The groups of pigments and their CF values

Inorganic pigments and fillers

6 ± 50% **(kg CO_{2e}/kg product)**

Metal and effect pigments

8 ± 30% **(kg CO_{2e}/kg product)**

Organic pigments

26 ± 50% **(kg CO_{2e}/kg product)**

CO_{2e} = CO_2-equivalents

Evaluation of pigment CFs

Pigments and fillers are always used in mixtures to achieve **effects** and adjust **colours**.

Regarding the evaluation of the published CF values, the differences in **colour strength** and **concentration in use** of pigments and fillers need to be taken into account.

The pigmentation depends on the application and usually ranges between 0.1% and 20%.

Don‘t forget:

- **PCF = greenhouse gas emissions throughout the product life cycle**
- **Pigments and fillers are usually processed at low concentrations**
- **The contribution of pigments and fillers to the CF value of a product is almost negligible in comparison to the product life cycle (cradle to grave)**
- **The CF of many products is mainly determined during the use phase**

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Product Carbon Footprint

Pigments and Fillers

Eurocolour
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Aim

The Product Carbon Footprint (PCF) totals the greenhouse gas emissions of a product in CO_2-equivalents during its life cycle. Starting from the exploitation (mining) of raw materials, through the production process and use phase to recycling and finally disposal.

The pigment and filler industry was looking for a practical approach to CF assessment for its products and for communication to downstream users.

Our route - „cradle to gate“

More than half of the elements of the periodic table are utilised by the pigment and filler industry for the fabrication of its products.

This results in a large variety of raw materials, being of mineral or petrochemical origin.

Pigments and fillers can be found in nearly all products of our everyday life and the companies of our downstream supply chain are equally numerous.

Thus, we decided to determine the CF values of the products from cradle (raw materials) to gate.

Our companies have calculated the greenhouse gas emissions (in CO_2-equivalents) in relation to the various production processes and thereby determined the respective CF values of products within the plant’s boundaries.

Grouping - our solution

Our aim was to obtain valid results, which meet scientific standards, in a cost-efficient manner.

Thus, we divided pigments and fillers into subgroups. The Eurocolour secretariat was provided with the CF values of certain products, according to these groups, by the company members.

Approach

During the calculations the availability of CF values for the starting materials turned out to be problematic. As far as CF values were accessible in databases, these were used. If the CF values of raw materials were not available, CF values of products with a comparable production process were employed (read across).

Formulation ingredients with concentrations lower than 3% were discarded.

If the sum of the minor ingredients added up to 10% or more of the formulation, one minor ingredient was chosen as representative for the calculation.

The error margin is about ± 50%, which is mainly due to inaccuracies of the raw materials’ CF values.

Relevant Pigments & Fillers

Inorganic pigments and fillers

- Barium sulphate
- Bismuth vanadate
- Carbon blacks
- Chromium oxides
- Iron oxides
- Lithopone
- Rutile
  - Chromium titanium yellow, nickel titanium yellow, manganese titanium brown
- Spinel
  - Cobalt blue, cobalt green, zinc iron brown, black spinel
- Synthetic amorphous silica
- Titanium dioxides
- Zinc sulfide

Metal and effect pigments

- Aluminium
- Copper & gold bronze
- Pearlescent pigments

Organic Pigments

- Anthraquinone pigments
- Benzimidazolone pigments
- Quinacridone pigments
- Quinophthalon pigments
- Diketopyrrolopyrrole pigments
- Disazo condensation pigments
- Disazo pigments
- Isoindolinone pigments
- Isoindoline pigments
- Lake pigments
- Monoazo pigments
- Perylene pigments
- Phthalocyanine pigments