PCC

Paints and Coatings

Local. Global. Integrated.


Operating in 17 countries, in 39 different locations, PCC SE currently employs over 3 300 people.

About Us

The PCC Group is an international capital structure made up of dozens of companies operating in three major sectors of the economy. Chemicals, Energy and Logistics. The organisations within the PCC Group are both business units engaged in production activities and service companies operating simultaneously for the external market. The PCC Group is centrally managed by the German company PCC SE and comprises more than 74 companies at 39 locations in 17 countries around the world. One of the key elements of PCC SE's strategy is the dynamic development of the chemicals business by exploiting the potential of new market segments and diversifying the portfolio of raw materials and chemical formulations in line with current trends in various industries. Every day, our specialists work on the stable growth and development of their organisations, making the PCC Group stronger and building a solid business platform for all contractors interested in reliable and long-term cooperation.

PCC ROKITA SA
PCC PCG OXYALKYLATES
IRPC

Polyols

- Polyether polyols
- Polyester polyols
- Prepolymers
- Polyurethane Systems

PCC ROKITA SA

Chlorine

- Chlorine
- MCAA
- Other Chlorine Downstream Product

PCC ROKITA SA

Phosphorus

- Phosphorus derivatives
- Naphthalene derivatives
- Polycarboxyethers (PCE)

PCC EXOL SA
PCC CHEMAX INC
PCC PCG OXYALKYLATES

Surfactants

- Anionic surfactants
- Cationic surfactants
- Nonionic surfactants
- Amphoteric surfactants (betaines)
- Chemical formulation

PCC SYNTEZA

Alkylphenols

- Nonylphenol
- Dodecylphenol
- Tristyrylphenol

PCC CONSUMER PRODUCTS SA

Consumer Products

- Household & industrial Cleaners, Detergents and Personal Care Products

PCC ROKITA SA

Energy

- Renewable Energy
- Conventional Energy

PCC INTERMODAL SA

Logistics

- Intermodal transport
- Road Haulage
- Rail Transport

PCC BAKKISILICON HF.

Silicon

- Microsillica
- Silicon Metal

PCC SE

Holding & Projects

- Portfolio Management
- Project Development


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The high quality and chemical purity of PCC Group products guarantees stability and repeatability of production processes for our customers.

Introducion

We provide professional, high quality additives for the paint and coating industry.

One of PCC Group's objectives is to solve prob-lems that occur in the formulation of paints and coatings. We offer technical support for all of our customers, no matter how large or small. Thanks to the use of our additives and PCC Group's technical support, we can provide optimal solutions to our customers from the paint and coating industry.

Paints

Many structures around us in our everyday life are coated with a proper type paint. The main reasons for using these coatings are decorative function and surface protection.

Coating products have a long history and modern coatings have many functions. The fundamental components of a typical coating product include polymer resin, pigments and fillers, as well as a dispersing medium.

The polymer resin is responsible for creating a homogenous coating which results in the permanent coverage of the coated surface. Pigments and fillers provide colour and suitable hiding power when creating non-transparent coats. A dispersing medium, which may be water or an organic solvent, is necessary to dissolve or dilute the resin and to disperse the pigment in order to make the product's manufacture and its application easier.

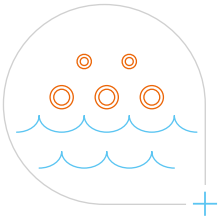
In order to assure the paint's proper stability and its functional properties, it is necessary to use auxiliary compounds. Their concentration is usually a seemingly insignificant 0.01-5.0% of the total formulation, but they have an strong influence on the applicability of paint products.

The group of compounds include:
- dispersing and wetting agents
- rheology modifiers
- defoamers
- surface improving additives
- humectants
- other (biocides, gloss improving agents, adhesion improving agents, UV stabilisers and others).

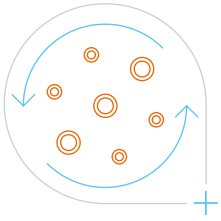
01 / Wetting and dispersing additives

The best quality high gloss coats and high feature coverage power, with perfectly dispersed pigments, require an optimal size of pigment particles as well as long-term stabilisation of dispersed particles in the composition of the whole formulation. The pigment dispersing process, performed in order to create a stable, timely suspension with paint or ink formulations, consists of three stages:

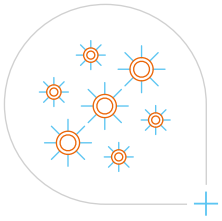
Pigment wetting
all of the air is removed from the surface of pigment and from the space between the pigment, as well as from pigment agglomerates, and is replaced by the resin solution. The pigment/air interface is transformed into a solid/liquid (pigment/resin solution).



Pigment grinding (pigment milling)
through mechanical energy (impact and shear forces), the pigment agglomerates are broken up and disrupted into smaller particles and dispersed (uniformly distributed).



Stabilisation of the pigment suspension
pigment dispersion is stabilised by dispersing agents in order to prevent the formation of flocculates and agglomerates. The resultant suspension is stabilised due to the adsorption of the binder or dispersing agents on the pigment's surface.



The choice of a more efficient dispersing agent is strongly related to the chemical nature of the pigment (organic or inorganic pigments) and the type of applied resin.

