CLEAN by Design

Funded by and prepared in partnership with the South Asia Environment, Water Resources and Climate Change Unit of the World Bank

Standout Practices at High-Performing Bangladeshi Textile Mills

How Top Resource-Efficient Factories in Bangladesh Save Money and Curb Pollution

The accompanying *Best Practice Guide* is available at **www.nrdc.org/cleanbydesign**

For more information please contact
Avinash Kar
akar@nrdc.org

As part of the Clean by Design project, the Natural Resources Defense Council-World Bank project visited more than 25 factories in Bangladesh. Among these were three factories that are high-performing in energy, water, and chemical efficiency: DBL Group (Hamza and Mymun factories), Epyllion Group, and Partex Denim. All three are leading garment manufacturers in Bangladesh who have found that reducing pollution means significant savings to their bottom line, and are proof that textile factories in Bangladesh can achieve a high level of resource efficiency. These factories are saving both money and the environment by taking a range of actions—from carrying out effective savings measures that are inexpensive and simple, to using resource savings as an important criterion in purchasing major equipment. This case study highlights a few of those measures.

NRDC
THE EARTH'S BEST DEFENSE

www.nrdc.org/cleanbydesign
September 2012

Bangladesh is facing a water crisis. A country historically bedeviled by too much water, it also faces a lesser-known problem of too little usable water. Dhaka, a city of 12 million people, is surrounded by four rivers so polluted as to be deemed "ecologically critical." The pollution of the surface water is putting additional pressure on the groundwater resources that supply drinking water for 80 percent of Dhaka residents. Industrial pollution accounts for 60 percent of pollution in the Dhaka watershed, and the textile industry is the second largest contributor. Textile manufacturing has a huge environmental footprint, generating as much as 300 metric tons of water pollution per ton of fabric with a suite of harmful chemicals, and consuming tremendous amounts of energy for steam and hot water. These high-performing factories show that the industry can be a large part of the water solution in Bangladesh, while saving money in the process.

PRACTICES REQUIRING SIGNIFICANT INVESTMENT

DBL Group: Reducing Liquor Ratios

Liquor ratio refers to the weight of fabric processed to the weight of dye solution. The lower the ratio, the less water is used to produce colored fabric. DBL has invested in dyeing machines that allow a liquor ratio of 1 to 6 compared to the typical machines used in Bangladesh, which allow, on average, a liquor ratio of 1 to 8. This could result in savings of 25 percent of water and chemicals used, as well as effluent treatment. Dyeing machines with even lower liquor ratios are available. Costs range between US $200,000 and $500,000 (Tk 16.4 million to 41 million). DBL reports that the investment paid itself back within a few months.

To optimize the liquor ratios, DBL worked with its staff and the equipment provider to overcome staff concerns about using the machine to its maximum capacity.

Epyllion Group: Precise Laboratory Recipe Preparation

Epyllion employs state of the art automated laboratory equipment—a robotic dispensing system—to optimize dye recipes and reduce recipe variation between the lab and the production floor, thus increasing the chance that the fabric will be dyed exactly the right color on the first try and saving water and reducing chemical use. This technology prepares the solutions, ensuring precision, consistency, quality control, and reduced waste in the lab and eventually on the production floor. Through trials at very small concentrations (at the 100 ml scale), automation allows for precise optimization of recipes in the lab, where amounts of water and chemicals are carefully controlled and tested, and only then applied on the production floor (at the 10 cubic meter (m^3) scale).

Epyllion combines the automated system with a spectrophotometer for better color-matching. The factory estimates that by helping the factory to achieve the desired color on the first try, with no re-dyeing necessary, the advanced lab system reduces re-processing rates by 10 percent, resulting in reductions in chemical and water usage. Based on a daily processing rate of 30 tons of fabric, and avoided reprocessing rate of 3 tons of fabric, Epyllion estimates annual chemicals savings of approximately 500 tons (US $254,000/Tk 20.8 million) and water savings of 37,800 tons a year (US $3,700/Tk 303,700). Epyllion also points out that the automated system significantly increases how often the lab is used, and reduces time spent on analysis.

DBL Group is mainly focused on knit garment manufacturing. The group dyes and finishes about 10,500 tons of fabric a year. The group is completely export-oriented and its in-house laboratory is accredited by well-known global retailers.

