

Effect of number of packing layers on absorption column efficiency

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A commercial-scale amine absorber having a height of 31 meters and a diameter of 3.25 meters was considered in the off-shore operation. The absorber was equipped with one liquid distributor at the top, three packing beds, two liquid redistributors between the two beds, and one gas distributor at the bottom. One bed was composed of 20 structured-packing layers with Mellapak 250.X. Since the CO₂ removal efficiency is deteriorated under the ship tilting and motion, the total bed height should be increased. The objective of this study was to present design guidelines of the bed height for the amine absorber subjected to 2 degree of tilting. A porous media Eulerian CFD (computational fluid dynamics) model was used to investigate hydrodynamics of gas-liquid multiphase flow in the absorber. Six cases with the number of packing layers from 10 to 20 were simulated to find an optimum number of packing layers. It was found that 4 beds with 16 packing layers (totally 64 layers) under the ship tilting may be sufficient to achieve the same CO₂ removal efficiency as that of 3 beds with 20 layers (totally 60 layers) without ship tilting.