

# MARLIPAL 24 $C_{12}$ – $C_{14}$ fatty alcohol ethoxylates

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Sasol Performance Chemicals



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## About us

Sasol's Performance Chemicals business unit markets a broad portfolio of organic and inorganic commodity and speciality chemicals. Our business employs about 1300 people in four key business divisions: Organics, Inorganics, Wax and PCASG (Phenolics, Carbon, Ammonia and Speciality Gases). Our offices in 18 countries serve customers around the world with a multi-faceted portfolio of state-of-the-art chemical products and solutions for a wide range of applications and industries.

Our key products include surfactants, surfactant intermediates, fatty alcohols, linear alkyl benzene (LAB), short-chain linear alpha olefins, ethylene, petrolatum, paraffin waxes, synthetic waxes, cresylic acids, high-quality carbon solutions as well as high-purity and ultra-high-purity alumina. Our speciality gases sub-division supplies its customers with high-quality ammonia, hydrogen and CO<sub>2</sub> as well as liquid nitrogen, liquid argon, krypton and xenon gases.

Our products are as individual as the industrial applications they serve, with tailor-made solutions creating real business value for customers. Ongoing research activities result in a continuous stream of innovative product concepts that help our customers position themselves successfully in future markets.

Our products are used in countless applications in our daily lives to add value, security and comfort. Typical examples include detergents, cleaning agents, personal care, construction, paints and coatings, leather and metal processing, hot-melt adhesives, bitumen modification and catalyst support for automotive catalysts and other diverse specialty applications including oil and gas recovery, aroma production, plastic stabilisation, and polymer production. Every day, our researchers explore ways to improve our products and develop innovations that improve the quality of people's lives.

## 1. Introduction

The products of the MARLIPAL 24 series are fatty alcohol polyethylene glycol ethers and belong to the class of nonionic surfactants. The MARLIPAL 24 ethoxylates are prepared from a natural-based C<sub>12</sub>-C<sub>14</sub> fatty alcohol and thus are excellent candidates for use in consumer products such as green and environmental friendly cleaners.

The individual grades in the MARLIPAL 24 series a broad spectrum of properties. In general, the product group is characterized by the following properties:

- High surface activity and detergency
- Synergistic effects with other surfactants
- Good hard water stability
- Chemical stability over a wide pH range
- Produced from a natural-based, renewable raw material
- Low environmental impact as a result of rapid and complete biodegradation

These favourable and widespread properties have opened up numerous fields of application. The MARLIPAL 24 ethoxylates are effective in detergents & cleaners and also in personal care products or in technical applications.

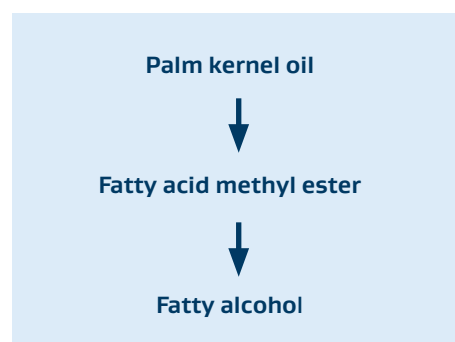
## 2. Product description

### 2.1 Fatty alcohol base

The MARLIPAL 24 ethoxylates are based on a primary linear C<sub>12</sub>–C<sub>14</sub> fatty alcohol. The alcohol is obtained from oleo oils, e.g. palm kernel oil, by transesterification and hydrogenation reaction.

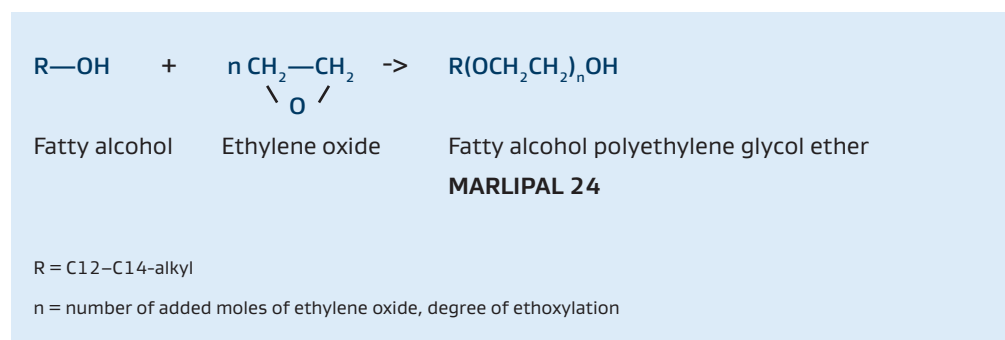
#### Properties C<sub>12</sub>–C<sub>14</sub> fatty alcohol

Origin	Oleo oil
Carbon distribution	(% by weight)
C <sub>10</sub>	max. 1
C <sub>12</sub>	65–75
C <sub>14</sub>	21–28
C <sub>16</sub>	4–8
C <sub>18</sub>	max. 0.5
Molecular weight	ca. 200 g/mol



