CASE STUDY

All-Weather, Sustainable Catalysts Outperform Cobalt in Water- and Solvent-Based Alkyds

Summary

Product type: High-Performance Catalyst
Application: Coatings that dry by oxidation (e.g., alkyd window, door, and trim paint)
Key benefits:

- Higher performance compared to cobalt catalysts (color, dry time, durability, gloss, haze)
- Prolong coating season (hot and cold, dry, or humid)
- Sustainable (meets stringent regulatory requirements)

The Challenge

Driers are added to air-drying coatings to accelerate the auto-oxidation drying process. Without these catalysts, the cross-linking process is very slow, and the paint may take months to dry completely. With driers, the formation of a hard, weather-insensitive film is accomplished typically within a few hours after paint application. Cobalt carboxylates are the most widely used driers to date, but their use is under pressure due to their probable classification as carcinogens.

The **search for a cobalt substitute has been challenging**. A replacement must not only be sustainable but must also be appropriate for all alkyd-based paints (solvent-based, water-based, and high solids), provide equal or superior paint properties when compared to cobalt driers, and be cost-effective.

The Solution

Two new organometallic catalysts have been developed by Borchers: A Milliken Brand as **sustainable, high-performance alternatives to cobalt catalysts**. These catalysts also extend the painting season by providing consistent curing performance in all weather conditions. They can be used in all alkyd water and solvent-based paint systems.

- Borchi® OXY-Coat (propylene glycol solution)
- Borchi® OXY-Coat 1101 (water solution)

These catalysts provide a complete drier package for the replacement of cobalt. They are used in very low dosages with concentrations of 0.5 to 3.0 % for Borchi® OXY-Coat and 0.25 to 2.0% for Borchi® OXY-Coat 1101 depending on the paint systems.

Faster Drying

One key benefit of Borchi® OXY-Coat and OXY-Coat 1101 is the significant improvement in dry time compared to cobalt. They also provide consistent dry time performance across different temperatures and humidity which expands the application window. The fast-drying capability allows quick return to service when painting windows, doors, and trim.

Drying Times Conducted at 25µm with Optimized Catalyst Concentrations

Catalyst	Binder*	Drying Time, Hours					
		23°C, 50% RH		14 days aging @ 50°C		10°C, 80% RH	
		Tack Free	Through Dry	Tack Free	Through Dry	Tack Free	Through Dry
OXY-Coat	**1**	**3**	**12**	**7**	**17**	**11**	**16**
Cobalt	1	12	22	10	20	34	24
OXY-Coat 1101	**2**	**0.1**	**2.0**	**0.8**	**2.8**	**0.8**	**2.0**
Cobalt	2	0.8	3.0	1.0	5.0	1.0	4.5

*Notes: Binder 1 – WorleeKyd AC 6030 long-oil alkyd resin (Worlée-Chemie G.m.b.H.)
Binder 2 – Synaqua 4804 short oil alkyd resin (Arkema)

Most coatings formulated with Borchi® OXY-Coat high-performance catalysts can be applied and recoated in one day without negatively impacting the appearance of the coating. Painting in extreme weather can negatively impact the appearance of a coating. For example, hot weather can cause wrinkling on substrates. Borchi® OXY-Coat solutions minimize this issue, ensuring smoother surfaces on application.

Value Added Sustainability

The Borchi® OXY-Coat technology provides a high-performance alternative to cobalt. Extensive testing has shown higher performance in most resin systems. Coupled with its very low use level, Borchi® OXY-Coat technology provides a drier system with no regulatory issues and without the carcinogenicity concerns of cobalt. These driers provide fast cure to coatings that cure oxidatively including resins based on renewable resources.

Borchi® OXY-Coat 1101 has zero VOCs and is ideal for low VOC water-based systems. It is compliant with the environmental labels "Blue Angel" (RALUZ 12a) and "EU Ecolabel" (Regulation (EC) No. 66/2010, Commission Decision 2014/312/EU).

Optimized formulations with Borchi® OXY-Coat and Borchi® OXY-Coat 1101 can result in lower formulation costs when compared to traditional drier packages. This helps coating manufacturers maintain the lower cost position when using alkyd resin technology.

