



PATCHAM

DRIERS AND ANTI-SKINNING AGENTS FOR ALKYD BASED PAINTS COATINGS AND INKS

Patcham Paint Driers

Driers for Alkyd Systems

Paints and Coatings based on alkyd or modified alkyd resins are common in today's markets. These air drying systems require catalysts to accelerate the chemical reactions of the drying process. These catalysts are called Driers.

Types of Driers:

Primary Driers: (Also termed as Active Driers; Drying Initiators; Surface or Top Driers.)

Act as primary oxidation catalysts and work mainly on the surface of the wet film.

Cobalt	Most powerful at ambient temperatures. Can lead to discoloration due to its purple color	Iron	Weak at ambient temperatures– often used in baking finishes. Efficacy can be enhanced by the use of chelating agents.
Manganese	Weaker than cobalt but its efficacy can be enhanced with chelation agents. Can discolor white paints Also gives some through drying.	Cerium	Very weak as an initiator at ambient temperatures. Colorless. Provides some through drying

Secondary Driers: (Also termed as Through Driers.)

Used in conjunction with primary driers to ensure a balanced drying process of both the surface and body of the film.

Zirconium	Powerful through drier. Most widely used	Strontium	Good through drier
Zinc	Strong through drier. Slows surface dry slightly. Gives harder films	Bismuth	Weaker through drier. Not as toxic as lead.
Lead	Good through drier. Has some initiation effects as well.		

Auxiliary Driers: (Also termed polarizing driers.)

Modify the action of primary and secondary driers

Calcium	Assists in the through drying process. Improves the action of primary driers. Most widely used.	Lithium	Used to improve the hardness of high solids coatings.
Barium	Good at maintaining drying under humid conditions.	Potassium	Used occasionally to improve the action of cobalt driers.

Patcham Paint Driers

Commodity Driers		Non Flammable High flash point No aromatics		Green Driers 2 Ethyl Hexanoic Acid - free Low VOC No aromatics Non Flammable	
Primary Driers / Drying initiators		Primary Driers / Drying initiators		Primary Driers / Drying initiators	
Patcham Cobalt Octoate	12%	Patcham Cobalt Octoate	12% D80		
	10%		10% D80		
	8%		8% D80		
	6%		6% D80		
Patcham Cobalt Neodecanoate	12%			Patcham Cobalt Neodecanoate	10% BD
	10%				
Patcham Manganese Octoate	12%	Patcham Manganese Octoate	12% D80	Patcham Manganese Neodecanoate	8% BD
	10%		10% D80		
	9%				
	6%				
	4%				
Patcham Iron Octoate	8%				
Patcham Iron Naphthenate	6%				
Patcham Cerium Octoate	12%				
Secondary Driers / Through Driers		Secondary Driers / Through Driers		Secondary Driers / Through Driers	
Patcham Zirconium Octoate	24%	Patcham Zirconium Octoate	18% D80	Patcham Zirconium Neo	18% BD
	18%		12% D80		
	12%				
	10%				
	6%				
Patcham Zinc Octoate	18%	Patcham Zinc Octoate	16% D80	Patcham Zinc Neodecanoate	16% BD
	16%				
	12%				
	10%				
	8%				
	6%				
Patcham Lead Octoate	36%				
	30%				
	24%				
Patcham Strontium Octoate	10%			Patcham Bismuth Neodecanoate	20% BD
Patcham Bismuth Octoate	28%				
Secondary Driers / Auxiliary Driers		Secondary Driers / Auxiliary Driers		Secondary Driers / Auxiliary Driers	
Patcham Calcium Octoate	10%	Patcham Calcium Octoate	10% D60	Patcham Calcium Neodecanoate	5% BD
	8%				
	6%				
	5%				
Patcham Calcium Neutral	6%				
Neutral	5%				
Neutral	4%				
Patcham Barium Octoate	12.5%				
Octoate	15%				
Patcham Lithium Octoate	2%				
Patcham Lithium Neodecanoate	2%				
Patcham Potassium Octoate	15%				
Patcham Potassium Octoate	10%				

Non-Metallic Drying Enhancer :

PATox 41 when used in conjunction with traditional primary metallic driers:

Accelerates drying times

Reduces the tendency for these primary metallic driers to deactivate

Helps to prevent loss of dry typically associated with pigmented oleo-resinous, high-solids, water-reducible, and urethane coatings

PATox 41 is typically used at levels ranging from 0.04% to 0.40% based on resin solids.

