

## 迷宫滴头水力特性的计算流体动力学模拟

### Modeling of hydraulic characteristics through labyrinth emitter in drip irrigation using computational fluid dynamics

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中文摘要:

建立了迷宫滴头的CFD(Computational Fluid Dynamics)数值模型,并对滴头的压力流量关系、流道内部的压力和流速分布进行了数值模拟计算。利用原型滴头和滴头放大模型实测值对模型和模拟计算结果进行了实验验证。结果表明,滴头流量压力关系模拟计算值与实测值之间的平均偏差小于5%;滴头放大模型内部压力分布的模拟值与实验值间的平均偏差小于3%。结果还表明,迷宫式滴头流道内压力沿流道长度呈线性变化,在滴头齿尖附近的主流区流速达1.6~2.8 m/s,而滴头齿根附近的旋流区的流速为0.1~0.4 m/s,在其它尺寸保持不变时,滴头齿距对滴头流态指数的影响不大。CFD数值模拟可以为滴头水力性能的进一步研究提供有效的研究手段。

英文摘要:

Mathematical model for hydraulic characteristics through labyrinth emitter in drip irrigation was established using computational fluid dynamics(CFD) in this paper. Computational fluid dynamics method was applied to calculate the relationship between the emitter discharge and pressure and the distributions of the pressure and velocity inside the emitter. The calculated results were compared with the test results of original emitters using amplified emitter model with dimension ratio of 10:1. The results showed that the average error was less than 5% between the calculated values and tested values on the relationships of emitter discharge with pressure. The average pressure distribution error between calculated and measured value was less than 3%. The pressure change in the emitter was linear with the length of the flow path. The velocities near tooth cusp and bedrock in the labyrinth emitter were 1.6~2.8 m/s and 0.1~0.4 m/s, respectively. CFD method could be a powerful tool for emitter design and manufactures.

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