### 2.2 Preparation of the ethoxylates

The fatty alcohol polyglycol ethers of the MARLIPAL 24 series are formed by reacting the C<sub>12</sub>–C<sub>14</sub> fatty alcohol with varying amounts of ethylene oxide according to the following equation:

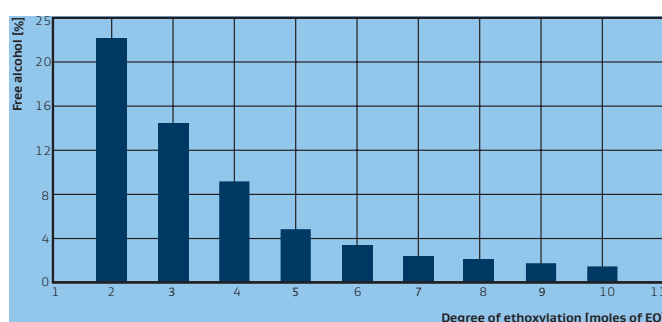


The individual grades differ in the number n of added moles of ethylene oxide and thus in the length of the polyethylene glycol ether chain. The letter n denotes the average degree of ethoxylation, since a whole range of ethoxylation stages is produced during the reaction. The MARLIPAL 24 grades are thus, like all fatty alcohol ethoxylates, mixtures of homologous fatty alcohol polyethylene glycol ethers.

## 2.3 Purity

The MARLIPAL 24 products have a high active content of fatty alcohol polyethylene glycol ethers. Depending on the degree of ethoxylation, the products also contain varying amounts of the starting fatty alcohol. The free fatty alcohol, the proportion of which decreases with increasing degree of ethoxylation, as shown in the diagram, supports the cleaning action of the ethoxylates and contributes to foam regulation.

Content of free alcohol in  
MARLIPAL 24 products



During the ethoxylation, secondary reactions yield polyethylene glycols having the structure  $\text{H}(\text{OCH}_2\text{CH}_2)_n\text{OH}$ . The proportion of polyethylene glycols having varying chain lengths typically is below 2 %. The polydiols are water-soluble products which do not impair the properties of the nonionic surfactants.

To neutralize the alkaline catalyst used for the ethoxylation reaction, MARLIPAL 24 grades are treated with short-chain organic acids (usually acetic acid) and adjusted to a neutral pH range. Accordingly, the ethoxylates contain a small quantity of organic salt and a small amount of water. The water content of the MARLIPAL 24 products is usually less than 0.5 %.

## 2.4 Nomenclature

The MARLIPAL range is classified by a code system which is descriptive of the composition of the surfactant. Accordingly, the extension 24 denotes the  $\text{C}_{12}$ – $\text{C}_{14}$  lauryl/myristyl alcohol content. Numbers after the oblique denote the degree of ethoxylation  $n$ , and 100 % MARLIPAL 24 grades additionally have a zero as the last digit. If, on the other hand, the last digit is a 9, the product contains 90% ethoxylate and 10% of water.

### 3. Product range

The standard product range includes the following MARLIPAL 24 grades:

Product	Chemical characterization	INCI name
MARLIPAL 24/20	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 2 mol EO/mol	Laureth-2
MARLIPAL 24/30	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 3 mol EO/mol	Laureth-3
MARLIPAL 24/40	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 4 mol EO/mol	Laureth-4
MARLIPAL 24/50	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 5 mol EO/mol	Laureth-5
MARLIPAL 24/60	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 6 mol EO/mol	Laureth-6
MARLIPAL 24/70	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 7 mol EO/mol	Laureth-7
MARLIPAL 24/79*	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 7 mol EO/mol	Laureth-7
MARLIPAL 24/90	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 9 mol EO/mol	Laureth-9
MARLIPAL 24/99*	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 9 mol EO/mol	Laureth-9
MARLIPAL 24/100	C <sub>12</sub> –C <sub>14</sub> fatty alcohol + 10 mol EO/mol	Laureth-10

\* 90% supply form

The MARLIPAL 24 ethoxylates are listed in the INCI inventory, the INCI names are shown in the product list.

An overview of the technical data of the MARLIPAL 24 surfactants is given in the table on pages 12 and 13. The product specifications of the MARLIPAL 24 products can be obtained from the current product data sheets.

