Sustainable Waste Management and Resource Tapping options for Distillery Wastewater

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Industries with high energy consumption and pollution poses a major challenge for 2E (Environment and Economy) of the developing countries. With the adoption of Paris agreement, efforts have been made to intensify the actions and new technologies for a sustainable low carbon future. Distillery (ethanol) industry, generates an average of 8-10 L of waste effluent i.e. spent wash for 1L ethanol production. The characterization of spent wash shows a high concentration of potassium upto 8-10 g/L and the potential of a proper effluent management to recover potash as well as to generate Carbon credit with power generation. To achieve the main objective of the present study i.e. to separate mixture into streams of organic and inorganic nutrients, NF membrane with MCWO 1000 Da was used. Analysis of variance (ANOVA) was used to analyze experimental data in Response Surface Methodology (RSM) and the experimental response models were derived to find the optimized conditions of the operating variables. Before NF treatment, the initial Values of EC – 34 mS/cm, TOC – 18500 mg/L, COD – 40000 mg/L, NF showed max. 25, 85 and 82% (approx.) of EC, TOC and COD removal respectively. The permeate flux of 22 L/hm^2 was observed at optimized conditions. The reject generated for an initial volume of 2.5L sample has high value of TOC 20 g/L. The experimental results confirm the viability of membrane technology as pretreatment option for an energy efficient process to separate the salt stream from the organic stream and concentrate the organic waste. The study can be further elaborated in commencing the novel approach for the recovery of the calorific value of the organics and precipitation of the inorganic nutrients in the form of potash.