



**Directive 2004/42/EC of the European Parliament and of the Council on the limitation of emissions of volatile organic compounds due to the use of organic solvents in decorative paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC**

**Guideline for VOC (Volatile Organic Compound) determination for the Decorative paint industry**

**1. Introduction.**

This document is intended as a guideline for common approaches to be applied by the Decorative paint industry concerned with the European directive on the limitation of VOC emissions from Decorative and vehicle refinishing coatings (2004/42/CE). This directive describes a range of product categories for which maximum threshold values for VOC content have been defined.

Definitions of VOC and analytical methods to be applied have been specified as well (see below). In practice routine analytical determination of VOC would be problematic and this guideline proposes a practical way to determine compliance with the directive so that a uniform and accepted way of working can be applied throughout the European Decorative paint industry.

**2. Definition and methods.**

- *VOC definition as used in Directive 2004/42/EC*  
The directive specifies the following definition for VOC's:  
" Volatile Organic Compound" ( VOC) means any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101,3 kPa.
- *VOC determination as specified in Directive 2010/79/EU on the adaptation to technical progress of Annex III to Directive 2004/42/EC*
  1. VOC content below 15 % by mass when reactive diluents are not present: ISO 11890-2
  2. VOC content equal to or greater than 15 % when reactive diluents are not present: ISO 11890-1 or ISO 11890-2
  3. VOC content where reactive diluents are present: ASTM D 2369.

**3. General approach.**

For practical reasons the (maximum) VOC content of a product can be determined by the paint supplier based on calculation. The VOC limits set in the directive relate to the ready for use product and so the maximum VOC should be calculated based on any recommended additions of for example colorants and thinners. For this calculation data supplied by the raw material suppliers regarding solids content, VOC content and density etc. will be used. See paragraph 5 for more details.



#### 4. **Boiling point.**

VOC is to be determined based on the official stated boiling point specification as provided by the producers/suppliers of these materials within their product and material safety datasheet. Paint industry will apply those data which are assumed to be based on latest methods for boiling point determination.

#### 5. **VOC calculation of ready to use product formulations.**

The VOC calculation of a product has to be based on the VOC content in its ready to use state. This includes the highest amount of VOC's that may be introduced from i) recommended tinting processes outside the primary production process, ii) from VOC additions that are specified to be added to thin the product for application with the intended tools and iii) any other recommended additions - as specified on the label or technical datasheet.

Composition data of the ready for use material can be derived by calculation from the formulations (as specified for manufacturing) of the relevant products. The formulations will provide an overview of the intended volatile materials to be present in the product. VOC calculation can now be made by summation of that part of volatile organic materials originating from the formulation that have a specified boiling point (according to specification of the raw material supplier) lower than 250° C and that will be present in a litre of paint. Subsequently, any VOC amount from recommended tinting or thinning procedures outside the primary production process have to be included in the VOC calculation.

In case of theoretical calculation, one can use the calculated density, again derived from the density specification of the intended materials specified in the ready to use state. Alternatively the statistical upper limit of practical density determinations (in the ready for use state) can be used.

#### 6. **Practical VOC determination of products ready to use.**

To assess compliance (with the relevant VOC limit) of a ready for use product by analytical measurement of VOC, the following procedure should be followed:

- Analyse the product in its ready to use state. That is the composition that gives the highest VOC that could result from any composition recommended for the product e.g. on the label or datasheet.
- Analyse the product according the analytic methods specified in the directive being either ISO 11890-2 or ISO 11890-1 or ASTM D 2369 when the product contains volatile reactive diluents.
- Calculate from the analytical measurement data the VOC content in grams/litre, whereby the density of the product is measured with the appropriate density determination method (ISO 2811).

#### 7. **Disputes with authorities on VOC content.**

As it is to be expected that products placed on the market will frequently be based on calculated VOC content, it may arise that monitoring authorities determine by practical measurement VOC data that deviate from the ones made from theoretical calculations.



In case of “borderline exceed” VOC limits, as specified in Annex II of the directive, it is recommended that any dispute is resolved by open book discussion whereby the paint company can provide background about the intended VOC content of the product.

CEPE/EC/20130212