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FROM SCIENCE TO SHINE ™

STARBRITE® REVEAL: REDUCING THE VMP CARBON FOOTPRINT

Calculating an exact carbon footprint takes into account many variables and different parts of a product's life cycle, including the feed materials, transportation, and production steps.

The Reveal process eliminates several of these steps when compared to traditional vacuum-metallized pigment (VMP) production, resulting in an unequivocal reduction in the materials and energy required.

While for many of the steps it would be difficult to calculate a hard-fast number for the reduction of CO_2, it can be estimated using some published data to give an idea of the scope.

ESTIMATING THE SAVINGS

Sacrificial Plastic

The PET substrate that makes up a VMP feed roll requires the input of raw materials, energy, and water. These raw materials are by and large petroleum and natural gas products which are transported and converted into plastic feeds.

Once the metallization and stripping process is complete, the plastic substrate is now mechanically-, thermally-, and solvent-stressed. It cannot be reused for metallization and all 1200-1400 kg must be treated in the waste stream. Recycling is the preferred fate, but recycling has its own equipment and processes. This mean more energy, more water. Otherwise the plastic is incinerated.

In 2019, worldwide greenhouse gas emissions from plastic production lifecycles was estimated at the equivalent of 1.7 trillion kilograms of CO_2.

The lack of any single-use plastic substrate in the Reveal process means that there is a 100% reduction of the equivalent carbon footprint. No amount of recycling or sustainable practice in a plastic's lifecycle can do that.

Center for International Environmental Law (May 2019) *Plastic & Climate: The Hidden Costs of a Plastic Planet. Retrieved from https://www.ciel.org/plasticandclimate/, 11/2/2020.*

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Transportation

For film-based VMP, every 100 kg of metal requires approximately 2600-3100 kg of completed film. Reveal VMP is significantly more efficient and requires up to 150-200 kg of completed feed for the same 100 kg of metal. When this material is transported, that is a weight savings of 13-21 times! That translates directly into less fuel to move the material and fewer vehicles on the move.

The Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT) have a 2020 standard of 51.9 to 85.9 g(CO2) tonne-^{1} km-^{1} emitted by non-refrigerated commercial trucks, depending on exact configuration. For Reveal feed to make 100 kg of metal (1000 kg of dispersion) to be transported 1000 km might produce 5.2 to 8.6 kg of CO2. That same amount of dispersion creates 73-172 kg using film, but that's not the whole story.

Since the film is produced elsewhere and recycled elsewhere, that means that the savings of ~100s of kg of CO2 occurs every time the substrate travels. That is several hundred kilograms of CO2 saved for every 100 kg of metal produced.

United States Environmental Protection Agency (Jan 28, 2020) Final Rule for Phase 2 Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. Retrieved from *https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-phase-2-greenhouse-gas-emissions-standards-and - https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf*

Dispersion Production

The in-house Silberline process for Starbrite Reveal is extremely energy efficient. This is due to the fact there is no roll-handling equipment, and the strap material undergoes a simplified cycle for dispersion production. Compared to our normal film-based VMP material, it is over 50 times more efficient. That's 50 times less CO2.

The U.S. Energy Information Administration estimates that between 0.4 and 1 kg of CO2 are produced per kWh for non-sustainable energy sources.

Based on that same 1000 kg of dispersion, we estimate a CO2 footprint reduction of up to 22,000 to 55,000 Kgs!

While an increasing portion of our power comes from sustainable sources, particularly solar, this both reduces our current carbon footprint and reduces the power demand on our local infrastructure. This in turn allows more power customers to switch to greater percentages of sustainable energy.

U.S. Energy Information Administration (Feb 20, 2020) How much carbon dioxide is produced per kilowatthour of U.S. electricity generation? Retrieved from *(https://www.eia.gov/tools/faqs/faq.php?id=74&t=11 - Oct 20th, 2020*

Conclusion

While there are many variables which determine the actual carbon footprint, the simplified Reveal process clearly results in a reduction in the environmental impact. The elimination of steps as opposed to the mitigation or replacement is the preferred sustainable action, requiring no off-setting of the impact of manufacturing even with the use of sustainable power and feedstocks.