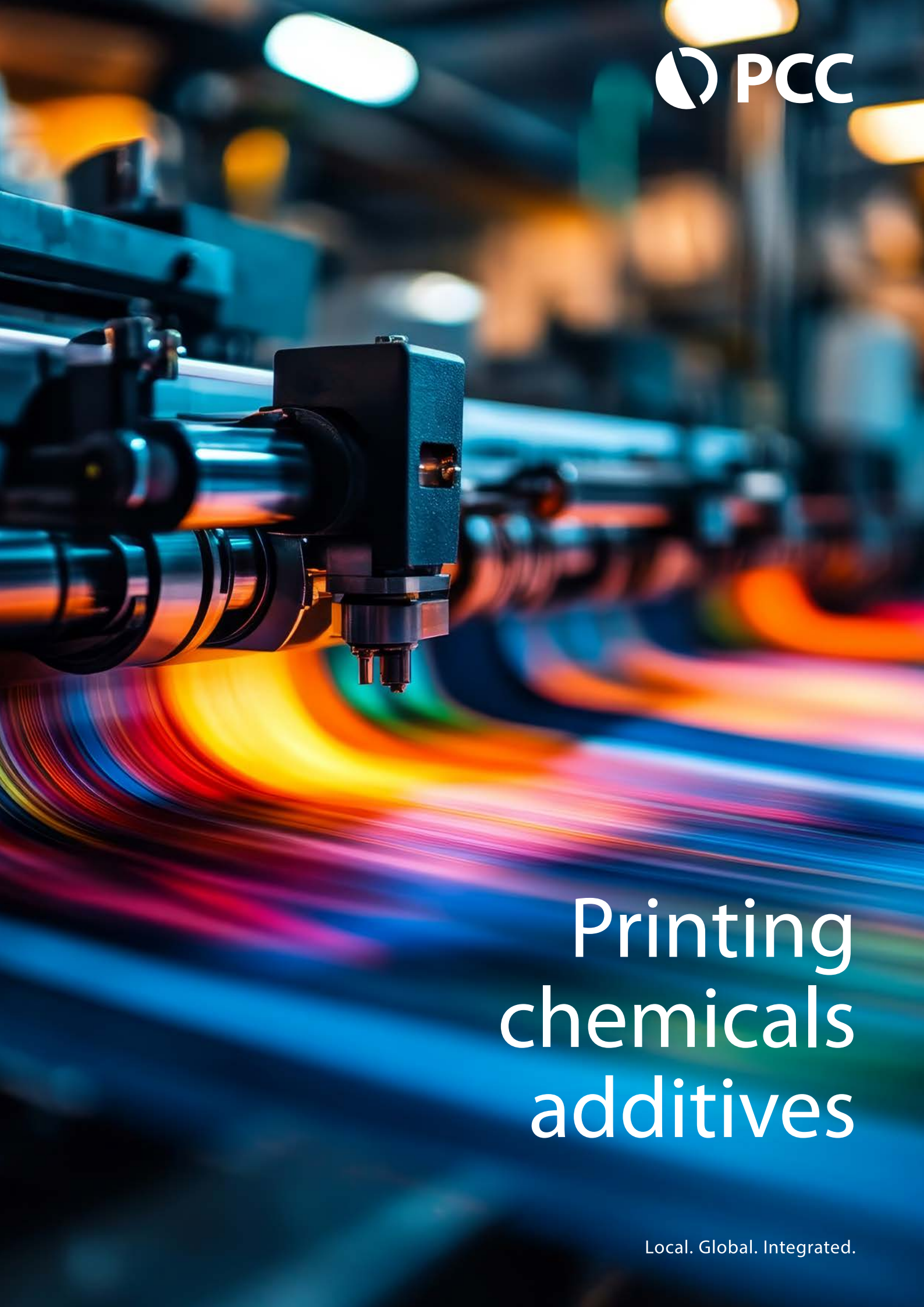

Printing chemicals additives

Local. Global. Integrated.


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

About Us

PCC Exol SA is a major player in the European surfactants market. In the eastern and central-eastern part of the continent, it is the undisputed leader in its industry. Most of the production facilities and the company's headquarters are located in Brzeg Dolny, Poland. Here we develop, test and manufacture a wide range of anionic, non-ionic and amphoteric surfactants and speciality industrial formulations.

New products are continuously added to the portfolio in response to market trends and individual customer requirements. The surfactants produced at the plants have a very wide range of industrial applications. They are used as wetting agents, emulsifiers, auxiliaries in paper, metallurgy and many other industries, as well as in household chemicals, personal care products and textiles.

PCC EXOL pays special attention to the issue of sustainable development, which is one of the key elements of the company's strategy. In order to strengthen its competitive position in the surfactants market, the company is committed to promoting responsible production and consumption throughout the value chain. The concept of sustainable development is therefore a key aspect of all the company's management and operational processes.

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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01 / Additives for flexographic and rotogravure inks

Water-based inks for flexographic and rotogravure printing are among the most important products used in the modern printing industry. This is due to not only the increasing share of flexographic and rotogravure printing in overall printing, but also due to ecological reasons and a reduced impact on human health. Ready flexographic and rotogravure inks should meet a number of requirements regarding viscosity, stability, colour strength and intensity, gloss, adhesion to the substrate or the drying time of the coating. The PCC Exol's product offer for e.g. dispersing and wetting agents, used in the production of water-based pigment concentrates for the printing industry. For ready-made paint formulations, it is recommended to use agents that improve paint flow and humectants, which for example act as agents that extend the open time of the paint.

