Opacilite

(a ‘flash calcined’ kaolin)
in coatings below & above the CPVC

Replacement of Medium Particle Calcined Kaolin

IMERYS

Contents

IMERYS

1. Creation of Opacilite

Patented process

Produced by heating fine hydrous kaolin rapidly to 1000°C

- rapid dehydroxylation (loss of chemically bonded H_2O)
- results in 'bloating' of particles (popcorn effect)

'Bloating' results in sealed internal voids

- provide opacity below CPVC
- reduce specific gravity from 2.6 to 2.06

Aggregation of platy kaolin results in external voids

- provides opacity above CPVC

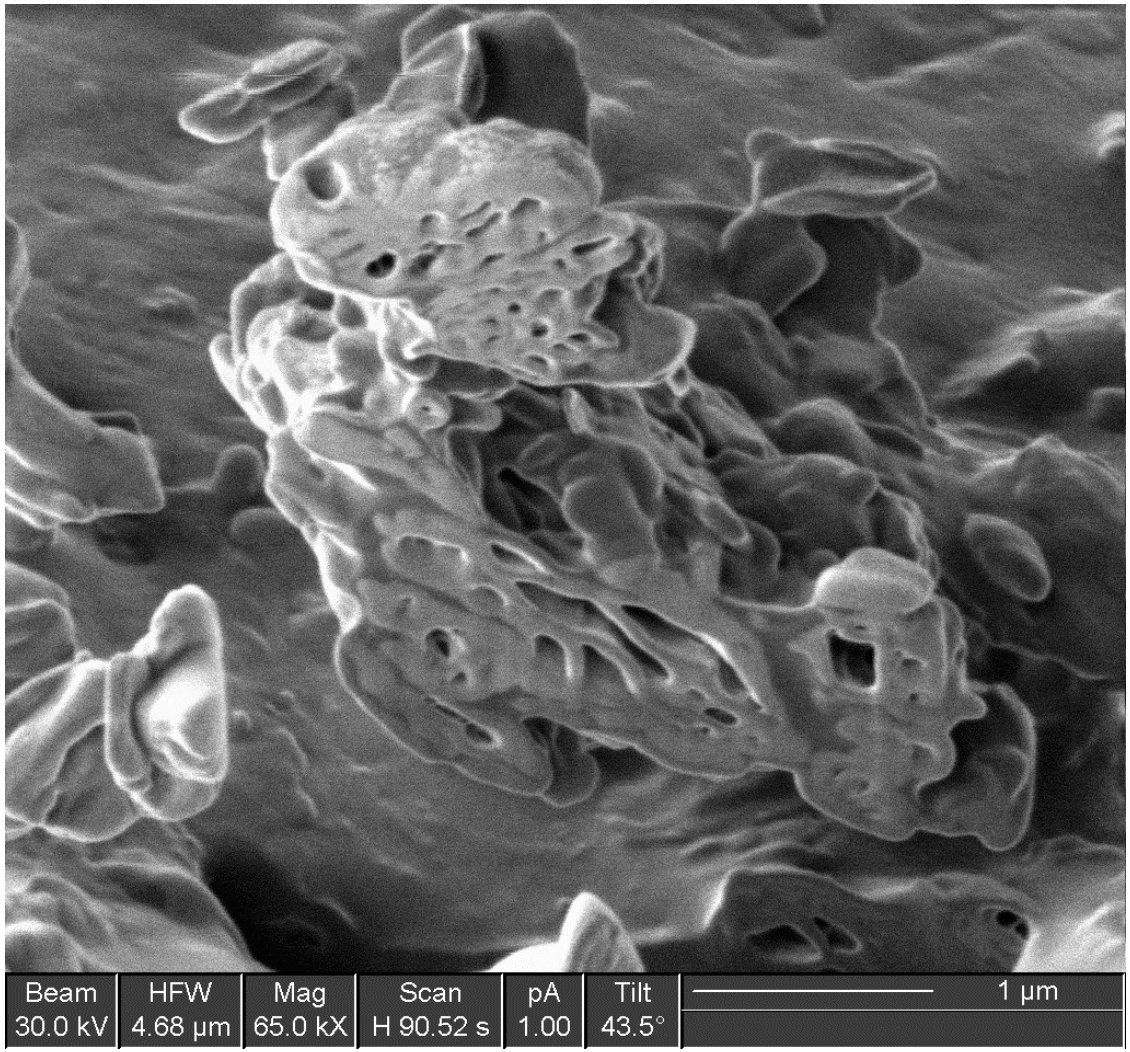
Typical hegman value of 30μm

- improved dispersion in solvent coatings

IMERYS

Opacilite Cross Section

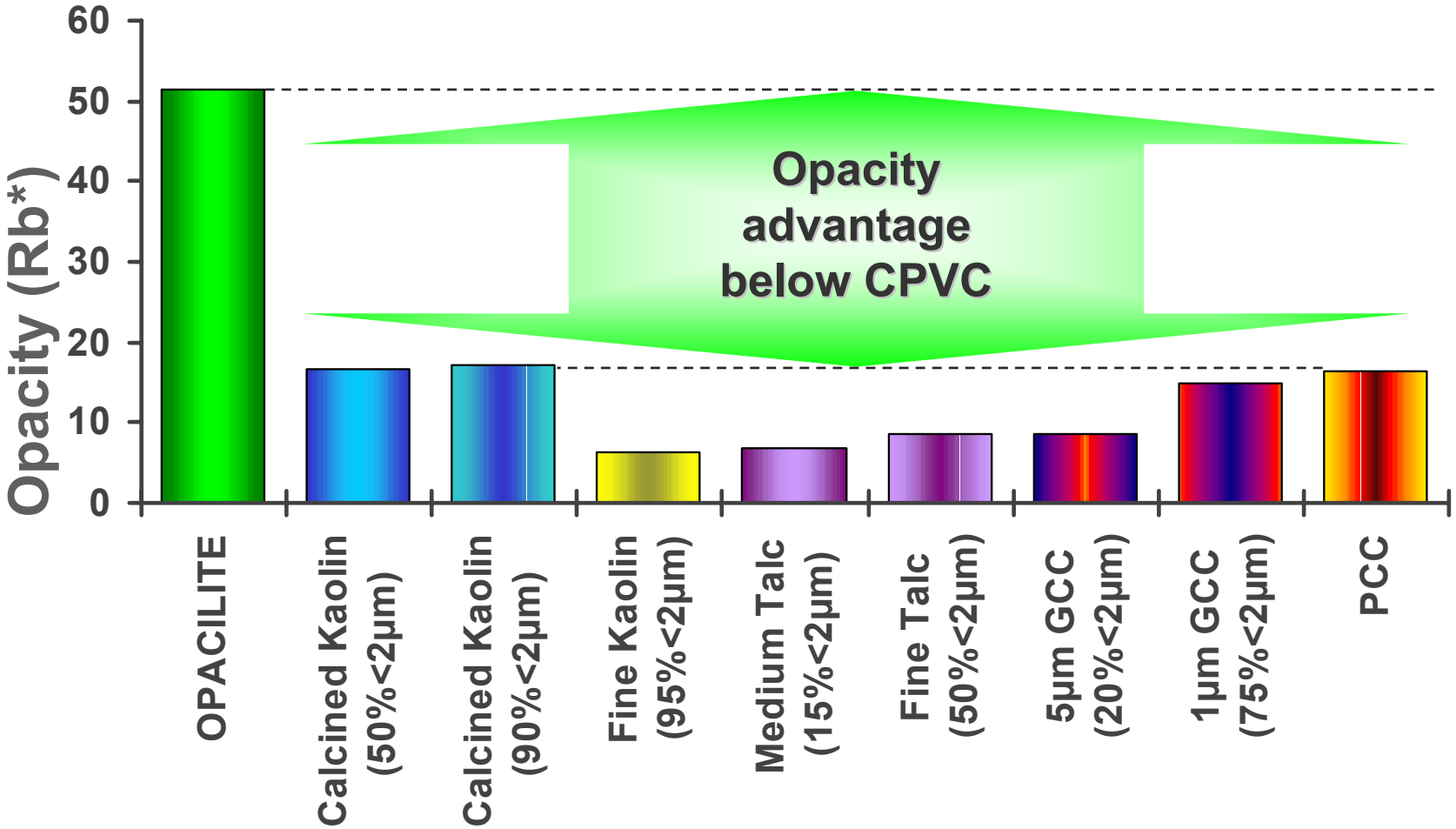
Focused ion-beam



IMERYS

2. Opacilite in Coatings Below CPVC

Comparison of extenders at 25%PVC



40% volume solids, no TiO_2

*Rb is reflectance over black

IMERYS

Scattering Efficiency*

Function of the difference in bulk refractive index

Fresnel's equation:

