

Numerical simulation of particles in turbulent flow in a rotating pipe

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The rotational particle separator (RPS) is a patented device for separating particles from a lighter fluid by centrifugation in a bundle of channels which rotate around a common axis. Originally, the RPS was designed in such a way that the flow in the channels is laminar. In that way it is avoided that disturbances in the flow deteriorate the separation efficiency of the RPS. However, in some applications the required volume flow is so large that turbulent flow cannot be avoided. Since the width of the channels is small, the Reynolds number in the channels is often low enough for the flow in the channels to be calculated by means of direct numerical simulation (DNS). In order to study the effect of turbulence on the RPS efficiency, a DNS code for turbulent flow in a rotating pipe has been developed. In addition, particle trajectories have been calculated. The effects of rotation on the flow and on the particle behavior will be shown and discussed.