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.

Wetting and dispersing additives

Product name	Active substance %	Description	Resin-containig	Resin-free	Inorganic pigments	Organic pigments	WB	SB
EXOdis PC250	34–36	Mixture of surface active polymers	●			●	●	
EXOdis PC40	42–44	Polyacrylic acid sodium salt		●	●		●	
EXOdis PC416	89–92	Nonionic wetting&dispersing additive with pigment affinic group		●		●	●	
EXOdis PC417	min. 99	Phosphate ester with pigment affinic group		●	○	●	●	
EXOdis PC418	min. 97.5	Phosphate ester with pigment affinic group, alkylamonium salt		●	○	●	●	
EXOdis PC800	78–82	Mixture of W&D additives		●	●	●	●	
EXOdis PC950	89–92	Nonionic surfactant		●		●	●	
ROKAdis 900	min. 98.5	Phosphate ester		●	●	○	●	
EXOdis PC220	min. 99	Polyether copolymer		●		●		●
EXOdis PC230	min. 97	Phosphate ester		●	●			●
Rodys L	39–41	Naphthalenesulfonic acid, polymer with formaldehyde, sodium salt		●	○	●	●	

○ partially recommended ● recommended

Wetting agents

Flexographic and rotogravure printing processes are characterised by a relatively high speed, so the key factor is the quick wetting of the surface by the applied ink. Water is characterised by a high value of surface tension, which translates into poor wettability of the surface. In order to reduce the value of this parameter as much as possible, appropriate surface agents are used, which visibly improves the wettability of the substrate by the paint.

The PCC Group offers products whose addition effectively reduces the value of static and dynamic surface tension. They are used as flow improvers in water-based formulations of flexographic and rotogravure inks, as well as OPV varnishes.

Product name	Active substance %	Solvents	Description
EXOwet PC25	min. 90	–	Acetylenic diol alkoxylated
EXOwet PC85W	73–77	water	Acetylenic diol alkoxylated
SULFOSUCCINATE DOSS	min. 60	water	Sodium di(2-ethylhexyl) sulfosuccinate
SULFOSUCCINATE DOSS70GP	min. 70	propylene glycol/water	Sodium di(2-ethylhexyl) sulfosuccinate
SULFOSUCCINATE DOSS70E	68–72	ethanol/water	Sodium di(2-ethylhexyl) sulfosuccinate
SULFOSUCCINATE DOSS50BGE	48–52	butyldiglycol/water	Sodium di(2-ethylhexyl) sulfosuccinate
ROSULfan E	38–42	water	Sodium 2-ethylhexyl sulfate

Emulsifiers

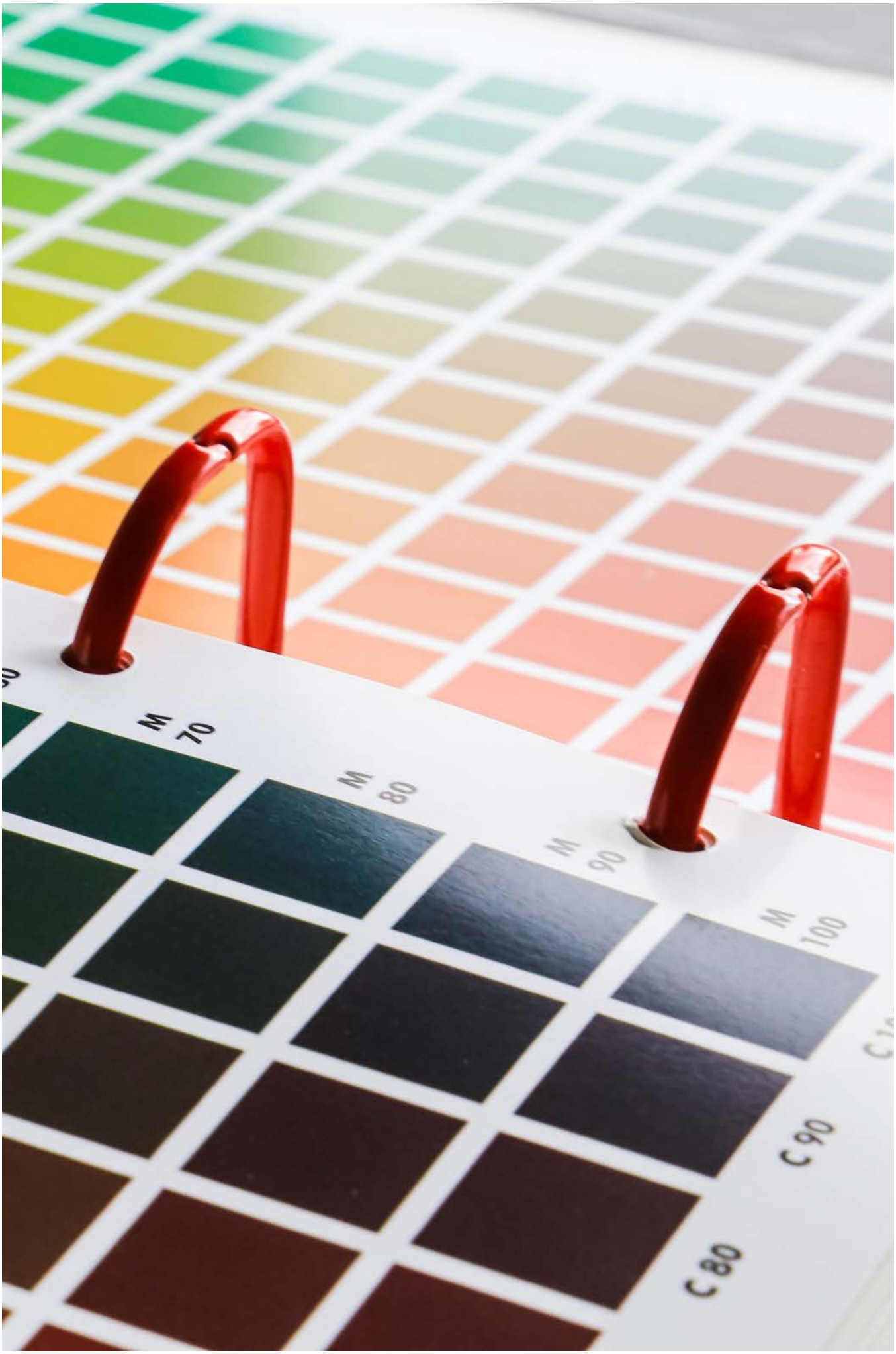
One of the basic properties of surface active agent is the ability to emulsify substances that are insoluble in water. Products from the PCC Exol's portfolio provide very good emulsifying properties, which translates into excellent stability of the finished emulsion.

