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Quantifying the Water Footprint of Manufactured Products: A Case Study of Pitcher Water Filters

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Fresh water is a finite resource that is critically needed by society for a variety of purposes. The demand for fresh water will grow as the world population and global living standard increase, and fresh water shortages will become more commonplace. This will put significant stress on society. It has been argued that fresh water may become the next oil, and efforts have to be made to better manage its fresh water consumption by agricultural and domestic users. Industry also uses large amounts. Surprisingly, only recently is serious attention being directed toward water-related issues. This effort to quantify the water footprint of a manufactured product represents one of the first initiatives to characterize the role of water in a discrete good.

This study employed a life cycle assessment methodology to determine the water footprint of a pitcher water filter. This particular product was selected because many water-intensive materials and processes are needed to produce its major components: for example, agricultural processes used to produce activated carbon and petrochemical processes used to produce the polypropylene casing. In addition, a large amount of water is consumed during the product's use phase. Water data was obtained from the Ecoinvent 2.1 database and categorized as either being associated with blue or green water.

The blue water footprint (surface water consumption) for the pitcher water filter was 76 gallons per filter: 10 gallons consumed for materials extraction, 15 gallons for the manufacturing stage, and 50 gallons during the use phase. The green water footprint (precipitation) was associated with the cultivation of the coconut tree; activated carbon is obtained from the coconut shells. The green water footprint was calculated to be 164 gallons per filter. The overall water footprint was 240 gallons per filter; the filter footprint is heavily dominated by green water (68%) rather than blue water (32%). Future studies may investigate how the production and distribution processes can be altered to reduce these footprints for a less water-intensive product.

Research advisors Sutherland and Zhao write, "Ms. Barker's work to characterize the water footprint of a manufactured product represents a seminal contribution to the field of sustainable manufacturing. Her efforts to quantify the blue and green water consumption across all the life cycle stages of a product is one of the very first research initiatives we have seen to quantify the direct and indirect use of water in a discrete manufactured product."

Anionic resin and activated carbon, the heart of the pitcher water filter.

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