PATcom Drier Combinations

Any single metal is not sufficient to catalyze fast and uniform drying. For this reason, a mixture of driers are used in alkyd paints. Pre-mixing the concentrated driers usually results in gelling. There are a variety of stable combination drier packages available both standard and custom made.

Driers for Water-Based Alkyd Systems

Water-based alkyd resins are often hybrid alkyd/acrylic dispersions. The alkyd part of these binders again dries via an oxidative polymerization process catalyzed by driers.

PATcom WB series of driers is specially formulated for water borne alkyd systems providing performance and ease of incorporation.

Cobalt	10% WB & 6% WB	Zirconium	12% WB	Combinations WB 102 WB 103
Manganese	6% WB	Calcium	5% WB	

Loss-of-Dry Inhibitors

Air drying paints tend to lose drying efficiency during storage as the result of undesired interactions between the drier catalyst system and other paint components. Driers are prone to absorption by high surface area pigments and fillers and to hydrolysis issues through the presence of water. The problem is most acute when primary driers are impacted.

Patcham Cobalt 21% is an all-purpose loss of dry inhibitor.

PATcom 78 provides loss of dry protection in systems containing high surface area pigments.

Lead Replacement:

Concerns surrounding the toxicity of lead have caused users to seek replacements such as zirconium driers. However, some of the advantages offered by lead are not always obtained when using substitutes.

PATcom PBF is a specially formulated lead free combination drier that mimics the action of lead when used in combination with cobalt and calcium.

Cobalt Replacement:

Recent concerns regarding the regulatory status of cobalt has led to interest in cobalt replacement driers.

PATcom 2516 is a special metal complex that can be used in place of cobalt driers. This is also recommended for urethane alkyds and in air drying paints where the color of cobalt is an issue.

Patcham Ink Driers

Commodity Driers	Appropriate
Economical	No VOC emissions in pressroom Low fountain solution leachability Minor effect on ink rheology
Primary Driers / Drying initiators	Green Driers
Patcham Cobalt Octoate 12% Patcham Manganese Octoate 12% Patcham Cerium Octoate 12% Patcom 79 (6% cobalt 6% Manganese) Patcom 2516 (Cobalt replacement Drier)	Patcham Cobalt Neodecanoate 10% BD Patcham Manganese Neodecanoate 8% BD Patox Manganese 6% TF Patcham Calcium 10% BD Patcham Calcium Neodecanoate 5% BD Patcham Zirconium Neodecanoate 18% BD Patcom 83 (4% Cobalt 4% Manganese) Patcom 2507 BD (Cobalt replacement Drier)
Secondary Driers	Drying enhancer
Patcham Calcium 10% Patcham Zirconium 24%	PATox 41

Anti-skinning agents

Anti-skinning agents endeavor to inhibit paint drying in the can, thus preventing skin formation, without hindering drying on the substrate. The use of anti-skinning agents usually cause a slight increase in the drying time.

PATox1 MEKO (Methyl Ethyl Ketoxime)

MEKO-FREE Anti-Skinning Agents

MEKO has been included by ECHA in ATP 15 and classified as Carc. 1B. There is regulatory pressure to replace MEKO (Methyl Ethyl Ketoxime) in alkyd based paints and coatings.