Higher Performance

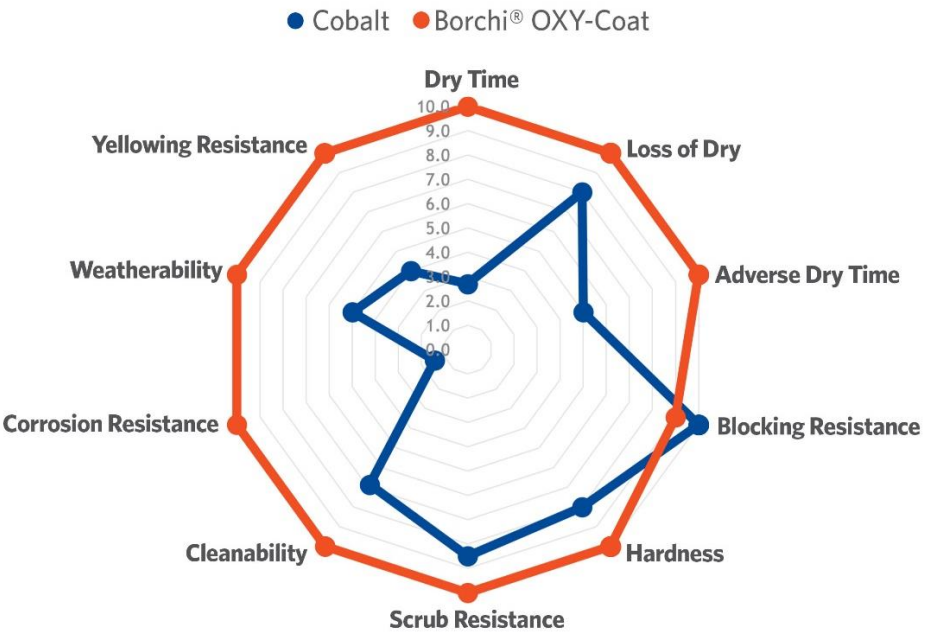
Borchi® OXY-Coat high-performance catalysts provide many performance advantages over cobalt driers. Both Borchi® OXY-Coat and OXY-Coat 1101 enable more versatile formulations that can be used on multiple substrates such as metal, wood, and composites, expanding the potential end-use applications. They show superior durability and weatherability to withstand both indoor and outdoor environments. This allows the formulations to be used even in light industrial applications.

When compared to cobalt or other traditional driers both Borchi® OXY-Coat and Borchi® OXY-Coat 1101 will:

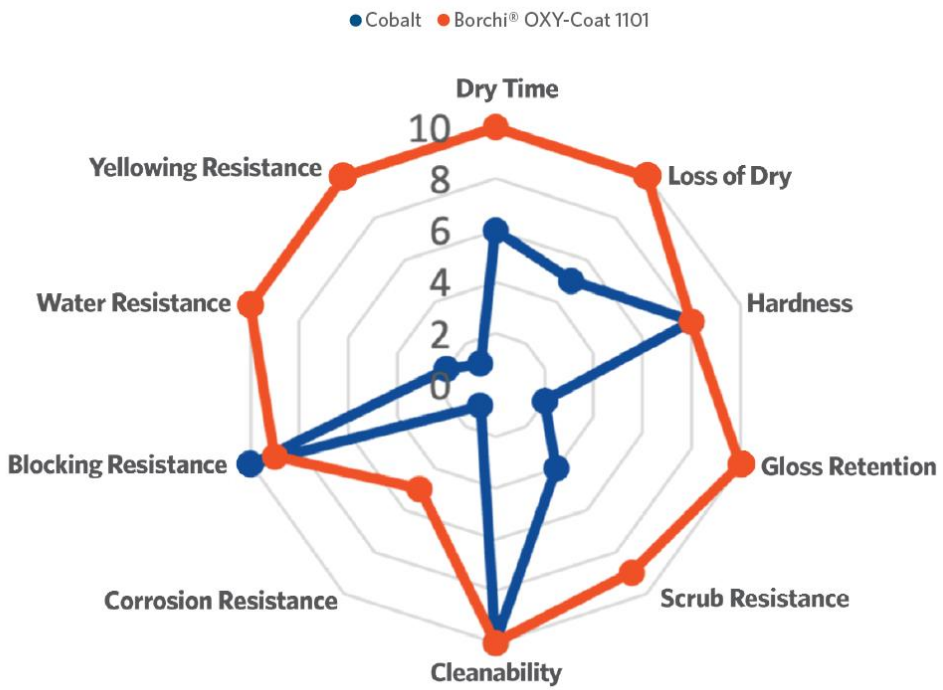
- Preserve gloss and reduce yellowing with superior ability to withstand direct sunlight
- Provide enhanced durability as measured by Taber Abrasion
- Exhibit superior corrosion resistance after 110 hours in salt spray per ASTM B117, indicating better adhesion and resistance to water
- Improve scrub and cleanability per ASTM 2486 so that typical stains can be removed easily.

The following spider chart shows the quantitative value of performance variables for Borchi® OXY-Coat and Borchi® OXY-Coat 1101 across an axis that starts in the chart's center point.

Performance Differences of Borchi® OXY-Coat vs. Cobalt in a Solvent-Based Paint System with WorleeKyd AC 6030 Resin



Performance Differences of Borchi® OXY-Coat 1101 vs. Cobalt in a Water-Based Paint System with Synaqua 4804 Resin



Conclusion

Cobalt carboxylates are the main driers for alkyd resins in paints and inks but concerns about their possible classification as carcinogens have generated considerable interest in alternatives to cobalt. Alternatives have been proposed but until recently, none were found to have the broad performance qualities of cobalt driers.

The Borchi® OXY-Coat and Borchi® OXY-Coat 1101 driers provide high-performance alternatives to these traditional catalysts. Extensive testing has shown superior fast drying characteristics and performance properties. Coupled with their very low use levels, these high-performance catalysts reduce regulatory and carcinogenicity concerns when compared to cobalt.

See the portfolio of solutions offered by Borchers.

Download TDS and Request Samples

Borchi® OXY-Coat **Borchi® OXY-Coat 1101**