Product name	Active, %	Solvent	Description	Features and benefits	Dosage	WB	SB	IN	OR
EXOdis PC40	42 – 44	water	poliacrylic acid, sodium salt	standard dispersing agent for inorganic pigments, especially for TiO2 and mineral fillers, excellent dispersing properties	0.1-0.6% in coatings; 5.0-15.0% in pigment concentrate for inorganic pigments	●		●	
EXOdis PC40A	42 – 46	water	poliacrylic acid, ammonium salt	standard dispersing agent for inorganic pigments, especially for TiO2 and mineral fillers, excellent dispersing properties	0.1-0.6% in coatings; 5.0-15.0% in pigment concentrate for inorganic pigments	●		●	
EXOdis PC540i	38 – 42	water	acrylic copolymer, sodium salt solution	hydrophobized dispersing agent for inorganic pigments, especially for TiO2 and mineral fillers, improves water resistance	0.1-1.5% in coatings	●		●	
EXOdis PC540P	min. 90	water	acrylic copolymer, sodium salt solution	hydrophobized dispersing agent for inorganic pigments, especially for TiO2 and mineral fillers, improves water resistance	0.1-0.5% in coatings	●		●	
EXOdis PC540A	24 – 26	water	acrylic copolymer, ammonium salt solution	hydrophobized dispersing agent for inorganic pigments, especially for TiO2 and mineral fillers, improves water resistance	0.2 - 2.0% in coatings	●		●	
EXOdis PC105	49 – 51	water	mixture of W&D agents with anionic character	in pigments concentrates wetting and dispersing agent for inorganic pigments mainly, in WB/ SB coatings to improve colour acceptance	5.0-10.0% active in pigment concentrate for inorganic pigments	●		●	
EXOdis PC185	min. 99	–	nonionic mixture of W&D agents	wetting agent for inorganic pigments and fillers in white paints, excellent synergy with polyacrylates	0.1 – 0.5 % in coatings	●		○	○
EXOdis PC416	88 – 91	water	nonionic wetting and dispersing agent with pigment affinic groups	in WB pigments concentrates wetting and dispersing agent for organic pigment and carbon black, dedicated for POS and in-plant colourant; product provides excellent tinting strength and colour stability of colourant	5.0-30.0% active in pigment concentrate for organic pigments and carbon blacks	●			●
EXOdis PC417	min. 99	–	phosphate ester with pigment affinic groups	in WB pigments concentrates wetting and dispersing agent for organic pigment and carbon black, dedicated for POS and in-plant colourants; product provides excellent tinting strength and colour stability of colourant	5.0-30.0% active in pigment concentrate for organic pigments and carbon blacks	●		○	●
EXOdis PC418	min. 97.5	–	phosphate ester with pigment affinic groups, alkylamonium salt	in WB pigments concentrates wetting and dispersing agent for organic pigment and carbon black, dedicated for POS and in-plant colourants; product provides excellent tinting strength and colour stability of colourant	5.0-30.0% active in pigment concentrate for organic pigments and carbon blacks	●		○	●
EXOdis PC480	79 – 81	water	phosphate ester with pigment affinic groups, alkylamonium salt	in WB pigments concentrates wetting and dispersing agent for organic pigment and carbon black, dedicated for POS and in-plant colourants; product provides excellent tinting strength and colour stability of colourant	5.0-30.0% active in pigment concentrate for organic pigments and carbon blacks	●		○	●
EXOdis PC440	88 – 91	water	nonionic, vegetable oils alkoxylated	in WB pigments concentrates wetting and dispersing agent for organic pigment, gives low viscosity and let for very high pigment load; in WB coatings to improve compatibility with organic pigments; product based on natural and sustainable feedstock	5.0-25.0% active in pigment concentrate for organic pigments; 0.1 ÷ 1.0% in ready-to-use paint formulation	●			●
EXOdis PC950	88 – 91	water	nonionic dispersant	in pigments concentrates wetting and dispersing agent for organic pigment, in WB coatings to improve compatibility with organic pigments wide compatibility with most of WB resins, for Uni POS colourants	5.0-25.0% in pigment concentrate for organic pigments; 0.1 ÷ 1.0% in ready-to-use paint formulation	●			●
ROKAdis 900	min. 98.5	–	anionic, phosphate ester of fatty alcohols ethoxylated	in pigments concentrates wetting and dispersing agent for inorganic pigments mainly, in WB/SB coatings to improve colour acceptance, in combination with PC950 for Uni POS colourants	5.0-10.0% active in pigment concentrate for inorganic pigments	●		●	

Product name	Active, %	Solvent	Description	Features and benefits	Dosage	WB	SB	IN	OR
EXOdis PC800	78 – 82	water	mixture of W&D agents	in pigments concentrates universal wetting and dispersing agent for inorganic and organic pigments, provides very good compability with WB and SB coatings; for production of Uni POS colourants; product based on natural and sustainable feedstock	5.0-10.0% active in pigment concentrate for inorganic pigments 5.0-25.0% active in pigment concentrate for organic pigments	●	○	●	●
EXOdis PC250	34 - 36	water	mixture of surface-active polymers	in pigments concentrates wetting and dispersing agent for carbon blacks and organic pigments; especially recommended for resin-containing colourants	1.0% - 5.0 % in resin-containing pigment concentrates 5.0-25.0 % active in pigment concentrate for organic pigments	●			●
EXOdis PC220	min. 99	–	polyether copolymer	dispersing agent for organic pigments and carbon black in SB systems especially for high and medium polarity systems	1.0% - 10% in coatings		●		●
EXOdis PC230	min. 97	–	phosphate ester	specifically designed for dispersing and stabilising inorganic particle dispersions in SB systems, especially for high and medium polarity systems; also recommended as dipersing agent for pigments concentrates in polyols for PU systems	5.0-10.0% active in pigment concentrate for inorganic pigments		●	●	

● highly recommended
○ suitable

WB - waterborne
SB- solventborne

IN - inorganic pigments
OR - organic pigments

EXOdis PC540i – new hydrophobic polymeric dispersing agent for water-borne coating systems

Key features:

- 40% solution of hydrophobic anionic dispersant in water
- APEO-free
- VOC-free
- for WB Acrylic 1K anticorrosion matt/gloss
- for Inorganic pigments and fillers

Key benefits:

