

Americhem's Take on Sustainability in Textiles

Introduction

Two fiber materials dominate the global textile industry – cotton and polyester. Over the past thirty years or so, the share of synthetic fibers has expanded significantly with polyester outpacing all other materials – synthetic and natural. In 2018, polyester fibers comprised of over 50% of the fiber used in textiles and twice that of cotton. Considering the fact that synthetic fibers use less than 1% of crude oil and use far less water to produce a kilogram of polyester, means that the eco-balance of synthetic fibers is very favorable among all textile fibers.

In contrast, a growing public opinion is that plastics, and therefore synthetic fibers in the textile industry, are a growing threat and problem to the environment and do not appear to be using sustainable raw materials. At Americhem, we are developing a multitude of solutions to this problem and have increased our sustainability efforts in regards to projects we take on, products we offer, and how our products are used.

Sustainable Solutions

Solution Dyeing

Most textile materials are dyed, a process which uses a significant amount of water. Printing and solution dyeing are other techniques used for coloring textile materials. Americhem plays an important role in coloration of textile materials, specifically polyester and synthetic fibers, through solution dyeing – a process which offers significant environmental benefits and cost savings in terms of resources needed for coloring synthetic fibers. Further, Americhem offers solutions for improving the dyeability of polyester and solutions for recycled polyester.

We see solution dyeing as an important technology to make the textile production process much more sustainable and environmentally friendly. Solution dyeing, also referred to as dope dyeing or spin dyeing, refers to the addition of a color masterbatch to a polymer melt during the extrusion phase of the fiber manufacturing process. Thus, fiber spinning and coloring is achieved in one step without the use of water. A color masterbatch is a mixture of pigments dispersed in a suitable polymer matrix. Americhem can supply those masterbatches for all major polymers used in the production of synthetic fibers, i.e. PET, Polyamide, PP/PE and even more exotic polymers like PLA or PTT.

The current post dyeing process of polyester apparel yarn generates 18 liters of waste water for every kilogram of yarn. The water-soluble disperse-dyed colored effluents can contaminate water streams and the ground on which they are emptied. The apparel industry is a vast, worldwide business with massive fortunes made and lost on a regular basis. In 2016, the global market for polyester fiber was 50.4 million metric tons; India produces approximately 5 million and China alone produces 32.8 million of the global market share with 10.9 million being post dyed PET for the apparel textile market. Therefore, approximately 196.2 million metric tons of waste water have been generated (see Image 1 for size comparison). By 2025, China's forecast for polyester fiber is 64 million metric tons, which correlates to an even higher amount of waste water being produced.

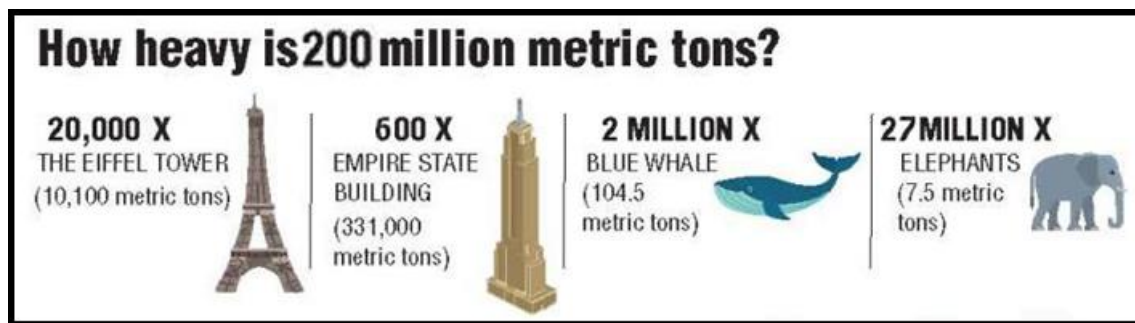


Image 1:

Solution dyed polyester eliminates the need for water clean-up after the post dyed process. Adding pigments and dyes through color masterbatch that go into polyester as the fiber is being spun, brings many other variables into the fiber spinning, texturizing, knitting and weaving apparel processes. Solution dyeing can result in up to 90% water use reduction and 96% CO₂ savings overall. Compared to conventional bath dyeing processes, solution dyeing releases considerably less chemicals during the overall process.

