

论文

水垫带式输送机水垫压力场的计算模拟与实验研究

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摘要:

建立水垫流场的二维雷诺方程, 利用CFD软件对不同情况下的水垫压力场进行数值模拟。数值计算结果表明, 水垫压力场主要是由喷嘴喷出的水产生的静压力组成。水垫压力随着喷嘴直径的增大而增大, 喷嘴错位布置比平行布置方式能一定程度上提高水垫带式输送机的承载能力; 喷嘴排数和列数也影响着水垫压力的大小和稳定性。研制了水垫带式输送机静态模拟试验台, 对喷嘴直径、排列方式相同的情况下对不同载荷的水垫压力场进行实验研究, 得到水垫流场的压力分布。与数值模拟结果比较表明, 理论计算结果基本反映了水垫流场压力分布的主要特征, 为进一步研究水垫带式输送机提供了参考。

关键词: 水垫带式输送机; 水垫压力; 数值模拟; 压力测量

Experiment and numerical simulation of pressure field for water cushion belt conveyor

Abstract:

Reynolds equation of water cushion was deduced from Navier-Stokes equation. The pressure field of water cushion was numerically calculated by the CFD software under different conditions. Results of numerical simulation show that hydrostatic pressure which caused by nozzles is the main part of the load capacity of the water film. The pressure of water film is bigger with bigger nozzle diameter. The arrangement of the nozzles influence the pressure field distribution of water film. Staggered arrangement of nozzles can increase the pressure and carrying capacity of conveyor. The number of nozzle rows and lines influence the pressure and stability of water film. Presented the experiment facility of the water cushion belt conveyor, the experimental study on the facility was carried out to measure the pressure distribution of the water film under the same nozzle diameter and arrangement. Comparison of the computational results with the experimental data show that numerical results basically indicate the flow features of the water cushion and can provide the theoretic evaluation to improve the air-cushion design.

Keywords: water cushion belt conveyor; water cushion pressure; numerical calculation; pressure measure

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