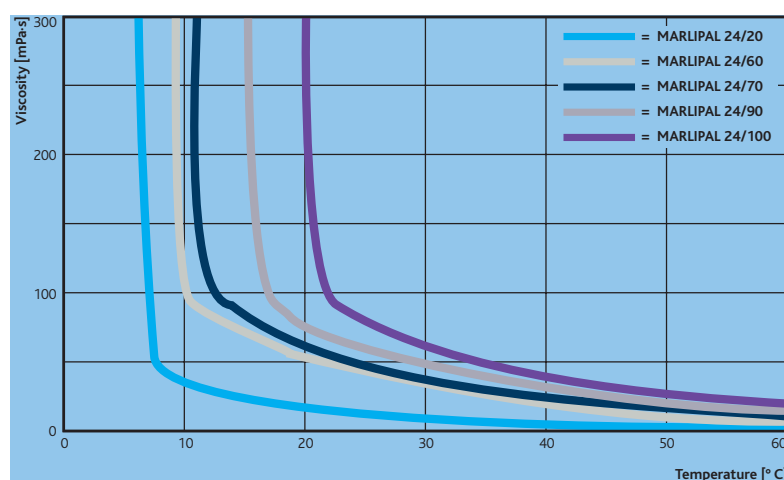


## 4. Technical data

### 4.1 Viscosities

The ethoxylates of the MARLIPAL 24 series with short EO chains are liquid with low viscosity at room temperature. Within this product series the viscosity increases continuously with increasing degree of ethoxylation. The viscosities measured at 20° C and 50° C according to Brookfield method are given in the table on pages 12 and 13.

The temperature dependent viscosity at a constant shear rate is shown in the diagram. The viscosity of the water free MARLIPAL 24 ethoxylates increases rapidly at lower temperatures.



Temperature vs. viscosity at a shear rate of  $D=10 \text{ 1/s}$









Rotary viscometer with plate-plate geometry according to DIN 53018

4.2 Solubility in water, gel formation

Solubility in water

The solubility of the MARLIPAL 24 alcohol ethoxylates is determined by the chain length of the water soluble ether chain. Accordingly the solubility increases with increased degree of ethoxylation. The lower ethoxylates (2–4 moles EO) are only sparingly soluble in water as these molecules are dominated by the hydrophobic alcohol part. They are soluble in non-polar organic solvents and can be applied therefore as emulsifiers. The higher ethoxylates are readily soluble in water and they are used predominantly for cleaning applications.

The solubility behaviour of MARLIPAL 24 surfactants in dilute, aqueous solutions is shown in the photo below.

MARLIPAL 24/20	MARLIPAL 24/30	MARLIPAL 24/40	MARLIPAL 24/50	MARLIPAL 24/60	MARLIPAL 24/70	MARLIPAL 24/90	MARLIPAL 24/100
							
cloudy	cloudy	cloudy	cloudy	slightly opaque	clear	clear	clear

Appearance of a 1% solution of MARLIPAL 24 surfactants in deionized (D.I.) water at room temperature.



### Gel formation with water

Mixtures of water and alcohol ethoxylates like the MARLIPAL 24 surfactants can cover a wide range of viscosities from free flowing liquids to solid gels depending on the amount of water added. The gel phases typically occur at medium concentrations and can have significant stability when water is added. When diluting MARLIPAL 24 products to lower concentrations it is recommendable to avoid these gel phases during processing. This can be achieved by adding the nonionic surfactant to water, to use warm water and to stir well. Additional solvents, for example alcohols, but also salts and other electrolytes can help to suppress gel formation.

The viscosity profile of MARLIPAL 24 grades is shown in the table. At very high surfactant concentrations (10% water) and at relatively low concentrations below approximately 30% surfactant (70% water), the mixtures of the higher ethoxylates are homogeneous and clear. In the middle concentration range, on the other hand, the MARLIPAL 24 products form pastes or gels which may be clear or cloudy.

The diagram, which is only intended as a guide to possible physical states of mixtures with water, shows that the addition of 10% of water to the MARLIPAL 24 grades always gives a homogeneous and clear product. This fact is taken into account in our sales products MARLIPAL 24/79 and 24/99.

Physical states of aqueous solutions at 20° C, viscosity profile and appearance of gel phases	Water in %										
	MARLIPAL	0	10	20	30	40	50	60	70	80	90
24 /20		■	■	●	●	●	●	●	●	●	■
24 /30		■	■	■	■	■	■	■	■	■	■
24 /40		■	■	■	■	■	■	■	■	■	■
24 /50		■	■	■	■	■	■	■	■	■	■
24 /60		■	■	■	■	■	■	■	■	■	■
24 /70		■	■	■	■	■	■	■	■	■	■
24 /90	◆	■	■	■	■	■	■	■	■	■	■
24 /100	◆	■	■	■	■	■	■	■	■	■	■
■ = liquid    ■ = gel    ● = paste    ◆ = solid											

### 4.3 Cloud points

The cloud point is a leading parameter for characterizing nonionic surfactants and can be determined by a simple test method, described e.g. in DIN EN 1890.

At a certain temperature, the initially clear solution of an ethoxylate becomes cloudy because a water-immiscible surfactant phase is formed. This process is reversible, i.e. upon cooling, the solution clarifies again at the same temperature.

The temperature, at which this clouding occurs, is specific for each ethoxylate and is referred to as the cloud point of the surfactant.

The phenomenon of the cloud point can be explained as follows: the solubility of the ethoxylates in water is based on hydration of the oxygen atoms via hydrogen bonds. Since this hydration decreases with increasing temperature, the solubility of the ethoxylates in water decreases accordingly.

