Staying Alive: Making Textiles Sustainable

By Maria C. Thiry

Along with the rest of the world, the textile industry is rapidly heading toward a precipice: an environmental, social, and political disaster that we can all see coming all too well. What happens when we run out of resources?

According to Steven A. Jesseph, president and CEO for Worldwide Responsible Accredited Production (WRAP): "By the year 2050, we will have almost 10 *billion* people competing for limited clean water, non-renewable *and* renewable resources, land to grow food, and energy to sustain their businesses, families, and lifestyles. Failure to heed the obvious warning signs will, in my belief, be the death knell of businesses that fail to read the tea leaves."

"It's about survival our ability to endure as an industry. Sustainability ensures that survival." *~Kanti Jasani, Performance & Technical Textile Consulting*

It's the textile industry's responsibility as much as anyone else's. "In terms of its scale of production and employment, the textile industry is one of the largest industries in the world, so its impact is significant," notes Andrew Xin, vice-president of global business management for BASF Textile Chemicals.

The modern world *needs* textiles for a vast array of applications, and—from the carpets beneath our feet, to the clothes on our backs, to the architectural textiles shielding us from the elements—textiles are completely ubiquitous. The immovable object of the need for textiles will soon meet the unstoppable forces of population pressure and resource depletion. "We're rapidly increasing the population of the planet and nobody's going to be walking around naked," points out Chris Parkes, national sales manager for Concept III Textiles.

"Current projections tell us that in the next few years, we will see a dramatic reduction in the availability of oil—*the* product from which we create products and that we use to manufacture and move raw materials and finished goods around the world," says Jesseph. Experts are also increasingly concerned with the growing scarcity of fresh water, especially with the great amounts of good-quality fresh water needed to dye fabrics. In addition, Parkes notes that approximately 30-35% of the chemicals in the world go through the textile industry, and "the effluent problem hasn't gone away."

According to "Eric" Shengfeng Wu, of Oriental Giant Dyes & Chemical Ind. Corp. Taiwan, the sustainability concept of the "three Rs" (reduce, reuse, recycle) is still valid for the textile industry, and "the most important of those is 'reduce'," he says. The experts' mantra seems to call for textile mills to keep doing more and more with less.

But is ever-increasing efficiency enough? "Whether it's water, land, or oil, resource intensity is one of the largest issues facing the textile industry," says Mallory McConnell, technical specialist for Intertek. "Rising scarcity of resources will continue to affect the textile manufacturing industry, making it less feasible and more expensive to continue doing business as usual." If the industry can't afford to do "business as usual," what are the alternatives? And what can we all do in the meantime?

An Accounting Issue

"Being good for the planet is also good for the bottom line. It's a mistaken notion that sustainability is more costly. If you get rid of waste, you reduce costs and improve the bottom line."
~Paul Raybin, AirDye Solutions

Everyone knows that for the textile industry, as for many industries, cost is critical. And thus, some textile mills use the excuse that sustainable production practices are "expensive" to keep from starting a sustainability program. That's a mistaken assumption, according to Samuel B. Moore, managing director for Hohenstein Institute America Inc. He says that "like any quality management process, investments in sustainability, by definition, should pay dividends, not add costs."

Kanti Jasani, president of Performance & Technical Textile Consulting, urges mills to consider a sustainability program as another quality program: sustainable fabrics must necessarily be quality fabrics. He says that (popular quality programs) LEAN and Six Sigma direct implementers to reduce unnecessary processes in production and "these concepts are integral to the concept of sustainability," says Jasani. Jasani says that since costs include raw materials, they obviously also include water, energy,

and chemicals, the reduction of which allows a mill to produce fabric more sustainably.

"That's what sustainability means," says Jasani. "It's reducing costs in every single way while increasing quality. If you're truly being sustainable, your costs will go down and profits go up." The original definition of sustainability did not just mean *ecologically* sustainable, although that is often the part of sustainability that's focused on today. Sustainability means *social* and *economic* sustainability as well.