$$F = \frac{(\eta_1 - \eta_2)^2}{(\eta_1 + \eta_2)^2}$$

where, F = reflectivity

η_1 = R.I. of the dispersed phase

η_2 = R.I. of the medium

Dispersed Phase	Medium	η_1	η_2	F (%)
TiO_2	Polymer	2.73	1.50	8.4
Typical Extender	Polymer	1.56	1.50	0.1
Air Void	Kaolin	1.00	1.56	4.8

*scattering efficiency also depends on d_{50}, psd and distance separating the pigment particles, which in turn depends on the PVC and dispersiblity.

IMERYS

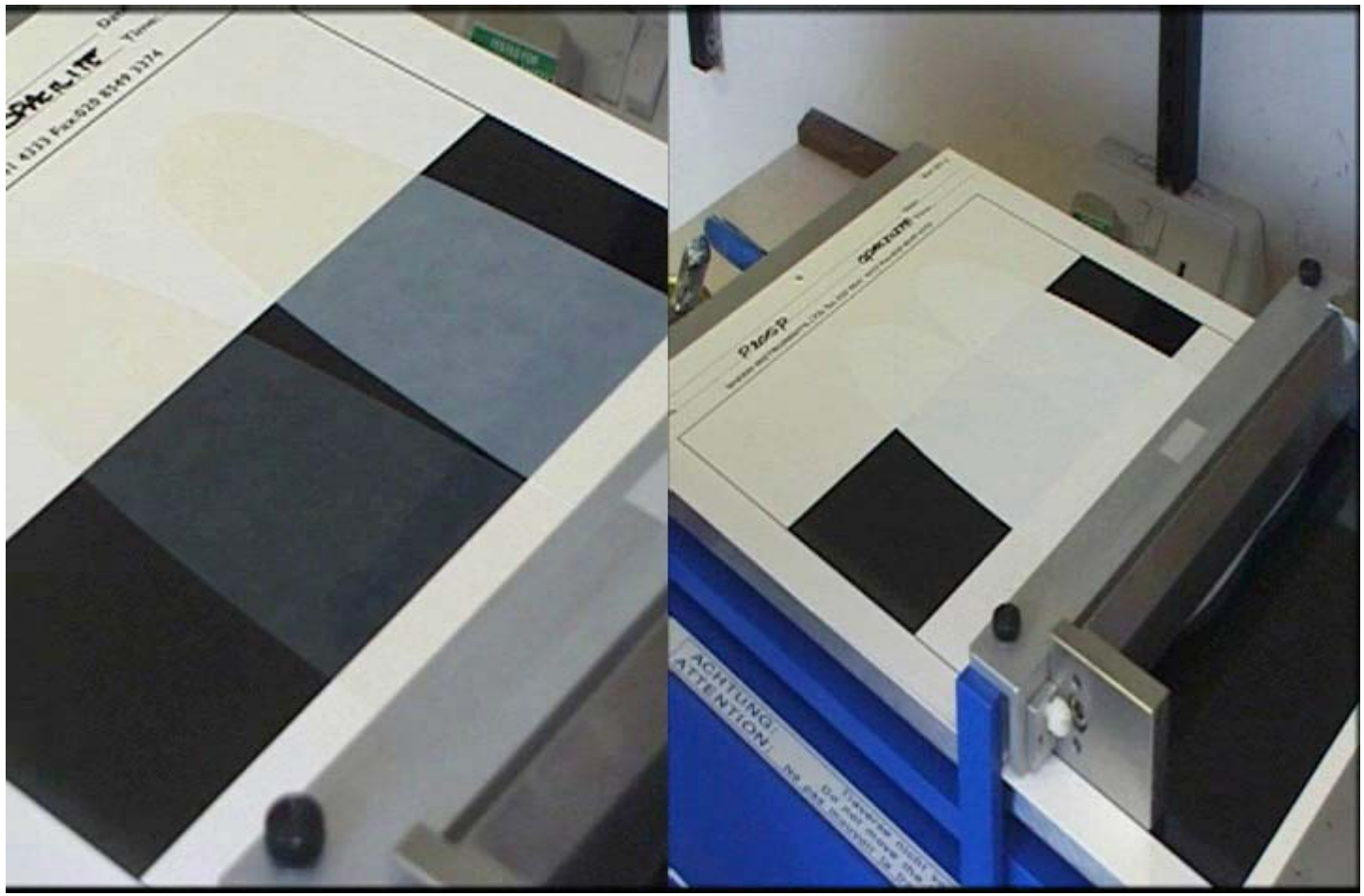
3. Opacilite Effect on Dry Film Opacity

Below CPVC (25%PVC)

4. Opacilite Effect on Wet Film Opacity

25% PVC Alkyd, no TiO_2

