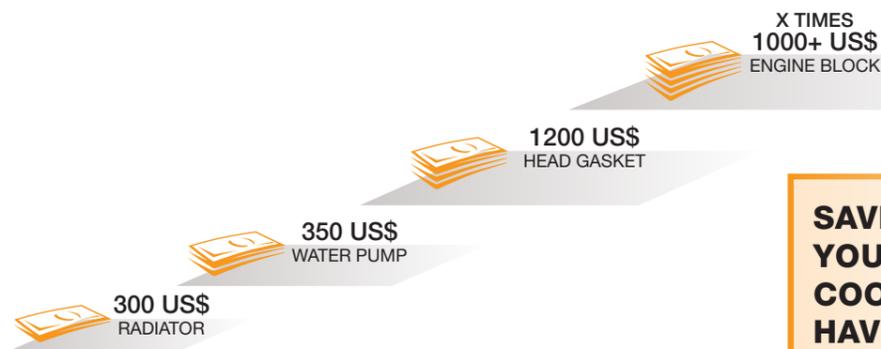


Reasons for vehicle failures
Source: cg car-garantie, reasons for vehicle failures

#2 BECAUSE A COOLANT CAN AVOID UNNECESSARY EXPENSES

MANY THINGS CAN GO WRONG. BUT THAT COULD BE AVOIDED BY TAKING CARE OF YOUR COOLANT.

The estimated cost of a coolant replacement is about 110 US\$. Typically, the coolant system components are way more expensive:



SAVING ON YOUR ENGINE COOLANT CAN HAVE UNPLEASANT AND EXPENSIVE CONSEQUENCES.

WHY DO YOU NEED A COOLANT?

#3 BECAUSE WITHOUT A COOLANT, AN ENGINE COULD BE DESTROYED

A COOLANT IS NECESSARY TO:

► Protect all cooling system materials against:



FREEZING

Volumetric expansion of 9%, which will cause cooling system breakdown.



BOILING

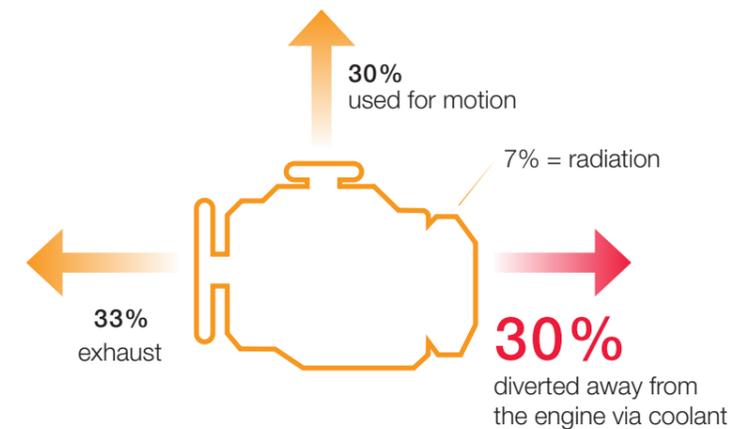
Risk of overheating and corrosion



CORROSION, EROSION, CAVITATION

A QUALITATIVE COOLANT HAS TO EFFICIENTLY TRANSFER HEAT AND PROTECT AGAINST CORROSION. FREEZE PROTECTION IS A STANDARD AND BASIC REQUIREMENT.

► Guarantee that excessive heat from combustion is transferred:



WHAT IS A GOOD COOLANT?

COOLANT PROPERTIES:

FREEZING POINT ALONE DOES NOT DETERMINE A COOLANT QUALITY. A GOOD COOLANT SHOULD:



▶ EXCHANGE HEAT EFFICIENTLY:

- **Wrong Coolant:**
Bad quality or inappropriate coolant
- **Wrong Volume:**
Too much or just not enough inhibitors
- **Aged Coolant**

All of this can cause deposit formation.

This will lead to overheat = Increased fuel consumption

Even a mild overheat on bimetallic engines can break your head gasket

- This happens when head and block expand differently
- Replacing will cost you more than 1000€, even for passenger cars
- Not fixing will just ruin your engine (further overheating, leaks, blockages,...)

JUST 0,6 MM OF DEPOSITS CAN REDUCE THE HEAT DISSIPATION BY 40%.

IF NOT TREATED, OVERHEAT CAN DAMAGE THE COOLANT SYSTEM AND LEAD TO ENGINE BREAKDOWN.

WHAT IS A GOOD COOLANT?

▶ PROTECT ALL COOLING SYSTEM MATERIALS AGAINST CORROSION, CAVITATION, EROSION

Coolant is susceptible to stress as it is situated in an abrasive environment. Therefore compatibility is required with all coolant system components:

- **Metals**
e.g. cavitation in cylinder head, cylinder liners, radiator, water pump, ...
- **Elastomer and other components**
e.g. Cracks and leaks from coolant hoses, water pump impellor incompatibility with seals,..



Deposit scaling on a radiator

7 OUT OF 10 VEHICLES CONTAIN RUST AND SCALE.



Cavitation in a waterpump (heavy duty application)

OVER 60% OF WATER PUMP FAILURES CAN BE ATTRIBUTED TO SEAL FAILURE.

WHAT IS A GOOD COOLANT?

COOLANT COMPOSITION

► COMPOSITION CAN BE TRACED BACK TO COOLANT REQUIREMENTS:



WATER

Heat transfer
Still the best heat transfer fluid, is cheap and abundantly available



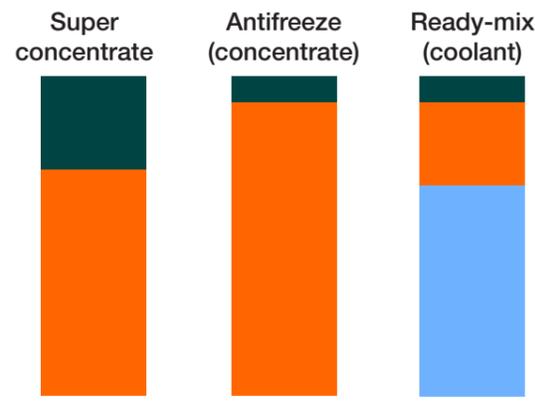
MEG OR MPG

Protection against freezing & boiling
MEG often preferred as it is the cheapest and has lower viscosity, with comparable heat transfer properties



INHIBITOR PACKAGE (ADDITIVES)

Protection against corrosion, cavitation and erosion
The inhibitor package can also influence heat transfer and to a lesser extent freezing and boiling protection



To be diluted with MEG or MPG then with demi water

To be diluted with demi water

Water (blue), MEG or MPG (orange), Inhibitor Package (additives) (green)

MEG: Monoethylene glycol
MPG: Monopropylene glycol

Many parameters may influence the selection of a base fluid: corrosion, toxicity, freezing point... See more information in the "Coolant lessons/The components/Base fluids".

CHARACTERISTIC	MEG	MPG	WATER
Boiling point (°C)	197	187	100
Specific heat (cal/g*°C)	0.574	0.6	0.998
Viscosity at 20°C (cP)	20.9	60.5	1
Freezing point (°C)	-13.3	Supercool	0
· Pure	-36.6	-33	N.A.
· 50% water solution			
Price	Neutral	Expensive	Affordable
Toxicity LD50 (Rats)	1.5g/kg	21g/kg	N.A.

WHAT IS A GOOD COOLANT?

INHIBITOR PACKAGE

THE **INHIBITOR PACKAGE** IS ONLY A SMALL PART OF THE COOLANT CONTENTS, BUT HAS A STRONG INFLUENCE ON THE **COOLANT QUALITY**.

► TWO INHIBITOR TYPES ARE BEING USED:

Mineral inhibitor technology

· This is also referred to as 'traditional' inhibitors.

Organic Additive Technology (OAT)

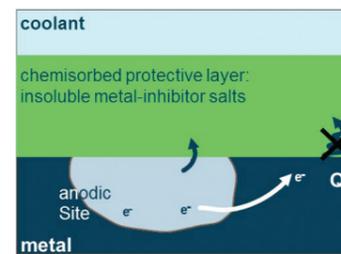
· Applied in most modern applications, also called 'carboxylates'.

