



umicore
Cobalt & Specialty Materials



ECOS ND[®]15
ECOS ND[®] Neo Mixes

Cobalt Future



Cobalt future

The introduction of REACh has put a lot of question marks behind the further use of cobalt based carboxylates. As a result the future of all oxidatively curing coatings became a point of discussion and concern. On the other hand REACh also created a platform for innovation.

Umicore has introduced a new technology that offers an easy drop in against currently used cobalt carboxylates. On top of the outstanding application results, Umicore provides an insight into the non-hazardous characteristics of its new polymerization catalyst ECOS ND[®]15.

Based on these figures and results, Umicore clearly differentiates from any other catalyst producer. On top Umicore has developed mix driers, based on ECOS ND[®]15 to facilitate the drop-in replacement against currently used carboxylates.

Last but not least, USMB offers catalysts for aqueous systems, eg ECOS ND[®]15 Aqua and ECOS Mix 353 Aqua.

Points of concern

Metal carboxylates are subject to REACH registration. The toxicity of many chemical products is unknown today.

The solubility and bio accessibility of commonly used cobalt carboxylates differ, nevertheless always reach high levels.

Cobalt 2-ethylhexanoate is labelled as highly acute aquatic toxic. Cobalt neodecanoate and cobalt naphthenate are labelled as acute aqua toxic.

The ROS (Reactive Oxygen Species = Radicals) potential of cobalt carboxylates in living cells is significant to high. Radical reactions that occur in alkyds will also occur on, or in living cells (a cell membrane contains lipids = unsaturated fatty acids). The formation of radicals is considered as the most critical toxic pathway.

The potential carcinogenic aspect of cobalt carboxylates is a serious subject of anxiety. (Water soluble) Inorganic cobalt salts, like cobalt sulphate, are classified as carcinogenic by inhalation. If cobalt carboxylates would get classified as carcinogenic by inhalation, this would lead to restrictions in their use as drier for paints, coatings and inks or as accelerator for composites.

Points of concern

- . REACH registration
- . Solubility and bio accessibility
- . Aqua toxicity
- . ROS potential
- . Carcinogenic effect

**Dealing with all the challenges of
traditional cobalt carboxylates
creates opportunities and results in a complete solution :
ECOS ND® 15!**

The long term solution : ECOS ND[®]15 !

One is bound to the chemistry of alkyds. The free radical mechanism is essential for the drying of polymers based on unsaturated fatty acids.

The polymerization process is slow if not catalyzed. Toxicological mechanisms show that any substance that catalyzes the free radical mechanism will have the same effect on cell lipids.

Cobalt has shown to be consistent in many paint formulations. It can be bound into a high molecular weight matrix decreasing its bio availability, yet safeguarding its drying performance. Umicore offers a cobalt polymer with a metal content of 4%!



ECOS ND[®]15 is a cobalt containing polymer and so does not have to be REACH registered!

Although polymers are exempt from REACH, Umicore has already covered all issues by performing various critical toxicity tests and so is prepared for the moment when REACH eventually addresses polymers as well. In this context Umicore offers a real long term solution.

Mixed driers based on ECOS ND[®]15

USMB offers a wide range of combination driers, based on the ECOS ND[®]15.

Advantages are :

- * improved efficiency
- * ease of use
- * less raw materials in stock
- * excellent and stable quality, with the exact amount of metal concentrations each time
- * reduction of production and weighing errors

Please find our current portfolio below. USMB produces the ECOS mixes through a combination of the ECOS ND[®]15 and the neodecanoate versions of the composing metal soaps, in this way replacing the reprotoxic 2 ethyl hexanoic acid. Samples are available on request. More detailed information can be shared after the signing of a confidentiality agreement (NDA) with Umicore Specialty Materials Brugge NV. Please do not hesitate to get in contact with your local USMB distributor or USMB directly!

