

Retrofit of STC purification columns

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Polysilicon is a key component in the production of renewable electricity solar power. To make solar power competitive, there is a need to reduce the manufacturing cost of polysilicon. This can be done by saving energy in existing plants or developing alternative cost-effective process designs. In polysilicon manufacturing process, silicon tetra chloride (STC) is produced, purified and converted into tri chloro silane (TCS), which is converted into polysilicon in a CVD reactor. STC purification base case process is composed of two distillation columns in which distillate of first column is waste and distillate of second column is the required product. In this work, two retrofit schemes have been proposed for STC purification process. First scheme is to install pre-fractionator arrangement in which distillate stream of first column is connected with the rectifying section of the second column. Second scheme is to retrofit Petlyuk column arrangement by bypassing condenser and reboiler of the first column. Optimization of design variables for both schemes has been carried out by sensitivity analysis and by automating Aspen plus with Matlab. Results show that 68% energy can be saved for first scheme, while utilizing maximum amount of available equipment from base case and for second scheme 39% energy can be saved.