Waste (such as effluents and emissions) and dealing with that waste "is an expense factor that has to be included in the production calculation worldwide," says Anton Schumann of Rudolf Chemie GmbH. Too often in the past, the costs of dealing with effluents and emissions were not calculated as part of the costs of products, but instead pushed off onto the environment for people living near the textile mills to pay, in terms of increased health risks and polluted air and water.

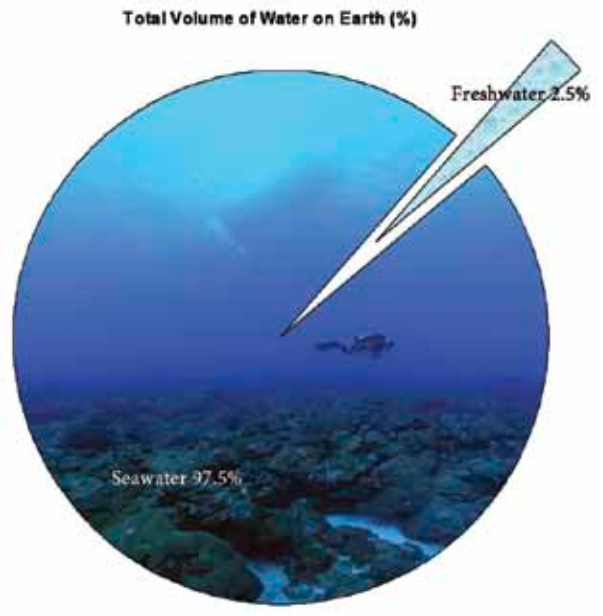
Thus sustainability is also an accounting issue—and for too long, environmental costs haven't been "accounted for." "Our costing system falls short," says John Easton, ecology solutions manager for DyStar, "when we focus on the costs of inputs as opposed to the total cost of the product."

"Instead of only considering the lowest cost per unit produced, we should be looking at the cost per unit consumed," advises Paul Raybin, chief sustainability officer for AirDye Solutions. "Using the cost per unit produced model makes more waste and squeezes the margins—it's both ecologically and economically unsustainable." Making products that don't sell, or that sell poorly and are destined for the sale racks, makes poor economic *and* ecologic sense. Raybin suggests making some textile products closer to where they'll be consumed, because it "gives you more flexibility, and even if it is higher cost per unit produced, you can have lower total costs and therefore a lower cost per unit consumed"

Water, Water Everywhere

"Potable water is becoming an increasingly precious commodity for the world's growing population…. We simply cannot afford to continue polluting our waterways as an increasing number of people, and animals, must have clean drinking water."
~Steven A. Jesseph, WRAP

"Water scarcity is the most important sustainability issue facing the textile industry," says Raybin. This is because of the industry's dependence on water to process, dye, and finish fabric. Raybin says that



A Thirsty Planet

"The total volume of water on Earth is about 1.4 billion km^3. The volume of freshwater resources is around 35 million km^3. The total usable freshwater supply for ecosystems and humans is about 200,000 km^3 of water—less than 1 percent of all freshwater resources." *~United Nations Environment Programme (UNEP)*
www.unwater.org/statistics_res.html

most, if not all, of the sustainability issues in the textile industry revolve around water. One reason why water is key is what Raybin calls the "water/energy nexus": the amount of energy required by the textile industry is mostly because of the need to heat water to process fabric, and then dry the wet fabric. So cutting down on water use should theoretically cut down on energy use as well.

Then there is the issue of toxicity. According to Wolfgang Schrott, professor at the University of Applied Sciences Hof, "Water is the most important solvent in the [textile] industry…[but] when *clean water* is polluted by the industrial production process, it cannot be used for all the other vital processes, including for drinking."

Kingwhale makes yarn that takes up dye more easily, thus saving water and reducing effluent.

According to environmental consultant Michael S. Brown, principal of Brown & Wilmanns Environmental LLC, "The notion of water-driven dyeing in this era of increasing scarcity of fresh water is really ridiculous. How to get color into textile materials without water is the big issue the textile industry is facing." Brown says that current water-based dyeing is "fundamentally flawed technology that we're stuck with at the moment." In the short to medium term, the industry has to keep working on ways to use less water. But in the medium to long term, Brown believes that developing a sustainable technology that can replace water as a primary medium to color fabric is a priority for our industry. "The issue of the last decade has been carbon," says Brown. "The major issue of the coming decade will be water."