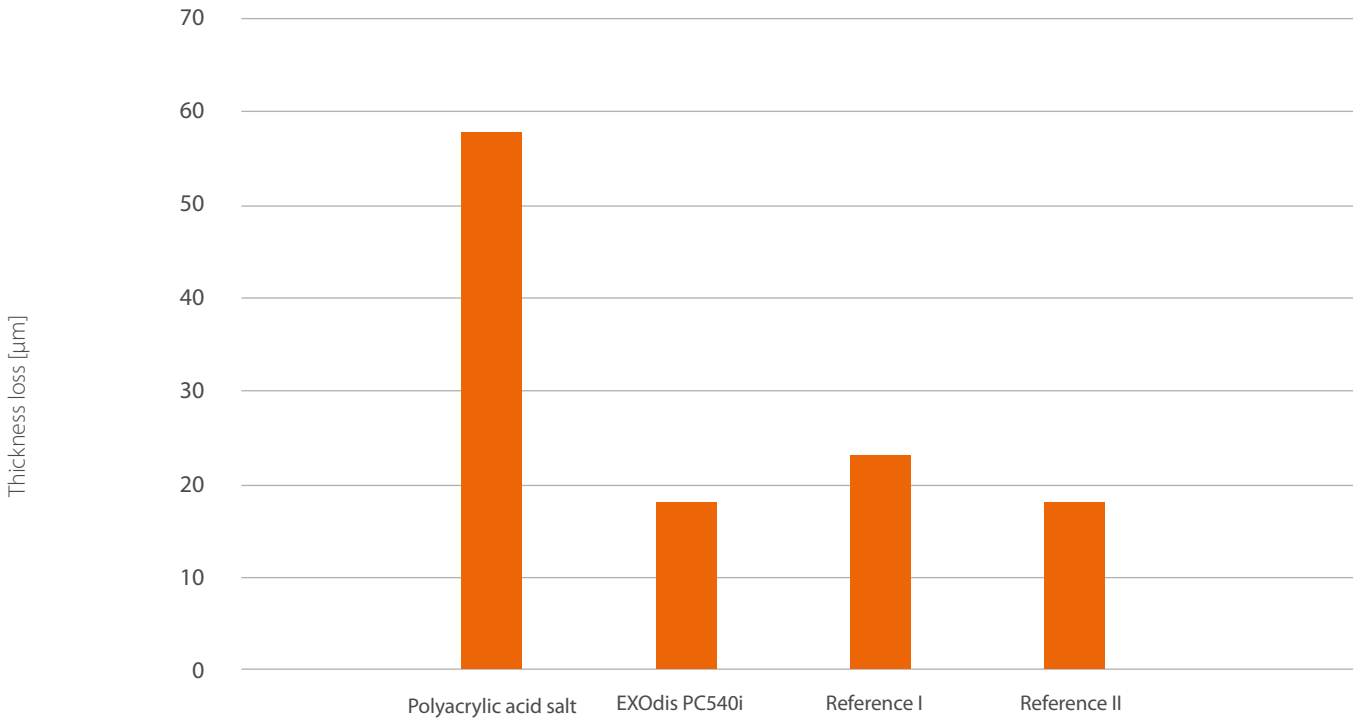
- cost effective
- high stability of pigments can be achieved
- improves corrosion resistance
- improves water resistance
- label-free

Recommended usage (dependent on PVC):
0.1 ÷ 1.5 % by weight in ready-to-use paint formulation

Interior white paint formulation PVC= 83%

Raw material	Polyacrylic acid salt (40% active)	EXOdis PC540i HYDROPHOBIC DISP.	Reference I (25% Active)	Reference II (25% Active)
Water	34.55	34.3	33.9	33.5
Hydroxyethylcellulose	0.5	0.5	0.5	0.5
Wetting and dispersing agent	**0.35**	**0.6**	**1**	**1.4**
Titanium white	7	7	7	7
Calcium carbonate, 2µm	23	23	23	23
Calcium carbonate, 5µm	18	18	18	18
Calcium carbonate, precipi-tated	7	7	7	7
Low MFFT styrene-acrylic dispersion	9	9	9	9
Defoamer	0.4	0.4	0.4	0.4
Biocide	0.2	0.2	0.2	0.2
Total %	**100**	**100**	**100**	**100**

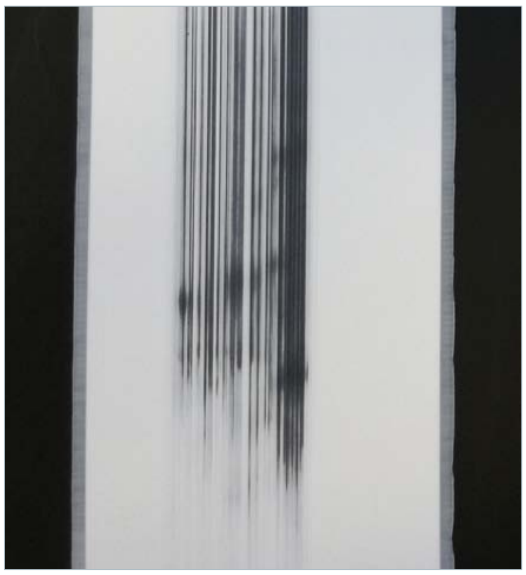
Wet-scrub resistance of samples



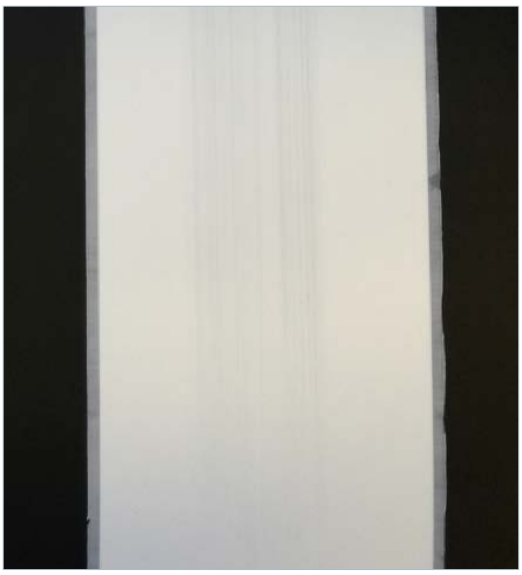
EXOdis PC540i is more effective than Reference I and Reference II - gives good stability in lower concentration.

EXOdis PC540i significantly improves wet scrub-resistance vs standard polyacrylic dispersant and gives similar results as Reference I and Reference II.

Polyacrylic acid salt



Exodis PC 540i



EXOdis PC416 and **PC417** are wetting and dispersing additives with superior performance

Key features:

- dispersants with pigment anchoring groups
- APEO-free
- VOC-free
- for WB pigment concentrates
- for organic pigments and carbon black

Key benefits:

- high TS
- low viscosity
- improved colour development
- improved compatibility with WB paint
- improved colour stability

Recommended usage

5.0 ÷ 30.0% in pigment concentrate | 0.1 ÷ 1.0% in ready-to-use paint formulation