65% PVC Emulsion , 16% TiO_2, 8% Calcined Kaolin, 21% other extenders)



Both drawdowns 100μm, PoleStar 200P on the left, Opacilite on right

IMERYS

5. Reformulating with Opacilite

Formulating guidelines

Replace the medium particle size calcined kaolin with an equal volume of Opacilite

- minimise differences in oil absorption
  - *minimise differences in mechanical properties*

Reduce TiO_2 loading by 10%

- Initial TiO_2 content must be > 10% wt

Replace substituted TiO_2 with high brightness 5μm $CaCO_3$

- minimise differences in colour & sheen

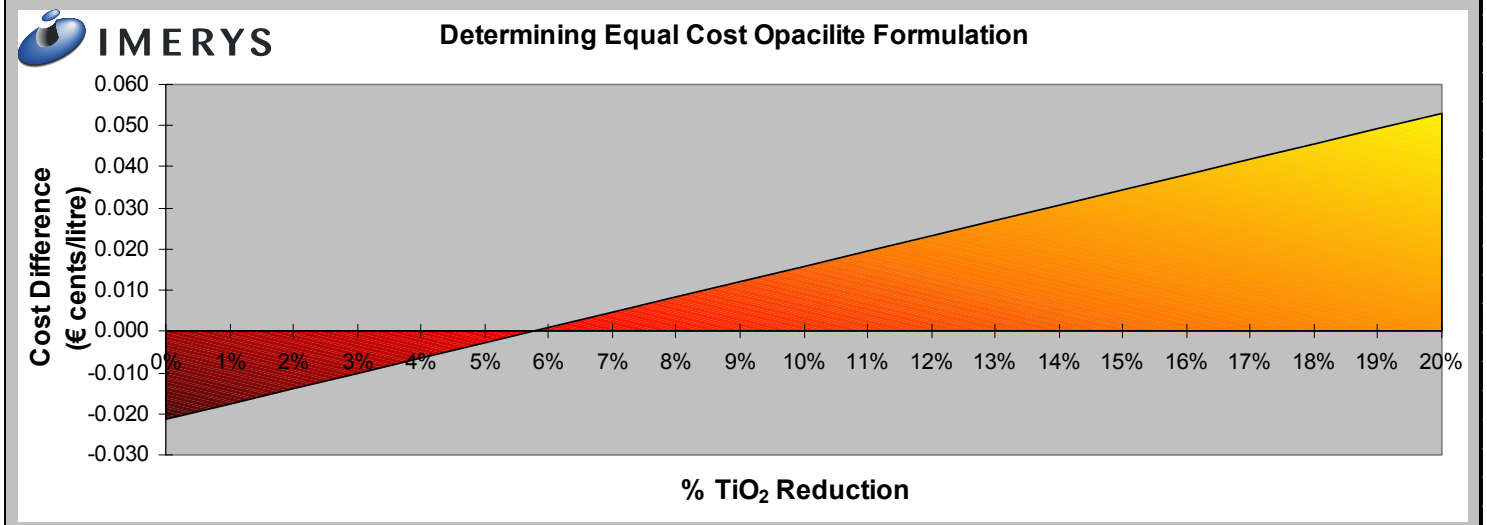
Evaluate results & adjust TiO_2 reduction accordingly

