

PROJECT LEADERS

JAM Kuipers

RESEARCH THEME

Complex dynamics of fluids
Mathematical and computational
methods for fluid flow analysis

PARTICIPANTS

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COOPERATIONS

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FUNDED

AkzoNobel, DSM, FOM, NWO, Yara,
Shell, Unilever
1st 10% 2nd 50% 3rd 40%

START OF THE PROJECT

1996

INFORMATION

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PROJECT AIM

We use various types of CFD models (both commercial codes but mostly "in house" made codes) to study the relevant hydrodynamic phenomena at all relevant length and time scales (i.e. at the microscopic, mesoscopic and macroscopic scale) in dense gas-particle flows. A very important area of attention is the set of gas-solid contactors that belong to the fluid bed family of reactors.

PROGRESS

See the different sub-projects.

DISSERTATIONS

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SCIENTIFIC PUBLICATIONS

- O. Gryczka, S. Heinrich, V. Miteva, N.G. Deen, JAM Kuipers, M. Jacob and L. Mörl (2008): Characterization of the pneumatic behavior of a novel spouted bed apparatus with two adjustable gas inlets, *Chemical Engineering Science*, Volume 63, Issue 3, February 2008, Pages 791-814.
- M.A. van der Hoef, M. van Sint Annaland, N.G. Deen and JAM Kuipers (2008): Numerical Simulation of Dense Gas-Solid Fluidized Beds: A Multiscale Modeling Strategy, *Annual Review of Fluid Mechanics* Jan 2008, Vol. 40: 47-70.
- W. Godlieb, N.G. Deen and JAM Kuipers (2008): On the relationship between operating pressure and granular temperature: a discrete particle simulation study, *Powder Technology*, Volume 182, Issue 2, 22 February 2008, Pages 250-256.
- C. Zeilstra, J.G. Collignon, M.A. van der Hoef, N.G. Deen and JAM Kuipers (2008): Experimental and numerical study of wall-induced granular convection, *Powder Technology* 184 (2), pp. 166-176.
- F. Kleijn van Willigen, B. Demirbas, N.G. Deen, JAM Kuipers and J.R. van Ommen (2008): Discrete particle simulations of an electric field enhanced fluidized bed, *Powder Technology* 183 (2), pp. 196-206.
- J.M. Link, X. Fan, J. Wood, N.G. Deen, A. Ingram, D.J. Parker, J.P.K. Seville and JAM Kuipers (2008): PEPT and discrete particle simulation study of spout-fluid bed regimes, *AIChE Journal*, Volume 54, Issue 5 (p 1189-1202).
- Zeilstra, C., Van Der Hoef, M.A., Kuipers, J.A.M. (2008): Simulation of density segregation in vibrated beds, *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics* 77 (3), art. no. 031309.
- J.A. Laverman, I. Roghair, M. van Sint Annaland, JAM Kuipers (2008): Investigation into the hydrodynamics of gas-solid fluidized beds using particle image velocimetry coupled with digital image analysis, *Canadian Journal of Chemical Engineering*, Volume 86, Issue 3 (June 2008), p 523-535.
- Mao Ye, Junwu Wang, M.A. van der Hoef and JAM Kuipers (2008): Two-fluid modeling of Geldart A particles in gas-fluidized beds, *Particuology*, 6 (6), pp. 540-548.
- O. Gryczka, S. Heinrich, N.G. Deen, JAM Kuipers, L. Mörl (2008): Characterization of the pneumatic behavior of a novel spouted bed apparatus with two adjustable gas inlets, Presentation at the 9th International Conference on Circulating Fluidized Beds (CFB9), Hamburg, Germany, May 13-16, 2008.
- M.S. van Buijtenen, N.G. Deen, S. Heinrich, S. Antonyuk, JAM Kuipers (2008): Improvement of the discrete element model for the study of granulation in a spout fluidized bed, Presentation at the 9th International Conference on Circulating Fluidized Beds (CFB9), Hamburg, Germany, May 13-16, 2008.

12. Y. He, N.G. Deen, M. van Sint Annaland and JAM Kuipers (2008): Gas-Solid Turbulent Flow in a Circulating Fluidized Bed Riser; Numerical Study of Binary Particle Mixtures, Presentation at the 9th International Conference on Circulating Fluidized Beds (CFB9), Hamburg, Germany, May 13-16, 2008.
13. S. Kriebitzsch, M.A. van der Hoef and JAM Kuipers (2008): Effects of heterogeneity on the drag force in random arrays of spheres, 6th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries Trondheim, Norway 10-12 June 2008.
14. S. Sarkar, M.A. van der Hoef and JAM Kuipers (2008): Fluid-particle interaction force for polydisperse systems from lattice Boltzmann simulations, 6th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries Trondheim, Norway 10-12 June 2008.
15. M.S. van Buijtenen, N.G. Deen, S. Heinrich, S. Antonyuk and JAM Kuipers (2008): A Discrete Element Study of Moisture Dependent Particle-Particle Interaction During Granulation in a Spout Fluidized Bed, 6th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries Trondheim, Norway 10-12 June 2008.
16. J.A. Laverman, M. van Sint Annaland and JAM Kuipers (2008): Experimental study on solids circulation patterns and bubble behaviour using Particle Image Velocimetry combined with Digital Image Analysis, 6th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries Trondheim, Norway 10-12 June 2008.
17. M.A. van der Hoef, M. van Sint Annaland, N.G. Deen and JAM Kuipers (2008): Multi-scale simulation of poly-disperse, dense gas-particle flows, Computational Fluid Dynamics in Chemical Reaction Engineering IV, June 15-20, 2008, Whistler, British Columbia, Canada.
18. J.A. Laverman, M. van Sint Annaland, JAM Kuipers (2008): Macroscopic circulation patterns in gas-solid bubbling fluidized beds, International Conference on the Reaction Engineering of Polyolefins, Montreal, Canada, June 22-27, 2008.
19. M.S. van Buijtenen, N.G. Deen, S. Heinrich, S. Antonyuk and JAM Kuipers (2008): A discrete element study of wet particle-particle interaction during granulation in a spout fluidized bed, Fifth International Symposium on Spouted Beds (ISSB-2008), July 21-23, 2008, Changping, Beijing, China.
20. O. Gryczka, S. Heinrich, N.G. Deen, M. van Sint Annaland and JAM Kuipers (2008): Characterization and modeling of the pneumatic behavior of a novel spouted bed apparatus with two adjustable gas inlets, Fifth International Symposium on Spouted Beds (ISSB-2008), July 21-23, 2008, Changping, Beijing, China.