Formulation of Pigment Yellow 74 concentrate

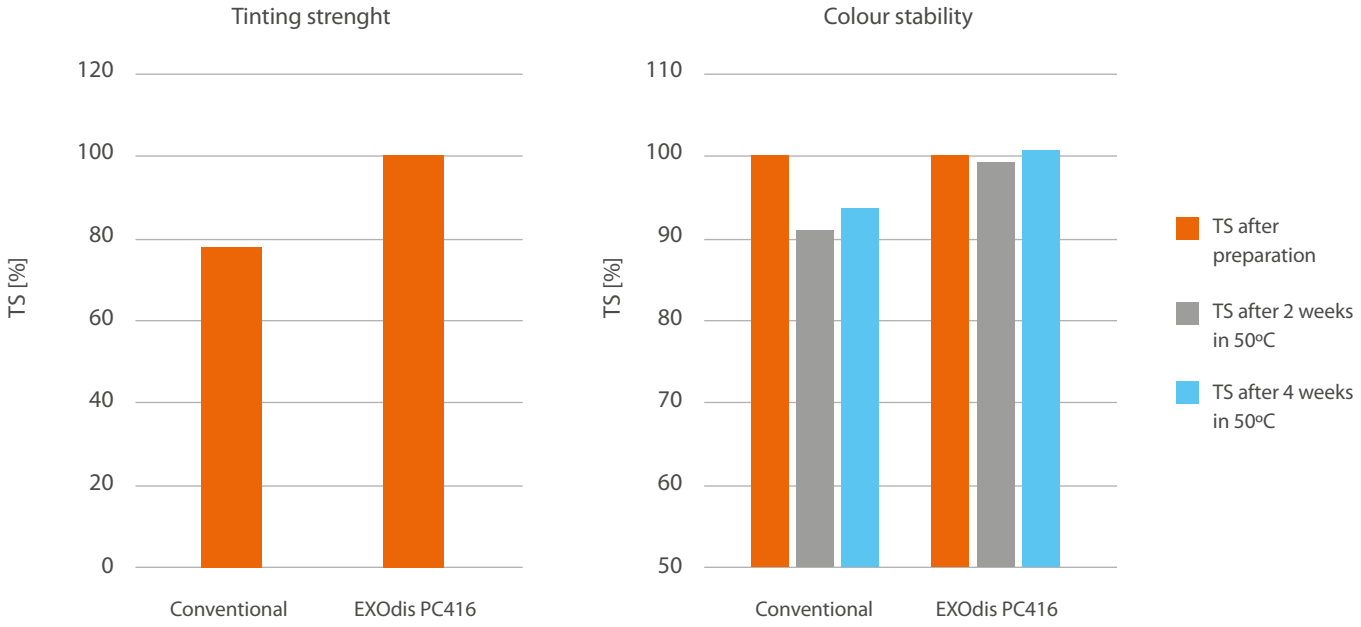
Raw material	EXOdis PC416	Control*
Water	39.2	39.2
EXOplast OTE3	5	5
Wetting and dispersing agent	5	5
Defoamer	0.7	0.7
Biocide	0.1	0.1
Pigment Yellow 74	50	50
Total	100	100
Active dispersant/pigment, %	9	9

Formulation of Pigment Blue 15:3 concentrate

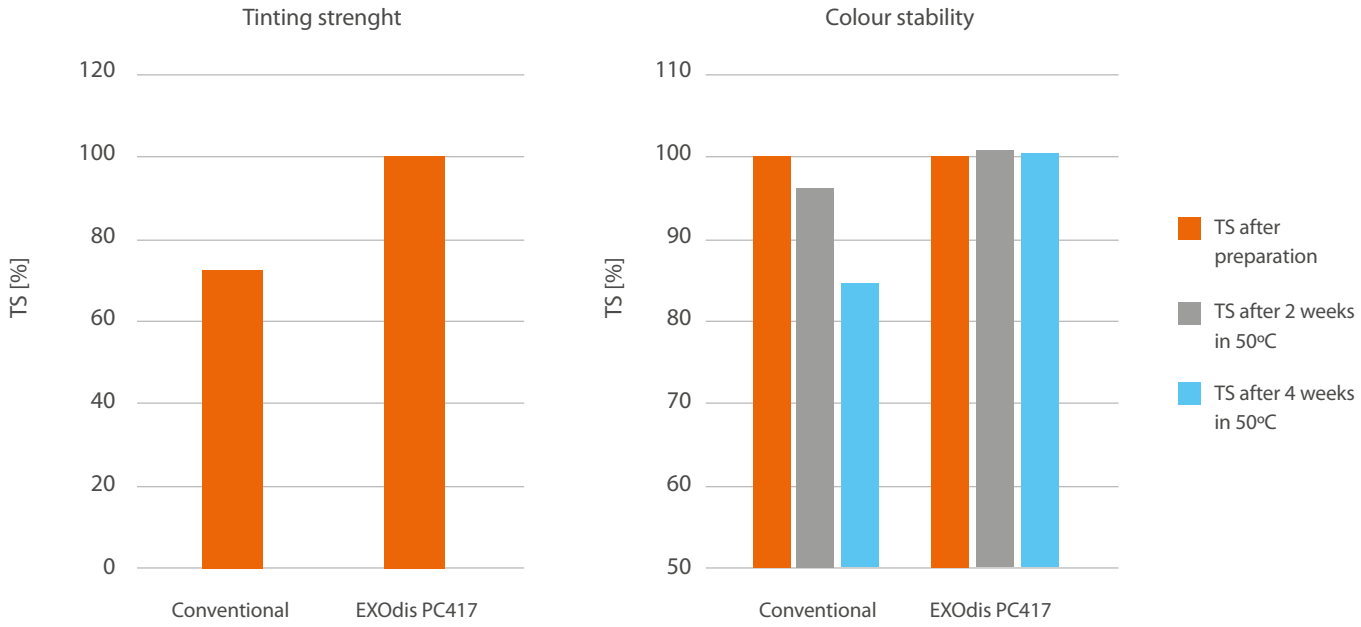
Raw material	EXOdis PC417	Control*
Water	42.2	41.7
EXOplast OTE3	5	5
Wetting and dispersing agent	7	7.5
Defoamer	0.7	0.7
Biocide	0.1	0.1
Pigment Blue 15:3	45	45
Total	100	100
Active dispersant/pigment, %	15.6	15

*conventional wetting&dispersing agent (90% of active)

Tinting strength and colour stability of **Pigment Yellow 74 concentrate**



Tinting strength and colour stability of **Pigment Blue 15:3 concentrate**



Effect on colour development

EXOdis PC416 and **PC417** significantly improve colour strength of pigment concentrates.

Effect on colour stability

EXOdis PC416 and **PC417** provide excellent colour stability during long-term storage time.

02 / Flame retardants

Roflam series – phosphate ester-based flame retardants are recommended for the paint and coating industry, especially for epoxy intumescent coatings and polyurethane based varnishes.

