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螺旋片导流式气液分离器的数值模拟与试验研究

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摘要 The gas/liquid spiral separator, a key component in the compressed air system, was used to remove liquid and oil from gas stream by centrifugal and gravitational forces. To optimize the design of the separator, the relationship between the performance and structural parameters of separators is studied. Computational fluid dynamics（CFD） method is employed to simulate the flow fields and calculate the pressure drop and separation efficiency of air-liquid spiral separators with different structural parameters. The RSM（Reynolds stress model）turbulence model is used to analyze the highly swirling flow fields while the stochastic trajectory model is used to simulate the traces of liquid droplets in the flow field. A simplified calculation formula of pressure drop in spiral structures is obtained by modifying Darcy’s equation and verified by experiment.

关键词 螺旋片导流式气液分离器, 数值模拟, 试验研究, 压降, 分离效率.

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Numerical Simulation and Experimental Study on the Performance of Gas/liquid Spiral Separator

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Abstract The gas/liquid spiral separator, a key component in the compressed air system, was used to remove liquid and oil from gas stream by centrifugal and gravitational forces. To optimize the design of the separator, the relationship between the performance and structural parameters of separators is studied. Computational fluid dynamics（CFD） method is employed to simulate the flow fields and calculate the pressure drop and separation efficiency of air-liquid spiral separators with different structural parameters. The RSM（Reynolds stress model）turbulence model is used to analyze the highly swirling flow fields while the stochastic trajectory model is used to simulate the traces of liquid droplets in the flow field. A simplified calculation formula of pressure drop in spiral structures is obtained by modifying Darcy’s equation and verified by experiment.

Key words gas/liquid separator; spiral structure; computational fluid dynamics; pressure drop; separation efficiency; numerical simulation.

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