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Techno-Economic Analysis of the Production of Aniline

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Abstract : The project for the production of aniline is done by providing 295.46 tons per day of nitrobenzene as feed. The material and energy balance calculations for the different equipment like distillation column, heat exchangers, reactor and mixer are carried out with simulation via DWSIM. The conversion of nitrobenzene to aniline by hydrogenation process is considered to be 96% and the total production of the plant was found to be 215 TPD. The cost estimation of the process is carried out to estimate the feasibility of the plant. The net profit and percentage return of investment is estimated to be ₹27 crores and 24.6%. The payback period was estimated to be 4.05 years and the unit production cost is ₹113/kg. A techno-economic analysis was performed for the production of aniline; the result includes economic analysis and sensitivity analysis of critical factors. From economic analysis, larger the plant scale increases the total capital investment and annual operating cost, even though the unit production cost decreases. Uncertainty analysis was performed to predict the influence of economic factors on profitability and the scenario analysis is one way to quantify uncertainty. In scenario analysis the best-case scenario and the worst-case scenario are compared with the base case scenario. The best-case scenario was found at a feed rate of 120 kmol/hr with a unit production cost of ₹112.05/kg and the worst-case scenario was found at a feed rate of 60 kmol/hr with a unit production cost of ₹115.9/kg. The base case is closely related to the best case by 99.2% in terms of unit production cost. since the unit production cost is less and the profitability is more with less payback time, it is feasible to construct a plant at this capacity.

Keywords : aniline, nitrobenzene, economic analysis, unit production cost
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