The cloud point is a function of the surfactant concentration and is usually determined using 1% or 2% surfactant solutions. If the ethoxylate is insoluble or only sparingly soluble in water, the cloud point can also be determined in aqueous butyl diglycol solution.

The cloud points of MARLIPAL 24 products are listed in the table.

#### Cloud point in °C according to DIN EN 1890

MARLIPAL	10% in 25% butyldiglycol solution	5g + 25g of 25% butyldiglycol solution	1% in D.I. water	2% in D.I. water	2% in 10% NaCl solution	1% in 5% NaCl solution
24/20	49–51	ca. 37	—	—	—	—
24/30	59–61	ca. 51	—	—	—	—
24/40	66–68	ca. 62	—	—	—	—
24/50	72–74	ca. 70	ca. 22	ca. 21	—	—
24/60	76–78	ca. 75	ca. 42	ca. 42	ca. 22	ca. 31
24/70	ca. 79	ca. 78	ca. 54	53–56	ca. 33	ca. 43
24/79						
24/90	ca. 84	ca. 84	ca. 82	81–83	ca. 54	ca. 65
24/99						
24/100	ca. 86	ca. 86	ca. 94	ca. 94	ca. 64	ca. 78

## 4.4 Surface activity

One of the most characteristic properties of surface active agents like the MARLIPAL 24 ethoxylates is their ability to reduce the surface tension of water. The MARLIPAL 24 ethoxylates provide an excellent surface tension reduction already at low concentrations. Adding MARLIPAL 24 ethoxylates the surface tension of water of 72 mN/m can be reduced to values below 30 mN/m. The table gives the surface activity at different concentrations in an aqueous solution.

Surface tension (in mN/m,  
at 25° C in D.I. water)

	Surfactant concentration		
	0.01 g/l	0.1 g/l	1.0 g/l
MARLIPAL 24/30	28.0*	26.0*	25.5*
MARLIPAL 24/40	28.5*	26.5*	26.5*
MARLIPAL 24/50	29.0*	26.5*	26.5*
MARLIPAL 24/60	29.5*	27.5*	27.5*
MARLIPAL 24/70	30.0	28.0	28.0
MARLIPAL 24/90	33.0	31.0	31.0
MARLIPAL 24/100	35.5	33.5	33.5

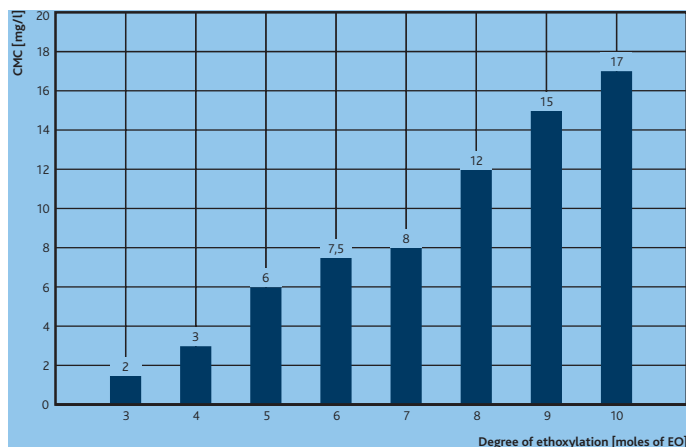
Ring method according to DIN EN 14370

\* Turbid solution, may lead to less accurate results

### Critical micelle concentration

The critical micelle concentration (CMC) is a further characteristic property of a surfactant. The CMC is the concentration at which single surfactant molecules start to build micellar aggregates. The MARLIPAL 24 surfactants show CMC values from 2 mg/l up to values around 20 mg/l. The diagram below shows that the CMC increases in dependence to the ether chain length and increasing water solubility.

CMC in dependence  
to the ether chain length



## 4.5 Technical data of MARLIPAL 24 products

### Product name

MARLIPAL		24/20	24/30	24/40
Chemical composition	$C_{12}-C_{14}$ fatty alcohol + n mol EO/mol	n = 2	n = 3	n = 4

### Technical data

Appearance at 20° C			liquid, clear to turbid	liquid, clear to turbid	liquid, clear to turbid
Iodine colour number	mg I/100 ml		—	—	max. 2
APHA no.	mg Pt/l		<25	< 50	—
Cloud point	10% in 25% BDG solution	° C	49–51	59–61	66–68
	2% in D. l. water	° C	—	—	—
pH value	2% in D. l. water		5–7	5–7	5–7
Density	at 20° C	g/ml	—	—	—
	at 50° C	g/ml	ca. 0.88	ca. 0.91	ca. 0.93
Refractive index n 20/D			—	—	—
Refractive index n 50/D			ca. 1.438	ca. 1.441	ca. 1.443
Solidification temperature <sup>1)</sup>		° C	ca. 4	ca. 4	ca. 4
Viscosity	at 50° C	mPa·s	10	11	13
(Brookfield)	at 20° C	mPa·s	25	30	35
Water	% by weight		max. 0.1	max. 0.5	max. 0.5
Polyethylene glycol	% by weight		max. 2	max. 2	max. 2
EO content (calculated)	% by weight		31.2	40.5	47.5
HLB value (calculated)	$\frac{20 \times \text{MW hydrophilic}}{\text{MW total}}$		6.2	8.1	9.5
OH value	mg KOH/g		ca. 200	ca. 174	ca. 148

Specifications of MARLIPAL 24 products are given in the current product data sheets.



