

## Can You Really Wash Clothes Without Water?

By J. Michael Quante

### A Sustainable Alternative

Clothes laundering is a major daily chore for most people worldwide. According to the US Bureau of Labor Statistics, in 2008, 50% of US women and 20% of men spend at least some time cleaning and doing laundry daily. The water and carbon footprints of this activity over the life span of the garment are considerable. Consumers do have some options to make their existing laundering process "greener" (e.g., running full loads, using cold water in front loading machines, and line drying). In addition, recent laundering technology developments may significantly improve the process's sustainability by reducing both the amount of water and energy used. This new process is popularly known as "waterless washing," essentially a new form of dry cleaning, although it can also include washing with very low amounts of water.

### Negative Ions to the Rescue?

An early "waterless washing" candidate resulted from the [Electrolux Design Lab](#) 2005 award winning entry from Gabriel Tan and Wendy Chua of the National University of Singapore's School of Industrial Design: the [Airwash](#). A combination of negative ions, compressed air, and deodorants does the cleaning in minutes. The Airwash requires no water or detergent. The Airwash is a concept design that has not been commercialized. However, ideas like this can provide inspiration to future innovators. An Electrolux Design Lab 2009 finalist, Zhenpeng Li of Zhejiang University, created the [Naturewash](#), a system designed for negative ion cleaning of nano-coated fabrics.



The Electrolux Airwash  
Photo Courtesy Electrolux



The Electrolux Naturewash  
Photo Courtesy Electrolux

### Nylon May Save the Day!

A different approach was unveiled in 2008 at the University of Leeds School of Design in the UK. Textile chemist Stephen Burkinshaw came up with the idea of a [virtually waterless washing process](#) by replacing most of the wash water with tiny nylon beads. As little as one cup of water and a small amount of detergent are required along with the beads. The prototype machine looks like a regular front loading washing machine. Water, detergent, and beads are added to the load. The inherently polar nylon beads adsorb stains from the fabric. High humidity causes the bead structure to change and become more absorbent—drawing the stain into the bead—during the washing process. The beads are then separated from the clothing in the machine, resulting in garments that are clean and nearly dry. The nylon beads can be reused hundreds of times before being recycled.



**Nylon Beads Used for Xeros Cleaning Process**  
Photo Courtesy of Xeros

Burkinshaw founded the company [Xeros](#) (Greek for "dry") to further develop the concept into a commercial product. The company's effort has been aided by the investment of US\$3 million in public and venture capital funding. The company claims that its technology can save as much as 90% of the water and 40% of the energy (if the energy reduction from tumble drying and the environmental cost of bead recycling are included) normally used in the laundering process.

### **"Waterless Washing" and Its Effect on Clothing**

Bill Westwater, the CEO of Xeros, is confident that remaining product development hurdles will be overcome. The first prototype duplicates the load capacity of current machines and initially targets the commercial laundering sector, while hoping to build the interest and confidence of the residential market. "We are working with standard stain sets for [determining] performance," says Westwater, when asked about stain removal development. Protein stain removal, the effect of bleach addition, and redeposition of the stain back onto the fabric are also currently under study. The effect on colorfastness is yet to be determined.

The effects of detergent type are also of interest. Biological powdered and liquid detergents have both been used, but Xeros is working on a "more tailored" detergent solution amenable to the new process.

One might think that fabric durability would be affected by replacing water with nylon beads. "We don't think so, having been testing for three years" comments Westwater. "[The method was] originally to replace dry cleaning of delicate fabrics, with silk and woolens being the first tested. Current tests didn't reveal any damage. [It's] quite a gentle process." Based on early testing, he believes that fabric care is also enhanced by the lower extractor speeds needed for water removal using the Xeros machine since there is little water to remove.



### **What's Next?**

Xeros is projecting that commercial machines will be available by the end of 2011. "Prior to that," says Westwater, "testing with late stage prototypes [will occur] by late 2010 in laundry businesses in several countries [including] the US, UK, Germany, and the Middle East." He is excited about the prospects. The potential of this technology to reduce water and carbon footprints is substantial.

Soon the question may not be whether the technology is ready for the market, but whether the market is ready for the technology.