Typical properties

Product name	Chemistry	Appereance	Viscosity at 25°C [mPa·s]	Density at 25°C [g/cm³]	Phosphorus content, %	Features and benefits	Dosage
Roflam B7	t-butylated triaryl phosphate	clear, homogenous liquid	65–90	1.16 – 1.19	8.5	plasticiser for hydrocarbon and cellulosic intumescent coatings, good compability with APP, medium phosphorous content, non-halogen solution, popular replacement for phtalates or chloroparafine	1 – 20% in coatings
Roflam B7L	t-butylated triaryl phosphate	clear, homogenous liquid	200–400	1.10 – 1.15	7.4	plasticiserfor hydrocarbon and cellulosic intumescent coatings, good compability with APP, medium phosphorous content, non-halogen solution, low triphenyl phoshpate content	1 – 20% in coatings
Roflam B4L	mixture	clear, homogenous liquid	35–70	1.02 – 1.06	5	low-viscosity, Label-free liquid flame retardant; exhibits very good plasticizing effect, espe-cially at lower temperatures	1 – 20% in coatings
Roflam R	Tetraphenyl resocinol diphosphate	clear, homogenous liquid	400–800	1.28 – 1.32	11	plasticiser for hydrocarbon and cellulosic intumescent coatings, good compability with APP, high phosphorous content, non-halogen solution. Sole flame retardant for 2K PU spray coatings	1 – 20% in coatings
Roflam P	Trichloropropyl-phosphate	clear, homogenous liquid	61–89	1.28 - 1.30	9.5	sole flame retardant, halogen derivative, high phosphorous content	1 – 20% in coatings
Roflam OA-20*	Alkylphosphate containing ethylene oxide	clear, homogenous liquid	–	–	–	halogen-free oligomeric flame retardant which can be used in various applications as a sole component. Due to high phosphorous content and good compability perfect solution for transparent wood impregnates and coatings	5-20% in coatings

* under development

Roflam B7 1K water-based intumescent coating

Key features:

- 1K water-based thin film intumescent coatings
- Internal & on-site protective coatings

Key benefits:

- Improves fire resistance with char barrier
- Enhances performance, aesthetic and environmental demands
- Provides synergistic effect with solid FRs

General 1K WB intumescent coating formulation

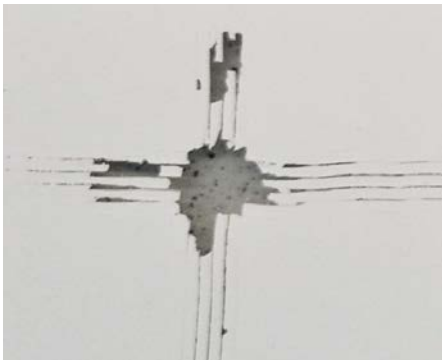
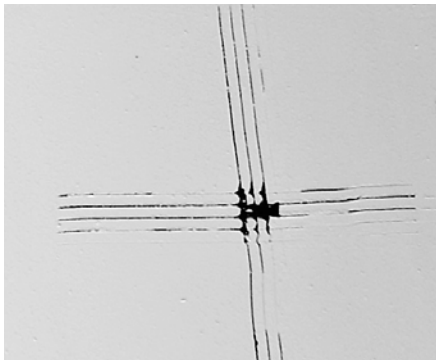
Raw material	Role	Loadings [wt. %]
Water	–	22.05
Hydroxyethylcellulose	Rheology modifier	0.05
EXOdis PC540i	**Wetting and dispersing agent**	**0.5**
EXOdis PC418	**Wetting and dispersing agent**	**0.2**
Defoamers	Antifoaming agents	0.5
Titanium white	Pigment	7
APP	Phosphorus source	25
Pentaerythritol	Carbon source	9
Melamine	Blowing agent	9
Hydrophilic fumed silica	Antisettling agent	0.1
Emultex FR 728	Binder	25
Coalescent	–	1,5
Biocide	–	0.1

Test results

Flame retardant	Loadings [wt.%]	Pendulum damping test ISO 1522	Buchholz indentation test ISO 2815 [mm]	Cross-cut test ISO 2409 class
Control*	–	0.22	1.6	5
Roflam B7	**1**	**0.19**	**2.6**	**3**
Roflam B7L	**1**	**0.17**	**2.6**	**0**

* no liquid form phosphates in formulation

Cross-cut test

Control	Roflam B7	Roflam B7L
		
Class 5	Class 3	Class 0

Fire test

Char formation after 30 min. in 50 °C

Roflam line benefits

Flame retardancy	↖
Coating flexibility	↑
Adhesion	↑

03 / Open time extenders and humectants

EXOplast OTE series are used as humectants and open time extenders for water-borne paint with low VOC content. They improve paint open time, which translates into an improvement in rheological properties during application.
The recommended amount for use is 1-20% depending on the type of a product (colourant, paint).

Product name	Active, %	Chemistry	VOC, %	SVOC, %	Features and benefits	Dosage	WB	SB
Exoplast OTE2	100	polymer	<0.1	<0.1	humectant in pigments concentrates, to prevent drying; open time extender in WB coatings	1.0-5.0% in coatings 4.0-10.0% in pigment concentrates	•	
Exoplast OTE3	100	polymer	0.1	2.8	humectant in pigments concentrates, to prevent drying; open time extender in WB coatings.	1.0-5.0% in coatings 4.0-10.0% in pigment concentrates	•	
Exoplast OTE4	100	polymer	1.0	8.3	humectant in pigments concentrates, to prevent drying; open time extender in WB coatings	1.0-5.0% in coatings 4.0-10.0% in pigment concentrates	•	

EXOplast OTE series are VOC-free open time extenders and humectants for waterborne coatings

Key features:

- non-ionic polymers
- APEO-free
- VOC-free
- for WB paints and pigment concentrates

Key benefits:

- products don't increase VOC value of coatings
- high performance, similar to propylene glycol
- prevents fast-drying of colourant
- improved compatibility with WB paint

Recommended usage:
4.0 ÷ 10.0% in pigment concentrates | 0.1 ÷ 5.0% in ready-to-use paint formulation

Interior matt paint formulation PVC= 83%

Raw material	Propylene glycol	EXOplast OTE2	EXOplast OTE3	EXOplast OTE4
Water	31.65	31.65	31.65	31.65
Hydroxyethylcellulose	0.5	0.5	0.5	0.5
EXOdis PC40	**0.35**	**0.35**	**0.35**	**0.35**
Titanium white	7	7	7	7
Calcium carbonate, 2µm	29	29	29	29
Calcium carbonate, 5µm	18	18	18	18
Styrene-acrylic dispersion	12	12	12	12
Defoamer	0.3	0.3	0.3	0.3
Biocide	0.2	0.2	0.2	0.2
OTE additive	**1**	**1**	**1**	**1**
Total %	**100**	**100**	**100**	**100**