Satisfying a Thirsty Industry

"Clean water is not only a basic human right; it is the world's most threatened essential resource. Securing clean water for current and future generations is essential for the health of ecosystems and human societies alike." ~Greenpeace's *Dirty Laundry* report, July 2011

Marcus Bruegel, technical director of the International Working Group for the Global Organic Textile Standard (GOTS), says that, in the short term, many of the water-related sustainability issues the textile industry faces "can be relatively easily tackled by selection and use of less toxic dyes and auxiliaries, replacing inefficient and most polluting processing technologies, and setting minimum standards for wastewater treatment." In the long term, waterless dyeing technologies "will make an enormous difference in the next 20 years, if the industry adopts them," notes Parkes.

Some waterless or low-water technologies are available today, notes Schrott. These include electrochemical dyeing, where the same water/dye liquor can be reused many times, and ink jet printing, which uses a minimum of dye and chemicals—and no water. Schrott also points out coating and foam applications of finishes on fabric, "as well as corona and vapor [plasma] techniques [that] put the effect chemicals only on the surface of the substrate and not in the core of the textile fibers and therefore need less chemistry for the same effect."

This dress by designer Costello Tagliapietra was dyed without water, using AirDye technology.

Jasani notes that "cotton processing is typically the most water-intensive for textile wet processing—and cotton represents 40% of all the textile fibers in the world." Some experts believe using cationic cotton in even a portion of that dyeing and finishing would save a substantial amount of water and use vastly fewer chemicals.

Schrott says that ozone has begun to be used for non-chemical bleaching of textile fabrics in some applications—especially denim washing. Ozone can be used to help clean up dye effluent in textile wastewater as well.

Gathering Low-Hanging Fruit

"Many improvements can be made without major capital expenditure—there is still a lot of low-hanging fruit out there. A lot of progress could be made by management attention, and adopting best practices." *~John Easton, DyStar*

Even though big steps are needed, big steps can't be taken without baby steps. There is still a lot of low-hanging fruit for the textile industry to harvest, as far as manufacturing is concerned. One simple way for a mill to increase its sustainability is to increase its efficiency. "Wherever you're at, you can do better. The goal is continuous improvement," says Brown. "It's not just looking at how to use less, but looking at opportunities to do more with less."

Parkes points out that "Focusing on the little things in a facility can have a big effect." For example, Brown points out that "it's rare for mills to track their energy, water, and emissions usage beyond what they must in terms of compliance." If mills look at their energy use, water use, and effluent discharge—just *measure* it to start, says Brown—they will be able to analyze and see which systems or processes are using the most water and energy and producing the most waste. Half the job of reducing these items is pinpointing where the biggest problems lie. In addition, "Material purity analysis, including toxic checking, [can] be a big benefit to product output results," says Wu.

"There are some simple things that mills can do right away," says Jasani. "How much recycling can you do? How much chemical, water, and energy can you reuse or recapture? This is a resource! Use it

rather than throwing it away and spending money to clean it up or else damaging the environment." Jasani says that it's key to get rid of the old "more is better" mentality and starting thinking outside the box.

"Wastewater recycling, capture and reuse of chemicals, better use of heat exchangers, and more can all help a facility move toward the goal of becoming sustainable," says Jesseph. Moving further along the sustainability path, Jesseph says some mills are moving toward partial or full use of biomass as fuel to run their facilities. "A few enterprising textiles facilities have created biological wastewater treatment systems with virtually zero energy use and amazing results," he says.

