

An efficient and accurate particle method to study the liquid atomization of a rotary atomizer

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ABSTRACT

A meshless particle method, moving particle semi-implicit method (MPS) was employed to simulate the liquid film breakup and atomization process under centrifugal force. The inlet flow model of nozzles, centrifugal force loading model and surface tension model were established respectively. A new searching algorithm which based on the idea of eliminate invalid computation was proposed to improve the computational efficiency of the MPS method. A rotary atomizer which could be applied on low pressure and small flow rate was simulated, and the bulk-film-belt-droplet deformation process of the liquid atomization was reproduced directly by taking the advantage of the particle method. Two basic atomization mechanisms were presented and analyzed. The theoretical analysis and numerical simulation results could provide reference for the nozzle design and investigation.

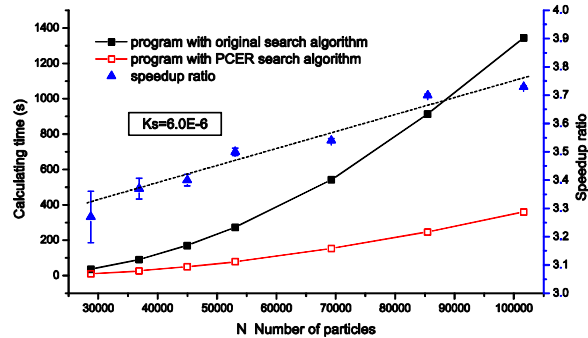


Fig. 1 Calculating time saving per time step by PCER over original search algorithm

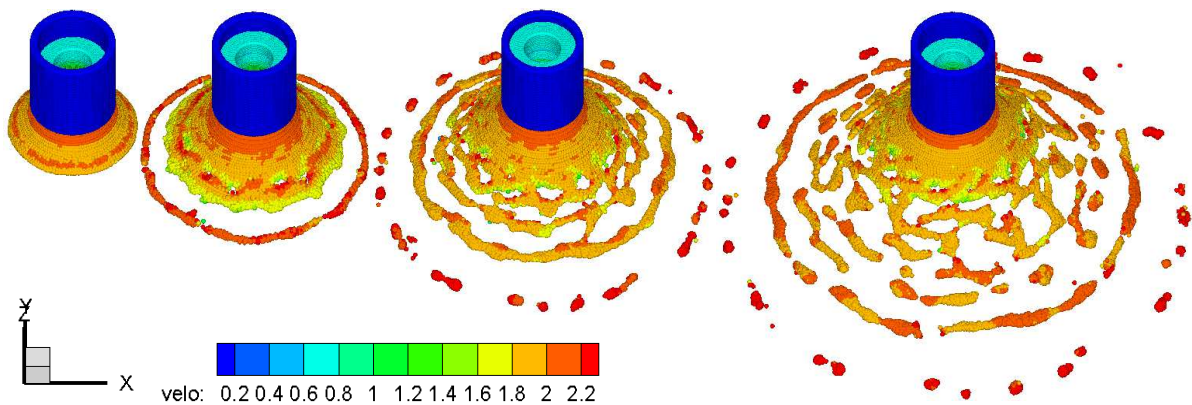


Fig. 2 Three dimensional view of liquid film break up and atomization process in time series

REFERENCES

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