

Title: Exploring the Reuse Potential of Chemical Sludge from Textile Wastewater Treatment Plants in India-A Hazardous Waste

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Abstract: Problem statement: This study was conducted to explore the reuse potential of the chemical sludge (considered as hazardous waste as per Indian Government Hazardous Waste Management Rules) generated from combined effluent treatment in textile clusters. These textile clusters mainly cover the cotton dyeing and printing operations. Approach: Therefore, treatability studies of chemical sludge were conducted using solidification/stabilization treatment to examine the possibility of its reuse in construction materials. The sludge was characterised for its physico-chemical parameters and heavy metals. Standard blocks of dimensions 70.6 × 70.6 × 70.6 mm were prepared, in which chemical sludge was used as a partial replacement of cement by mixing 30-70 % of sludge in cement. After the experimental curing, the blocks were evaluated for physical engineering properties such as hardening time, block density, unconfined compressive strength. The chemical properties were determined in terms of concentrations of heavy metals in the TCLP leachate. Results: The hardening time ranged between 30-45 h. The compressive strength in the sludge cement blocks ranged from 2.63-22.54 N mm<sup>-2</sup> after 14 days of water curing and 6.48-24.89 N mm<sup>-2</sup> after 28 days of water curing for 30, 40, 50, 60 and 70 % sludge replacement in cement. The block density varied between 1361.3408-1813.8992 Kg m<sup>-3</sup> after 14 days and 1386.3953-1842.3446 Kg m<sup>-3</sup> after 28 days of water curing. The concentrations of heavy metals were negligible in the TCLP leachate and thus below USEPA regulatory limits. Conclusion/Recommendations: As far as structural applications is concerned, it is fulfilling the criteria of some of the classes (C to K) as per the BIS standards of the bricks upto a strength of 25 N mm<sup>-2</sup>. The use of sludge can definitely be explored for other structural and non-structural applications depending upon strength requirement. Other applications of textile sludge in the construction materials to be explored by conducting more bench scale studies.