24/50	24/60	24/70	24/79	24/90	24/99	24/100
n = 5	n = 6	n = 7	n = 7	n = 9	n = 9	n = 10
liquid, clear to turbid	liquid, turbid	liquid, turbid	liquid, clear to turbid	pasty, solid	liquid, turbid	solid
max. 2	max. 2	max. 2	max. 2	max. 2	max. 2	max. 2
—	—	—	—	—	—	—
72–74	76–78	—	—	—	—	—
—	—	53–56	53–56	81–83	81–83	ca. 94
5–7	5–7	5–7	5–7	5–7	5–7	5–7
—	—	—	ca. 0.98	—	ca. 1.0	—
ca. 0.96	ca. 0.97	ca. 0.97	—	ca. 0.98	—	ca. 0.99
—	—	—	ca. 1.449	—	ca. 1.452	—
ca. 1.445	ca. 1.446	ca. 1.447	—	ca. 1.449	—	ca. 1.450
ca. 8	ca. 15	ca. 15	ca. 5	ca. 18	ca. 8	ca. 21
15	18	20	29	27	36	30
43	48	57	100	—	120	—
max. 0.5	max. 0.5	max. 0.5	ca. 10	max. 0.5	ca. 10	max. 0.5
max. 2	max. 2	max. 2	max. 2	max. 2	max. 2	max. 2
52.9	57.6	61.3	61.3	67.1	67.1	69.2
10.6	11.5	12.3	12.3	13.4	13.4	13.8
ca. 134	ca. 123	ca. 112	—	ca. 94	—	ca. 83

1) Determination under laboratory conditions (see Section 4.7)

## 4.6 HLB values

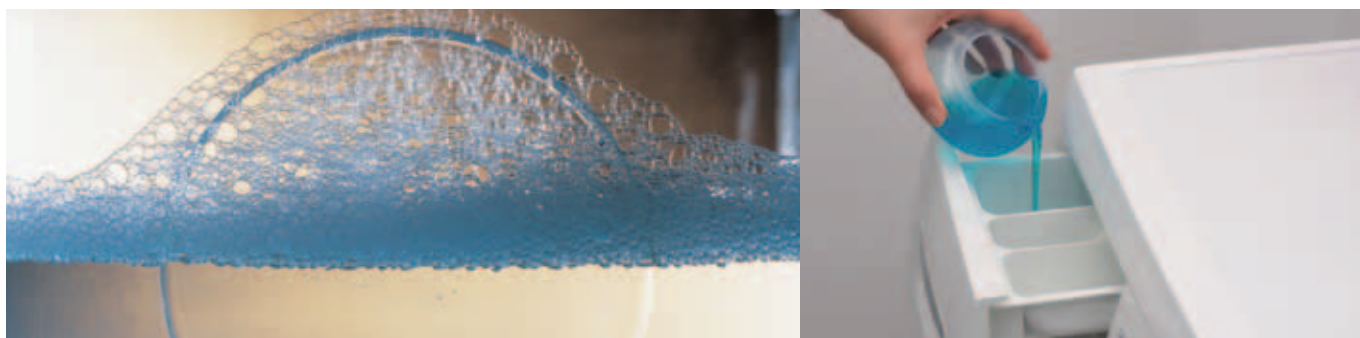
According to Griffin the hydrophilic-lipophilic balance (HLB) value of a surfactant is described by the ratio of the hydrophilic EO chain to the lipophilic alcohol part in the surfactant molecule and simplifies the selection of emulsifiers for a given product series.

The MARLIPAL 24 product series provides ethoxylates with HLB values in a broad range from HLB = 6.2 (MARLIPAL 24/20) to HLB = 13.8 (MARLIPAL 24/100). The HLB values of the individual ethoxylates are given in the table on pages 12 and 13.

## 4.7 Solidification temperatures

The solidification temperatures of the MARLIPAL 24 ethoxylates increase with increasing degree of ethoxylation. The 90% supply forms have significantly lower solidification points compared to the neat products.

The solidification temperatures measured under laboratory conditions are given in the table on pages 12 and 13. The ethoxylates were slowly cooled down with gentle stirring until solidification occurred. If, however, the products are stored for an extended period, e.g. in containers or storage tanks, the solidification temperatures may be higher due to crystallisation processes. Therefore, given solidification points are intended as guide information only.



