

THE ENGINEERING CALCULATION IN FLOW FIELD AND TEMPERATURE FIELD IN COAL GASIFICATION

Zhang Wenbin, Zhang Yan, Xin Wei, Jiang Congbin
Changzheng Engineering Co., Ltd., China
email:elyseason@163.com

Small grid scale is required to fully expose the birth, development and fade away of vortex in high speed shear flow. But it will lead to massive calculation in the application of Monte Carlo method which is used to calculate the radiation heat transfer. In addition, the result is not easy to convergence because of the random algorithm's characteristic.

In this thesis, the HT-L gasifier's flow field and temperature field are calculated under the large grid scale. The calculation of flow field, adopts the wavelet analysis method and vortex-flow function method. By the application of the wavelet analysis method, frequency characteristics of vortex fluctuation in the large grid, the medium grid, the small grid and the sub-grid are extracted. The turbulent viscosity is presented by using piecewise accumulated value at different frequencies. Then on the basis of the changes of turbulent viscosity under large grid scale, the vortex-flow function method is applied to calculate the dissipation and turbulence vortex in the flow field.

The synthesis gas composition, the carbon conversion, the water wall's temperature and heat flux are calculated in this thesis by the application of the integration of flow field calculation method, reaction kinetics calculation method and radiation heat transfer calculation method. Meanwhile, these parameters were compared with those in the actual cases. Specially, the gasifier's boundary temperatures are not required in the calculation process.

Because this calculation model is an engineering calculation model and the empirical constants in the calculation are developed from the data which collected from the industrial gasifier, the empirical constants will change once the coal or product's structure changes. Thus, one set of empirical constants should be groped again if the case has changed.

Key words: grid scale, vortex-flow function method, Monte Carlo method, wavelet analysis

References

- [1] WenQuan Tao, Numerical Heat Transfer (Second Edition). 2008. (*Xi'an Jiaotong University Press*).
- [2] JianGuo Yang, Wavelet Analysis and Its Engineering Applications. 2005. (*China Machine Press*).