

Environmental Friendly and Cost Effective Treatment of Textile Processing Wastewater: Employing Calcium Hypochlorite Oxidation Coupled with Sand Filtration Using Recycled Blast Furnace Iron Slag to Reuse Treated Effluent in Wet Processing

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Abstract

The textile industry is a cornerstone of Bangladesh's economy, contributing significantly to its foreign exchange earnings and providing employment to over four million, predominantly female workers. However, the unplanned concentration of textile industries has led to adverse environmental impacts, particularly through the unregulated discharge of untreated wastewater. Compliance challenges arise due to the high costs linked to treating this wastewater using expensive imported chemicals and energy-intensive systems. To address this, a pilot project was launched at an operational textile wastewater treatment plant to develop a sustainable solution. This initiative focused on refining the effluent through a tertiary treatment process to meet discharge standards while producing reusable water for textile manufacturing. The method involved chemically treating the wastewater with calcium hypochlorite, followed by rapid sand filtration aided by waste blast furnace iron slag. This tertiary treatment achieved complete color removal and impressive reductions of 92% for Chemical Oxygen Demand, 82% for Total Dissolved Solids, and 85% for Total Suspended Solids. Denim fabrics dyed with the recycled water showed comparable results in color fastness to wash and rubbing. This innovative approach, utilizing local resources and technology within the regional supply chain, holds promise as a sustainable wastewater treatment option for textile industries facing resource constraints. This strategy is aligned with sustainable development goals, embracing principles of the circular economy.

Keywords: Bangladesh; Blast furnace; Iron slag; Supply chain; Sustainable Development