Similarity analysis of gas phase flow field in the cyclone separator

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The outline

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- 3.3 analysis of self-mold area

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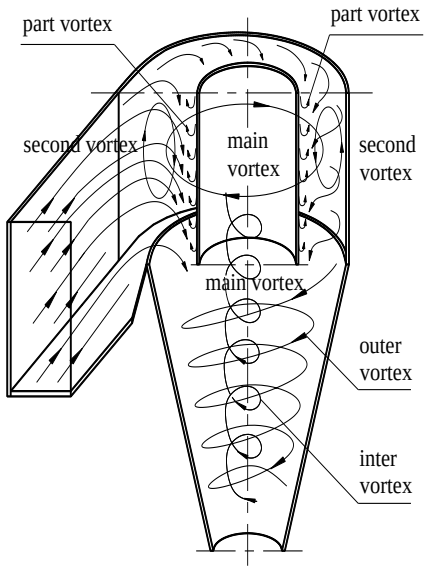
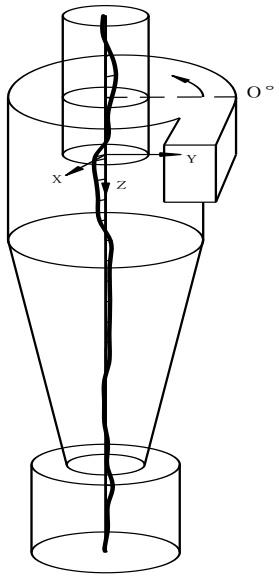
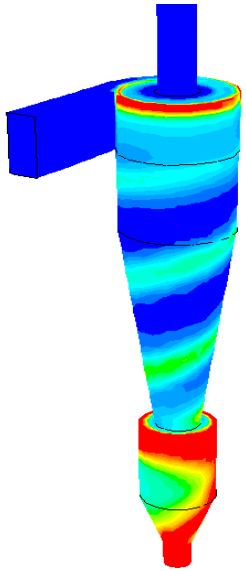
1. Introduction

- **The flow field in cyclone separator is a strong cyclone turbulent flow field, presenting Rankine vortex structure.**







A. primary vortex and secondary vortex **B** . axis of vortex center C. spiral gray belt

FIG. 1 flow field characteristics of cyclone separator

- **The flow field similarity is the basis of amplification and modeling. Therefore, it is necessary to establish a comprehensive dimensionless criterion of these flow parameters and size parameters. By the similarity criterion, the bridge from laboratory model to industrial application prototype will be built.**