► WHAT IS THE DIFFERENCE?

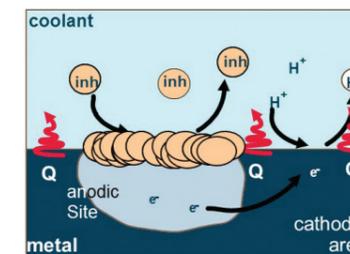
Different behaviour

Mineral inhibitors are typically forming a protective layer on the insides of the cooling system, whereas organic inhibitors are selectively protecting inherent weak spots of alloys.

MINERAL INHIBITORS

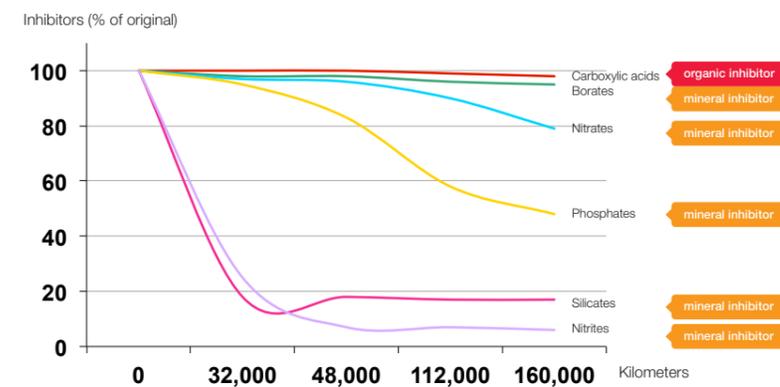


ORGANIC INHIBITORS (= NON MINERAL)



Different consumption

Organic inhibitors are less depleted and have a longer life.



Graph: Different Consumption

A MODERN COOLANT IS OFTEN BASED UPON AN ORGANIC BACKBONE WITH OR WITHOUT MINERAL ADDITIVES.

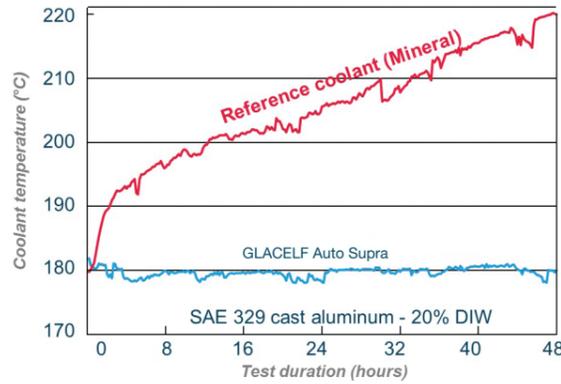
WHAT IS A GOOD COOLANT?

ADVANTAGES OF ROBUST OAT BACKBONE

▶ A BETTER HEAT TRANSFER, AND THUS A BETTER PERFORMING COOLANT

BETTER HEAT TRANSFER

- = the heat can be exported from the engine in a more efficient way
- = coolant and the coolant system components are exposed less to extreme temperatures
- = your engine can run longer and more efficiently
- = reduced risk for overheating, which would be expensive to fix



→ A BETTER PERFORMING COOLANT

▶ SUPERIOR MATERIAL COMPATIBILITY:

- **Waterpump life time increase by 50%**
Field tests showed that not only the life time can be increased, but also the amount of defects can be reduced.
- Best in class Aluminium protection
- Cavitation protection
- Improved compatibility with elastomers and plastics

	TRADITIONAL INHIBITORS	OAT TECHNOLOGY
# cars	116	80
# defects	94 (81%)	52 (65%)
Average distance at defect	101.816 km	145.746 km

Picture: Water pump test

WHAT IS A GOOD COOLANT?

▶ LONG LIFE:

- **Low consumption**
Thanks to the behaviour of the inhibitors, and also a decreased fuel consumption
- **Longer coolant life**
Current recommendation is 5 years on GLACELF Auto Supra or 250.000 km for passenger cars, 650.000 km for heavy duty



Picture: Longer life, less product disposal = eco-friendly

OUR COOLANTS MAKE YOU WORRY FREE FROM ENGINE BREAKDOWN OR DEPOSIT-FORMATION TENDENCY AS THEY ARE RECOMMENDED BY WORLD-CLASS CAR/TRUCK MANUFACTURERS.

OUR COOLANTS PROVIDE THE MOST SUITABLE PROTECTION AGAINST OVERHEATING AND CORROSION.

OUR COOLANTS HELP YOU TO SAVE MAINTENANCE COST CAUSED BY ENGINE PROBLEMS AND EROSIONS AS THEY ARE RECOMMENDED BY WORLD-CLASS CAR/TRUCK MANUFACTURERS.

OUR COOLANTS ARE ISSUED FROM ADVANCED RESEARCH & DEVELOPMENT CENTERS AND QUALITY ASSURED BY THE INTERNATIONAL BRAND TOTAL.

WHAT ARE THE NORMS?

ASTM NORMS (AMERICAN STANDARD FOR TESTING MATERIALS)

 Designation: D3306 - 10	Standard Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Services ¹
 Designation: D4985 - 10	Standard Specification for Low Silicate Ethylene Glycol Base Engine Coolant for Heavy Duty Engines Requiring a Pre-Charge of Supplemental Coolant Additive (SCA) ¹
 Designation: D5216 - 98	Standard Specification for Propylene Glycol Base Engine Coolant for Automobile and Light-Duty Service ¹
 Designation: D7518 - 10	Standard Specification for 1,3 Propanediol (PDO) Base Engine Coolant Automobile and Light-Duty Service ¹
 Designation: D7515 - 09	Standard Specification for Fully-Formulated 1,3 Propanediol (PDO) Base Engine Coolant for Heavy-Duty Engines ¹
 Designation: D6210	Standard Specification for Fully-Formulated Glycol Base Engine Coolant for Heavy-Duty Engines

OTHER NORMS

▶ BS NORMS (British Standard)



BS 6580 : Corrosion Inhibiting, Engine Coolant Concentrate ('Antifreeze')

- Antifreeze MEG or MPG based

▶ JIS NORMS (Japanese Industrial Standard)

JIS K 2234 : Engine antifreeze coolant

- Antifreeze MEG based
- Dilution from 25% to 60%
- Physical, chemical and performance requirements of ASTM D3306

▶ AFNOR NFR 15-601 (French Standard)



- Reserve alkalinity
- Aluminium heat transfer test
- Hardwater stability
- Glassware corrosion test

2 types

- Class 1 : Symbol AF winter use
- Class 2 : Symbol LLC year-round use



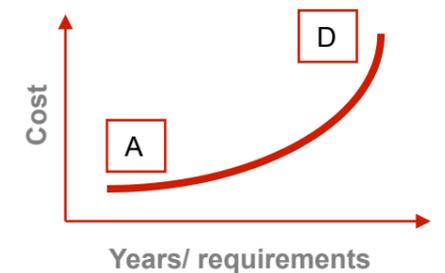
TOTAL AND PARTNERSHIPS

CLOSE CARS AND TRUCKS MANUFACTURERS (OEM) COOPERATION

- ▶ TOTAL IS MANAGING A **CLOSE COOPERATION WITH OEMS AND KEY COMPONENT SUPPLIERS.**
- ▶ **ONLY A FEW MANUFACTURERS IN THE MARKET : AS A SPECIFIC TESTING IS REQUIRING INTENSIVE EFFORTS – FINANCIALLY AND IN TIME.**
- ▶ **5 TO 8 YEARS IS THE TYPICAL CYCLE TO MARKET A NEW COOLANT**

OEM approval process:

- Standard testing lab: Industry standards, corrosion testing, elastomer testing
- Customer specific testing: Specific materials are being tested (corrosion and elastomer compatibility)
- Bench testing: Worst case scenario's
- Field testing = Actual fleet test in all kind of conditions to make a long term risk assessment



Graph: OEM approval process



Picture: Waterpump after 65k KM field test(up), with P-OAT technology

THE PRODUCT CARRYING THE MOST APPROVALS IN THE MARKET IS A TOTAL PRODUCT : GLACELF/ COOLELF AUTO SUPRA.