Product name	Active substance %	HLB	Description
SULFOROKAnol A360/1	58–62	–	Ammonium laureth sulfate
ROKAnol® IT15	min. 98.5	15.3	Alcohols, C13-iso ethoxylated
ROKAnol® K3	min. 99	7.0	Alcohols, C16-18 ethoxylated
ROKAnol® O3	min. 99	6.6	Alcohols, C16-18 ethoxylated
ROKwin 80	min. 99	4.3	Sorbitan monooleate

Humectants

Adjusting the ink drying time can have a positive effect on the appearance of the coating, eliminating faults and defects appearing on the surface. In addition, it prevents the ink from drying too quickly in presses and printing devices.

Product name	Active substance %	Description	Molecular weight (g/mol)	Appearance
Polikol 200	min. 99.5	Polyoxoethylene glycol	200	liquid
Polikol 300	min. 99.5	Polyoxoethylene glycol	300	liquid
Polikol 400	min. 99.5	Polyoxoethylene glycol	400	liquid
Polikol 600	min. 99.5	Polyoxoethylene glycol	600	liquid
Polikol 1000	min. 99.5	Polyoxoethylene glycol	1000	wax
Polikol 1500	min. 99	Polyoxoethylene glycol	1500	wax
Polikol 2000	min. 99	Polyoxoethylene glycol	2000	wax
Polikol 3000	min. 99	Polyoxoethylene glycol	3000	wax
Polikol 4500	min. 99	Polyoxoethylene glycol	4500	wax
Polikol 6000	min. 99	Polyoxoethylene glycol	6000	wax
ROKAnol® G8	min. 99.5	Glycerine ethoxylated	–	liquid
ROKAnol® G12	min. 99.5	Glycerine ethoxylated	–	liquid
ROKAnol® G15	min. 99.5	Glycerine ethoxylated	–	liquid
ROKAnol® G30	min. 99.5	Glycerine ethoxylated	–	liquid


M 70
M 80
M 90
M 100
C 80
C 90

02 / Additives for fountain solution formulations

Offset printing is one of the most important techniques used in modern printing. One of the key products used in the offset printing process are wetting solutions, the so-called fountain solution. Their task is to wet and adsorb on the hydrophilic surfaces of the mould cylinder, corresponding to the unprinted areas, which prevents ink particles from settling on them.
Fountain solution owes its properties to a properly selected composition, which consists of e.g. wetting agents, corrosion inhibitors and antistatic agents.

Wetting agents

In order to properly wet the mould cylinder, the fountain solution should have a sufficiently low surface tension value. This is possible to obtain through the use of an appropriate surface active agent, added as an auxiliary wetting agent. PCC Exol's products provide effective reduction of static and dynamic surface tension and are fully compatible with other components of the fountain solution.

Product name	Active substance %	Description	Appearance
EXOwet PC25	min. 99	Acetylenic diol alcoxylated	liquid
EXOwet PC85W	73–77	Acetylenic diol alcoxylated	liquid
ROKAnol® GA4	min. 99.5	2-propylheptanol ethoxylated	liquid
ROKAnol® GA4LA	min. 99.5	2-propylheptanol ethoxylated/ propoxylated	liquid
ROKAnol® GA7LA	min. 99.5	2-propylheptanol ethoxylated/ propoxylated	liquid
ROKAnol® GA8LA	min. 99.5	2-propylheptanol ethoxylated/ propoxylated	liquid
ROKAnol® H5	min. 99	Hexanol ethoxylated	liquid
ROKAnol® LP3841	min. 99	C8 – C18 alcohols ethoxylated/ propoxylated	liquid
ROKAnol® NL6	min. 99.5	C9 – C11 alcohols ethoxylated	liquid
ROSULfan E	38–42	Sodium 2-ethylhexyl sulfate	liquid
SULFOSUCCINATE DOSS70GP	min. 70	Sodium di(2-ethylhexyl) sulfosuccinate	liquid

Corrosion inhibitors

The metal parts of the press are exposed to the fountain solution. Due to its composition and specific pH (4.5–5.5), the fountain solution may contribute to the acceleration of corrosion processes. In order to counteract this phenomenon, corrosion inhibitors are added to the solution. PCC Exol's offers corrosion inhibitors that are highly effective at a relatively low level of use.

