

Recovery comparisons—Hot nitrogen Vs steam regeneration of toxic dichloromethane from activated carbon beds in oil sands process

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abstract

The regeneration experiments of dichloromethane from activated carbon bed had been carried out by both hot nitrogen and steam to evaluate the regeneration performance and the operating cost of the regeneration step. Factorial Experimental Design (FED) tool had been implemented to optimize the temperature of nitrogen and the superficial velocity of the nitrogen to achieve maximum regeneration at an optimized operating cost. All the experimental results of adsorption step, hot nitrogen and steam regeneration step had been validated by the simulation model PROSIM. The average error percentage between the simulation and experiment based on the mass of adsorption of dichloromethane was 2.6%. The average error percentages between the simulations and experiments based on the mass of dichloromethane regenerated by nitrogen regeneration and steam regeneration were 3 and 12%, respectively. From the experiments, it had been shown that both the hot nitrogen and steam regeneration had regenerated 84% of dichloromethane. But the choice of hot nitrogen or steam regeneration depends on the regeneration time, operating costs, and purity of dichloromethane regenerated. A thorough investigation had been made about the advantages and limitations of both the hot nitrogen and steam regeneration of dichloromethane.