TOTAL AND PARTNERSHIPS

PASSENGER CARS

OEM	SPECIFICATIONS	APPROVED PRODUCT OR ALTERNATIVE	
Volkswagen Seat Skoda Audi	<ul style="list-style-type: none"> · TL 774 A - nitrite-based · TL 774 B - nitrite-based, low silicate-level · TL 774 C - nitrite-free, silicate-based (G11) · TL 774 D - silicate-free (G12) · TL 774 F - silicate-free (G12+) · TL 774 G - combination of OAT with silicate 400-600mg/l SiO₂ (G12++) · TL 774 J - G12++, in which 20% MEG is replaced by glycerol (G13) 	<ul style="list-style-type: none"> · GLACELF Auto Supra (vehicles < 2008) · GLACELF G13 (vehicles > 2008) · NEW COOLELF G13 · NEW COOLELF SI-OAT 	
Mercedes-Benz	325.0	Nitrite free	GLACELF MDX
	326.0		COOLELF MDX
	325.3	Silicate free	GLACELF Auto Supra
	326.3		COOLELF Auto Supra
	325.5	SI-OAT	GLACELF SI-OAT
	326.5		GLACELF SI-OAT
PSA Peugeot Citroën	· PSA B 71 5110	· NEW COOLELF FR CP	
Renault	· 41-01-001 – Type D · Renault	· NEW COOLELF FR RD	
Fiat	· Fiat 9,55523	· COOLELF Auto Supra	
General Motors	· GM 6277M – silicate free	· COOLELF Auto Supra	



TOTAL AND PARTNERSHIPS

HEAVY DUTY, BUSES

OEM	SPECIFICATIONS	APPROVED PRODUCT OR ALTERNATIVE
Mercedes-Benz	<ul style="list-style-type: none"> · MB 325.0 & 326.0 - nitrite free coolant · MB 325.2 & 326.2 - traditional technology with nitrites · MB 325.3 & 326.3 - silicate free coolant · MB 325.5 & 325.6 - Si-OAT coolant 	<ul style="list-style-type: none"> · COOLELF MDX (MB 325.0/326.0) · COOLELF Auto Supra (MB 325.3/326.3) · NEW COOLELF SI-OAT
MAN	<ul style="list-style-type: none"> · MAN 324 Typ N - traditional technology with nitrites · MAN 324 Typ NF - nitrite free coolant · MAN 324 Typ SNF - silicate and nitrite free coolant · MAN 324 Typ Si_OAT 	<ul style="list-style-type: none"> · COOLELF Auto Supra (324 Typ SNF) · NEW COOLELF SI-OAT 324 type SI-OAT
Volvo	· 128 6083 / 002	· COOLELF Auto Supra
Renault Trucks	· 41-01-001/- -S Type D	· COOLELF Auto Supra
Iveco	· Iveco standard 18-1830	· COOLELF Auto Supra
DAF Trucks	· 74002	· COOLELF Auto Supra
Scania	· TB 1451	<ul style="list-style-type: none"> · COOLELF Auto Supra (all, except EURO 6) · New product under development

OFF-ROAD: EARTHMOVING, AGRICULTURE, PUBLIC WORKS, FOREST, RAILWAY, COASTAL AND INLAND MARINE NAVIGATION

TYPE	APPROVED PRODUCT OR ALTERNATIVE	TECHNOLOGY
Concentrate/antifreeze	GLACELF CLASSIC	MEG/contains no amines, nitrites or phosphates
Concentrate/antifreeze	GLACELF AUTO SUPRA	MEG/OAT
Ready-mix/coolant	COOLELF CLASSIC	MEG/contains no amines, nitrites or phosphates
Ready-mix/coolant	COOLELF AUTO SUPRA -37°C	MEG/OAT

TOTAL AND ARTECO SKILLS

ARTECO – THE COOLANTS MANUFACTURER, A 50% TOTAL JOINT-VENTURE

▶ SUPPORTED BY STATE-OF-THE-ART R&D FACILITIES

15% of staff dedicated to coolant developments

- Many patents
- In-house testing (ASTM, FVW, CEC)
- Analytical division (IC, HPLC, X-ray,...)
- Cooperation with international research institutes (USA, Belgium, UK and Germany)
- Close cooperation with cooling system component suppliers



▶ CONTINUOUS IMPROVEMENT

▶ ANSWERING TO HIGHEST INDUSTRY STANDARDS



ARTECO, YOUR TRUSTED COOLANT PARTNER

▶ ARTECO YOUR SOLUTION & SUSTAINABLE PARTNER

- Wide and premium range
- Approved by various OEMs
- Global & Innovative
- Securing reliability and quality

COMPROMISING ON THE QUALITY IS LIKELY TO BE COSTLY

TOTAL AND ARTECO SKILLS

PROVEN TO BE EFFECTIVE

▶ 60 YEARS OF COOLANT KNOWLEDGE

▶ UNIQUE TECHNOLOGY DEVELOPMENT HAS BEEN THE FOUNDATION FOR JOINT VENTURE SET UP, IN 1998

▶ THE MOST TESTED COOLANT IN THE MARKET IS AN ARTECO PRODUCT:

Fleet tested for over 100,000,000 km!
540 vehicles were tested, automotive and heavy duty, and showed exceptional results:

- No compatibility problems with seals, hoses and plastic components.
- Increased life time of coolant system components
- Excellent cavitation protection and superior aluminium protection
- Limited depletion rates

▶ WIDE AND PREMIUM PORTFOLIO, COVERING MULTIPLE APPLICATIONS

▶ CLOSE OEM COOPERATION

HAS MADE ARTECO A MARKET LEADER



ANAC COOLANT



TOTAL ANAC COOLANT

▶ THE DIAGNOSIS SYSTEM FOR COOLING LIQUIDS

TOTAL ANAC Coolant is an in-depth diagnosis for the follow-up of cooling liquids and cooling systems.

TOTAL ANAC Coolant is recommended in the following cases:

- Detailed follow-up of the coolant behaviour and the condition of the system the cooling liquid is operating in.
- Punctual analysis and diagnosis in certain cases (breakdown, complaint, expertise...)
- Compliance check of the properties of the cooling liquid in use with the new cooling liquid.

▶ MEASURED CHARACTERISTICS

COOLANT

TOTAL ANAC Coolant determines the physical chemical properties of the cooling liquid and its protection against corrosion and temperature.

- **Appearance, pH, reserve of alkalinity, hardness of water, density.**
- **Protection against temperature:**
Ratio antifreeze/water, freezing and boiling temperature
- **Corrosion of the cooling system:**
Spectrometric determination (ICP) of elements: Fe, Pb, Cu, Sn, Cr, Al, Ni (ppm)
- **Protection against corrosion:**
Determination of the concentration corrosion inhibitors, organic and mineral.

COOLANT VISIO

- **COOLANT + Pollution by sediments:**
Detection and qualification of the pollution by solid particles (of medium and big dimension >5µ) by filtration and microscopic observation.

ANAC COOLANT



▶ DIAGNOSIS REPORT

The diagnosis report is available within 1 week after reception in the lab. The results can be dispatched by post or e-mail or can be viewed on the Internet. In urgent cases, the report can be faxed immediately after diagnosis.



ANAC, a service of the TOTAL group

ANAC references : --P --2 -801

Sample Nr: 50811276

Vehicle: Component: Cooling circuit

Make and type:
Vehicle:
Component: Scania D58
Diagnosis date: 7 apr 2015
Fluo: Eff. Coolant Max. 26

Colour code : green , orange, red

Registered data relative to the customer, material and cooling system.

