

PERFORMANCE EVALUATION OF SQUARE CYCLONE SEPARATOR WITH CONE GEOMETRY VARIATIONS

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ABSTRACT

Rapid industrial development with intensive operations increases exhaust emissions that are polluting the environment and human health. Therefore, efforts to overcome the problem are urgent to be realized, one of which is by using a particle separator such as a cyclone separator. Along with that, the design of a cyclone separator with the best performance is very important. Therefore, it is necessary to innovate and analyze the design of the cyclone separator, among others, by varying the cone geometry shape of the cyclone. This study aimed to determine the best performance of a square cyclone separator on various cones.

This study compared the pre-determined aspects of three cone variations, including single cone, dual inverse cone 1, and dual inverse cone 2. Determination of the best cone was based on aspects of pressure drop results, collection efficiency, static pressure contours, tangential velocity contours, tangential velocity vectors in cone geometry, and tangential velocity vectors at the cyclone inlet from Computational Fluid Dynamics (CFD) simulation results.

Based on the numerical analysis of the seven aspects set, the single cone variation fulfils the best 5 aspects among the three cones, namely: pressure drop of 188.5 Pa, static pressure contour of 10.42 Pa, tangential velocity contour of 3.06 m/s, tangential velocity vector flow direction in the cyclone geometry at the centre of the bin, and tangential velocity vector flow direction at the cyclone inlet which is parallel. Therefore, the single cone is the best among the three cone geometry variations.

Kata Kunci: Computational Fluid Dynamics, Dual Inverse Cone, Single Cone, Square Cyclone Separator