Influence on open time

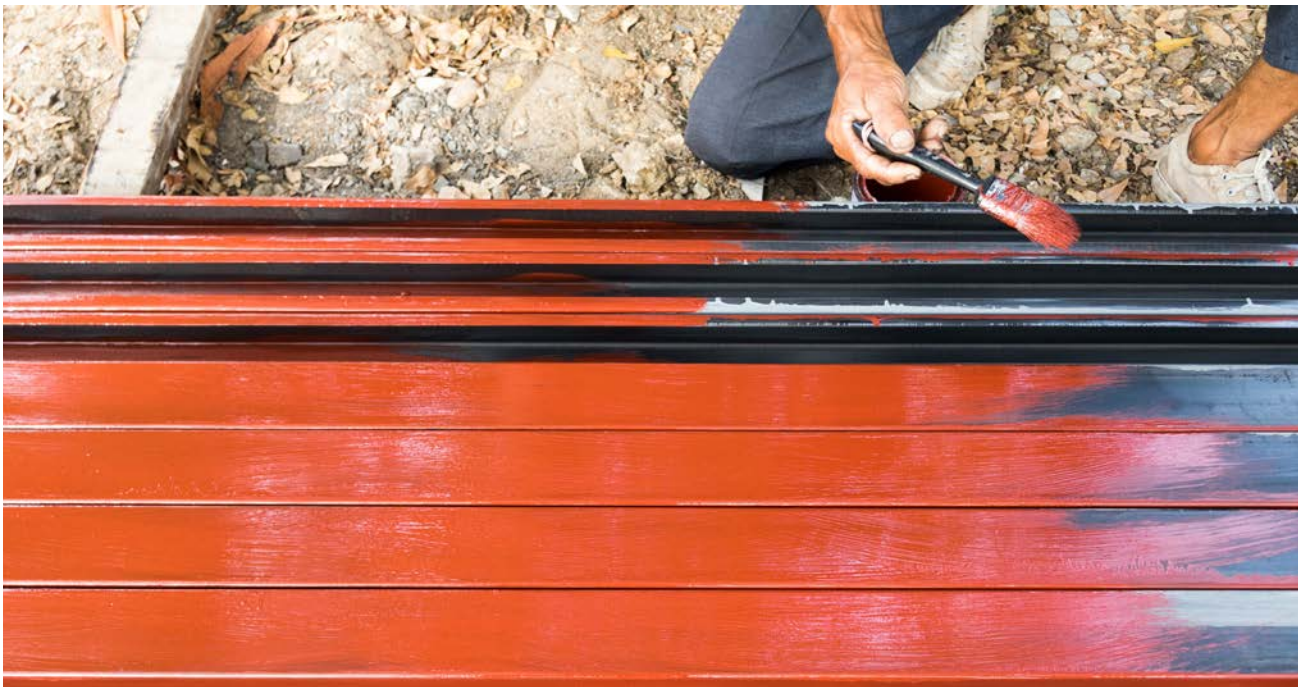
Test method	Propylene glycol	EXOplast OTE2	EXOplast OTE3	EXOplast OTE4
ASTM D7488-11	36 min	30 min	30 min	36 min

EXOplast OTE series improve open time in a similar way as propylene glycol, and do not generate VOC in final coating formulation.

04 / Corrosion inhibitors

Today's waterborne anticorrosive paints are high-performance modern coatings prepared to protect metal and construction elements. They must be formulated to comply with new VOC and environmental regulations. In waterborne systems, there are two types of corrosion inhibitors: main and anti-flash rust. Main corrosion inhibitors prevent corrosion processes during exposure of the coat in corrosive environments, providing long-lasting anticorrosive protection. The flash rust phenomenon occurs when a waterborne coating is applied to a steel surface and causes immediate corrosion of the steel during the first stage of drying. To inhibit this phenomenon, an anti-flash rust inhibitor should be utilized. PCC Exol corrosion inhibitors are modern and specialized products ready to use in water-borne anticorrosive coatings. These products are in liquid form and do not contain inorganic phosphates or nitrites.

Product name	Active, %	Solvent	Chemistry	Type	Features and benefits	Dosage	WB	SB
EXOhib PC400	approx. 70	water	mixture of amine borates	anti-flash rust	anti-flash rust agent dedicated for use in WB coatings; effective in low conc.; nitrite free	0.3 - 0.6% in paints on total formulation	•	
EXOhib PC500	48 – 52	water	mixture of corrosion inhibiting compounds	anti-flash rust	anti-flash rust agent dedicated for use in WB coatings; effective in low conc.; aminobo-rate and nitrite free	0.3 - 0.6% in paints on total formulation	•	
EXOhib PC108	approx. 50	propylene glycol	mixture of corrosion inhibiting compounds	main	prevents corrosion process and provides long-lasting effect, improves adhesion of WB coatings; extremely effective in relatively low-concentration	0.5 – 2.0% in paints on total formulation	•	



EXOhib PC400 and **PC500** – anti-flash rust inhibitors for waterborne coating systems and industrial fluids

Key applications:

- WB coating systems and industrial fluids
- especially for the protection of ferrous metals

Key benefits:

- DEA, nitrite and phosphate free
- low foaming
- low usage of anti-flash rust agents
- improve corrosion resistance
- replacements of sodium nitrite
- cost effective

General 1K matt primer formulation

Raw material	Loadings [WT. %]			
Water	14.1	14	14.2	13.95
Wetting and dispersing agent	1.2	1.2	1.2	1.2
Defoamer I	0.3	0.3	0.3	0.3
Titanium white	16	16	16	16
Talc	7	7	7	7
Fumed silica	0.1	0.1	0.1	0.1
Acrylic dispersion	55	55	55	55
Coalescent	2.2	2.2	2.2	2.2
EXOhib PC400	**0.3**	–	–	–
EXOhib PC500	–	**0.4**	–	–
Sodium nitrite	–	–	**0.2**	–
Reference	–	–	–	**0.45**
Surface wetting agent	0.2	0.2	0.2	0.2
Defoamer II	0.1	0.1	0.1	0.1
HEUR additive I, (50% solution)	3	3	3	3
HEUR additive II, (50% solution)	0.1	0.1	0.1	0.1
Biocide	0.2	0.2	0.2	0.2
Defoamer III	0.2	0.2	0.2	0.2
Total, %	100	100	100	100
Active, %	**0.21**	**0.2**	**0.2**	**0.2**

Influence on flash rust prevention

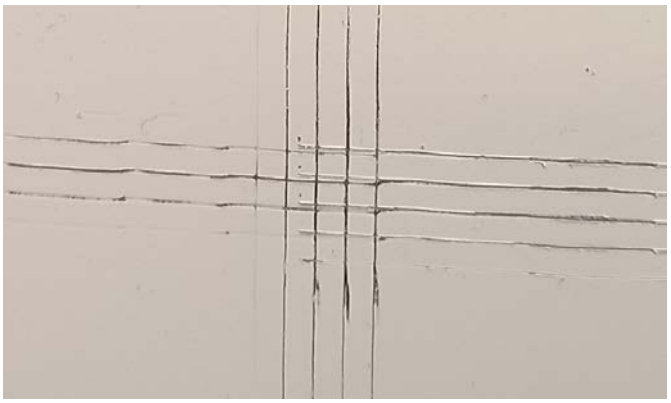
Samples applied on the steel plates. Visual evaluation of dry films.

