The Bio-Based Pigments Behind Formwork IO's Carbon Negative Paving Block

Published: 5/6/2023

Our environmentally friendly construction goals necessitated pigments and dyes that were renewable, non-toxic, biodegradable and locally sourced. We experimented with a wide range of sustainable and carbon neutral pigments, before settling on our final palette. With the advent of interesting new bio-colourants, we narrowed our selection down to three exquisite pigments — green algae, coffee and indigo.

Choosing Sustainable and Natural Colours

The toxicity of synthetic dyes has become a cause of grave concern to environmentalists. Construction products, which are often a complex mixture and contain additives, pigments, and stabilisation agents are often in contact with rain or seepage water during their lifetime and may release potentially harmful compounds by leaching.

Studies demonstrate that compounds released by construction products are found in storm water and other bodies of water and that the release of biocides in urban areas can be comparable to the input of pesticides from agricultural uses. It's undeniable — synthetic dyes have an adverse effect on all forms of life, and to ensure our carbon negative paving block didn't have the same drawbacks as a product, we dove into research on the available bio-ethical and environmentally friendly alternatives.

A Planet-Friendly, Plant-Based Palette

With the advent of interesting new bio-colourants, we explored a variety of viable alternatives to synthetic colourants available for industrial use. Our collaboration partner studied eco-friendly and carbon neutral pigments and trending colours, to determine the most-sustainable palette for our use.

When designing our paving block, our focus was squarely on themes of regenerative, low-impact, natural materials and pigments. Based on initial testing and observations while working with Formwork IO's material, the designers focused on two main pigment categories: Natural and Upcycled Waste.

The suggested pigments were either sourced naturally or were part of industry waste streams that could be transformed into suitable pigments. The design team explored four different categories: Pollution Pigments, Natural Pigments, Upcycled Waste Pigments and 'Other' — colourants that could be locally sourced and were suitable for Formwork IO's products.

Algae, Coffee, Indigo

We narrowed down our selection to a distinctive, future-proof palette that included a spirulina based green algae pigment, a pigment developed from coffee grounds, and iconic indigo.

Green Algae Pigment:

Algae is a renewable resource that can thrive in waste waters and at the same time purifies the water. The algae we selected — spirulina — has a natural rich green pigment, that can be sourced locally or abroad. Green is also a forecasted colour for interiors promoting wellness and mindfulness. This pigment can be used as a natural and eco-friendly alternative to synthetic pigments and met our sustainability parameters — it was renewable, easy to source locally and demonstrated high stability and resistance to UV light and weathering.

A Sustainable Palette: The Parameters

Renewable: Spirulina is a renewable resource that can be cultivated in waste waters, making it a sustainable alternative to synthetic pigments. Additionally, spirulina cultivation can help purify the water by removing nutrients and pollutants.

Local sourcing: Spirulina can be sourced locally or abroad, depending on availability. This can help reduce transportation costs and promote local production.

High stability: Spirulina pigment has high stability and resistance to UV light and weathering, making it suitable for use in outdoor applications like bricks.

Coffee grounds

Coffee grounds are a natural and renewable resource that can be locally sourced, giving us the opportunity to work with local communities and support sustainable practices. Using coffee grounds as a pigment is an eco-friendly alternative to synthetic pigments, helping reduce waste and promote sustainability. In addition to being environmentally friendly, coffee grounds are also cost-effective. As a byproduct of the coffee industry, they are readily available and often discarded after use. This makes them an affordable pigment that can help reduce production costs.

Indigo

Indigo is a timeless colourant from classic blue jeans to Japanese Indigo Shibori. Natural indigo dye comes from the Indigofera plant (or Isatis tinctoria) and has long been used by ancient civilisations from India, East Asia, Mesopotamia to Mesoamerica. In addition, dark blue tones are also suitable for permanent/exterior spaces that are impacted by sunlight, rain and wear and tear.

The indigofera species is found all over the world. The dye is obtained by processing the plants' leaves. The leaves are first soaked in water and fermented in order to convert the glycoside indicant which is naturally present in the plant into the blue dye idigotin. The Romans used indigo as a pigment in painting, for medicine and cosmetics. It was a luxury item that was imported from India into the Mediterranean by Arab merchants. Today, indigo is also produced synthetically and available in various shades.

The three natural colourants — green algae, coffee and indigo — met our sustainability criteria, but also created a contemporary palette that demonstrated the versatility and aesthetic potential of Formwork IO's carbon negative paving block.

A New Approach: Sustainable Palettes for Construction Materials

Our journey choosing environmentally friendly colourants taught us about the principles that underlie more sustainable material choices and brought us to a deeper understanding of the immense possibilities of natural colourants, the production and supply chain considerations when working with natural pigments, their resilience to weather and factors impacting their local availability. The sheer beauty and variety of natural pigments provides an opportunity to reframe our reliance on synthetic pigments and colourants.

While sustainable and carbon neutral pigments are only adopted by a tiny proportion of industries today, environmentally conscious generations are demanding change and radical transparency from companies — construction materials are no exception. As consumers gain awareness about the dangers of toxic colourants, the move to eco-friendly pigments may be a natural next step in our evolution. There are alternatives that are safer for the planet and its inhabitants. We are proud and excited to have made a start. This is one small step, and we look forward to exploring more of these planet-friendly pigments in the future.

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