Epyllion Group produces about 2.4 million knit garments every month and around 7,000 tons of fabric annually for well-known buyers.

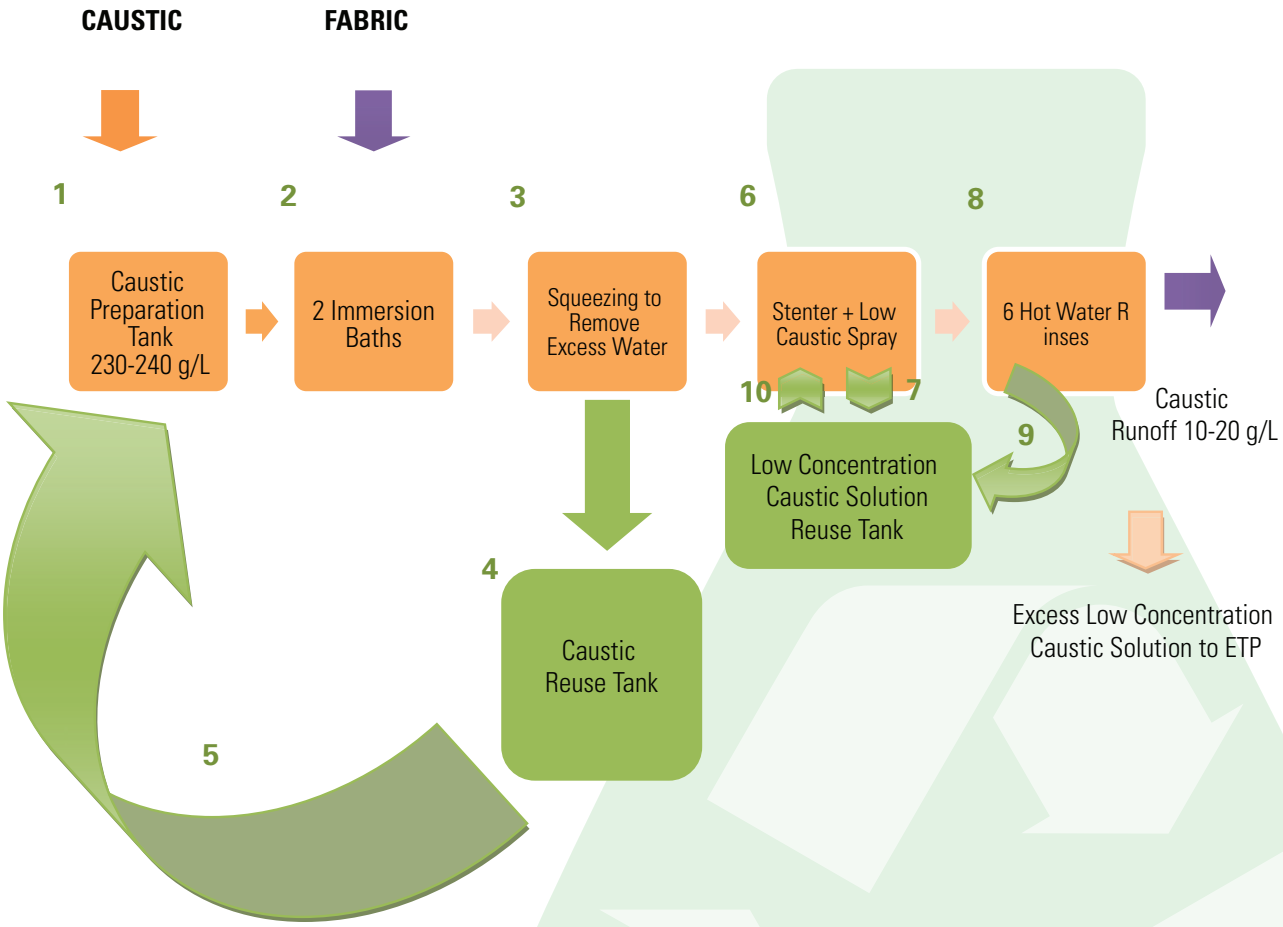
Partex Holdings is involved in a wide variety of businesses, including denim production. Partex Denim produces about 21.5 million yards of fabric a year, all for export.