Registered data relative to the sample: number and operating hours

Coolant properties

Protection against temperature

Protection against corrosion

Additives

Corrosion of the cooling system

Information:

- Info communicated by the customer
- Interpretation of the diagnosis by an TOTAL ANAC expert
- Comments

Coolant	
Sampling date	17-MAR-15
Sample Number	CC018167
Working time	
Working time fluid	
Characteristics	
Appearance	Clear
pH at 25 °C	8.59
Color	Green
Res. alcal. 3.5 mlHCl.1N	46.81
Res. alcal. 5.5 mlHCl.1N	24.49
Water Hard. deg.1H	12
Density g/mL	1.053
Protection	
Chcool. %	36
Water %	64
Freez. temp. °C	-20
Boil. Temp. °C	105
Inhibitors	
Nitrates mg/kg	2764
Nitrites mg/kg	<50
Sulfates mg/kg	<50
Chlorides mg/kg	<50
Inhib. org1 mg/kg	3872
Inhib. org2 mg/kg	<500
Inhib. org3 mg/kg	6614
Additives	
Phosphorus mg/kg	20
Iron mg/kg	424
Zinc mg/kg	13
Calcium mg/kg	<10
Molybdenum mg/kg	<10
Silicon mg/kg	10
Magnesium mg/kg	25
Sodium mg/kg	2884
Barium mg/kg	<10
Potassium mg/kg	141
Pollutions	
Flu mg/kg	<10
Lead mg/kg	<5
Nickel mg/kg	<5
Iron mg/kg	<5
Chromium mg/kg	<5
Aluminum mg/kg	<5
Copper mg/kg	345

ISO 9001:2008 Quality Management System

The 5 most recent diagnosis are displayed on the report. Reports are available in English, French, German, Dutch, Italian, Spanish and Portuguese.

A WEBSITE THAT HELPS TO MANAGE THE PARK MONITORING: WWW.ANAC-DIAGNOSIS.COM

A personal and secured access for:

- the consultation of new reports and history
- the possibility of making queries
- the download of the data in Excel files
- mobile version for smartphones & tablets

Available in 7 languages



▶ TOTAL ANAC MAKES A DIFFERENCE

- A personalized interpretation of the diagnoses.
- Specific analysis routine for mineral and organic liquids.
- A website allowing a user-friendly management of the analyses data.
- Results available by post, e-mail, fax or via internet.
- More than 20 years of experience in coolant analyses.

SALES PITCH + FAQ

FUTURE TRENDS

HEAT TRANSFER IS THE MOST IMPORTANT CHARACTERISTIC OF THE COOLANT, WHICH IS INFLUENCED BY COOLANT COMPOSITION:

- Deposit effects
- Heat transfer limitations of technologies

▶ HEAT TRANSFER PLAYS A ROLE ON FUEL CONSUMPTION

▶ FUTURE TRENDS = FURTHER STRESS ON COOLANT THANKS TO NEW DEVELOPMENTS:

- Waste heat recovery (WHR) and Exhaust gas recirculation (EGR)

▶ THE COOLING SYSTEM IS GETTING SMALLER AND AT THE EDGE OF DESIGN

▶ NEW MATERIALS ARE BEING USED TO DECREASE WEIGHT

NEW ENGINE DEVELOPMENTS WILL FURTHER STRESS COOLANT REQUIREMENTS

▶ DRASTIC EVOLUTION IN ENGINE EFFICIENCY AND COOLANT REQUIREMENTS

The coolant is interfering/reacting in each of the included systems (WHR, EGR, intelligent water pump, intercooler, ...), i.e. heat load and thermal stress on the coolant have considerably increased.

Waste streams of previous engine designs are now much better recuperated by the inclusion of system that are able to recover the heat and bring this energy streams back into the system. With this evolution, WHR has the biggest effect on energy recovery and hence reduction in fuel consumption.

Now, less energy is lost through the exhaust pipe.

SALES PITCH + FAQ

COMPATIBILITY

▶ WHAT HAPPENS IF COOLANTS ARE MIXED?

- Inhibitors equilibrium is strongly disturbed
- Protection against corrosion is no more provide
- Risk of several deposits

TOP-UPS AND MIXES WITH DIFFERENT COOLANTS ARE NOT ALLOWED

RISK OF SWITCHING COOLANT TECHNOLOGIES



▶ ORGANIC INHIBITORS HAVE DETERGENT PROPERTIES WHICH COULD «SCOUR» THE PROTECTIVE LAYER FORMED BY MINERAL INHIBITORS.

▶ THE METALLIC SURFACES STRIPPED BARE CAN HIGHLIGHT MICRO CRACKS ALREADY THERE AND LEAKS CAN APPEAR.

RINSE PROCEDURE

1 FIRST RINSE:

- Drain the old coolant.
- Fill the circuit with distilled water.
- Run a few minutes and drain completely.

2 SECOND RINSE:

- Repeat the operation with distilled water + 5% of new coolant.
- Run a few minutes and drain.

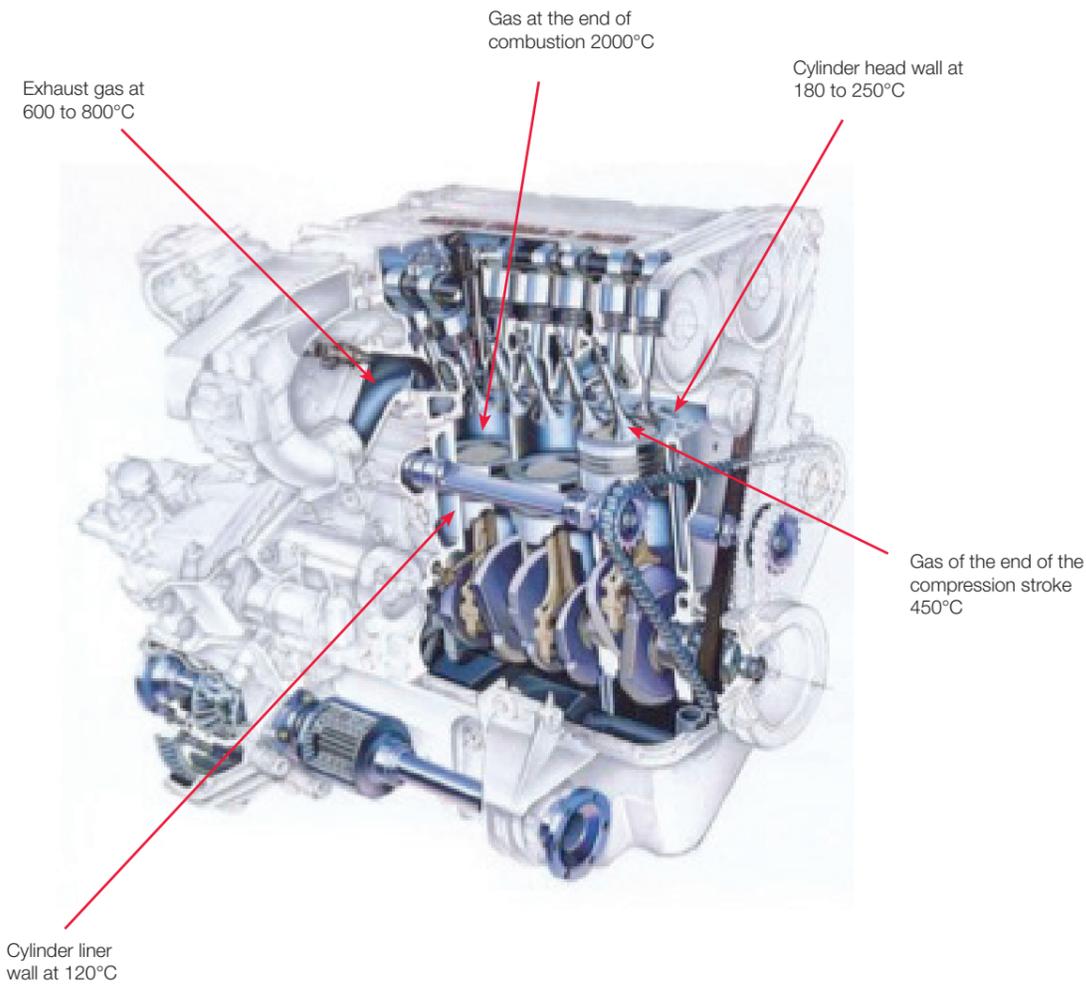
3 FILL WITH THE NEW PRODUCT



SALES PITCH + FAQ

WHY USE MEG-BASED COOLANTS IN HOT CLIMATES?