Product name	Active substance %	Description	Appearance
EXOhib PC400	Approx. 70	Aminoborate solution	liquid
EXOhib PC500	49–51	Mixture	liquid
EXOhib FS300	29–31	Lauroyl sarcosinate	liquid

Antistatic agents

Polymer materials are characterised by high surface resistance, which in turn leads to excessive accumulation of electrostatic charge on the surface of the material. The accumulated charge may cause the individual layers of the polymer material to stick together, and in an extreme case, it leads to the formation of an electric arc that may cause an explosion. Antistatic agents available in the portfolio of the PCC Group effectively reduce the surface resistance of the polymer, eliminating the phenomenon of electrostatic charge accumulation.

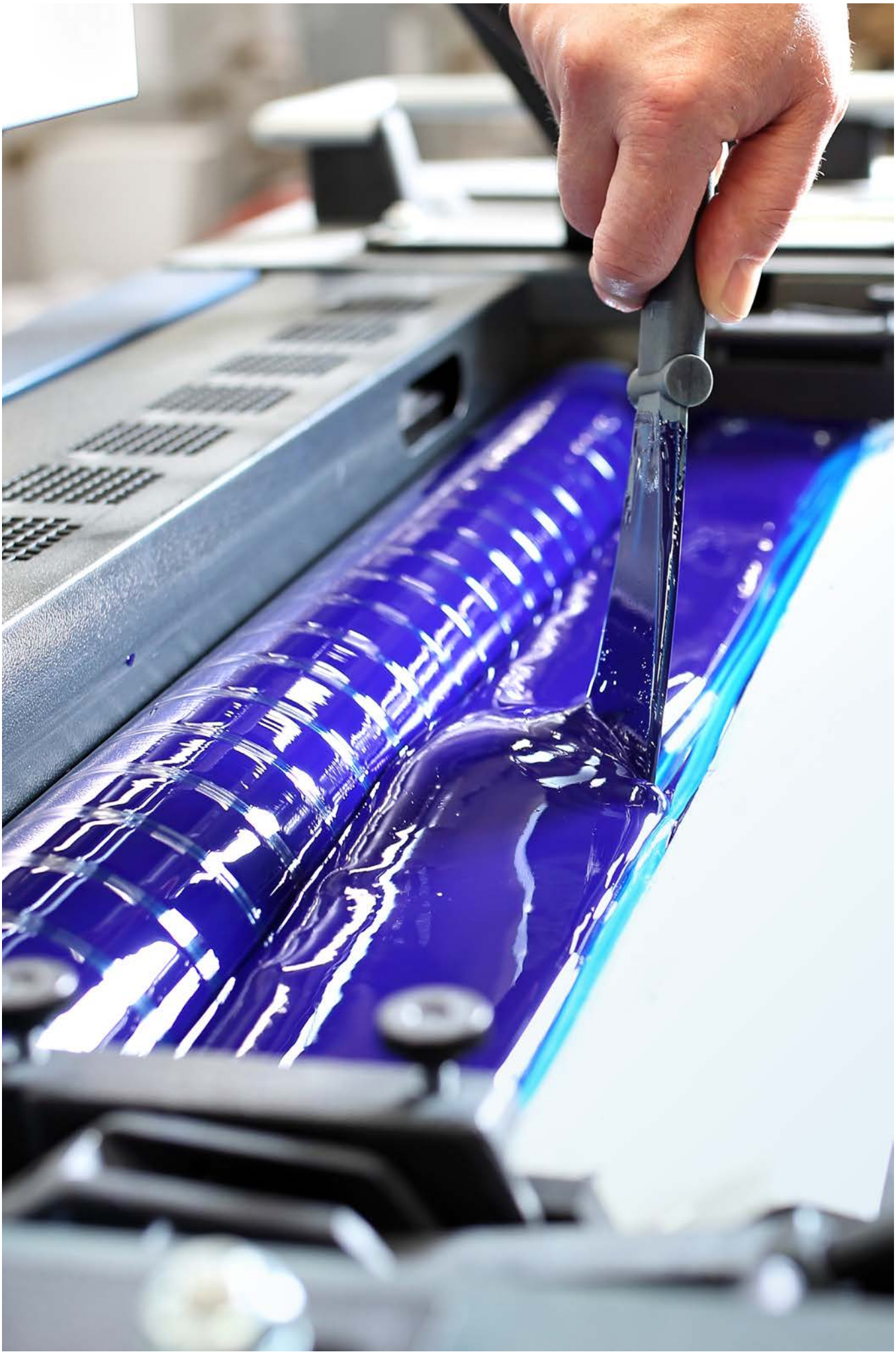
Product name	Active substance %	Description	Appearance
EXOstat K	min. 99.5	Cationic surfactant	liquid
EXOstat 122	min. 99.5	Nonionic surfactant	liquid

03 / Additives for UV inks

One of the most dynamically developing printing techniques is the method of curing coatings with UV light. UV light induces a polymerisation reaction in the applied coating, which allows for effective curing of the coating, without solvent emissions. This way of drying the paint is possible thanks to the special composition of the final product, which consists of e.g. photo-initiators and a polymer dissolved in the reactive monomer. UV paints are not only ecological, due to their emission-free nature, but also have better parameters of the applied coating, such as gloss, hardness, adhesion to substrates, mechanical resistance, and water resistance.