IMERYS

6. Reformulation using Opacilite

Cost saving calculator

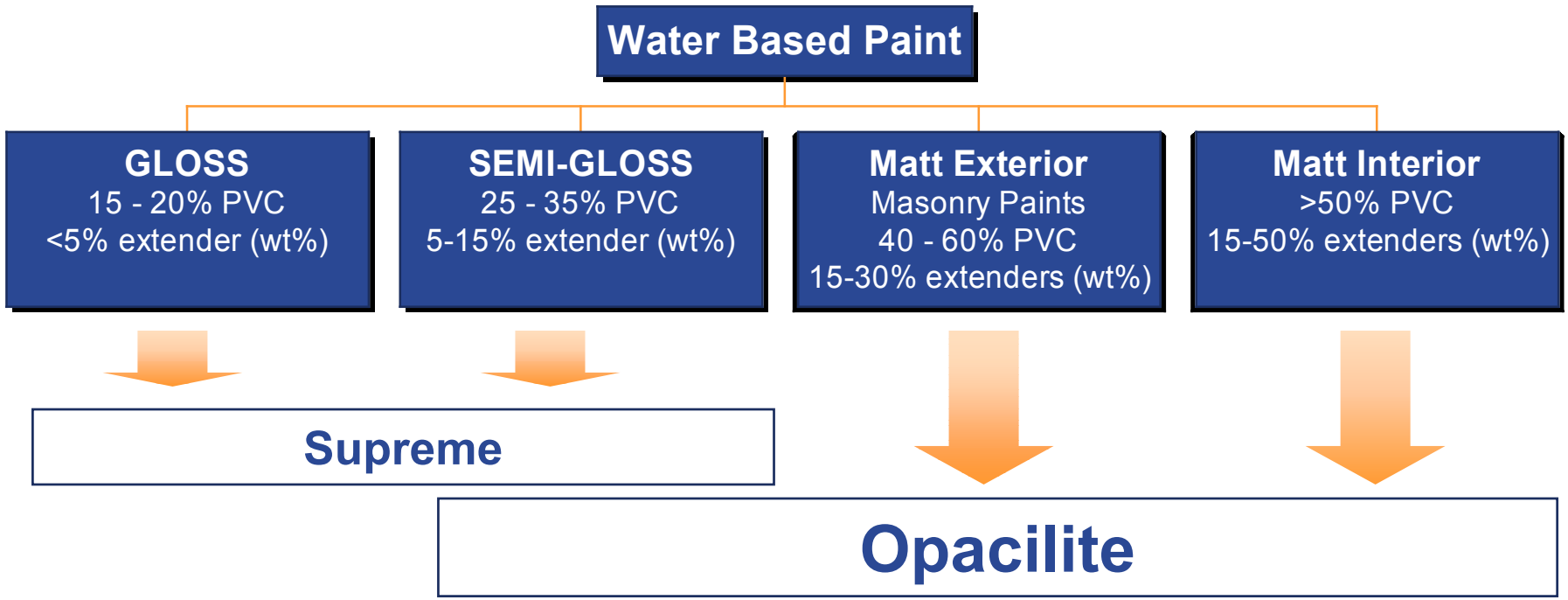
Standard Formula Details				Formulation Details			
Component	%wt	Cost PMT (€)		Start Formulation	1€ cent/l Saving	2€ cent/l Saving
TiO_2	**14.0**	1900	**Required TiO_2 Saving**	10.0%	8.4%	11.1%
Calcined Kaolin (medium)	**6.0**	530	Component	%wt	%wt	%wt
$CaCO_3$ (2μm & 5μm)	**20.0**	100	TiO_2	**12.6**	**12.8**	**12.4**
Other Extenders	**5.0**		Opacilite	**4.8**	**4.8**	**4.8**
Binder	**17.0**		$CaCO_3$ (2μm & 5μm)	**22.6**	**22.4**	**22.8**
Other Ingredients	38.0		Other Extenders	**5.0**	**5.0**	**5.0**
			Binder	**17.0**	**17.0**	**17.0**
%PVC (excluding additives)	65.0		Other Ingredients	38.0	38.0	38.0
Standard SG (estimate)	1.447					
STD Pigmentation Cost (€/litre)	0.460		%PVC (excluding additives)	66.0	65.9	66.0
			SG (estimate)	1.433	1.434	1.433
			Pigmentation Cost (€/litre)	0.444	0.450	0.440
Opacilite Quoted Price			Cost Saving (€/million litres)	15,983	10,000	20,000
			Probability of Cost Saving	**High**	**High**	**Medium**



