

The students at Genda Government Primary School in Bangladesh don't have to buy fashion magazines to know the latest color trends; they don't have to visit Vogue's website or even visit a shop. The canal will tell them. "Sometimes it is red. Or gray. Sometimes it is blue," says teacher Tamanna Afrous, "It depends on the colors they are using in the factories."<sup>1</sup> The canal, which runs behind the schoolhouse, is a dumping ground for factory wastewater, collecting the remnants of nearby textile dyeing plants, which use extraordinary amounts of water for the dyeing process. The toxic nature and coloration of the chemicals have killed the possibility of life in the canal, as sunlight and oxygen are unable to penetrate the water. And the damage isn't limited to life in the canal; at times the fumes make it impossible for students to focus on their schoolwork as they are overcome by nausea and lightheadedness. In Bangladesh, this situation isn't unique; across the country, textile wastewater has created "what experts describe as a water pollution disaster," filling rice paddies with poisonous chemicals, damaging natural ecosystems and farmland, and threatening public health.

In the West, public awareness of pollution caused by the textile industry in the developing world has been slow to take hold and those most affected often have the least amount of power to spur more environmentally-responsible practices. However, as digital images of bright red rivers are disseminated online and activist groups, environmental experts, and public health officials agitate for change, progress is being made; in recent years, a number of innovative new dyeing processes that eliminate or minimize the use of water have been introduced and are currently being used by a small number of major textile producers.<sup>2</sup> But while "waterless dyeing should be the textile industry's holy grail, [its] widespread adoption is years away." In the meantime, textile wastewater effluent treatment is the most effective way of reducing pollution from textile dyeing processes. The evaluation of existing effluent treatment methods and development of new treatment technologies depends on spectrophotometric measurement to optimize efficacy, minimize environmental damage, and preserve the health and wellbeing of people.

## Textile Effluent Treatment

Textile effluent treatments can take many forms, including electrochemical coagulation, biological oxidation, and biosorbent interventions. To [optimize water safety and comply with government regulations regarding allowable color content in wastewater](#), measuring color levels is a critical part of the effluent treatment process, both in research and development stages and once deployed. Spectrophotometry offers the most reliable method of measuring the effects of treatment by analyzing color data in wastewater and quantifying the degree of dye removal. The accuracy and precision of spectrophotometric instruments for liquid color measurement allows you to identify even slight color changes that, while undetectable to the human eye, may have significant environmental, economic, or legal ramifications. By pairing your spectrophotometer with advanced software such as [EasyMatch QC](#), you are also able to easily classify chromatic information within established liquid color scales such as the [APHA/Pt-Co/Hazen Color Scale](#), the [Gardner Scale](#), or customized indexes tailored to your needs.

## Variables Impacting Treatment

Because the efficacy of a treatment often depends on the specific type of dye or dyeing process used, it is critical to observe the impact of the treatment under a variety of conditions to obtain the most useful data. For example, in study published in the *Brazilian Archives of Biology and Technology*, UV-Vis spectrophotometric measurements revealed that while sugar-cane bagasse biosorbent treatment resulted in 94% removal of congo red dye, it removed only 84% of indigo blue dye.<sup>3</sup> Simultaneously, treatment variables such as temperature and pH level can also have a significant effect on a dye's reaction to treatment. A 2012 study on dye removal using bioflocuants produced by indigenous bacterial isolates found that whale and medibblue dye removal peaked at a pH of 7 while the best decolorization results for fawn and mixed dye were achieved between 9 and 10. Additionally, "Optimum temperature for whale and medibblue dye removal was 35 °C, and that for fawn and mixed dye varied between 40–45 °C and 35–40 °C, respectively."<sup>4</sup> As such, spectrophotometric color measurement allows you to modulate your effluent treatment process to maximize results.

Full article with photos available here:

<https://www.hunterlab.com/blog/color-in-textiles/looking-at-how-spectrophotometry-can-optimize-textile-effluent-treatment-and-protect-environment/>