PCC's range includes products that are used as substrates in the synthesis of for the synthesis of reactive monomers

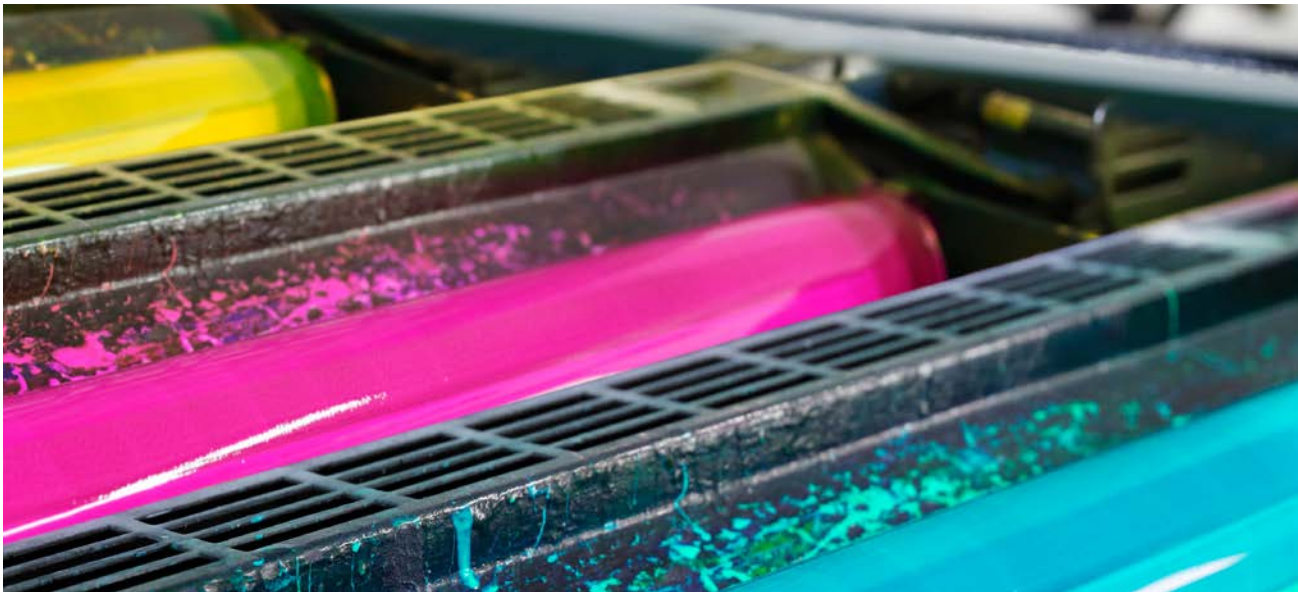
Product name	Active substance %	Description	Hydroxyl number (mg KOH/g)	Appearance
ROKAnol® GP3	min. 99.9	Propoxylated glycerin	550–590	liquid