	Co (ECOS ND [®] 15)	Ca	Zr	Sr	Ba	Zn	Li	Mn
ECOS Co 1 Mn 3 Neo Ester	1,0							x
ECOS Co 2 Zr 3 Neo D60	2,0		X					
ECOS Mix 203 Neo D60	2,5		X				X	
ECOS Mix 213 Neo D60	2,0		X		X			
ECOS Mix PL1 Neo D60	1,9	X				X	X	
ECOS Mix 26 Neo D60	1,1	X	X					
ECOS Mix 145 N Neo D60	1,1	X	X			X		
ECOS Mix 330 Neo D60	1,1	X		X				
ECOS Mix 380 Neo D60	1,1	X	X	X				
ECOS Mix 633 Neo D60	1,1		X		X	X		
ECOS Sil 413 Neo D60	1,0	X	X					
ECOS Mix 7 Neo D60	1,0				X	X		
ECOS Mix 9 Neo D60	1,0		X		X			
ECOS Mix 53 Neo D60	1,0	X					X	
ECOS Mix 103 Neo D60	1,0	X	X					
ECOS Mix 835 Neo D60	0,7	X	X					
ECOS Mix EXPB Neo D60	0,6	X				X		
ECOS Mix 236 Neo Aqua	1,9		X			X		
ECOS Mix 353 Neo Aqua	2,0		X		X			
ECOS Mix 265 Neo Aqua	2,5		X				X	

If for any reason you are not fully satisfied with the current product offer, we will gladly advise you on the right drier mix for your specific needs.

Application results

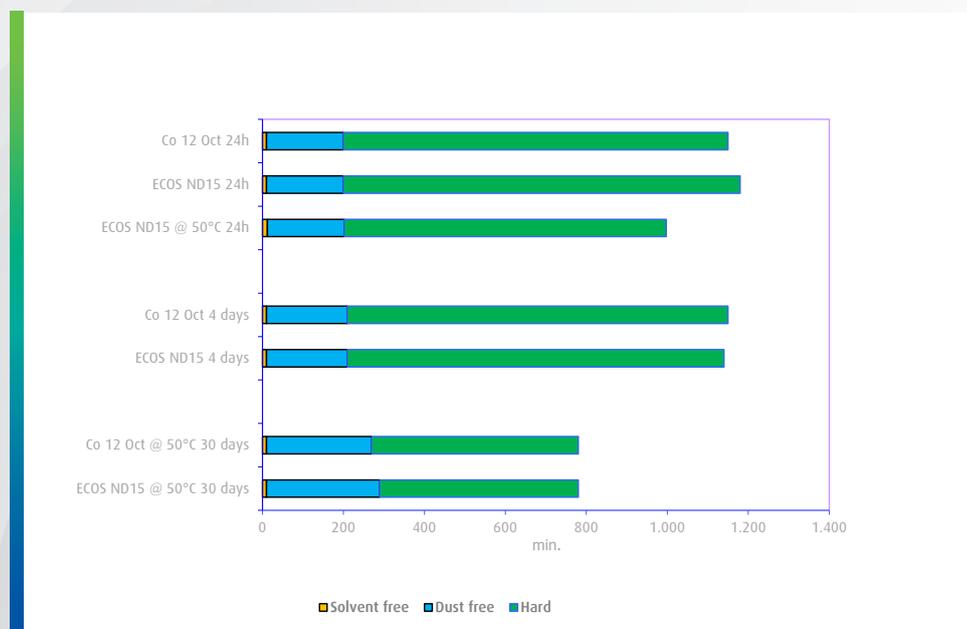
Coatings

In order to evaluate the drying action of the ECOS ND[®]15 a long oil white gloss paint was applied with a film thickness of 75 µ at a temperature of 20°C and a relative humidity of 60 to 70%.