2. Research model

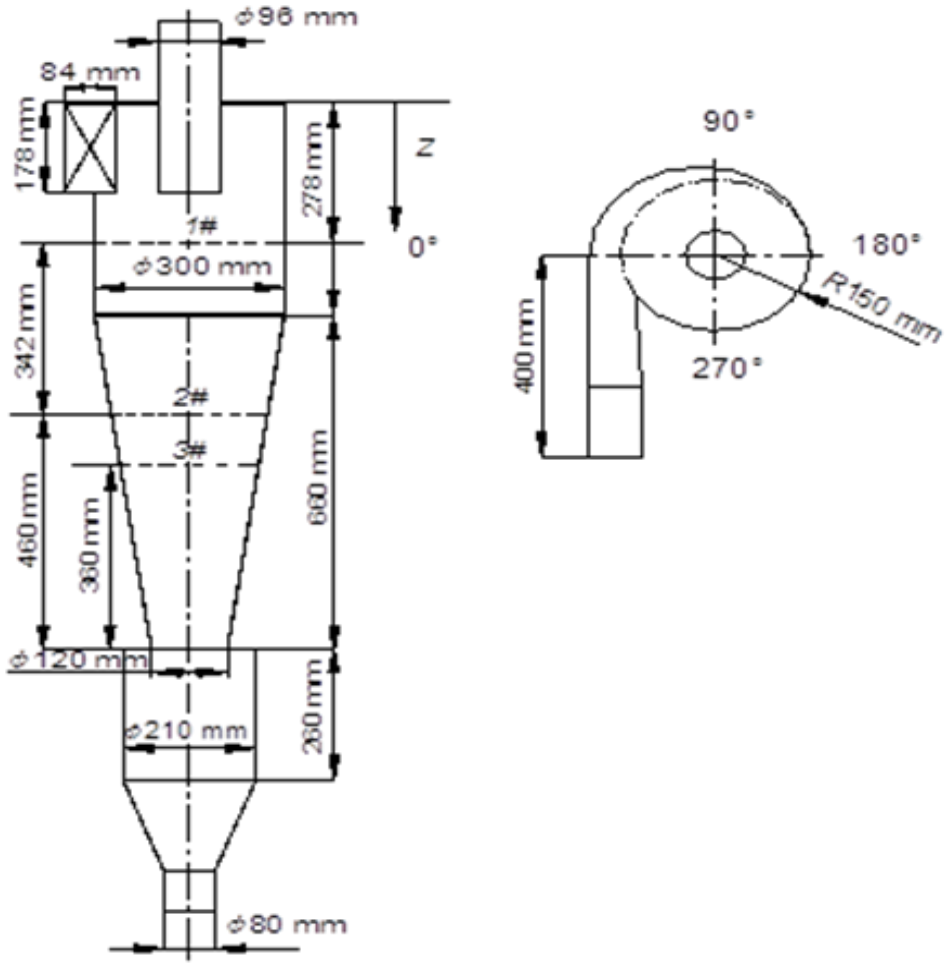


FIG. 2 PV cyclone separator

3. Results and discussions

