Numerical simulation of film forming characteristics and mass transfer enhancement in horizontal polycondensation kettle

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Abstract

The process of producing high viscosity polyester by transesterification polycondensation needs to adjust the operating conditions and equipment structure of pre-polycondensation kettle and final polycondensation kettle to realize process intensification. In view of this, the fluid volume function (VOF) method of CFD was used to investigate the film formation and surface renewal characteristics of horizontal polycondensation kettle under different operating conditions, including viscosity, rotating speed and liquid height. The results show that the viscosity and rotating speed were positively correlated with the film area and surface renewal in the pre-polycondensation stage. However, increasing the viscosity by several orders of magnitude in the final polycondensation kettle, the larger the film area and film thickness, but the overall surface renewal of the disk decreased. Therefore, a hexagonal hole disk is designed. It is found that the film is more uniform and the power consumption can be reduced by more than 20 %.

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