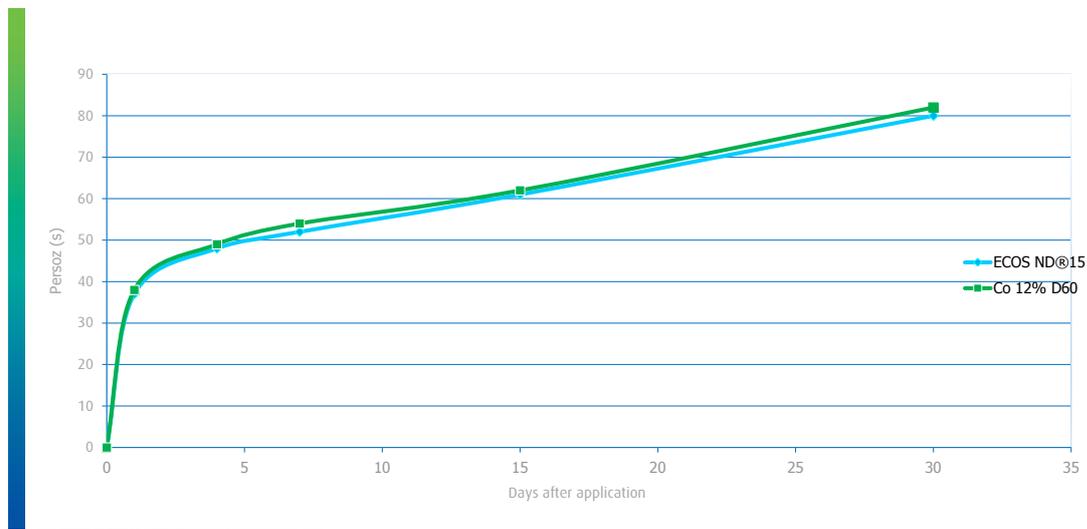
The paint contained 65% resin solids. One sample was dosed with Valirex Ca 5% N D60, Valirex Zr 18% D60 and Valirex Co 12% D60 (0,06% Co - 0,09% Ca - 0,26% Zr on the resin solids). In a second sample Valirex Co 12% D60 was replaced by ECOS ND[®]15 (metal on metal content). The drying performance was evaluated with the needle test (10g, 3cm/h).

Hardness, yellowing, gloss, skin formation and stability were evaluated. A similar dosage of anti-skinning (MEKO) was applied.

Graphic 1 : Drying time ECOS ND[®]15 - White gloss long oil



Graphic 2 : Hardness development ECOS ND[®]15 - White gloss long oil



Conclusion

In graphs 1 and 2 one can see the details on drying performance and hardness. The drying performance of ECOS ND[®]15 is identical or very similar to standard cobalt octoate (Valirex Co 12% D60) on white paint.

The results with ECOS ND[®]15 are very good in combination with Valirex Ca 5% N D60 and Valirex Zr 18% D60.

It appears that the drier stability after ageing is very good. A maturation time of 2 to 3 days before application is suggested, cfr tip.

All other characteristics like stability, hardness, skin formation, gloss and yellowing turned out to be identical to the reference.

Tip :

We advise to put a paint sample, immediately after production, in a sealed can in a drying oven at 50°C for +/- 20h overnight. An application test can be evaluated the next day. This allows faster quality control.