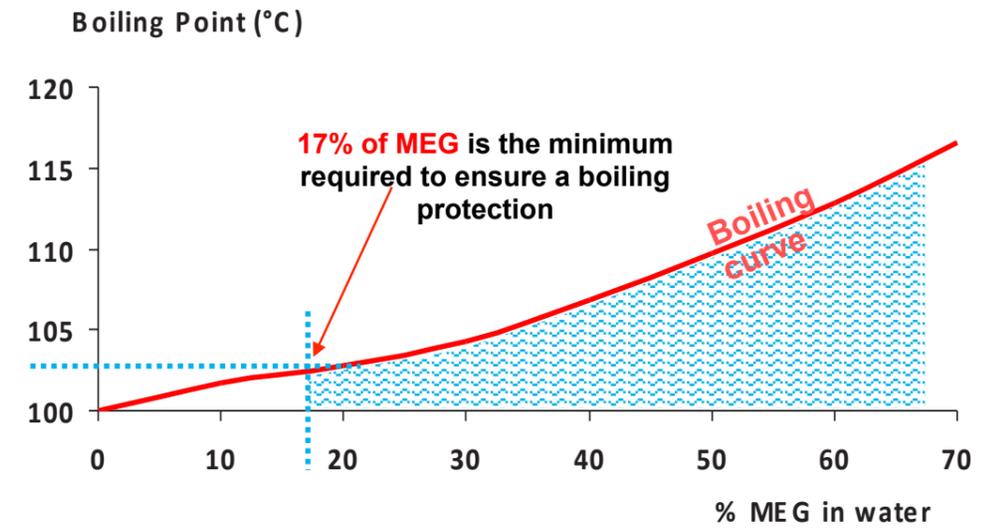
► THE CONDITIONS IN ENGINES ARE SEVERE



SALES PITCH + FAQ

► MEG ALSO PROVIDES BOILING PROTECTION

- to resist to evaporation
- to avoid top-ups
- to prevent engine damages



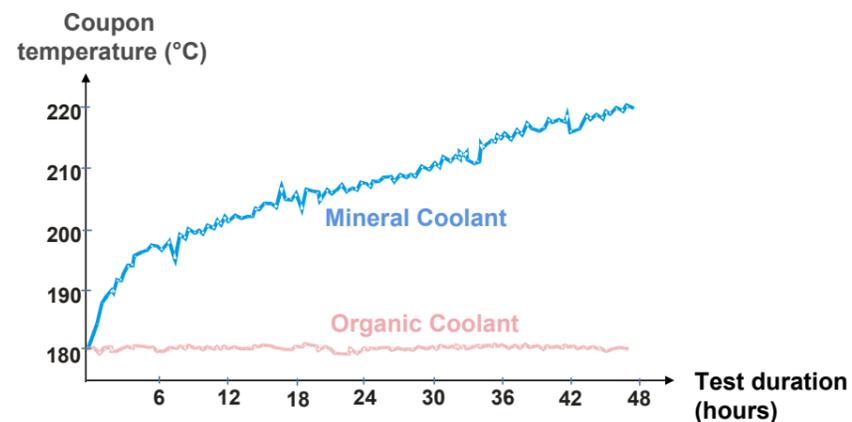
SALES PITCH + FAQ

HOW TO EXPLAIN THE KEY BENEFITS OF ORGANIC COOLANTS ?

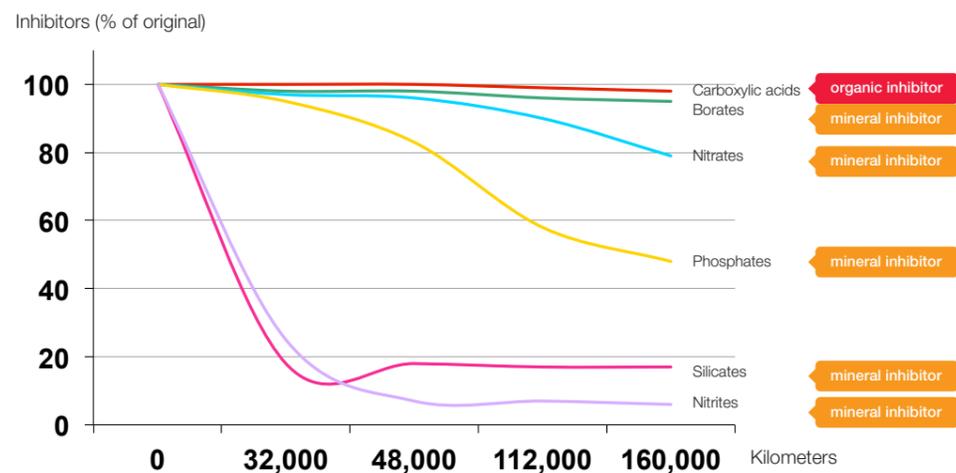
MOSTLY IN THE MARKET, COMPETITORS ARE SELLING A MINERAL SOLUTION.