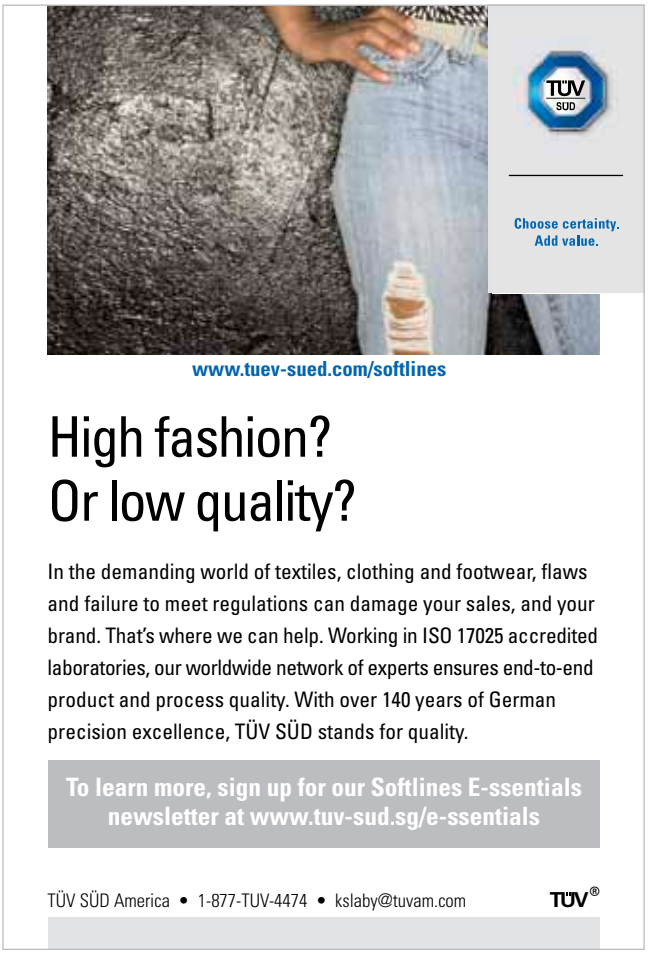
A philosophy of always following Best Available Practice (BAP) makes sure that all available low hanging fruit is consistently plucked. BAP and using Best Available Technology (BAT) involve "combining chemical aspects (reactions) in the textile manufacturing process with technical aspects (mechanical, electrical, etc.) in the same production process," says Schrott. "Big innovations can be expected from interdisciplinary approaches compared with isolated chemical or equipment developments."

Easton notes that the European Integrated Pollution Prevention and Control (IPPC) Bureau has developed a BAT reference document (BATREF) that "defines *Best Available Technology* for textile dyeing. [The] US Environmental Protection Agency (EPA) also has a *Pollution Handbook* for textiles, outlining best practices across all textile sectors."

Examples of BATs are procedures like online dye monitoring. Easton says that "Any improvement in right-first-time dyeing rates reduces the environmental impact and thus improves the textile mill's sustainability." This can include improved dyes, more efficient chemical auxiliaries, better production equipment, more sensitive monitoring equipment, better optimized processes, or any combination of these elements.

Schrott believes that, to survive, the industry must begin with the "restructuring of traditional textile mills into modern factories based on BAT that meet the latest technical, environmental, social, and economic standards." BAP, by definition, must produce quality products. "If a process is limited…in yield or capacity to a quantity below the relevant demand, it cannot be defined as BAT. Therefore, BAT is a moving target, which is always defined as the optimal technology available (in principle and in capacity)," says Schrott.

Brown says that further progress may require "a completely different approach for how you do manufacturing. It's too easy to stay on the same course. Changing the way you think of how to use resources creates opportunities for innovation. Deliver product the customer wants/needs. How you get there is up to you."



