

New Developments Considering Total Costs of Ownership of Tinting Systems

The process of coloring coatings is subject to a wide spectrum of sought after values i. e. flexibility in color offering, costs of tinting, VOC compliance, Eco-label certification, reliability of ship tinting solutions, performance of colored paints (wet and film) and many more. These combined factors lead to a need for an integral tinting solution. Evonik offers customizable solutions. It's features and benefits (for performance and cost) will be explained in this article.

Colorants

Colorants are pigment dispersions with well-defined coloristic and rheological properties essential for successful use in dispensing machines. Universal colorants combine above mentioned properties with a high degree of compatibility in a variety of water and solvent based paints. Today, low VOC substitutes for the classic organic co-solvents are used in colorant formulations to maintain open time. The first colorants based on such formulations were marketed in the early 90's under the trade names Covon® 800, Colortrend® 802, followed by Colortrend® 803, Colortrend® 807 and Colortrend® 808. All these series are APE-free.

according to ISO 17895 (German eco-label "RAL Blue Angel 102 UZ"). Colortrend® 807 colorants show a typical VOC content of 1 gram/liter.

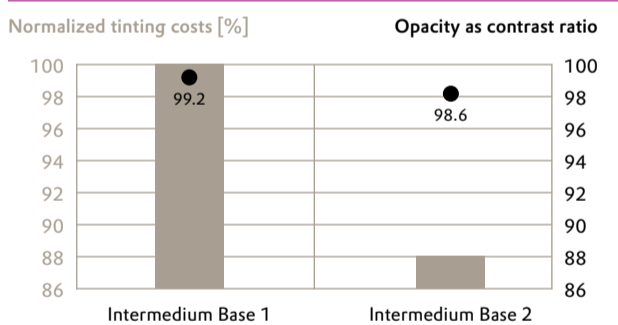
The Level of Performances

Color Space in Relation to Number of Bases

A tinting system consists of a dedicated set of colorants and a set of paint bases per paint product. The bases form a constellation with descending white pigment concentrations from high to zero. The constellation is designed in such a way that the achievable color spaces of all paint bases leave no gaps when tinted with colorants amounts ranging from 0.077 ml to a common used maximum of 9 volume %. Traditionally, four bases are used per paint product. Each base paint is a stock keeping unit (SKU) with associated costs. Generally, each reduction in number of paint bases will reduce SKU's but causes an increase in colorant additions to preserve the original color space.

This dilemma has now been solved: due to the availability of high concentrated Colortrend® 807 colorants, there no longer is a need to preserve a four base system. Test work and calculations proved, that by eliminating one of the white intermediate bases, the tinting costs dropped by an average of 12% for all colorshades made from the original base. In addition, a 25% reduction in SKU's is another achieved cost benefit. (see graph 2).

Tinting Costs and Opacity Impact Based on Reducing from Four Paint Bases to Three



Graph 2

Physical Properties of Colorants

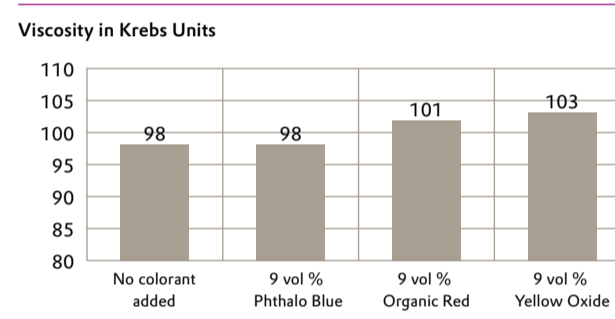
Due to tight coloristic specifications of Colortrend® colorants and a good rheology profile, dispensing by high resolution dispensing machines yields high color reproduction accuracy and repeatability. Reproducibility and repeatability studies show typical coloristic variations within the dispensed set to be equal to or lower than ΔE 0.1 (CIE-Lab). Colortrend® 802, 803, 807 and 808 colorants are formulated to resist micro-biological spoilage, coloristic drift and drying to brittle residues. The colorant formulation reduces costly downtime of dispensing equipment apart from routine maintenance procedures.

Physical Properties of Tinted Paints

Paints contain thickeners of various chemical types to create favorable flow behavior under different stress

loadings and shear rates. Associative thickeners are a well-known group of thickeners, of which the HEUR thickeners are widely used in the paint industry. Below are some examples of the influence of Colortrend® 807 colorants on a water-based clear lacquer based on Acrylic and PUR resins and a HEUR thickener. Colorants were added at 9 vol % relative to the clear lacquer volume. These additions are in reality exceptional for achieving adequate opacity by tinting systems based on Colortrend® 807.

Influence of Colorant on the Viscosity in KU of Water Based Clear Lacquer Based on Acrylic and PUR Resins and HEUR Thickener



Viscosity of a w. b. clear lacquer based on HEUR

Colorant additions 9 vol. % related to lacquer

Graph 3

Viscosity was measured by using a Brookfield® KU viscometer.

Evonik offers tinting modules with special colorants that meet the cost and special performance requirements of particular surfaces. For example: a tinting module for paints for use on exterior mineral surfaces contains only colorants based on inorganic pigments and additives that are low in hydrophilic content. Another example: coatings with high surface gloss maintain that function after being tinted with Colortrend® colorants.

Color durability (lightfastness) is a property that is influenced directly by the choice of pigments. This is a topic unto itself on which Evonik can guide to the right choice for particular tinting needs.

Conclusion

Systematic mapping of customer needs and Evonik's global technical expertise have led to the creation of tinting systems that satisfy the combinatorial needs for environmental compliance, color space coverage and minimal impact on tinted paint properties. In addition, reduced costs, optimal logistics, technical performance and the ability for customizing to new market conditions by modular systems have been achieved using the Colortrend® Systems.

Please visit the presentation of paper 22.2 on the subject, during European Coatings Congress on Wednesday, 1 April 2009 at 09:30 – 10:00 a.m.

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General Colorant Composition and the Related Properties



Graph 1

- Quantifiable on colorant
- Quantifiable on paint/colorant blend

Value for Paint Manufacturers

Two major factors need to be considered with regard to costs vs. value of tinting systems: breadth and level of performances:

The Breadth of Performance

Spectrum of Paint Chemistries

The advantage of universal colorants is that they offer one tinting solution for a wide spectrum of paints and coatings. Universal colorants contain carefully chosen combinations of non-ionic and ionic dispersants in their colorant formulation. This results in pigment dispersions that resist flocculation in a variety of paint systems.

VOC Compliance

European standards for VOC values stipulate content levels from 30 grams/liter and higher by 2010. VOC values of Colortrend® 802, 803, 807 and 808 colorants are all below 10 grams/liter.

Voluntary compliance to paint eco-label standards include VOC and many other criteria. Colortrend® 807 colorants are formulated with careful consideration of eco-label criteria such as APE-free, formaldehyde-free etc. Apart from ISO 11890-2, VOC is also determined

Additives
Coloring
Crosslinkers
Matting
Resin Components
Resins