▶ COMPARING HEAT TRANSFER EFFICIENCY

Temperature of heated coupon is used to measure effectiveness of cooling ability



▶ COMPARING LIFETIME / DRAIN INTERVAL



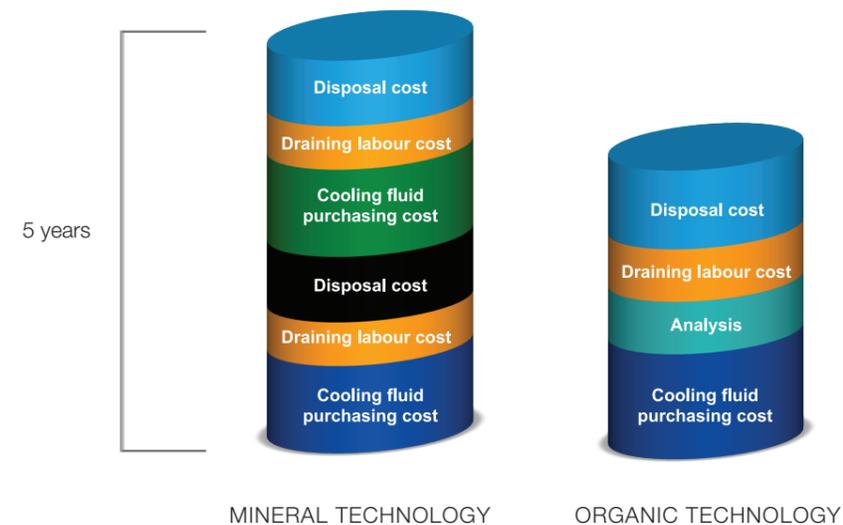
NON DEPLETING INHIBITORS

EXTENDED PRODUCT LIFE

COST BENEFIT

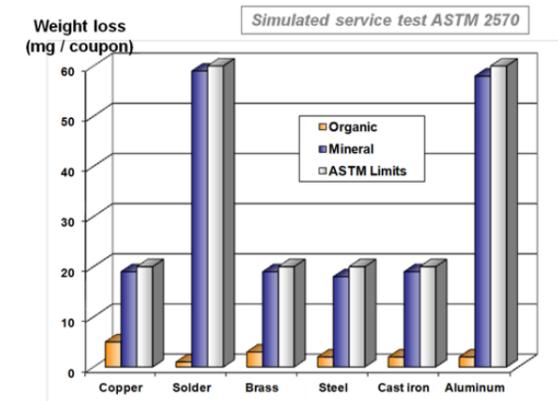
SALES PITCH + FAQ

▶ COMPARING PRICE



▶ COMPARING CORROSION PROTECTION

High temperature aluminium protection



SALES PITCH + FAQ

▶ COMPARING THERMAL & OXIDATION STABILITY

Comparing Thermal Stability

Liners after 400h thermal stability test on 6.2L engine



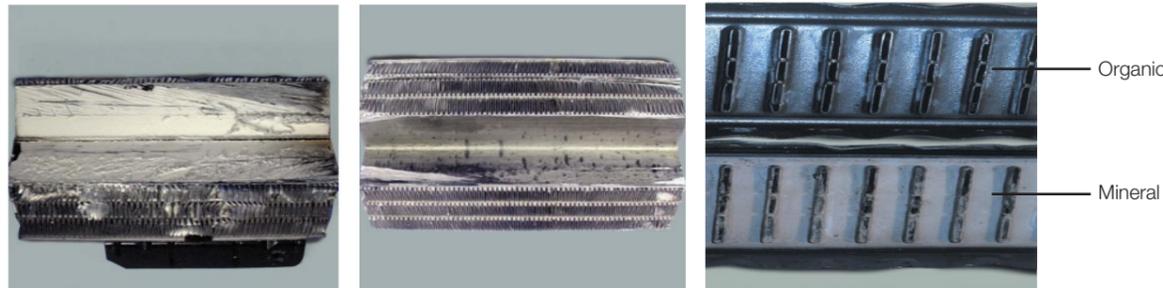
With mineral coolant

With organic coolant

▶ COMPARING MAINTENANCE COST

Amounts of deposits and scaling

No silicate gel on radiator tubes with OAT coolants



Organic

Mineral

With mineral coolant

With organic coolant

SALES PITCH + FAQ

COMPLAINTS	APPROVED PRODUCT OR ALTERNATIVE
Is our coolant more expensive than local brand?	TOTAL COOLELF and GLACELF are the best worry-free coolants with homologations by the leading OEM and the different official authorities. To stay up to date to the last technology and fit the needs of new technology we invest to give the best product to optimize the global maintenance cost of your engine.
Why is GLACELF AUTO SUPRA not cheap?	<ul style="list-style-type: none"> · This product has twice as long a service life as conventional products. It is a real saving made. · What's more, cheaper to remove as it has a longer service life. · Thanks to less plant downtime, it plays a part in reducing maintenance costs.
Competitors' products on site are in spare parts contracts, or they are laid down by the maker.	Reducing purchase values compared with turnover and singing the praises of product performance.
The existing product is very good.	The new product is high performance and is appropriate with the stresses of modern engines.
My existing product does not give me any problems.	This product has twice as long a service life as conventional products. So it is a real saving made for maintenance cost. Technological and environmental stresses change and bring out these new generation products.

WHAT IF...

PART	DAMAGE	REPERCUSSIONS
Lining	<ul style="list-style-type: none"> · Damaged corrosion inhibitor coating · Cavitation · Corrosion 	<ul style="list-style-type: none"> · Temperature rises · Metal lamination, wear · Deposits, surface weathering
Lining joint	<ul style="list-style-type: none"> · Deposits forming 	<ul style="list-style-type: none"> · Pipes blocked between the gearbox unit and cylinder block and/or joint wear
Cylinder head	<ul style="list-style-type: none"> · Additive coating consumed · Cavitation · Exhaust pipe corrosion 	<ul style="list-style-type: none"> · Temperature rises · Pipes blocked, wear · Intense wear on exhaust
Radiator	<ul style="list-style-type: none"> · Deposits · Localised corrosion 	<ul style="list-style-type: none"> · Temperature rise and heat exchange effects reduced · Water, leaks
Water pump	<ul style="list-style-type: none"> · Cavitation 	<ul style="list-style-type: none"> · Out of operation, leaks (blades broken)
Hoses and fittings	<ul style="list-style-type: none"> · Corrosion · Elastomers spoiled 	<ul style="list-style-type: none"> · Leaks · Hardening, porosity · Fractures
Thermostat	<ul style="list-style-type: none"> · Deposits 	<ul style="list-style-type: none"> · Thermostat blocked

IT'S ABOUT FINDING THE RIGHT MIX

TOTAL COOLANT IS THE SUM OF:

▶ INHIBITOR PACKAGE

- Unique
- Combination of organic and mineral additives
- In the right dosage
- Offering a synergetic package
- To protect against corrosion, cavitation and erosion

▶ PRIME GRADE BASE FLUIDS (MEG, MPG, DEMI WATER)

**RELIABILITY OF YOUR COOLANT
WORRY FREE FOR YOU AND DECREASING OF MAINTENANCE COST**

THE 11 ADVANTAGES OAT TECHNOLOGY:

1. Increases heat transfer efficiency
2. Extends life of the coolant
3. Has superior high temperature aluminium protection
4. Extends water pump life with 50%
5. Has excellent cavitation protection
6. Has high temperature oxidation stability
7. Has improved compatibility with elastomers & plastics
8. Reduces cooling system scaling and deposits
9. Requires less product disposal
10. Has environmentally friendly inhibitors
11. Decrease of maintenance costs

**OAT BASED TECHNOLOGY KEEPS GROWING
(INCL. HYBRID & LOBRID)**

Please visit us online at:
www.lubricants.total.com



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8 *OUR COOLANT RANGE & TECHNOLOGY*

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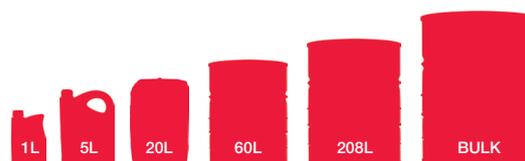
OUR RANGE & TECHNOLOGY

COOLELF AUTO SUPRA -26°C

O.A.T.



COOLELF AUTO SUPRA -26°C is a «very long life» coolant based on monoethylene glycol and organic corrosion inhibitors. COOLELF AUTO SUPRA -26°C is the top-of-the-range product of our cooling liquid range.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 • ASTM D4985 • ASTM D6210 	<ul style="list-style-type: none"> • BS 6580 • JASO M325 • JIS K2234 • SAE J1034 • NATO S-759
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • VW SEAT AUDI SKODA • PORSCHE : VW TL 774 D/F/G (G12/G12+/G12++) • DAIMLER MB 326.3 • FORD WSS-M97B44 • MAZDA MEZ MN 121 D • JAGUAR LAND-ROVER STJLR • 651.5003 • MAN 324 Typ SNF • DEUTZ DQC CB-14 • GM 6277M 	<ul style="list-style-type: none"> • GMW 3420 • GE Jenbacher TA 1000-0201 • MWM 2091/11 • CAT 2091/11 • CUMMINS IS series u N14 • KOMATSU 07 892 (2009) • LIEBHERR MD1-36-130 • MTU MTL 5048 • PACCAR DAF 74002 • YANMAR
<u>Meets the requirements of:</u>	<ul style="list-style-type: none"> • RENAULT 41-01-001/ S Type D • SAAB • LEYLAND TRUCKS 	<ul style="list-style-type: none"> • SCANIA • WARTSILLA 32-9011

CUSTOMER BENEFITS

Very long-term protection against metals corrosion	Organic technology ensures a long-term action to offer maximum protection against any type of corrosion, erosion and cavitation, even at high temperatures.
Maximum heat transfer	<p>The organic additives in COOLELF AUTO SUPRA -26°C give to the coolant:</p> <ul style="list-style-type: none"> + Chemical neutrality (pH 7-8.5) + A reserve of alkalinity to neutralise the acids resulting from the combustion gases + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>Avoids formation of deposits (no risk of limescale) and leaves surfaces clean.</p>

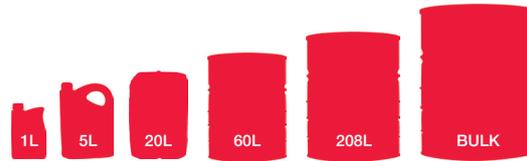
OUR RANGE & TECHNOLOGY

COOLELF AUTO SUPRA -37°C

O.A.T.



