

## **2D Modeling of Grain Transport and Separation in the Horizontal Air Stream**

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### **Abstract**

Winnowing is a cross flow aerodynamic process that involves both forces and motion analysis. Aerodynamic principle was used to model the 2 D movement of grain in horizontal air stream. Drag and gravitational forces were resolved and the motion equation was developed. The resulting numerical equation was solved using MATLAB. This has provided an insight into air and particle dynamics in such system and enabled a simplistic solution to the study of material transport in horizontal air stream. It has also transformed the winnower into a cross flow classifier. Results obtained using cowpea has shown that the resulting cross flow classifier has the feasibility of achieving separation, cleaning, sorting, grading and density classification processes in one machine. This could reduce space requirements, energy consumption and cost of production, while machine efficiency and profitability are optimized.

**Keywords:** Keywords Winnowing, Separation, Material transport, Horizontal air stream, Density classification, Aerodynamics, Particle dynamics