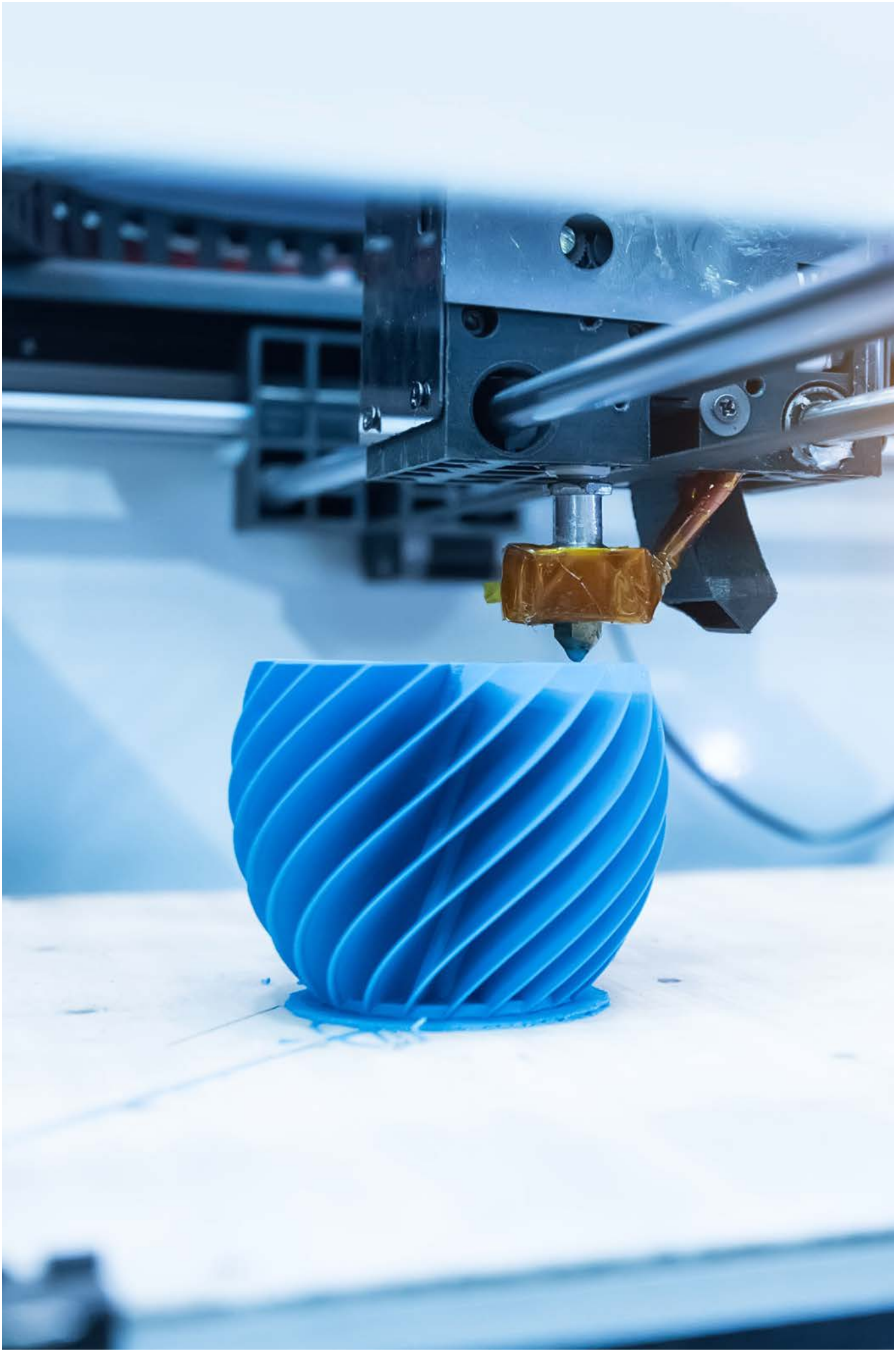


04 / Raw materials for the production of PU resins

Offset printing is one of the most important techniques used in modern printing. One of the key products used in the offset printing process are wetting solutions, the so-called fountain solution. Their task is to wet and adsorb on the hydrophilic surfaces of the mould cylinder, corresponding to the unprinted areas, which prevents ink particles from settling on them.
Fountain solution owes its properties to a properly selected composition, which consists of e.g. wetting agents, corrosion inhibitors and antistatic agents.

Product name	Active substance %	Description	Hydroxyl number (mg KOH/g)	Appearance
Polikol 600	min. 99.5	Polyoxoethylene glycol	600	liquid
Polikol 1500	min. 99	Polyoxoethylene glycol	1500	wax
Rokopol® D450	min. 99	Polyoxopropylene glycol	450	liquid
Rokopol® D1002	min. 99.94	Polyoxopropylene glycol	1000	liquid
Rokopol® D2002	min. 99.94	Polyoxopropylene glycol	2000	liquid
PolyU L 8000	min. 99.95	Polyoxopropylene glycol	8000	liquid
PolyU L 12000	min. 99.95	Polyoxopropylene glycol	12000	liquid
PolyU L 18000	min. 99.95	Polyoxopropylene glycol	18000	liquid