COOLELF AUTO SUPRA -37°C is a «very long life» coolant based on monoethylene glycol and organic inhibitors of corrosion. COOLELF AUTO SUPRA -37°C is the premium product of our cooling liquid range.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 • ASTM D4985 • ASTM D6210 	<ul style="list-style-type: none"> • BS 6580 • JASO M325 • JIS K2234 • SAE J1034 • NATO S-759
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • VW SEAT AUDI SKODA • PORSCHE : VW TL 774 D/F/G (G12/G12+/G12++) • DAIMLER MB 326.3 • FORD WSS-M97B44 • MAZDA MEZ MN 121 D • JAGUAR LAND-ROVER STJLR • 651.5003 • MAN 324 Typ SNF • DEUTZ DQC CB-14 • GM 6277M 	<ul style="list-style-type: none"> • GMW 3420 • GE Jenbacher TA 1000-0201 • MWM 2091/11 • CAT 2091/11 • CUMMINS IS series u N14 • KOMATSU 07 892 (2009) • LIEBHERR MD1-36-130 • MTU MTL 5048 • PACCAR DAF 74002 • YANMAR
<u>Meets the requirements of:</u>	<ul style="list-style-type: none"> • RENAULT 41-01-001/ S Type D • SAAB • LEYLAND TRUCKS 	<ul style="list-style-type: none"> • SCANIA • WARTSILLA 32-9011

CUSTOMER BENEFITS

Very long-term protection against metals corrosion	Organic technology ensures a long-term action to offer maximum protection against any type of corrosion, erosion and cavitation, even at high temperatures.
Maximum heat transfer	<p>The organic additives in COOLELF AUTO SUPRA -37°C give to the coolant:</p> <ul style="list-style-type: none"> + Chemical neutrality (pH 7-8.5) + A reserve of alkalinity to neutralise the acids resulting from the combustion gases + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>Avoids formation of deposits (no risk of limescale) and leaves surfaces clean.</p>

OUR RANGE & TECHNOLOGY

COOLELF AUTO SUPRA -50°C

O.A.T.



COOLELF AUTO SUPRA -50°C is a «very long life» coolant based on monoethylene glycol and organic corrosion inhibitors. COOLELF AUTO SUPRA -50°C is the top-of-the-range product of our cooling liquid range.



SPECIFICATIONS

<p>Meets the <u>international specifications</u> for antifreezes:</p>	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 • ASTM D4985 • ASTM D6210 	<ul style="list-style-type: none"> • BS 6580 • JASO M325 • JIS K2234 • SAE J1034 • NATO S-759
<p><u>Officially approved</u> by the following manufacturers:</p>	<ul style="list-style-type: none"> • VW SEAT AUDI SKODA • PORSCHE : VW TL 774 D/F/G (G12/G12+/G12++) • DAIMLER MB 326.3 • FORD WSS-M97B44 • MAZDA MEZ MN 121 D • JAGUAR LAND-ROVER STJLR • 651.5003 • MAN 324 Typ SNF • DEUTZ DQC CB-14 • GM 6277M 	<ul style="list-style-type: none"> • GMW 3420 • GE Jenbacher TA 1000-0201 • MWM 2091/11 • CAT 2091/11 • CUMMINS IS series u N14 • KOMATSU 07 892 (2009) • LIEBHERR MD1-36-130 • MTU MTL 5048 • PACCAR DAF 74002 • YANMAR
<p><u>Meets the requirements of:</u></p>	<ul style="list-style-type: none"> • RENAULT 41-01-001/ S Type D • SAAB • LEYLAND TRUCKS 	<ul style="list-style-type: none"> • SCANIA • WARTSILLA 32-9011

CUSTOMER BENEFITS

<p>Very long-term protection against metals corrosion</p>	<p>Organic technology ensures a long-term action to offer maximum protection against any type of corrosion, erosion and cavitation, even at high temperatures.</p>
<p>Maximum heat transfer</p>	<p>The additives in COOLELF AUTO SUPRA -50°C give to the coolant:</p> <ul style="list-style-type: none"> + Chemical neutrality (pH 7-8.5) + A reserve of alkalinity to neutralise the acids resulting from the combustion gases + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>Avoids formation of deposits (no risk of limescale) and leaves surfaces clean.</p>

OUR RANGE & TECHNOLOGY

COOLELF PLUS -26°C

Hybrid



COOLELF PLUS -26°C is a "long life" coolant based upon monoethylene glycol and inorganic corrosion inhibitors (silicates), a long proven coolant and heat transfer technology. It contains also an organic inhibitor, it is a semi-organic technology. **COOLELF PLUS -26°C** is the semi-organic product in our range of coolants.



SPECIFICATIONS

Meets the international specifications for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 	<ul style="list-style-type: none"> • ASTM D4985 • BS 6580
Officially approved by the following manufacturers:	<ul style="list-style-type: none"> • VW TL-774 C (G 11) • AUDI TL-774 C (G 11) • SEAT TL-774 C (G 11) • SKODA TL-774 C (G 11) 	<ul style="list-style-type: none"> • BMW GS 94000 • PORSCHE TL-774 C (G 11) • FIAT CHRYSLER MS-7170 • GM-OPEL GME L1301
Meets the requirements of:	<ul style="list-style-type: none"> • FORD • MB 326.0 • FIAT-LANCIA 9.55523 • LADA TTM VAZ 1.97.717-97 • CUMMINS 85T8-2 	<ul style="list-style-type: none"> • VECO standard 18-1830 • MAN 324 Type NF • MTU MTL 5048 • PERKINS • VOLVO 128 6083 /002

CUSTOMER BENEFITS

Long-term protection against corrosion of metals and of all type of materials	<p>COOLELF PLUS -26°C offers an adequate solution against corrosion problems of all the materials in the cooling system.</p> <p>The additives in COOLELF PLUS -26°C give the coolant:</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>COOLELF PLUS -26°C is inert to elastomeric seals and paints.</p>
Excellent quality ratio	

OUR RANGE & TECHNOLOGY

COOLELF PLUS -37°C

Hybrid



COOLELF PLUS -37°C is a "long life" coolant based upon monoethylene glycol and inorganic corrosion inhibitors (silicates), a long proven coolant and heat transfer technology. It contains also an organic inhibitor, it is a semi-organic technology. **COOLELF PLUS -37°C** is the semi-organic product in our range of coolants.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 	<ul style="list-style-type: none"> • ASTM D4985 • BS 6580
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • VW TL-774 C (G 11) • AUDI TL-774 C (G 11) • SEAT TL-774 C (G 11) • SKODA TL-774 C (G 11) 	<ul style="list-style-type: none"> • BMW GS 94000 • PORSCHE TL-774 C (G 11) • FIAT CHRYSLER MS-7170 • GM-OPEL GME L1301
<u>Meets the requirements of:</u>	<ul style="list-style-type: none"> • FORD • MB 326.0 • FIAT-LANCIA 9.55523 • LADA TTM VAZ 1.97.717-97 • CUMMINS 85T8-2 	<ul style="list-style-type: none"> • IVECO standard 18-1830 • MAN 324 Type NF • MTU MTL 5048 • PERKINS • VOLVO 128 6083 /002

CUSTOMER BENEFITS

Long-term protection against corrosion of metals and of all type of materials	<p>COOLELF PLUS -37°C offers an adequate solution against corrosion problems of all the materials in the cooling system.</p> <p>The additives in COOLELF PLUS -37°C give the coolant:</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>COOLELF PLUS -37°C is inert to elastomeric seals and paints.</p>
Excellent quality ratio	

OUR RANGE & TECHNOLOGY

COOLELF MDX -26°C

Hybrid



COOLELF MDX -26°C is a “long-life” coolant fluid based upon monoethylene glycol containing no amines, nitrites or phosphates. COOLELF MDX -26°C figures as a “speciality” in our range of liquid coolants.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • BS 6580
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • Audi TL-774 C (G11) • VW TL-774 C (G11) • Skoda TL-774 C (G11) • Seat TL-774 C (G11) • GM-OPEL • BMW GS 94000 • Volvo Cars 128 6083/002 • MB 326.0 • MTU - MTL 5048 • MAN 324 Type NF • CATERPILLAR MWM 0199-99-2091/9 • Opel-GM GMW 3420 • Vauxhall GM 6277M (+B040 1065) • Steyr-Daimler Puch N 05045 • Porsche TL-774 C (G11) • Van Hool • Volvo Construction 128 6083 / 002 • Volvo Trucks 128 6083 / 002

CUSTOMER BENEFITS

Protection against corrosion of metals, especially aluminium	<p>COOLELF MDX -26°C provides an effective solution to the problems of corrosion affecting all the materials used in cooling circuits.</p> <p>COOLELF MDX -26°C performs well in the corrosion tests required by the specifications: hot plate corrosion and glassware corrosion.</p> <p>COOLELF MDX -26°C gives excellent protection against cavitation that can perforate liners and cause water pump problems.</p>
Homologation profile compatible with MTU materials	<p>The additives in COOLELF MDX -26°C gives the coolant fluid:</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + A resistance to foaming + A compatibility with hard water (maximum 40°F). <p>COOLELF MDX -26°C is also inert to elastomeric seals and paint.</p>