- **3.1 different diameters**

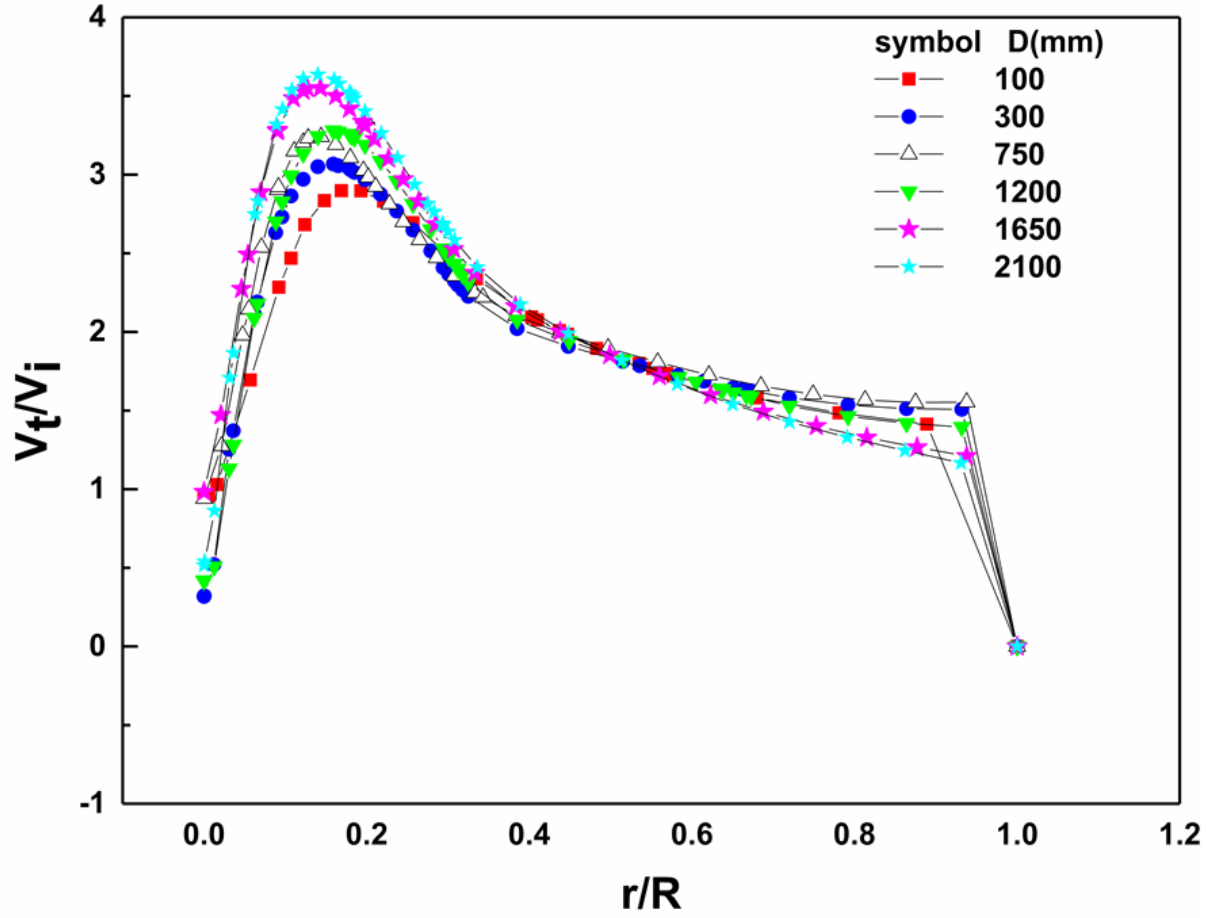


Fig. 3 Distribution of tangential velocity with different diameters

