



The carbon neutral paint shop

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AdobeStock/Ivan Traimak

Current situation

On August 31, 2021, the amendment to the Climate Protection Act came into force, markedly tightening climate protection targets. The aim is to reduce greenhouse gas emissions by 65% by 2030 compared to 1990 and to achieve global greenhouse neutrality by 2045. This means that a balance must be struck between emitted greenhouse gases and those removed through the planet's natural absorption processes. In accordance with the Climate Protection Act, every company is therefore obliged to significantly reduce its carbon footprint and thus lower its CO₂ emissions in particular. This applies especially to **painting processes**, which are generally associated with high CO₂ emissions. A survey by the German magazine "Besser Lackieren" has shown that most painting companies in the DACH region do not know what their CO₂ emissions were in 2023.

The carbon footprint

According to the Federal Environment Agency, greenhouse gases (GHG) are the main cause of climate change. The most important greenhouse gases are carbon dioxide, methane, nitrogen oxides and fluorinated hydrocarbons. These GHGs are generated along the entire coating and painting process chain. The greenhouse gases emitted in the paint shop must be recorded, converted into CO₂ equivalents using emission factors and reduced to a common denominator. This is the only way to establish comparability. Carbon accounting can be used to record CO₂ emissions and systematize the values to show the carbon footprint. This gives an overview of the total greenhouse gas emissions generated in all paint shop processes and also in the company as a whole. The carbon footprint is therefore an important indicator for assessing the carbon neutrality of the painting process and ultimately of the company.

Carbon accounting is becoming mandatory for more and more companies, must be calculated annually in the future and includes all CO₂ emissions. The goal is a minimal carbon footprint, which gives an indication of low emissions. Comprehensive measures and action are required to achieve this.

Carbon accounting and how to optimize your net CO₂ emissions – We can help.

The Painting Process Engineering Group at Fraunhofer IPA is a highly qualified specialist department that can assist you with carbon accounting and help you optimize the carbon footprint of your painting process.

For carbon accounting, first of all data on resource consumption must be collected. This takes place along the entire painting process, including all materials used. The data is recorded and systematized according to Scope 1 (direct emissions), Scope 2 (indirect emissions) and Scope 3 (further indirect emissions in the supply chain) based on the Greenhouse Gas Protocol (GHG). Two approaches can be followed:

- Product Carbon Footprint
- Corporate Carbon Footprint

Product Carbon Footprint (PCF) according to ISO 14067

To calculate a product's carbon footprint and derive the necessary optimization measures, the emissions generated by each production step in the paint shop (e.g. pre-treatment, paint application, drying) and throughout the entire process chain until the product leaves the factory must be recorded. The CO₂ value for paint production, including all operating and auxiliary materials, can also be taken into account.

The PCF can also be calculated for the entire life cycle of a product, i.e. from cradle to grave. The analysis begins with the extraction of the raw materials, continues through production and use and ends with the disposal of the product. Any repairs during use can also be taken into account. In the case of a vehicle, for example, these are the CO₂ values that are incurred during the life cycle, for example for repair paintwork or for preparing and caring for surfaces. Services associated with the product can also be included in the PCF calculation.

By systematically determining each single value of the PCF, the most important drivers can be identified, and the necessary measures taken. For instance, when considering the thermal energy required for a pre-treatment process, it may make sense to replace energy-intensive zinc phosphating with a lower-emission alternative in the form of a thin-film application. The PCF ultimately allows products to be compared and was developed as a roadmap with the aim of increasing a product's climate friendliness.

Corporate Carbon Footprint according to ISO 14064

An alternative to the Product Carbon Footprint is the Corporate Carbon Footprint (CCF). The CCF includes all emissions generated by a company. After breaking down the sources of emissions in the company, the emissions become comparable and the company's contribution to climate neutrality becomes visible.

Aspects included in the CCF:

- (Business) trips
- Buildings
- Events
- Vehicle fleet

- Production processes
- Business processes
- Etc.

To sum up, the following applies to both the PCF and the CCF: The more detailed the information, the more accurate the carbon footprint will be. This makes it possible to precisely define optimization potential, monitor the effect of the measures taken and ensure success..

How we go about optimizing the carbon footprint in a paint shop

After recording the CO₂ emissions generated by each sub-process (e.g. pre-treatment, application technique, process technology, material) in your paint shop, the emission values are systematized. The key control elements can then be derived from the data obtained. Once the carbon footprint has been calculated, three mandatory paths are taken to reduce CO₂ emissions:

1. Prevention,
2. Reduction,
3. Compensation.

It is crucial to consider and work on the paths one after the other. Prevention options are first developed for the identified areas. Alternatives that result in lower CO₂ emissions are prioritized for the future process. Technologies that can be examined with a view to improving a company's carbon footprint include, for example, switching the paint separation system from wet to dry separation or the possible use of infrared technologies instead of an air circulation dryer. After implementing the alternatives in a targeted manner, a small unavoidable proportion of emissions remains. Ways to reduce this are then identified. These include, for example, improving higher application efficiency, reducing the reject rate or increasing the efficiency of the drying process used. The remaining proportion of CO₂ emissions can be offset by participating in compensation projects in order to achieve completely climate-neutral operations. These include projects directly related to renewable energies, such as wind, hydro and solar power projects. The level of participation can be determined and defined by converting the remaining CO₂ content into a CO₂ equivalent.

Take advantage of Fraunhofer IPA's expertise and infrastructure to optimize the net CO₂ emissions in your painting processes. Get in touch with us!

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