CHAPTER VII
CONCLSIONS AND RECOMMENDATION

7.1 Conclusion

The aerodynamics of particles and fluid flow in the two-dimensional spouted bed with draft plates has been investigated in detail with the aid of the DEM. The validity of the method has been confirmed with published experimental data of Kudra (1992) and Kalwar (1991). Our results reveal that some slug flow still occurs in the spout at the minimum spouting velocity. This is the reason why the time-smoothed particle velocity decreases in the spout region as the height increases. The slugs gradually disappear when the gas velocity is further increased.

In the downcomer region, the particle vertical velocities near the draft plates are found to decrease as the height increases whereas the velocities near the walls increase with the increasing height. The fluid velocities in the downcomer decrease as the superficial gas velocity increases while the particle circulation rate increases. As expected, the particle circulation rate decreases when the coefficient of friction increases. The calculated particle circulation rate is good agreement with the experimental value of Kalwar (1991) when the friction coefficient is sufficiently small at 0.063. When the separation height increases, the particle circulation rate also increases. However, the bed height does not significantly affect the particle circulation rate at u_{ms}. The installation of the draft plates in the 2DSB not only reduces the minimum spouting velocity and pressure drop but also increases the maximum spoutable bed height.

Gas-to-particle heat transfer in the two-dimensional spouted bed with draft plates has been investigated with the aid of the DEM and developed thermal model. It is found that gas-to-particle heat transfer occurs mainly in the central or spout region of the bed as the same reported by L.A.P Freitas and J.T. Freire (1998). The particles are heated in the spout region while it is cooling in the downcomer region. Gas-to-particle heat transfer occurs shortly in the spout region. Therefore, the two-dimensional spouted bed with draft plates is suitable for coarse heat-sensitive particles.

7.2 Recommendation

DEM simulation is a good tool for investigating the phenomena of the particles in two-dimensional spouted bed with draft plates. In this work, the geometry of vessel can't set as the same as that of experiment of Kudra (1992) and Kalwar (1991) due to the technical problem (set up fluid cell). In the future work, the experimental apparatus that is the same geometry as the simulation should be set up. The particles are assumed to be spherical and monodisperse in this simulation. The particles should be polydisperse in the future work. Heat transfer in two-dimensional spouted bed with draft plates is only gas-to-particle heat transfer. Particle-to-particle heat transfer should be including in the model in the next work. Furthermore, the future work should extend to both mass transfer and heat transfer in two-dimensional spouted bed with draft plates because this model is very useful for drying industry of grains.