From a product specification standpoint, solution dyeing is also a more viable option than traditional dyeing processes. Because the pigments are entrapped within the fiber, superior color fastness and bleach resistance is achieved when using a solution dyeing process. The process allows to produce much higher lot sizes of yarn with consistent color versus traditional bath dyeing, i.e. 20 or 50 tons of yarns under 1 dye lot is very common in the industry.



RPET from PCR (Recycled PET from Post-Consumer Recycled Resin)

Besides the dyeing process itself, the feedstock for the textile industry needs to be re-evaluated. For instance, for many years Americhem has supplied premium masterbatches for PET bottles; those bottles are widely recycled nowadays and used partially as raw material for spinning PET fibers.

A crucial point for us has always been finding a suitable source and grade of recycled plastics to use as feedstock for masterbatches. For instance, typical feedstocks of that kind are PET bottle flakes made out of ground PET bottles, which are commonly known as RPET.

Traditional post-consumer recycle typically varies vastly in color – within and between lots – and often comes with contaminants and alien polymer. Such color variance and contaminants renders them as unsuitable for the production of high quality custom color masterbatches. Nowadays, the only commercial application for such type of recycle is used in black masterbatches.

There are technologies to improve typical post-consumer plastic waste by means of color and contaminant sorting or by entirely re-extruding and screening them into pellet form. Those re-granulated RPET grades can have a very good quality in terms of purity and processing and they come very close to virgin PET. Depending on the feedstock, it still can have a yellowish or slightly brownish tint, creating a problem for chromatic and light colors. Additives are generally used to adjust for color since recycled PET is inherently known for its yellow tone. Americhem offers an extensive range of toners and optical whites to overcome those problems.

Recycled PET often has a yellowish tint to it and hurts the appearance of the end product. If you think about the appeal of water bottles, food packaging, etc., they all draw consumers in because of how clear and clean they look. Americhem's Renewal Additive allows post-consumer recycled resin, or PCR, which has a yellow tint, to be restored to PET PCR that looks very close to natural. This preserves the appearance of the water bottle or food packaging to continue being clear and appealing, but also recycled and much more sustainable. Americhem's PET Renewal additive advantage is that it helps overcome the common yellowing of recycled PET, it is environmentally friendly because we do not use any heavy metals or metal oxides, and it increases the amount of recycled content in your product.

Chemical Recycling

Previously mentioned recycling technologies are commonly referred to as mechanical recycling; over the last couple of years, the chemical recycling of plastic waste has made significant progress. Chemical recycling for the case of PET means the de-polymerizing of the PET waste. A typical method of this is dissolving them in MEG/glycol, hence referred to as glycolysis or adding H₂O to the polymer, commonly referred to as hydrolysis or saponification, which is breaking the PET down to its 2 major building blocks, PTA and MEG.

Unfortunately, both advanced mechanical recycling as well as chemical recycling often result in a feedstock product being considerably more expensive than virgin PET chips. Nevertheless, Americhem has plans to add significant amounts of recycled content to their masterbatch products in the near future whilst still maintaining the high quality and performance. We have already started initiatives around this topic for all major polymers, but primarily have focused on PET, PA and PE.

Available Polymeric Solutions Today

Having said this, it's also important to mention that Americhem has already launched a range of products to add functionality to fiber products produced out of recycled PET. Some of those products are for cat dye (cationic dyeing of PET), easy dye (atmospheric dyeing of PET yarns at 95 degrees Celsius) and FR, and adding flame retardancy to RPET.

nBalance™ color & additive masterbatches can reduce the impact on the environment through products such as easy cationic dyeable polyester masterbatch for RPET (recycled polyester) and easy dyeable polyester masterbatch for PET that will help improve dye bath exhaustion and manufacturing energy reduction. Americhem also offers ColorComplete™ color & additive masterbatches, which allow all of our PET black masterbatches to use bottle grade PET's and is used for applications that use recycled PET fibers and WPC (wood plastic composites) that contain recycled materials and/or wood fillers in substrates.

Make the change and don't sacrifice the product; contact Americhem today to learn more about sustainable polymeric solutions.