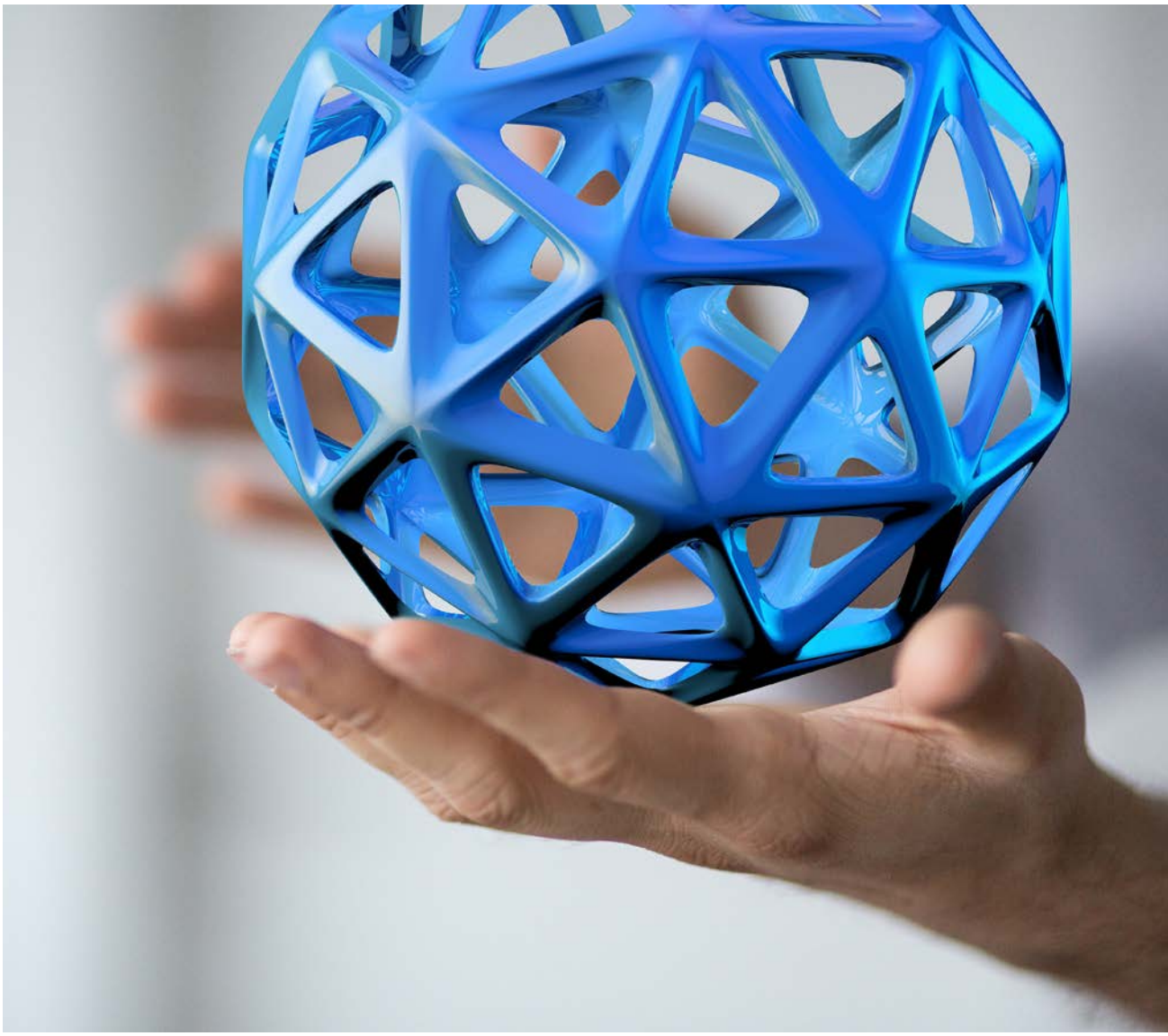




05 / 3D printing additives

3D printing is one of the youngest and fastest growing techniques of modern printing. This method consists in applying successively thin layers of material (thermoplastic, metals, ceramics) to obtain the final object. EXOfos PA080 S can be successfully used as a dispersant for inorganic pigments and ceramic substances used in 3D printing.

Product name	Active substance %	Description	Appearance
EXOfos PA-080S	min. 99	Phosphoric acid, 2-ethylhexyl ester	liquid