3. Results and discussions

- 3.2 inlet velocities

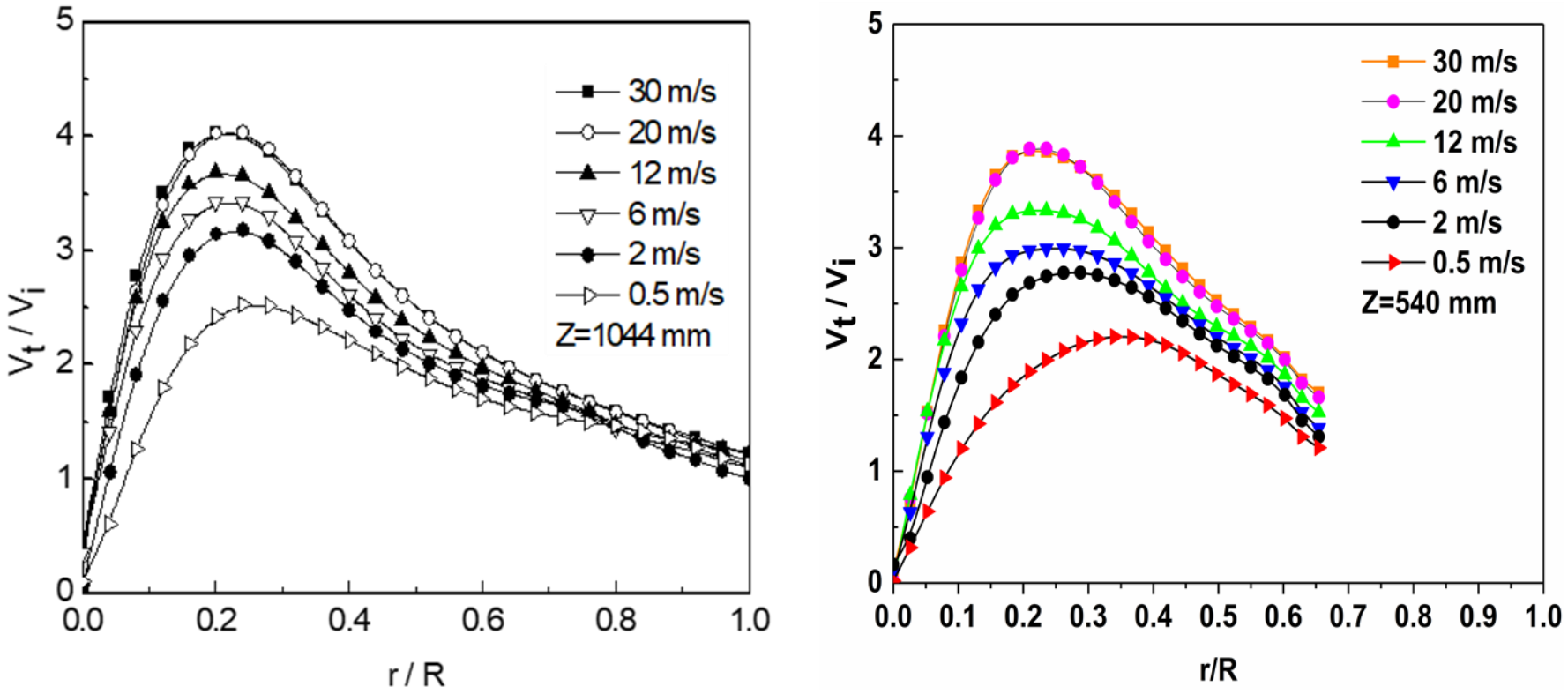
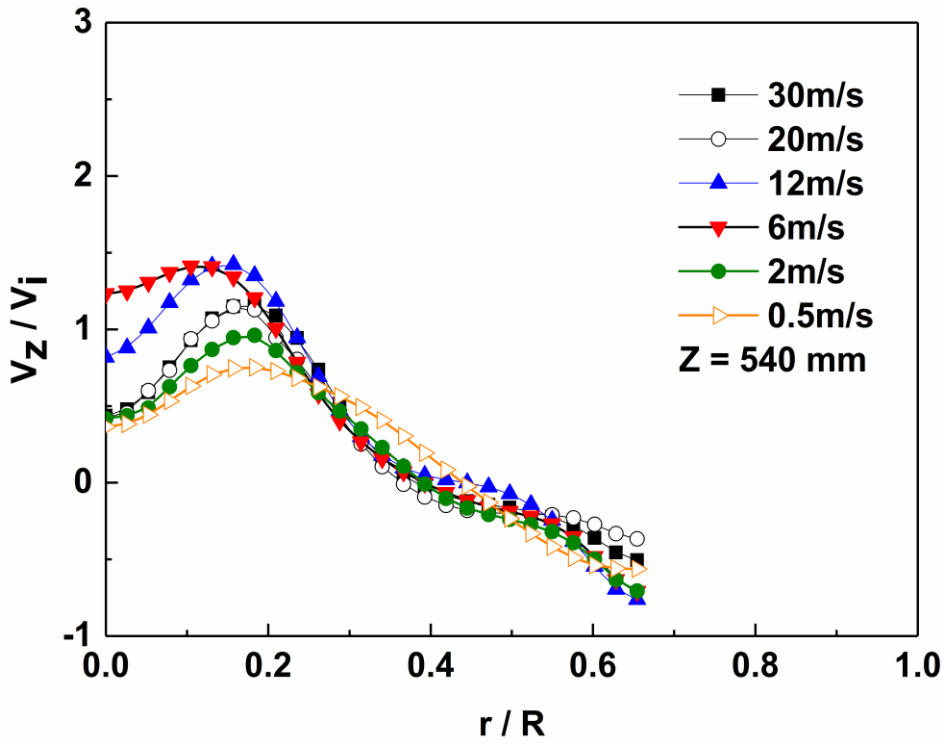