All three factories use European dyes and are Oeko-Tex Standard Certified, an international certification awarded to factories that limit the use of certain chemicals in their manufacturing processes, thus reducing the pollutant load in water.

PRACTICES REQUIRING LOW OR INSIGNIFICANT INVESTMENT

Partex Denim: Reusing Caustic Soda in Denim Mercerizing Operation

Caustic soda is widely used in the denim industry to ensure the quality (smoothness and lifespan) of the product. After use, this diluted chemical is discharged to the effluent treatment plant and, when neutralized, generates water pollution (total dissolved solids). Partex reuses caustic in the production process when possible, saving chemicals and money and reducing pollution (see figure 1 for diagram of Partex's reuse process). This reuse measure can also be implemented by knit factories if they mercerize their fabric. For those factories that do not mercerize, the measure still serves as a good example of how thinking carefully through factory processes can help eliminate inefficient use of materials, thereby saving money and reducing pollution. Partex estimates that the measure saves at least 4 percent to 6 percent of the 1,200 kg of caustic soda used daily, resulting in reduced pollution loads and savings of approximately US $9,600 to $14,500 (Tk 790,000 to 1,188,000) per year.



This amounts to savings of about Tk 0.18 to 0.27 per yard of fabric processed based on caustic soda usage on average of 90 grams per yard. The system costs between US $400 and $500 (Tk 30,000 to 40,000). To institute this process, a factory needs to invest in a corrosion-resistant pump and appropriate piping.

At Partex, the caustic solution is prepared in a tank at a concentration of 230 to 240 grams per liter and then dispensed to the immersion baths in which fabric is mercerized (Step 1 of diagram). After immersion (Step 2), the fabric is squeezed to remove excess water (Step 3). This water contains significant amounts of caustic (40 to 80 grams per liter) and is collected back in a

storage tank for reuse (Step 4). Five hundred liters of the solution is then added to the 2,000-liter-capacity caustic solution preparation tank and supplemented with additional caustic soda and clean water as needed to reach a concentration of 230 to 240 grams per liter (Step 5).

Following squeezing, the fabric passes through a stenter where it sprayed with a hot, low-concentration caustic solution to impart additional caustic to the fabric (Step 6). Because this low-concentration caustic solution is hot, the caustic penetrates and is absorbed more easily by the fabric. The solution that passes through the fabric during the stenter stage is suctioned off the fabric and collected in a holding tank (Step 7). After the stenter stage, the fabric goes through six hot water rinses with clean water (Step 8). This hot rinse water collects caustic and is also suctioned off below the fabric and collected in the holding tank (Step 9). This water has a caustic concentration of 10 to 20 grams per liter. The collected low-concentration caustic solution in the holding tank is then reused for the caustic solution spray during the stenter stage, which precedes the hot water rinses (Step 10). Excess low- concentration caustic solution is discharged for effluent treatment. The factory is thus also able to get some additional value out of the low concentration of caustic soda in the rinse water.

These measures demonstrate how careful thought about factory processes and opportunities to optimize and reuse resources, whether in selecting equipment or designing processes, can yield dividends in both monetary and environmental terms. They also demonstrate that high levels of resource efficiency are achievable, and indeed are being achieved, in Bangladesh.

[1] Conversions between Taka and US Dollars throughout the fact sheet reflect conversion rates in effect on May 9 2012 at 82 Tk per 1 USD; To remove artifacts of currency conversion and improve readability, dollar amounts were rounded as follows: values less than a million are rounded to the nearest hundred and greater than a million are rounded to the nearest hundred thousand (i.e. 23,760 = 23,800 and 6,243,123 = 6.2 million); Cotton Incorporated. 2009. A World of Ideas: Technologies for Sustainable Cotton Textile Manufacturing, at 23-24.

[2] All tons listed in the case studies are metric tons; Personal communication with Syed Sayeed Munir, GM, Epyllion; financial savings of water based on low end of estimates for water and effluent treatment costs for other factories evaluated during the project and calculated in US dollars.

[3] Based on caustic soda costs of Tk 50/kg (~ US $0.61) and 330 working days.