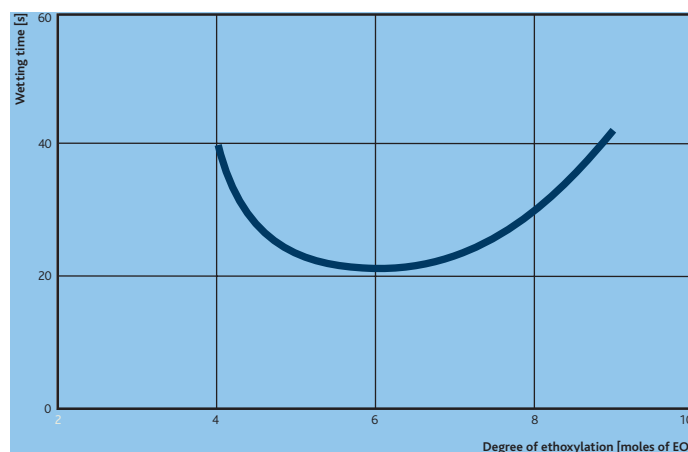
## 5. Performance properties

### 5.1 Wetting efficiency on textiles

In modern detergents, the surfactants are the active force which removes grease, soiling and pigment particles from the fibres. The wetting efficiency on textiles is therefore an important criterion for assessing the performance of a surfactant.

The products of the MARLIPAL 24 series provide excellent wetting performance on textiles, the best values being observed for MARLIPAL 24/40 to MARLIPAL 24/90. The wetting effect, which, in accordance to DIN EN 1772, corresponds to the time taken for a cotton disc to sink in aqueous solution, is shown as a function of the degree of ethoxylation. The shorter the sinking time, the better the wetting efficiency

Wetting efficiency on textiles  
Cotton disc method,  
20°C, 1 g/l in D.I. water



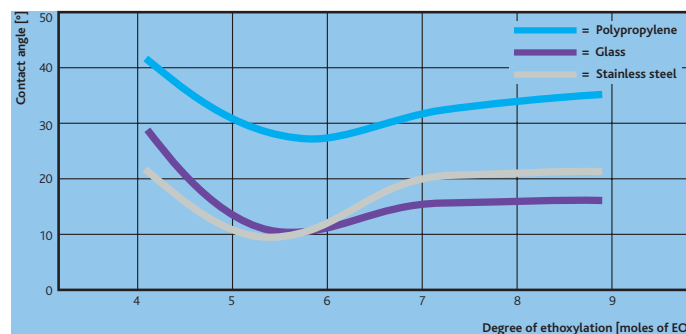
### 5.2 Wetting efficiency on hard surfaces

The wetting performance on hard surfaces such as glass, steel and plastics can be assessed by contact angle measurements. The contact angle indicates how far a droplet of a surfactant solution spreads on the given surface. The lower the contact angle the better the wetting efficiency on the surface. Hydrophobic surfaces like polypropylene are usually more difficult to wet with water than hydrophilic surfaces like glass. The MARLIPAL 24 grades show an excellent reduction of the contact angles on all surfaces. The performance is a function of the ether chain length and usually one will find a performance optimum at medium EO chain length.

The contact angles of MARLIPAL 24 surfactants dissolved in water with a concentration of 1 g/l are displayed on three different surfaces in dependence of the glycol ether chain length. The best wetting performance is found for the MARLIPAL 24 ethoxylates with 5 to 7 moles EO.

Contact angles of MARLIPAL 24 grades on hard surfaces

Sessile drop method, 1 g/l in D.I. water, 25° C, 50% humidity



The optimum cleaning performance on hard surfaces requires a balanced performance in wetting for ease of cleaning and emulsification properties to avoid dirt redeposition. The MARLIPAL 24 grades with medium EO chain length offer the required performance profile for cleaning.

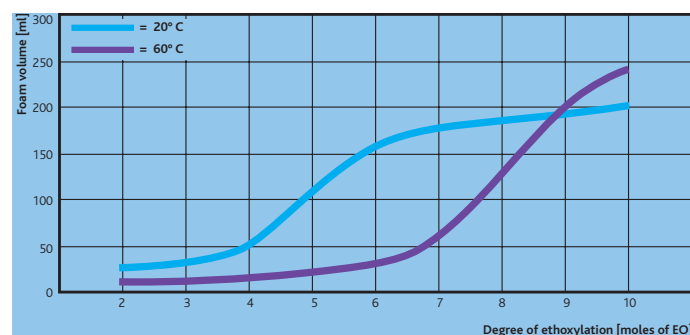
### 5.3 Foaming profile

The MARLIPAL 24 ethoxylates are moderately foaming surfactants. The foaming profile has been determined by the Schlag foam method (DIN EN 12728) and is shown in the figure below.

The MARLIPAL 24 ethoxylates with higher EO-content produce foam volumes of 150-250 ml in this test, whereas the low mole product grades of lower solubility in water develop significantly less foam. The foaming profile is well within the typical range of fatty alcohol ethoxylates.