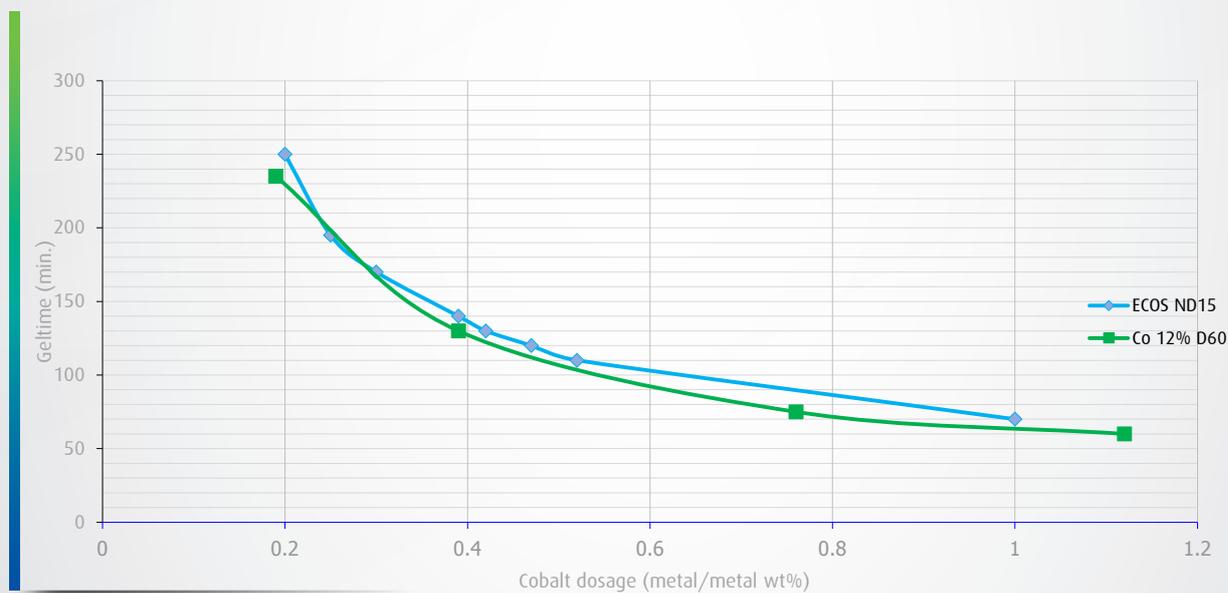
Application results

Unsaturated Polyester Resin UPR

The gel time is plotted as a function of the amount of accelerator used in a standard medium-reactive orthophthalic polyester resin for vacuum infusion.

ECOS ND[®]15 showed close to a 1:1 replacement for the whole range of typical UPR cobalt concentrations.

Drying performance ECOS ND[®]15 - UPR



Application results

Ink

The drying time was measured on foil with paper counter strips. As can be seen, the drying performance between cobalt 2-ethyl hexanoate and the cobalt polymer is nearly identical.

The drying time on a glass plate was measured applying a 15 micron film. The test indicates how long the ink can remain on the print roll without drying. The drying was evaluated using KS inks and OX inks. In all the tests the content of Mn, antioxidants and Co was constant. The drying times are very comparable.



Drying time polyacetate foil

OX Ink serie					
Yellow STD 4,5h	Yellow ND15 5h	Magenta STD 6h	Magenta ND15 6h	Cyan STD 6h	Cyan ND15 7h
KS Ink serie					
Yellow STD 7,5h	Yellow ND15 8h	Magenta STD 8h	Magenta ND15 8,5h	Cyan STD 8,5h	Cyan ND15 9h

Drying time glass plate

OX Ink serie					
Yellow STD < 10h	Yellow ND15 < 10h	Magenta STD < 10h	Magenta ND15 < 10h	Cyan STD < 10h	Cyan ND15 < 10h
KS Ink serie					
Yellow STD 48 - 52h	Yellow ND15 48 - 52h	Magenta STD 46 - 52h	Magenta ND15 48 - 52h	Cyan STD 48 - 52h	Cyan ND15 52 - 56h

OX inks are quick drying oxidative inks.

KS inks contain antioxidants which prevent the ink from drying in the color-boxes during a longer break at work.

Toxicology

On top of the outstanding application results Umicore also offers a true toxicology solution. Please find below a comparative list between CoSO₄, Co octoate and ECOS ND[®]15.

POINTS OF CONCERN	CoSO ₄	Co octoate	ECOS ND [®] 15
• REACH	Yes	Yes	Exempt
• Bio accessibility	High	High	Low
• ROS	High	High	No
• Indirect DNA damage	High	High	No
• Ecotox	High	High	Low
• Human Tox	Relevant	Relevant	No

Technical and Material Safety Datasheet

The hazard assessment of ECOS ND[®]15 is executed in line with the REACH requirements and shows it is a non-hazardous substance for all endpoints tested. A technical and safety datasheet is available on request.

Availability

ECOS ND[®]15 is produced on industrial scale! Umicore has full control over the supply chain and the production chain.

Packaging: 200 lit drums, 1.000 lit ibc's, bulk.

For inquiries and additional information please contact

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