Without ant-flash rust	EXOhib PC400	EXOhib PC500	Sodium nitrite	Reference
				

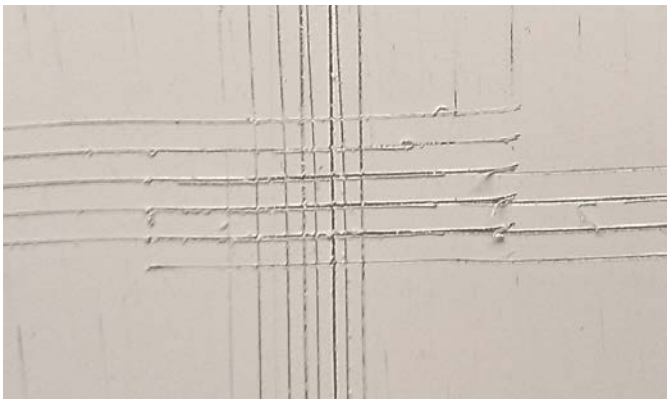
Influence on adhesion

Samples applied on the steel plates. Evaluation by cross-cut method.

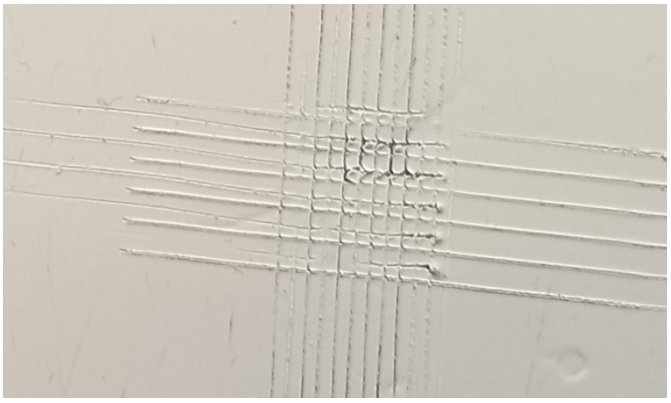
EXOhib PC400



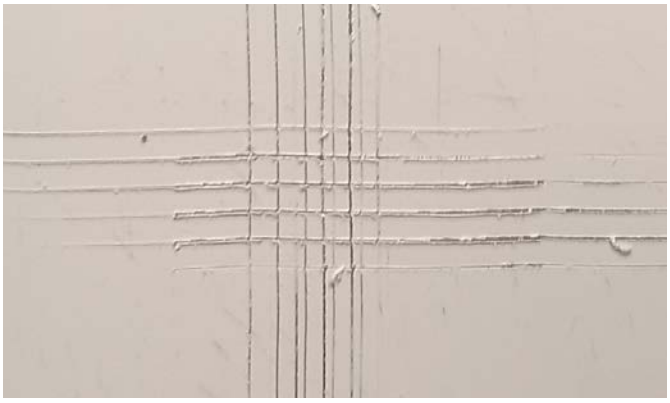
EXOhib PC500



Sodium nitrite



Reference



EXOhib PC series benefits

EXOhib PC400 and **PC500** provide very good protection against flash-rust. No negative effect on adhesion is observed.

PCC Exol products performance in WB DTM coating formulation

The DTM (direct to metal) coatings are modern anticorrosive solutions for the metal protection, which are increasingly gaining their popularity. The main reason is that they combine the properties of primers and top-coat, hence they are easy to handle. DTM coating also provide several additional benefits, such as strong adhesion or excellent anticorrosive resistance. PCC Exol products, including corrosion inhibitors – EXOhib PC108 and PC500 as well as wetting and dispersing additives – EXOdis PC540A and ROKAdis 900A/25 exhibit outstanding synergy and performance in WB DTM coatings.

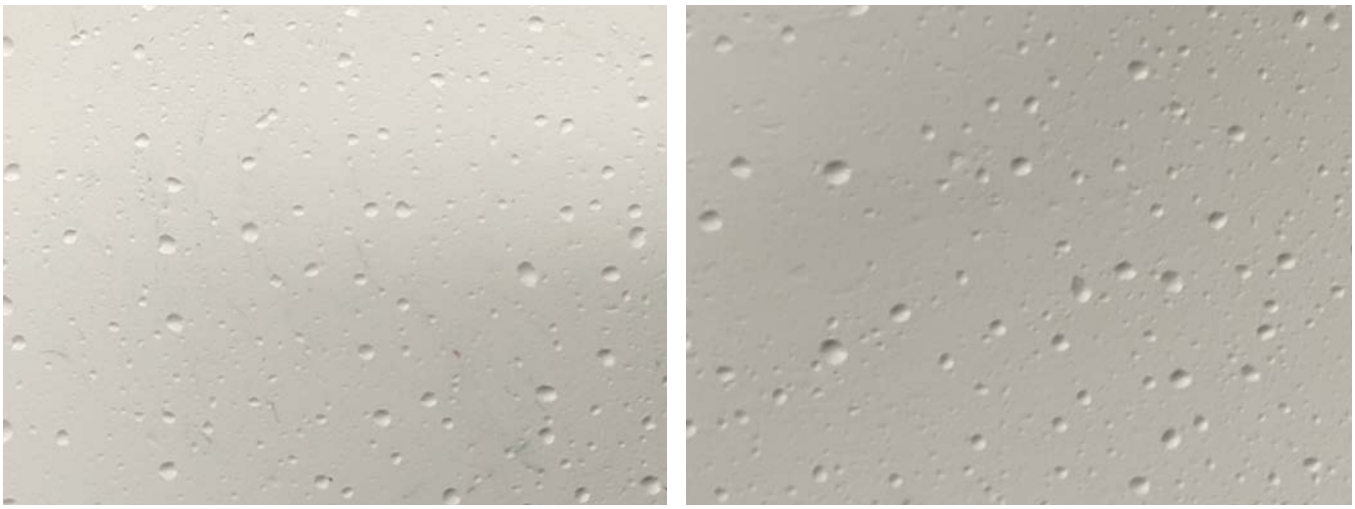
	PCC Exol DTM	Reference DTM
Raw material	Loadings (%WT)	
Water	11	10.85
EXOdis PC540A	**0.8**	–
ROKAdis 900A/25	**0.8**	–
Reference dispersant	–	**1.2**
Defoamer	0.6	0.6
Titanium white	16	16
Talc	7	7
Fumed silica	0.2	0.2
EXOhib PC108	**1.6**	–
Reference inhibitor	–	**2**
AMP90	–	0.15
Alberdingk AC 2403	55	55
Coalescent	2.2	2.2
Surface wetting agent	0.2	0.2
EXOhib PC500	**0.4**	**0.4**
HEUR additive I (50% solution)	4	4
HEUR additive II (50% solution)	0.1	0.1
Biocide	0.1	0.1