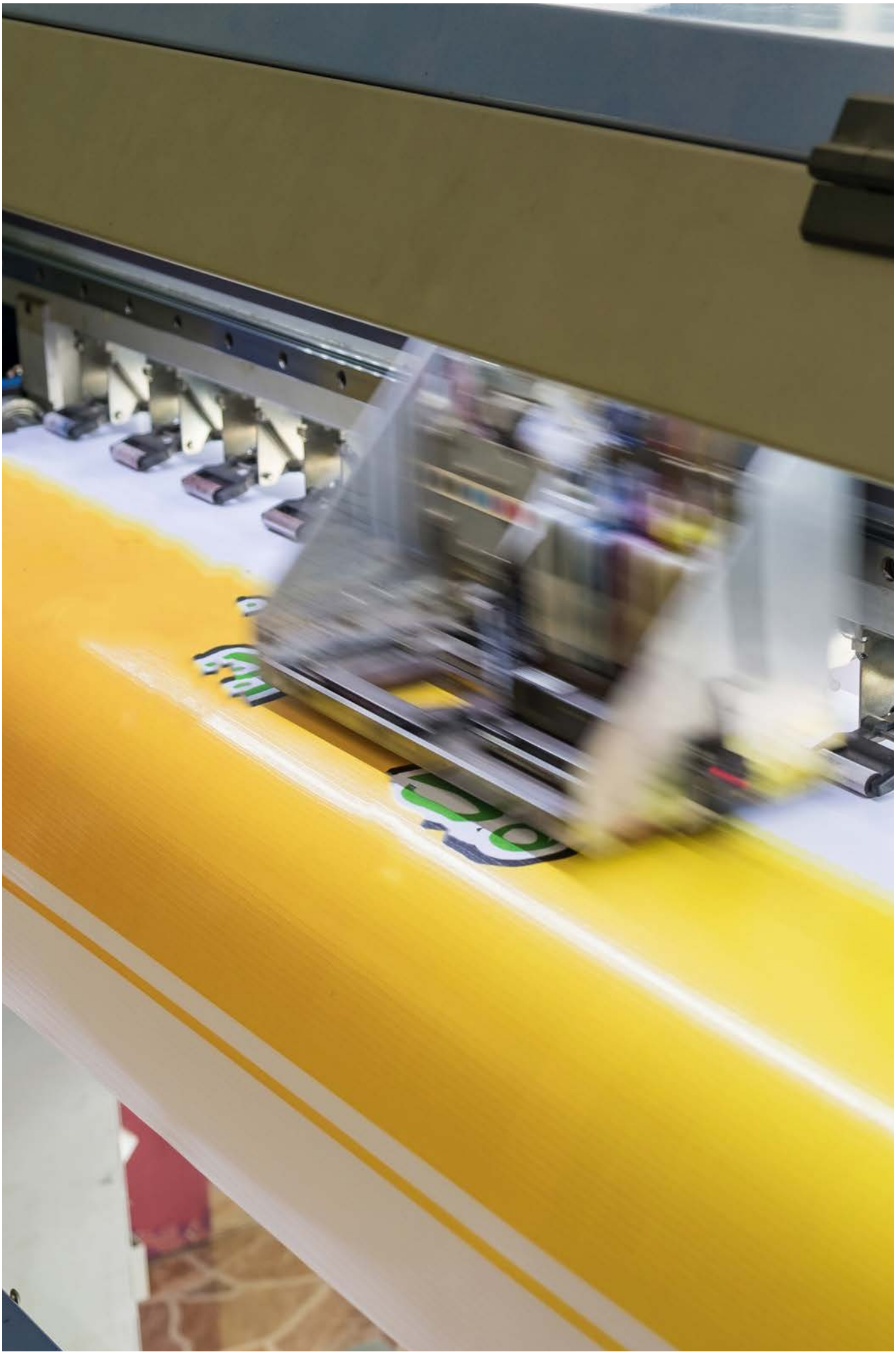


06 / Additives for the printing plate development proces

One of the key stages of offset printing is the appropriate preparation of the printing plate, which corresponds to the final image, transferred indirectly to the printed surface. In the plate preparation process, appropriate processing fluids are used to etch the selected areas of the plate. One of the components of such liquids are appropriate wetting agents, characterised by high efficiency and, at the same time, low foaming.

Product name	Active substance %	Description	Appearance
ROSULfan E	38–42	Sodium 2-ethylhexyl sulfate	liquid
Hydromax 300*	38–42	Quaternary Ammonium Chloride Solution	liquid

* product available only in North America



07 / Solvents

Polyalkylene glycols (PAG) and long-chain alkyl benzoate esters are used as solvents in the production of graphic inks and paints. PCC products are non-classified, non-combustible liquids with low volatility.

Due to their appropriate lipophilic-hydrophilic balance, they ensure excellent compatibility within the entire ink formulation.

Product name	Active substance %	Description	Kinematic viscosity at 25°C (mm^2/s)	Appearance
EXOsoft AB25	min. 99.5	C12-C15 Alkyl Benzoate	–	liquid
Rokolub B-10M	min. 99.92	Butanol ethoxylated/ propoxylated	9–11	liquid

Application research of PCC's products

EXOdis PC250

A mixture of surface-active polymers used as an auxiliary dispersing and wetting agent in a synergistic system with a grinding resin.

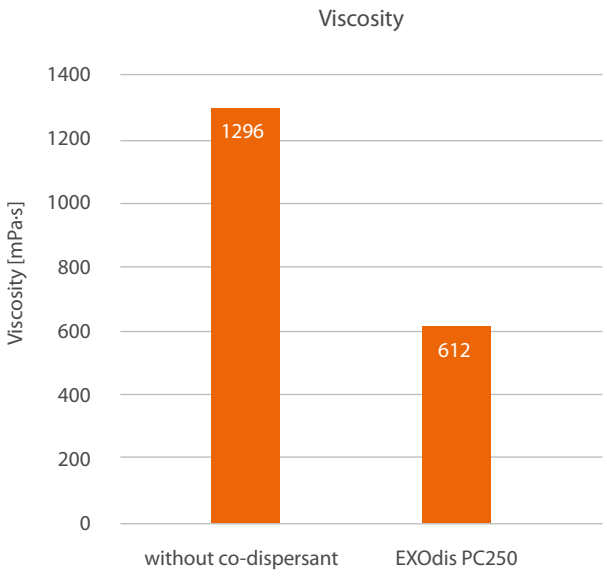
Key features:

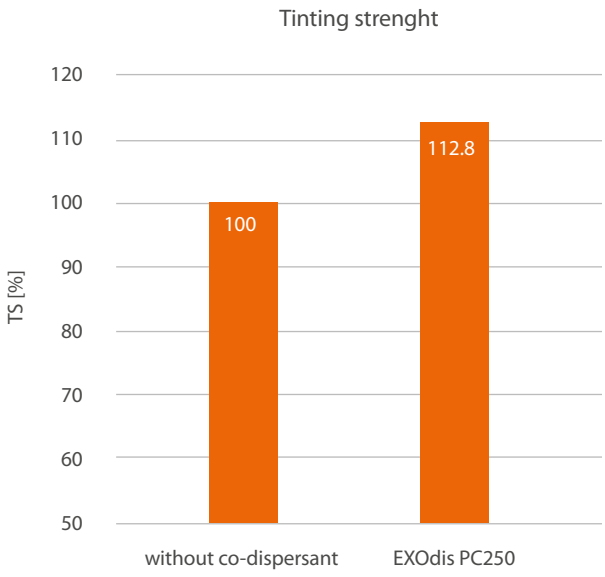
- water-based dispersing and wetting agent
- a mixture of surface-active polymers
- used in the production of concentrates with grinding resin
- concentrates of organic pigments and carbon blacks

Key benefits:

- significantly reduces the viscosity of the concentrate
- increases the tinting strenght of the concentrate
- provides excellent pigment compatibility in the formulation
- positively affects the gloss improvement
- product not classified in accordance with the CLP

Raw material	Loadings (%wt)
Water	43.3
Defoamer	0.6
Grinding resin (35% solution)	17
EXOdis PC250	5
Pigment Black 7	34
Biocide	0.1





EXOdis PC250 visibly lowers the initial viscosity of the formulation and significantly increases the colour strength of the colourant.

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 Exol SA
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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