Fig.4. Distribution of tangential velocity with different diameters

3. Results and discussions

- 3.2 inlet velocities



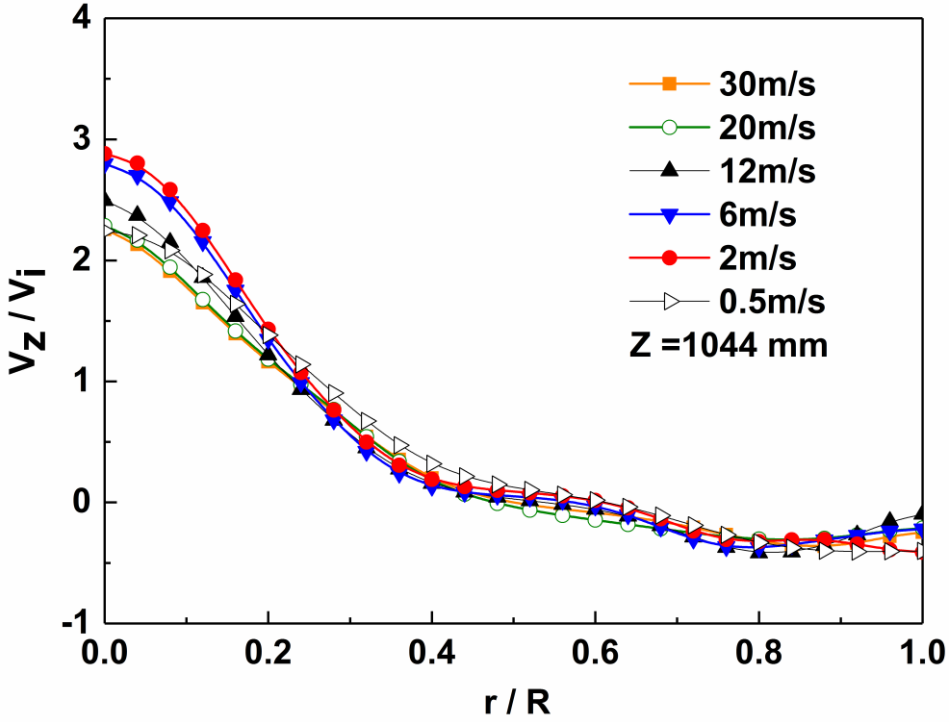


Fig. 5 shows the dimensionless axial velocity simulation results of typical cross-section with different inlet velocities.

