

## 二维谷仓通风方程的流函数形式及解法

### A Formulation of Two Dimensional Aeration Model With Stream Function

投稿时间: 1996-1-22 最后修改时间: 1997-4-22

稿件编号: 19970210

中文关键词: 谷仓, 通风, 数值模型, 流函数

英文关键词: Grain bin Aeration Numerical model Stream function

基金项目:

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摘要点击次数: 6

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中文摘要:

导出了与布鲁克的以压力为基本量的谷仓通风方程(即压力模型)完全等价的、以流函数为基本量的新的流函数模型。新模型的计算域包含谷床进风口前的部分空腔,根据入口流量可算出流场和压力场。由于新模型把压力模型仓壁边界上压力的自然边条件转化成仓壁边界流函数的强迫边条件,使迭代速度大大提高。通过布鲁克模型仓入口压力 500 Pa 工况算例比较,表明新模型所得结果和绘出的等压线与压力模型符合很好,而耗用时仅为压力模型的 1/1.5 左右。

英文摘要:

An approach is carried out for solving two dimensional aeration in grain bins and an alternative formulation is derived in which stream function is used instead of pressure in the model founded by Brooker and Segerlind. As a result, natural boundary conditions along bin walls in the pressure model is reduced to a forced one which allows to specify stream function values on bin walls. The new model is validated through a numerical example (the case of 500 Pa inlet pressure) which was presented and computed by Brooker using a scheme with control volume formulation. Flow patterns of stream line and plot of iso pressure lines are presented. Numerical comparison with the pressure model on pressure values at selected points shows good equivalence. The iteration practice shows the new model can greatly reduce CPU time to about 1/1.5 of the former model. The formulation is also suitable for use of the finite element method.

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