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Menu

Solution Dyeing

Solution dyeing involves adding pigment directly to the molten plastic solution before the fiber is made.



Why

Conventional batch-dyeing processes (using synthetic dyes) require a tremendous amount of water and energy, resulting in waste and carbon emissions. Patagonia switched a selection of our products to solution dyeing, an approach that can result in up to 90% reduction in water use and 96% CO₂e savings overall compared to batch-dyeing, with considerably fewer chemicals released from the overall process.

Solution dyeing diverts from traditional wet processing. Pigment is added to the molten plastic before making the fiber. Since the yarn is created in a specific color (versus first being produced and then dyed), the color is confined within the yarn. Imagine little pigment molecules becoming trapped inside the plastic after it cools to a solid form. The color becomes intrinsic to the yarn through solution dyeing, so the process often yields stronger fibers than batch dyeing, which weakens and damages the fiber's integrity.

Where We Are

We first tried solution dyeing in our luggage—the heaviest products by weight in our line. We’ve learned that heavier fabrics are more economical to solution-dye because the supply chain is priced out by weight. The amount of pigment needed is relative to the tons of pellets (the little plastic pieces used to make synthetic yarn) that are used. Essentially, it becomes more cost-efficient to solution-dye heavier fabric because we don’t have to commit to as many yards—yarn manufacturers sell by weight not by yardage.

We can also make the solution-dyeing process more cost-efficient by committing to our tried-and-true colors, like blacks and blues, which we can order in larger quantities. Despite the costs, we are incorporating solution dyeing everywhere it can be applied—luggage, fleece and shells included.

What’s Next

One of our main goals in incorporating solution dyeing is to reduce the amount of water used in the textile-coloring process. Other water-free dyeing techniques are being developed, and companies (including Patagonia) are building a better understanding of the advantages and disadvantages of this process. We’ve also recently learned that solution dyeing could be a potential answer to reducing microfiber shedding—making it a win (low carbon)/win (low water)/win (reduced shedding) for the environment. We’re working with suppliers and researchers to gather more data about this.

One of the lone downsides of solution dyeing is that it can only be applied to synthetic fibers. But strides are being made to change how organic fibers can be dyed in a more sustainable way—even though research and experimentation are still at an early stage. Cotton, for example, can be grown in different colors to achieve new pigmentation, but this method brings a host of other challenges at the agricultural level.

We are continuing to look for efficient dyeing technologies and techniques, and we’re striving to adopt new options as they become available. Ultimately, solution dyeing will be part of a portfolio of technologies that reduces our impact on the planet.

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