IMERYS

7. Opacilite for Water-Based Paints

Recommended uses



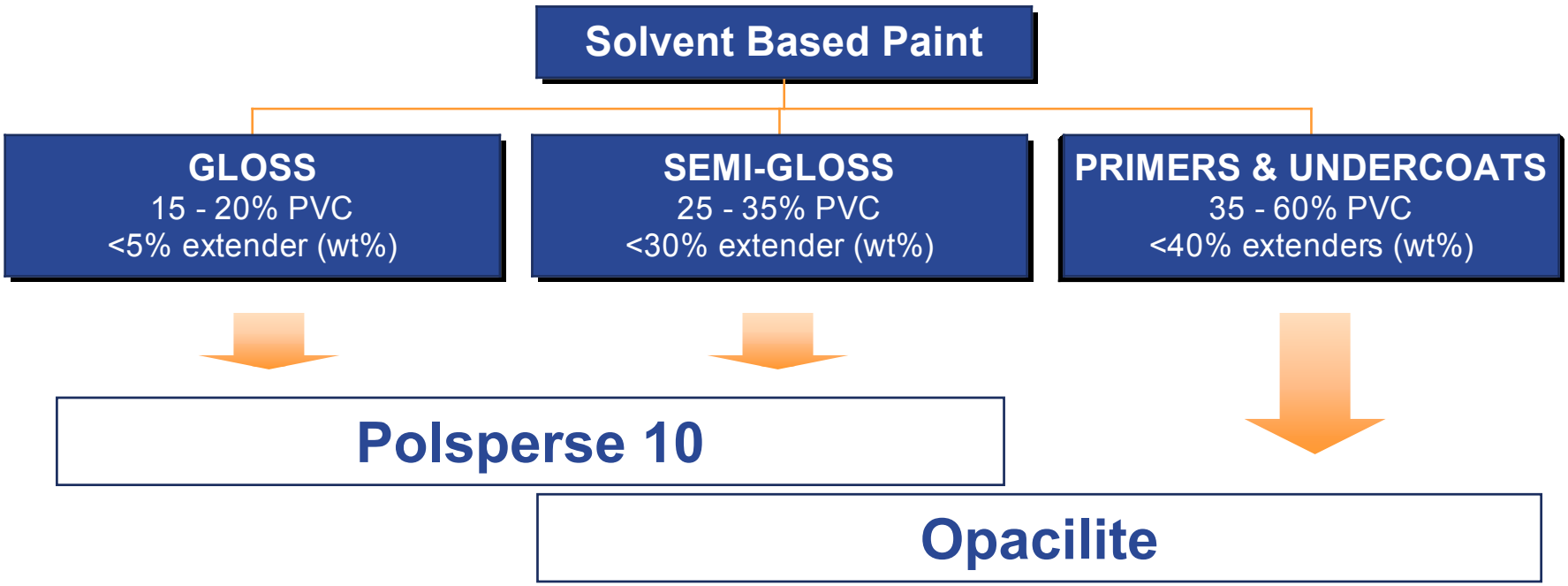
* Opacilite may have a gloss limitation in semi gloss coatings

* Suitable for gloss <20%/60° (<40%/60° if paint contains matting agents)

IMERYS

8. Opacilite for Solvent-Based Paints

Recommended uses



*** Opacilite may have a gloss limitation in semi gloss coatings**

IMERYS

9. Summary

Opacilite can replace medium particle size calcined kaolin

- provide significant cost savings
  - *partial replacement of TiO_2*
  - *reduced paint specific gravity*

Opacilite provides excellent dry opacity

- sealed internal and external voids

Opacilite provides excellent wet opacity

- sealed internal voids

Opacilite can be used in solvent & water based formulations

- highly recommended for exterior coatings
- highly recommended for matt emulsions <65% PVC

IMERYS