Havoline Extended Life Corrosion Inhibitor

1 Description

Havoline Extended Life Corrosion Inhibitor (Havoline XLI) is a low-toxic, environmentally friendly inhibitor concentrate. Based on patented carboxylate additive technology, **Havoline XLI** provides long-life corrosion protection in aqueous solutions for all engine metals, including aluminium, iron, copper and solder alloys.

Mixed with the appropriate amount of water, **Havoline Extended Life Corrosion Inhibitor** is recommended as a coolant, flushing fluid or hot test fluid for engine blocks and all cooling systems. During extensive field testing, the synergistic combination of mono- and di-carboxylic additives has proven to provide superior protection for at least **32,000 hours** in marine and stationary applications. The product is compatible with glycol-based engine coolants. It is recommended to change the coolant every five years or at above operating times, whichever comes first.

2 Benefits

Havoline XLI offers a lot of benefits to the engine designer as well as to the user:

- **Extended & superior corrosion protection** by synergistic combination of additives
- **Superior technology** provides more flexibility to engine design
- **Excellent protection** of thermostat, radiator and water pump
- **Reliability** depletion free and stable inhibitor
- **Improved hard water stability** absence of silicates and phosphates
- **Save time and money** maintenance-free inhibitor
- **Environmentally friendly** by using carboxylic additives in the inhibitor package

Havoline XLI provides long-life protection against all forms of *corrosion* by the use of optimized and patented organic corrosion inhibitors. Excellent and lasting high temperature corrosion protection is provided for the **aluminium** heat transfer surfaces contained in modern engines. The inhibitor package of **Havoline XLI** offers excellent cavitation protection even without using nitrite or nitrite-based supplemental coolant additives (SCA's).

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Havoline Extended Life Corrosion Inhibitor

3 Application

Havoline XLI provides long-life corrosion protection. Depending on the actual application the dosage may vary from 5 - 10 % but a minimum of 5 vol. % of **Havoline XLI** in water should be used. **Havoline XLI** may be used with confidence in engines manufactured from cast iron, aluminium or combinations of the two metals, and in cooling systems made of aluminium or copper alloys. The correct dosage of **Havoline XLI** is being checked with a refractometer. Please contact your local Arteco Area Sales Manager for more information.

Havoline XLI is particularly recommended for hi-tech engines like racing cars and heavy duty off-road equipment, where high temperature aluminium protection is important.

- In **marine** application the concentration of **Havoline XLI** should not be lower than 5 vol. %. At this dosage the recommended life-time is at least 32,000 hours. If **Havoline XLI** is replenished regularly to compensate for leakage, the cooling water can be considered as fill for life.
- Small marine engines sometimes require limited frost protection. This can be obtained by using the adequate dosage of **Havoline Extended Life Antifreeze Coolant**, based on ethylene glycol, supplemented with 5 % vol. **Havoline XLI**. For frost protections of -10 and -15°C, the required **Havoline Extended Life Antifreeze Coolant** dosages are respectively 22 and 29 vol. %.
- For **off-road, truck and bus** application the recommended life time is 8,000 hours or 650,000 km, provided a concentration of 7.5 % vol. **Havoline XLI** is used.
- At 7.5 % vol., **Havoline XLI** will provide outstanding corrosion protection in **stationary** engines for at least 32,000 hours.
- **Havoline XLI** can also be used at 10 % vol. as a **hot test liquid** for new engine blocks. Newly manufactured engines are tested for duration of approximately 5 to 10 minutes, after which the fluid is drained and usually reused. If the engine blocks are not immediately built into vehicles, **Havoline XLI** will provide corrosion protection of the empty engine for up to two months.
- At 5 % vol. **Havoline XLI** performs as a **flushing fluid** to clean cooling systems that were filled with other inhibitor packages. In most cases it is required to flush the system twice. For a good result it is important that the engine has reached normal operating temperatures and all thermo-valves are opened.
- **Havoline XLI** can also be applied as an inhibitor package for central heating systems, hydraulic safety fluids and mining fluids.

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The use of soft water is preferred for dilution. Though, lab testing has shown that acceptable corrosion results are still obtained with water of 20°dH, containing up to 500 ppm chlorides or 500 ppm sulfates. The water used for dilution should be free of zinc as presence of zinc will result in the formation of a precipitate.

4 Approvals by OEMs & National Authorities

Havoline XLI has been approved by several engine manufactures and an up-to-date list with approvals is available separately. Even though some OEMs have not yet given a formal approval **Havoline XLI** is suitable for use in the applications as described on the second page.

5 Availability

Havoline XLI is available in bulk and various packages. Please contact your local Arteco Area Sales Manager on availability of packages, dilutions and colours.

