

**USMB
ECOS ND15
Cobalt future**



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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. Various producers have developed a so called cobalt alternative.

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 on the toxicology solution its new polymerization catalyst ECOS ND15 brings.

Based on these figures and results, Umicore clearly differentiates itself from any other catalyst producer.

On top Umicore has developed mix driers, based on ECOS ND15 to facilitate the drop-in replacement against currently used carboxylates.

Last but not least, USMB offers catalysts for aqueous systems, eg ECOS ND15 Aqua and ECOS Mix 353 Aqua.

Points of concern

REACH registration

Solubility and bio accessibility

Aqua toxicity

ROS potential

Carcinogenic effect

Dealing with all of these issues creates real opportunities and allows offering a complete solution!

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 R50/53 (highly acute aqua toxic), cobalt neodecanoate and cobalt naphthenate are labelled as R51/53 (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) if a substance is bio available. The formation of radicals is considered as the most critical toxic pathway.

Since cobalt 2-ethylhexanoate has been REACH registered in 2010 (with various similarities to cobalt sulphate, even though the dossier must be further completed) and possibly other cobalt carboxylates might follow the same toxicological profile in due time, the uncertainty on the future of cobalt carboxylates remains.

The potential carcinogenic aspect of cobalt carboxylates is a serious subject of anxiety. (Water soluble) Inorganic cobalt salts, like cobalt sulphate, are already recognized as carcinogenic by inhalation.

If cobalt carboxylates would get classified as carcinogen by inhalation, this would lead to restrictions in their use as drier for paints, coatings and inks or as accelerator for composites.

The long term solution : ECOS ND15 !

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 (bio available) 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 ND15 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.

Application results

Coatings

In order to evaluate the drying action of the ECOS ND15 a long oil white gloss paint was applied with a film thickness of 75µ 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 10 D60 (0,06% Co - 0,09% Ca - 0,26% Zr on the resin solids).

In a second sample Valirex Co 10 D60 was replaced by ECOS ND15 (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.

Conclusion

In figures 1 and 2 one can see the details on drying performance and hardness.

The drying performance of ECOS ND15 is identical or very similar to standard cobalt octoate (Valirex Co 10 D60) on white paint.

The results with ECOS ND15 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.

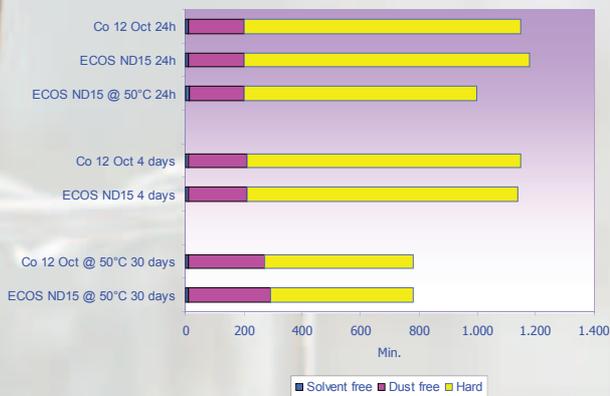
A maturation time of 2 to 3 days before application is suggested.

Tip :

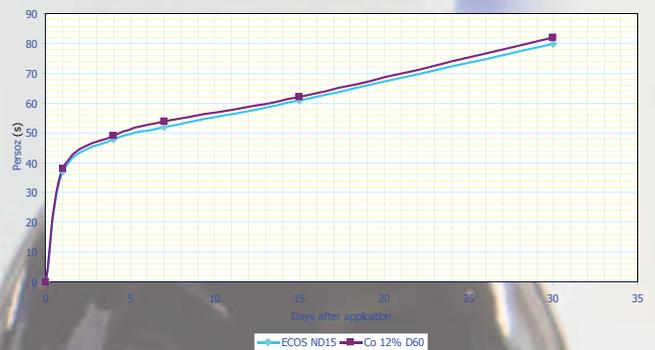
We advise to put a paint sample, immediately after production, in a sealed can in a drying oven at 50°C for +/- 20h overnight. An application test can be evaluated the next day. This allows faster quality control.

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

Drying time ECOS ND15 - White gloss long oil coating

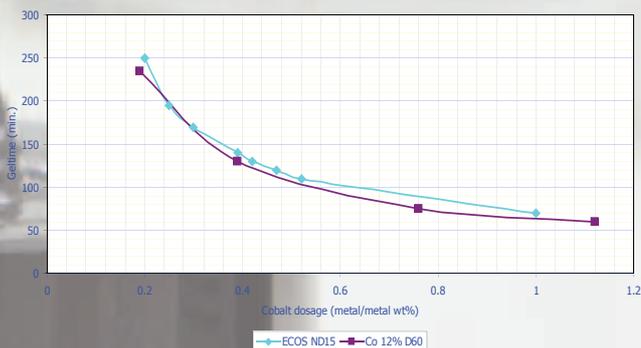


Hardness development ECOS ND15 - White gloss long oil coating



UPR

Drying performance ECOS ND15 - UPR



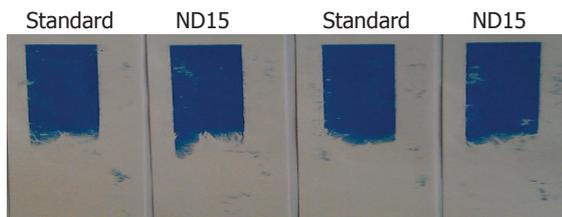
The gel time is plotted as a function of the amount of accelerator used in a standard medium-reactive orthophthalic polyester resin for vacuum infusion. ECOS ND15 showed close to a 1:1 replacement for the whole range of typical UPR cobalt concentrations.

ECOS ND 15

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 Ware Patmoskeweg 82Be-3000 Brugge

Drying time offset polyacetate foil

Drying time : 1 v cm/h
1,50 +/- 0,03 g/m



Counter strips A PCO II/II

Printed material: Polyacetate foil

Drying time Polyacetate foil					
OX Ink serie					
Yellow STD	Yellow ND15	Magenta STD	Magenta ND15	Cyan STD	Cyan ND15
4,5h	5h	6h	6h	6h	7h
KS Ink serie					
Yellow STD	Yellow ND15	Magenta STD	Magenta ND15	Cyan STD	Cyan ND15
7,5h	8h	8h	8,5h	8,5h	9h
Drying time glass plate					
OX Ink serie					
Yellow STD	Yellow ND15	Magenta STD	Magenta ND15	Cyan STD	Cyan ND15
< 10h	< 10h	< 10h	< 10h	< 10h	< 10h
KS Ink serie					
Yellow STD	Yellow ND15	Magenta STD	Magenta ND15	Cyan STD	Cyan ND15
48 - 52h	48 - 52h	46 - 52h	48 - 52h	48 - 52h	52 - 56h

The drying time was measured on foil with paper counter strips. As can be seen, the drying performance between cobalt bis (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.

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 ND15.

Points of concern	CoSO ₄	Co octoate	ECOS ND 15
REACH	Yes	Yes	No
Bio accessibility	High	High	Low
ROS	High	High	No
DNA damage	High	High	No
Ecotox	High	High	No
Human tox	Relevant	Relevant	Low

Material Safety Data Sheet

The hazard assessment of ECOS ND15 is executed in line with the REACH requirements and shows it is a non-hazardous substance for all endpoints tested. An MSDS is available on request.

ECOS ND15 – Availability

ECOS ND15 is produced on industrial scale and currently sold in significant volumes! Umicore has full control over the supply chain and the production chain.

Packaging: 200ltr drums, 1.000ltr IBC's, bulk.