Results of the application evaluation

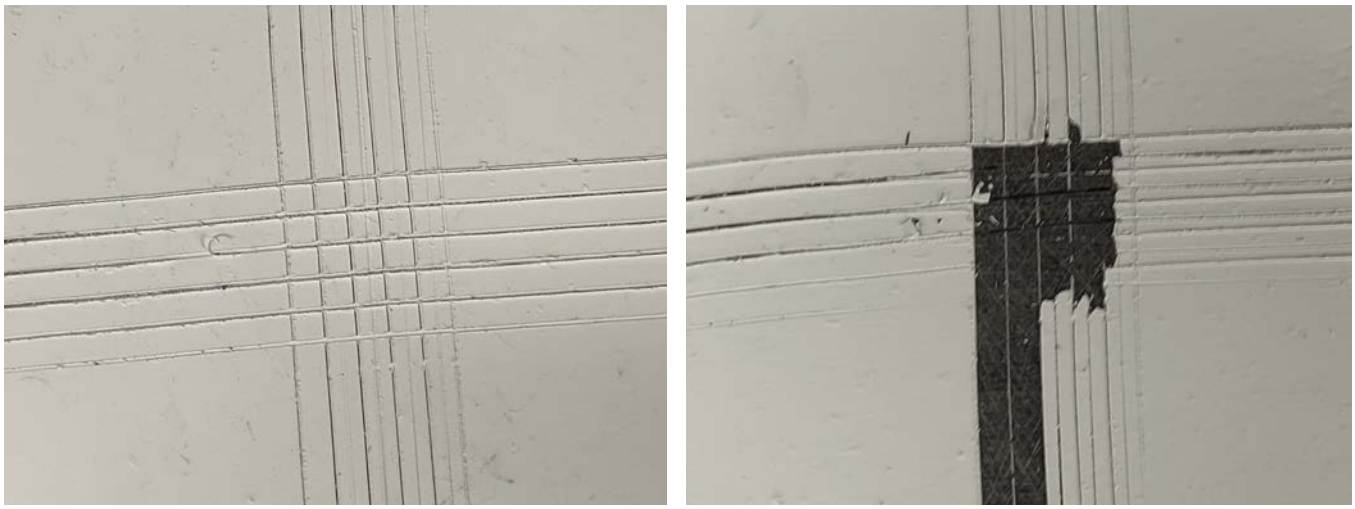
The application evaluation was performed using the Machu test. Samples of the coatings applied on steel plates were immersed for 48 hours at 40°C in a solution of 50 g NaCl, 10 g of acetic acid, and 5 g of 30% H_2O_2 dissolved in 1L of distilled water. Immediately after the 48-hour immersion, the degree of rusting and blistering was determined. After the next 24 hours, when the blisters disappeared, adhesion was examined. The results are exhibited in the following pictures.

PCC Exol DTM | Reference DTM

Appearance of the coats after 48h of the Machu test



Adhesion 24h after completing the test



PCC Exol products benefits

There is no visible rust in both formulations and they exhibit similar tendency to blistering (blisters disappearing after 24 h of completing the Machu test). Adhesion of PCC Exol DTM formulation is still excellent after the Machu and is far better than in case of reference DTM.

Notes for guidance concerning the functional parameters and notation used in the catalogue

HLB (Hydrophilic-Lipophilic Balance)

The hydrophilic-hydrophobic balance is a parameter that determines the ratio of the content of the hydrophilic group and that of the hydrophobic group in a particle. The validity scope of the HLB number for non-ionic surface-active compounds is included within the range of 0 to 20 and is the measure of the share of the hydrophilic group in the particle

$$HLB = 20 \cdot \frac{\text{molecular mass of hydrophilic part}}{\text{molecular mass of compound}}$$

On the other hand, for aqueous solution of ionic surface active agents, they acquire additional transformations increasing their degree of hydrophilicity, the value of the HLB number goes up to 40.

HLB for ester type compounds (ethoxylated fatty acids):

$$HLB = 20 \cdot \left(1 - \frac{LZ}{LK}\right)$$

LZ saponification number of ethoxylated product, mgKOH/g
LK acid number of acids subjected to ethoxylated product, mgKOH/g

On the basis of the HLB scale, the range of the utility fitness of surface-active agents can be determined.

Cloud point

Cloud point is an indicator determining the behavior of water or other organic solutions of non-ionic surfactants. Solutions of surfactants become cloudy during heating and revert to a clear solution at a certain temperature when cooled - this temperature is defined as 'cloud point'.

Depending on the temperature range at which the solution becomes cloudy, five determination methods are distinguished:

Method A – aqueous solution (10 - 90°C)
Method B – solution of NaCl 50g/l (>90°C)
Method C – solution of NaCl 100g/l (>90°C)
Method D – solution 45g of butyl diglycol/water (<10°C)
Method E – solution 25 g of butyl diglycol/water (<10°C)

HLB number	EO content in product %	Product application
1-3	5-15	Anti-foaming agent
4-6	20-30	W/O emulsifier
7-11	35-55	Wetting agent
8-18	40-90	W/O emulsifier
10-15	50-75	Detergent
10-18	50-90	Solubilizer

PCC Group
Sienkiewicza 4
56-120 Brzeg Dolny, Poland
products@pcc.eu

Please visit our capital group business platform:
www.products.pcc.eu

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