

# The Prospects of Acetogenic Pretreatment for Energy Conservation in Textile Processing Wastewater in Resource - Constrained Economies

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## Abstract

The textile sector holds a pivotal role in Bangladesh's economy, being its primary source of foreign exchange (84%) and employing around four million individuals, primarily women. However, the rapid and unregulated expansion of these industries has resulted in significant environmental repercussions. The uncontrolled discharge of untreated textile wastewater has emerged as a pressing concern, causing pollution in water bodies. Compliance challenges stem from the elevated treatment costs, driven by the usage of costly imported treatment chemicals and reliance on energy-intensive systems. Textile processing generates substantial wastewater volumes, often necessitating extended aerobic treatment to mitigate biochemical oxygen demand (BOD), which substantially consumes energy. This paper introduces a pioneering approach involving microbial acetogenic pre-treatment of textile wastewater, focusing on a practical case study within a textile processing industry. The outcomes highlight a remarkable 95% efficiency in reducing biodegradable organic matter through acetogenic pre-treatment, accompanied by further reductions in chemical oxygen demand and total dissolved solids. The kinetics of degradation adhere to well-defined first-order kinetics, with a first-order rate constant "k" for the degradation of textile dyeing wastewater measured at 0.048 hr<sup>-1</sup> (95% confidence bound: 0.030, 0.064). By reducing the BOD<sub>5</sub>/day loading to the extended aeration treatment system by 143 Kg, a substantial potential energy saving of 574 KWh/day in aeration requirements is projected.

**Key words:** *Textile wastewater, characterization, pre-treatment, acetogenic potential energy savings.*