OUR RANGE & TECHNOLOGY

COOLELF MDX -37°C

Hybrid



COOLELF MDX -37°C is a “long-life” coolant fluid based upon monoethylene glycol containing no amines, nitrites or phosphates. COOLELF MDX -37°C figures as a “speciality” in our range of liquid coolants.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • BS 6580
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • Audi TL-774 C (G11) • VW TL-774 C (G11) • Skoda TL-774 C (G11) • Seat TL-774 C (G11) • GM-OPEL • BMW GS 94000 • Volvo Cars 128 6083/002 • MB 326.0 • MTU - MTL 5048 • MAN 324 Type NF • CATERPILLAR MWM 0199-99-2091/9 • Opel-GM GMW 3420 • Vauxhall GM 6277M (+B040 1065) • Steyr-Daimler Puch N 05045 • Porsche TL-774 C (G11) • Van Hool • Volvo Construction 128 6083 / 002 • Volvo Trucks 128 6083 / 002

CUSTOMER BENEFITS

Protection against corrosion of metals, especially aluminium	<p>COOLELF MDX -37°C provides an effective solution to the problems of corrosion affecting all the materials used in cooling circuits.</p> <p>COOLELF MDX -37°C performs well in the corrosion tests required by the specifications: hot plate corrosion and glassware corrosion.</p> <p>COOLELF MDX -37°C gives excellent protection against cavitation that can perforate liners and cause water pump problems.</p>
Homologation profile compatible with MTU materials	<p>The additives in COOLELF MDX -37°C gives the coolant fluid:</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + A resistance to foaming + A compatibility with hard water (maximum 40°F). <p>COOLELF MDX -37°C is also inert to elastomeric seals and paint.</p>

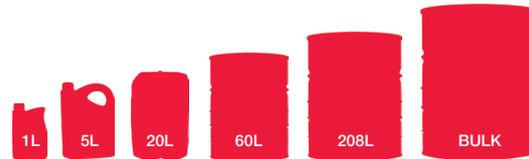
OUR RANGE & TECHNOLOGY

GLACELF AUTO SUPRA

O.A.T.



GLACELF AUTO SUPRA is a “very long life” antifreeze based on high purity monoethylene glycol and organic corrosion inhibitors. In our range of antifreezes, **GLACELF AUTO SUPRA** is the premium product.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 • ASTM D4985 • ASTM D6210 	<ul style="list-style-type: none"> • BS 6580 • JASO M325 • JIS K2234 • SAE J1034 • NATO S-759
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • VW SEAT AUDI SKODA • PORSCHE : VW TL 774 D/F/G (G12/G12+/G12++) • MB-Approval 325.3 • FORD WSS-M97B44 • MAZDA MEZ MN 121 D • JAGUAR LAND-ROVER STJLR • 651.5003 • MAN 324 Typ SNF • DEUTZ DQC CB-14 • GM 6277M 	<ul style="list-style-type: none"> • GMW 3420 • GE Jenbacher TA 1000-0201 • MWM 2091/11 • CAT 2091/11 • CUMMINS IS series u N14 • KOMATSU 07 892 (2009) • LIEBHERR MD1-36-130 • MTU MTL 5048 • PACCAR DAF 74002 • YANMAR
<u>Meets the requirements of:</u>	<ul style="list-style-type: none"> • RENAULT 41-01-001/ S Type D • SAAB • LEYLAND TRUCKS 	<ul style="list-style-type: none"> • SCANIA • WARTSILLA 32-9011

CUSTOMER BENEFITS

Very long-term protection against metals corrosion	Organic technology ensures a long-term action to offer maximum protection against any type of corrosion, erosion and cavitation, even at high temperatures.
Maximum heat transfer	<p>The additives in GLACELF AUTO SUPRA give to the coolant:</p> <ul style="list-style-type: none"> + Chemical neutrality (pH 7-8.5), + A reserve of alkalinity to neutralise the acids resulting from the combustion gases, + Resistance to foaming + Compatibility with hard water (maximum 40°F). <p>Heat transfer remains optimised: fully organic additives allow avoiding any formation of deposits and leave surfaces clean.</p>

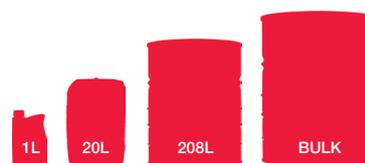
OUR RANGE & TECHNOLOGY

GLACELF PLUS

Hybrid



GLACELF PLUS is a "long life" coolant based upon monoethylene glycol and inorganic corrosion inhibitors (silicates). It contains also an organic inhibitor. **GLACELF AUTO SUPRA** is a semi-organic product in our antifreeze range.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	<ul style="list-style-type: none"> • AFNOR NFR 15-601 • ASTM D3306 • ASTM D4656 	<ul style="list-style-type: none"> • ASTM D4985 • BS 6580
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • VW TL-774 C (G 11) • AUDI TL-774 C (G 11) • SEAT TL-774 C (G 11) • SKODA TL-774 C (G 11) 	<ul style="list-style-type: none"> • BMW GS 94000 • PORSCHE TL-774 C (G 11) • FIAT CHRYSLER MS-7170 • GM-OPEL GME L1301
<u>Meets the requirements of:</u>	<ul style="list-style-type: none"> • FORD • MB 325.0 • FIAT-LANCIA 9.55523 • LADA TTM VAZ 1.97.717-97 • CUMMINS 85T8-2 	<ul style="list-style-type: none"> • IVECO standard 18-1830 • MAN 324 Type NF • MTU MTL 5048 • PERKINS • VOLVO 128 6083 /002

CUSTOMER BENEFITS

Long-term protection against corrosion of metals and all materials	<p>GLACELF PLUS provides an effective solution to the problems of corrosion affecting all materials used in cooling circuits.</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + Resistance to foaming (mainly instability of the foam that might form) + Compatibility with hard water (maximum 40°F). <p>The coolant fluids obtained by diluting GLACELF PLUS are also inert to elastomeric seals and paints.</p>
Excellent quality ratio	

OUR RANGE & TECHNOLOGY

GLACELF MDX

Hybrid



COOLELF MDX is a “long life” antifreeze based upon monoethylene glycol and contains no amines, nitrites or phosphates. **COOLELF MDX** figures as a “speciality” in our antifreeze range.



SPECIFICATIONS

Meets the <u>international specifications</u> for antifreezes:	AFNOR NFR 15-601 BS 6580
<u>Officially approved</u> by the following manufacturers:	<ul style="list-style-type: none"> • Audi TL-774 C (G11) • VW TL-774 C (G11) • Skoda TL-774 C (G11) • Seat TL-774 C (G11) • GM-OPEL • BMW GS 94000 • Volvo Cars 128 6083/002 • MB 325.0 • MTU - MTL 5048 • MAN 324 Type NF • CATERPILLAR MWM 0199-99-2091/9 • Opel-GM GMW 3420 • Vauxhall GM 6277M (+B040 1065) • Steyr-Daimler Puch N 05045 • Porsche TL-774 C (G11) • Van Hool • Volvo Construction 128 6083 / 002 • Volvo Trucks 128 6083 / 002

CUSTOMER BENEFITS

Protection against corrosion of metals, especially aluminium	<p>GLACELF MDX provides an effective solution to the problems of corrosion affecting all materials used in cooling circuits.</p> <p>GLACELF MDX performs well in the corrosion tests required by the specifications: hot plate and glassware corrosion</p>
Homologation profile compatible with MTU materials	<p>The additives in GLACELF MDX gives the coolant fluid:</p> <ul style="list-style-type: none"> + A reserve of alkalinity (to neutralise the acids resulting from the combustion gases) + A resistance to foaming + A compatibility with hard water (maximum 40°F). <p>The coolant fluids obtained by diluting GLACELF MDX are also inert to elastomeric seals and paints.</p>

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