In the range of organic additive technology Arteco can offer:

- **Havoline Extended Life Antifreeze Coolant (Havoline XLC)** is the MEG-based coolant concentrate
- **Havoline Extended Life Antifreeze Base (Havoline XLB)** is a MEG-based superconcentrate.
- **Havoline XLC** is obtained by mixing 25 % wt of **Havoline Extended Life Antifreeze Base** with 75 % MEG
- **Havoline Extended Life Antifreeze Coolant – PG (Havoline XLC-PC)** is based on MPG instead of MEG

Separate information bulletins with more details are available for all these different products.

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Havoline Extended Life Corrosion Inhibitor

6 Storage Requirements

The product should be stored above -5°C and preferably at ambient temperatures. Periods of exposure to temperatures above 35°C should be minimized.
Further, it is strongly advised to use new dark containers and not recycled ones. Exposure to direct sunlight might cause discoloration, although the product itself and the properties remain stable.

Havoline Extended Life Corrosion Inhibitor can be stored for minimum 5 years in unopened containers without any effect on the product quality or performance. As with any antifreeze coolant, the use of galvanized steel is not recommended for pipes or any other part of the storage/mixing installation.

7 Toxicity & safety

For Toxicity and Safety Data we refer to the Material Safety Data Sheet. The transport is not regulated. The following labeling applies for the concentrate, but not for dilutions below 15 %: Xn: R 63 (possible risk of harm to the unborn child) and S 36/37 (wear suitable protective clothing and gloves). This product should not be used to protect the inside of drinking water systems against freezing.

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Addendum - Technical information

Chemical and physical properties

	Havoline XLI	method
Inhibitor content	32 % w/w	
Water content	68 % w/w	ASTM D1123
Nitrite, amine, phosphate, borate, silicate	nil	
Colour	Uncoloured	
Specific gravity, 20°C	1.058 typ.	ASTM D1122
pH	9.4 typ.	ASTM D1287
Cloud point	- 15°C typ.	

	5% dilution	method
pH	8.1 typ.	ASTM D1287
Effect on non-metals	no effect	GME 60 255
Hard water stability	no precipitate	VW PV 1426

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Modified ASTM D1384 glassware corrosion tests – 300ppm chloride

	Weight loss in mg/coupon[1]						
	Brass	Copper	Solder	Steel	Cast Iron	Aluminum	AlMn
ASTM D5216 (max)	10	10	30	10	10	30	-
5% Havoline XLI	0.6	0.6	4.5	0.0	0.7	9.8	4.8

1 Weight loss AFTER chemical cleaning acc. to ASTM procedure. Weight gain is indicated by a - sign.

Modified MTU High Temperature corrosion test (2000 W)

test duration, 116 hrs	Weight loss in mg/coupon[2]		
	Cast Iron	Aluminium	
		SAE 329	AlMgSil
5 % Havoline XLI in deionised water - hot coupon	-1.3	9.3	1.8
5 % **Havoline XLI** in FVV water - hot coupon	-9.0	-16.4	40.7

2 Weight loss AFTER chemical cleaning acc. to (shortened) MTU procedure. Weight gain is indicated by a - sign.
3. Reference coolant is a conventional, high quality, silicate-based MEG coolant

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Havoline Extended Life Corrosion Inhibitor

Aging test

To emphasize the corrosion protection offered by **Havoline XLI**, the aging test is conducted under more severe conditions compared to those commonly used in the industry.

Test Conditions	Typical Industry	Havoline
Test duration	169 h	504 h
Fluid content	5.0 l	6.0 l
Pressure	1.5 bar	2.5 bar
Flow	3.0 l/min	3.5 l/min
Heat input	5500 W	5000 W
Temperature in heating vessel	95 °C	115°C
Temperature in cooling vessel	75 °C	95°C
Concentration of coolant in water	40 vol. %	20 vol. %

	Weight loss in g/m² (using Arteco test parameters) [1]						
	Al [2]	AlMn	Cast Iron	Steel	Cu	CuZn	Solder CB
Reference Coolant [3]							
after initial cleaning	82.10	64.02	-2.19	-1.68	3.62	2.90	21.45
after final cleaning	125.01	94.33	-0.36	0.11	4.99	5.66	25.83
Havoline XLI							
after initial cleaning	23.91	27.05	0.52	0.36	1.03	1.13	0.27
after final cleaning	60.16	63.15	0.69	0.40	1.46	1.76	0.52

1. Weight loss AFTER chemical cleaning acc. to (shortened) MTU procedure. Weight gain is indicated by a - sign.
2. Aluminum SAE 329.
3. Reference coolant is a conventional, high quality, silicate-based MEG coolant

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