Foaming profile

Schlagfoam method 1 g/l in D.I. water, 20° C and 60° C



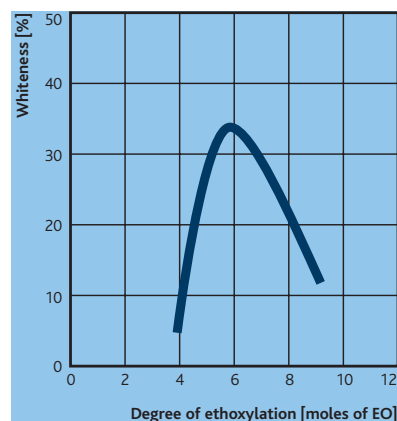


In comparison, an anionic surfactant such as linear alkyl benzene sulphonate (LAS) produces a foam volume of approximately 600 ml in this standard test. The moderate foaming profile makes MARLIPAL 24 ethoxylates excellent candidates for fabric detergents and hard surface cleaners. The “controlled” foaming profile needed for front loader washers can be achieved by using a smart combination of the anionic surfactants and MARLIPAL 24 ethoxylates.

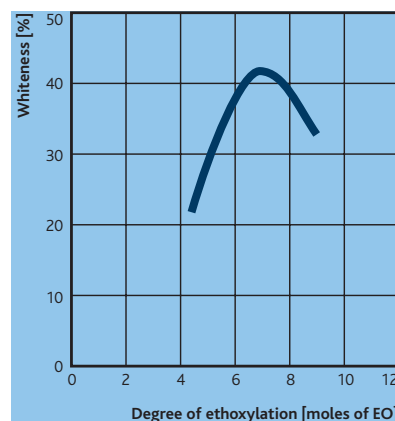
## 5.4 Detergency on textiles

The MARLIPAL 24 surfactants have excellent detergency properties both on synthetic and natural fabrics. The detergency performance was determined in Linitest laboratory washing machines with pigment/sebum soiling. The ethoxylates with 6-7 EO showed an optimum in detergency performance.

Detergency on polyester fabrics at 30° C



Detergency on cotton fabrics at 60° C



### Washing Conditions

Linitest laboratory washing machine

Test soiling	Pigment/sebum
Surfactant concentration	1 g/l
Water hardness	13° German hardness
Washing liquor	250 ml
Liquor ratio	1:80
Washing cycles	3

## 6. Applications

The MARLIPAL 24 ethoxylates have a diversity of end-uses. In particular the excellent wetting behaviour and cleaning performance opens the way for broad use.

MARLIPAL 24 surfactants are excellent candidates for use in consumer products such as environmental friendly cleaners. Since many cosmetic products preferably contain natural-based raw materials, oleo-

based MARLIPAL ethoxylates are an ideal ingredient for personal care articles. Moreover the MARLIPAL 24 surfactants are effective in I&I cleaners and in chemical-industrial products, such as auxiliaries for textile production. Furthermore, the low mole ethoxylates MARLIPAL 24/20 and MARLIPAL 24/30 are important intermediates for the industrial production of alcohol ether sulphates.

### 6.1 Fabric care

- Laundry powders
- Laundry tablets
- Laundry liquids
- Pre-treatment agents

### 6.2 Home care

- All-purpose cleaners
- Bathroom cleaners
- Sanitary cleaners
- Dishwashing liquids

### 6.3 I & I cleaners

- Janitorial products
- Vehicle cleaners

### 6.4 Personal care products

- Shampoos
- Shower gels
- Cosmetic cleaning emulsions

## 6.5 Chemical-industrial applications

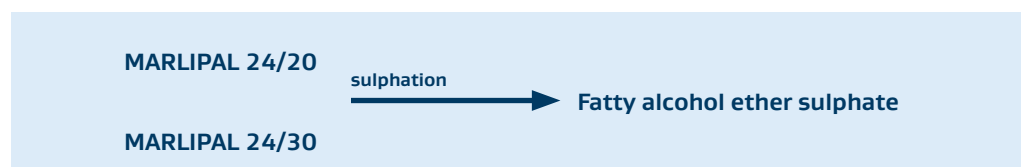
- Auxiliaries for textile production and leather processing
- Emulsions for technical processes



## 6.6 MARLIPAL 24 as intermediates for ether sulphates

The low mole ethoxylates MARLIPAL 24/20 and MARLIPAL 24/30 are versatile feedstocks for the industrial production of alcohol ether sulphates.

By sulphation reaction with  $\text{SO}_3$  gas and subsequent neutralisation, the ethoxylates are transferred into the ether sulphates:



The ether sulphates are anionic surfactants and are used as mild and foaming surfactants in personal cleansing products, dishwashing detergents and numerous other cleaning products.

Alcohol ether sulphates manufactured from MARLIPAL 24/20 feedstock are marketed from Sasol Performance Chemicals under the trade names MARLINAT 242.

## 6.7 Guideline formulations

For the formulator, MARLIPAL 24 ethoxylates are versatile building blocks for detergent compositions. By combining with other surfactants, e.g. anionics or cationics, it is possible to achieve synergistic and performance enhancing effects. It is advantageous that the MARLIPAL ethoxylates have a good hard water stability and are chemically stable over a wide pH range both in an acidic and in an alkaline medium.