3. Results and discussions

- **3.3 analysis of self-mold area**

$$Eu = ARe^{n}$$

A=330.167，n=-0.186

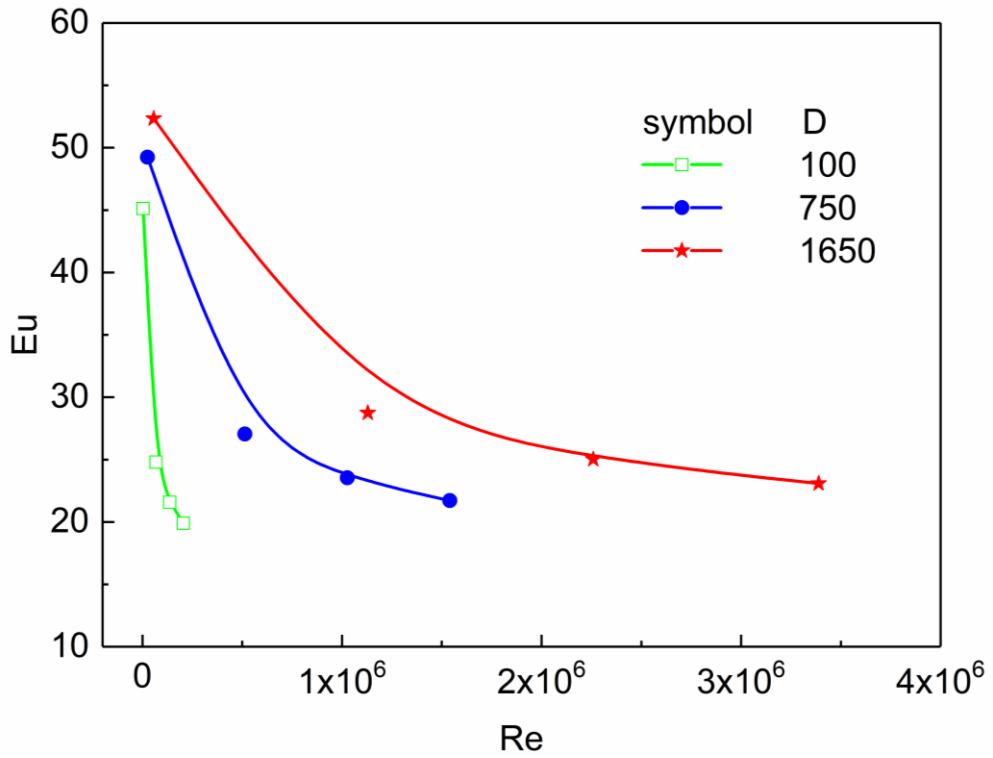


FIG. 6 relationship between the number of Eu in cyclone separator and the number of Re_D in diameter and size

3. Results and discussions

3.4. Under the change of inlet velocity

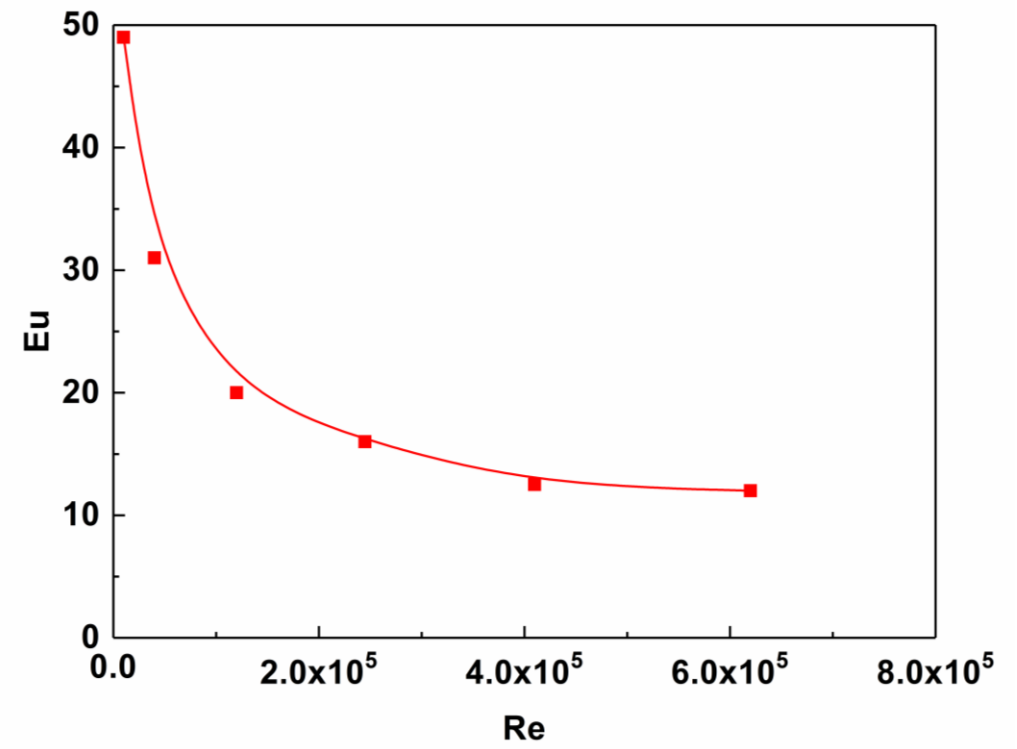


Fig. 7 Calculation results of the relationship between Euler's number and Reynolds number

4. Conclusion

- The flow field of cyclone separator has a self-model area within certain operating parameters and size parameters.

- The flow parameter changes in the self-model area have no influence on the dimensionless flow field.
- When Vi > 20 m/s and D > 2000 mm, the Euler number is not related to the Reynolds number, the flow field in the cyclone separator enters the self-mode area.

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