Finding Focus

"I have a lot of optimism as more and more people move into the [sustainability] field. There'll be some amazing things happening and a lot of change in the next decade in the textile world." *~Michael S. Brown, Brown & Wilmanns Environmental*

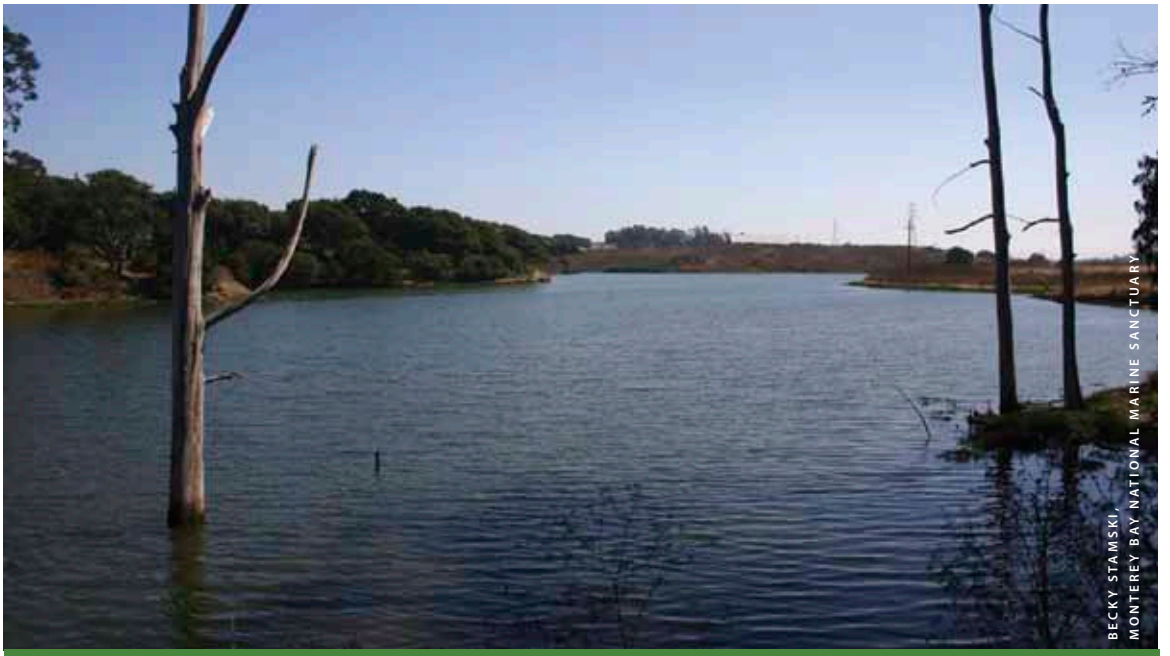
The textile industry hasn't been sitting idle with regards to sustainability all these years. Jasani says that, according to a study by Cotton Incorporated, from late 1990 to late 2009, overall, the textile industry reduced the water, energy, and chemicals used in processing cotton by 50%. "On average, the 130 to 200 liters of water per kilogram of fabric were reduced to 65 to 70 liters of water per kilogram of fabric processed," says Jasani. "Chemical use was reduced about 40%, and energy consumption was reduced as much as 50%."

However, Easton points out that there is still much to be done. "There are great examples of good practice; but for every mill with good practices, there are hundreds more with bad practices." McConnell sees a need for sweeping changes ahead. "Small incremental changes are not a viable solution to manage vulnerability to rising oil and water prices," she says. "The goal needs to be advancement toward clean technology, and creating processes and technology that utilizes rapidly available resources for energy."

Attaining sustainable textile manufacturing isn't just the responsibility of the fabric mills. "Mills don't need to work alone…we all need to work together," says Peter Johnson, team leader of Product Stewardship for Huntsman Textile Effects. "Mills must collaborate more closely with brands and seek joint solutions to achieve a sustainable impact."

Easton sees the textile industry's current struggle with sustainability as not a matter of technology or will, but a lack of leadership and focus. "Everybody knows it can be tackled and everybody wants to do it, but the organizational structures to deliver change are lacking. As an industry, we need to focus management attention on getting this done." However, he is confident, that "once industry partners along the supply chain start working together, [sustainable textile manufacturing] *can* be realized."

What's the next step in textile sustainability? Read the November *AATCC News* to find out! Subscribe at **www.aatcc.org/media/subscribe/newsletter.cfm**



BECKY STAMSKI, MONTEREY BAY NATIONAL MARINE SANCTUARY

Copyright of AATCC Review is the property of American Association of Textile Chemists & Colorists and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.