Guideline formulations are given below to illustrate some of the many possible

applications of MARLIPAL ethoxylates in detergents and cleaning products.

A major application is in laundry powders and liquid detergents. In European laundry liquids (HDL) alcohol ethoxylates typically are present with 10–25%. In all-purpose and bathroom cleaners ethoxylates are used as primary surfactants due to excellent grease removal properties and the moderate foam level when compared to anionics.



**Laundry liquid** (ca. 25% surfactant actives)

MARLON AS3 (LAS, Sasol Germany GmbH)	6%
MARLIPAL 24/70	12%
Coconut fatty acid	6%
MARLOQUEST L235M	1%
(Soil release polymer, Sasol Germany GmbH)	
Potassium hydroxide solution (50%) to pH 8.5	ca. 5%
Sodium citrate dihydrate	3%
Phosphonate (HEDP, 30%)	1.5%
1,2-propylene glycol	3%
Ethanol	4%
Water, dye, enzyme, perfume, preservative	add to 100%

HDL for 30° C, 40° C, and 60° C washes

**Concentrated laundry liquid** (ca. 40% surfactant actives)

MARLIPAL 24/70	20%
MARLON AS3	10%
Coconut fatty acid	10%
Potassium hydroxide solution (50%)	ca. 9.3% to pH 8.5
Sodium citrate dehydrate	3%
Phosphonate	2%
1,2-Propylene glycol	5%
Ethanol	2%
Water, enzymes, dye, perfume, preservative	add to 100%

Detergent for 30° C, 40° C, and 60° C washes

**All-purpose cleaner, concentrate**

MARLIPAL 24/70	7%
MARLON AS3 (LAS)	3%
MARLINAT 242/70	4%
(Lauryl ether sulphate, Sasol Germany GmbH)	
Coconut fatty acid	1%
Sodium citrate dihydrate	1%
Sodium hydroxide solution (50%) to pH 9	ca. 1%
Isopropanol	2%
Water, perfume, dye, preservative	add to 100%

For heavy soiling, use as is.

**Floor cleaner**

MARLON A350	4%
(Dodecylbenzene sulphonate, Sasol Germany GmbH)	
MARLINAT 242/28	2%
(Lauryl ether sulphate, Sasol Germany GmbH)	
MARLIPAL 24/70	1.5%
Isopropanol	15%
LIPOXOL 4000	3%
(Polyethylene glycol, Sasol Germany GmbH)	
Sodium citrate dihydrate	1%
Water, perfume, preservative	add to 100%

Recommended dosage:

dilute 1:20 to 1:100 according to degree of soiling.

**Bathroom cleaner**

MARLIPAL 24/99	3.5%
Citric acid	2%
Sodium hydroxide solution, 30%	0.3%
Isopropanol	4%
Water, perfume, dye, preservative	add to 100%

Acid spray cleaner with limescale removing properties

**Mild shower gel**

MARLINAT 242/70 C	16.5%
Cocoamidopropyl betaine (30%)	13%
Laureth-3	3%
Dicaprylyl ether	2%
D-Panthenol	1%
Water, sodium chloride, dye, perfume, preservative	add to 100%

Mild shower gel with refatting properties

## 7. Product safety and environmental impact

MARLIPAL 24 surfactants meet the high European environmental and handling safety standards. No long term effects have been reported after many years of experience in various applications. Since the ethoxylates are prepared from a natural linear alcohol, they are notable for rapid and complete biodegradation.

The MARLIPAL 24 ethoxylates show low to moderate oral toxicities. In view of their irritant action on skin and mucosa, safety precautions, such as skin and eye protection, have to be observed when handling the ethoxylates.

Precise information on safe handling, labelling, and toxicological and environmental classification of the individual grades is given in the Material Safety Data Sheets that are available on request.



## 8. Storage and processing

MARLIPAL 24 ethoxylates are stable products, which will maintain product quality for a long period of time if properly stored. The bulk products can be stored in stainless steel tanks (steel grade 1.4541 or 1.4571), which must be heatable for the higher range ethoxylates. For bulk storage we recommend a minimum storage temperature of 30-40° C, even for the lower ethoxylated grades MARLIPAL 24/20 and MARLIPAL 24/30.

If the MARLIPAL 24 products are stored at a low temperature they may turn cloudy, solidify or form layers. It is therefore advisable to heat and thoroughly mix the contents of drums or containers before partially draining some of the contents, in order to obtain a homogeneous product.

Overheating is a key variable that could have an adverse effect on product quality, e.g. on colour quality. Care should be taken, therefore, to store the product at the proper temperature and to use a heating medium that does not produce excessive localized temperature. It is generally recommended that MARLIPAL 24 products should not be stored at temperatures above 50° C for extended periods. It is best to store the individual products at the lowest temperature necessary to keep them fluid enough to pump and process.

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