MEKO-FREE

Raw Materials	MEKO	PATox 3		PATox 4
		Equal Use level	40% Less	Equal Use level
White alkyd enamel	100.00	100.00	100.00	100.00
Patcham Cobalt 10%	0.18	0.18	0.18	0.18
Patcham Zirconium 12%	0.58	0.58	0.58	0.58
Patcham Calcium 10%	0.70	0.70	0.70	0.70
MEKO (PATox 1)	0.20			
PATox 3		0.20	0.12	
PATox 4				0.20

PATox 3

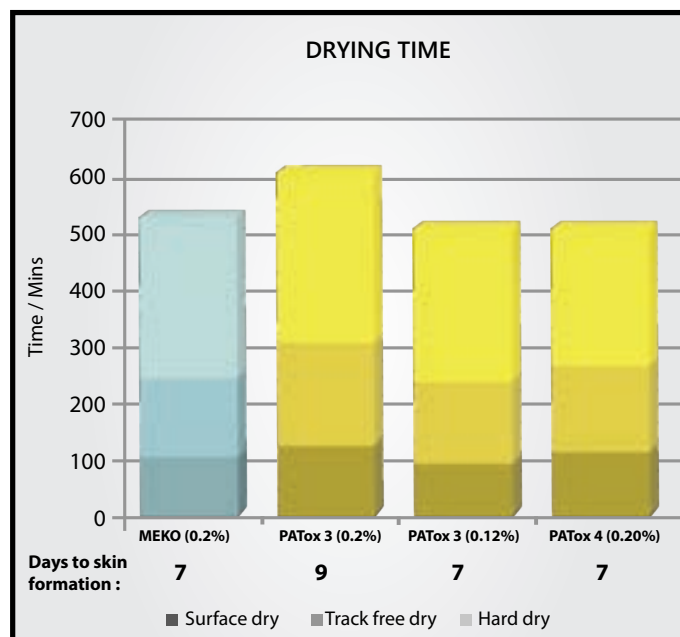
Liquid

- Efficient anti-skinning agent can be used at 25-40% lower use level than MEKO

PATox 4

Liquid

- Economical drop-in replacement for MEKO
- Lower cost than most MEKO-Free anti-skinning agents



PATox 5

Powder/flake

- Cyclohexanone oxime

Drier dosage requirement:

$$\text{Weight of drier required} = \frac{\text{Weight of resin solids} \times \% \text{ metal required}}{\% \text{ Metal in drier}}$$

Drier metal	Typical wt metal / resin solids %	Normal max. Conc.
Co	0.06	0.20
Mn	0.02	0.10
Fe	0.04	0.08
Ce	0.20	0.60

Drier metal	Typical wt metal / resin solids %	Normal max. Conc.
Zr	0.3	0.4
Pb	0.5	1.0
Sr	0.4	0.6
Bi	0.3	0.5
Zn	0.2	0.4

Drier metal	Typical wt metal / resin solids %	Normal max. Conc.
Ca	0.20	0.40
Ba	0.20	0.40
Li	0.03	0.05
K	0.03	0.08

Drier Related Troubleshooting

Dries too slowly	Increase all driers
Slow drying at low-temperature	Replace Ca with Ba or Sr or Li / Replace Co with Mn
Poor drying in high humidity	Replace Ca with Ba
Slow surface dry	Increase Co / Add K or Ca
Poor through dry	Increase Zr / Add Bi or Zn
Film is too brittle	Reduce Co / Replace Co with Mn / Increase Sr
Film too tacky	Increase Primary driers
After Tack	Increase Zr
Dust entrapment	Increase Primary driers
Coating is too soft	Add Zn, Bi or Li
Wrinkling	Increase Ca / Decrease Co / Add Zn / Replace Co with Mn
Coating has poor water resistance	Replace Ca with Ba or Sr
Low gloss	Add Zn
Yellowing	Replace Mn with Co
Blooming	Increase Ca
Poor color retention	Add Zn
In can skinning	Decrease Primary Driers / Increase Anti-skinning agent
Sulphide staining	Replace Pb with Zr
Poor pigment dispersion	Incorporate Zn or neutral Calcium Octoate in the grind stage
Loss of Dry:	
Coatings with high surface area pigments	Increase neutral Ca / Add Zn Add PATcom PBF
Coatings containing water	Add Patcham Cobalt 21%



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