Land Application of Textile Biosolids:

North Carolina's Experience

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Textile biosolids result from the biological treatment of wastewater produced by finishing and dyeing operations. Millions of yards of cloth are washed, finished, and dyed in the Carolinas and Georgia every year, with production expected to increase each year as demand for textile products increases on a global scale. As a result, several hundred million gallons of wastewater are treated every day, producing thousands of dry tons of biosolids each year.

Such quantities show a clear need for the management of biosolids within the textile industry. This need is heightened by the fact that North Carolina regulations, for example, forbid the disposal of biosolids in municipal landfills. As with municipal biosolids, however, the beneficial use of textile biosolids through land application in agriculture provides a valuable supplemental organic fertilizer to farmers and a fairly straightforward biosolids management option for the textile industry.

Some Background to Textile Wet Processing

To understand the product that's eventually applied to agricultural land, we need to know something about what goes into textile wastewater. Textile wet processing-sometimes called finishing-takes raw fiber, woven goods, and knitted goods through several different steps prior to sewing, blending with other fibers, assembly, and use in commercial products. Raw materials like wool and cotton must first be washed, sized, and sometimes mercerized prior to being bleached or dyed. *[Mercerizing* is the treatment of yarn or fabric in a cold bath of caustic soda to permanently swell the fiber; this process increases the fiber's luster-its shine and light-reflection qualities-and its affinity for dyes.]

Sizing uses compounds like starches, gelatins, waxes, and polymers. Cotton, for example, undergoes sizing to strengthen or stiffen thread, thereby providing resistance to abrasion during weaving. Once woven or knitted, the fabric may be prepared to take on dyes for color or for bleaching. This preparation involves the scouring or desizing of the cloth or fibers in dilute acid to neutralize any alkali present

and, in general, to remove any impurities left over from the sizing and mercerizing.

Each step along the finishing process requires extensive use of chemicals and large amounts of water to ensure proper preparation of the fabric or fibers. Other components of the waste stream include fibers, small percentages of sanitary waste, and, in some cases. sewage from neighboring communities (many wastewater treatment plants are located in small communities and serve as the wastewater and water utility for residents in the surrounding area).

The Benefits of Land Application

Just as with municipal biosolids. textile biosolids contain "the stuff of life." the essential nutrients. including nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, and other trace elements, such as copper, zinc, iron, and molybdenum. Crop farmers and livestock producers alike use textile biosolids to supplement their normal fertilizer programs. Textile biosolids can provide a significant cost savings to farmers when applied at proper agronomic rates.

These biosolids contain valuable plant nutrients, as mentioned. but do farmers realize this benefit? If farmers continue to fertilize at their "before-biosolids" schedule, they'll see an increased yield, but not the benefit of a reduced fertilizer bill. Maximizing benefits from an application of textile biosolids means reducing fertilizer purchases to account for the nutrients received from the biosolids. Interviews with several farmers involved with three land-application projects have shown that they have indeed reduced their fertilizer bills. In fact, they have not used fertilizer (other than lime) on their forage land since they began using textile biosolids. They admit to not keeping good records on the subject, but most say with confidence that forage yields have increased by a third with the use of textile biosolids and that they have been able to graze more cattle for longer periods. The result? Healthier-looking cattle.

Obstacles to Successful Land Application

Because the land application of textile biosolids in North Carolina requires a permit, textile firms-or, more specifically, their plant managers-must constantly play a public-relations role to ensure a positive relationship within the community. Even though land application permits in North Carolina don't require public notice, community leaders are notified about the project. And they can make permit issuance, and operating under a permit once it's issued, very difficult. As more people in the community learn of the project, environmental groups will organize. These groups often will choose to fight a project based on their feeling or perception that it will be harmful to the environment. This misperception can threaten a textile company's image in the community. jeopardize its permit. and result in greater costs for biosolids management.

In regard to land-application projects. many papers have been written about the obstacles related to public image. perception. and the not-in-my-backyard (NIMBY) syndrome. They explain how the obstacles are overcome through education: once the facts are known, the potential adversaries actually become allies and champions of the cause.

Conclusion

Textile firms across the Southeast are moving toward land application as an environmentally safe and beneficial option for biosolids management. Textile biosolids are suitable as a supplemental fertilizer to aid in the production of forage land in North Carolina when applied in accordance with state regulations and permits. In fact, one could make a case that most textile biosolids would qualify as an Exceptional Quality (EQ) biosolid under 40 CFR 503 due to the low inorganics and limited pathogen sources. The salt issue isn't a concern in this part of the country, because adequate rainfall moves soluble salts to below rooting depth to prevent problems with soil and plant growth. Groundwater-monitoring data gathered over five years from one site do not indicate nitrates above the drinking water standard. And compared to current fertilizer prices. textile biosolids are worth over $41 per hectare ($100 per acre). Livestock producers who are using textile biosolids claim they realize improved yields and save thousands of dollars on their fertilizer bills as a result of participating in their respective land-application projects.

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