HIGH GRAVITY HIGH SHEAR FOR INTENSIFIED CHEMICALS PRODUCTION

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Abstract

The chemical industry aims to apply the safest, most efficient, and most versatile plant for the sustainable production of chemicals. In the past decade, rotor-stator spinning disc technology has been developed, which uses rotating action to create high gravity and high shear conditions. This technology shows orders of magnitude higher mass transfer rates and heat transfer rates, enabling a shift from diluted reaction systems to process intensified, concentrated reaction systems operated at high temperatures and pressures. This allows for a significant reduction of chemical plant sizes. The relatively small size of the equipment enables the use of exotic construction materials and coating procedures, safely extending the operating conditions even further and improving the durability of the equipment.

In essence, all unit operations present in chemical production plants, i.e. reactors, extraction columns, distillation columns, crystallizers, settlers, even pumps and compressors, are ultimately integrated with this novel technology in a single compact device, consisting of discs stacked on a single rotating axis, in the functionality order required for the production of a specific chemical product. Each chemical production process then has a specific stacking of discs. The device can be quickly assembled and disassembled and is easily used for the production of different chemicals, leading to more flexibility and sustainability of chemical production plants. Moreover, the small size allows for easy relocation and safe, distributed production of chemicals at the customer's site. Also, the investment costs are relatively low, leading to high return on investment rates. These combined characteristics will allow the chemical industry to quickly respond to customers' and society's demands and needs.

The impact of this new technology will be demonstrated on specific process steps, i.e., reactors (e.g. BuLi reaction, ethynilation reaction), extractors, crystallizers, condensers, and evaporators. Additionally the redesign of a sodium/calcium acetate production plant and a chlor-alkali production plant is discussed.

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