

Editorial

Researchers who have attempted to model even seemingly simple drying processes readily admit to the complexity of mathematically describing in a general manner the basic heat, mass and momentum transfer phenomena made further complicated by generally unpredictable physical and/or chemical transformations that may occur during the drying process. Mathematical models therefore are rather simplistic (e.g. diffusion models intended for engineering design and optimization rather than to obtain insight into the basic phenomena) and mostly interpolative and not fully predictive in character. Yet, they serve a valuable purpose in practice for scale-up, optimization, model-based control etc.

Another useful use of reasonable mathematical models is their ability to intensify the innovation process by providing quantitative or at least semi-quantitative guidelines for arriving at new designs not tested heretofore due to the high cost of pilot testing. In some cases, e.g. invention of the omnipresent optical fiber, it was the mathematical prediction of the feasibility of using fused silica despite transmission losses that led to the development of the optical fiber almost a decade later with massive R&D effort. Astronomy, space explorations, even aircraft design routinely depend heavily on mathematical modeling. It is therefore not surprising that we need to continue this effort. Limited resources available for this activity implies that progress will be slow but hopefully steady.

Innovative designs of flash dryers using various geometric variants of the opposing jet principle (also called impinging streams) and possible horizontal orientation of the spray in a horizontal spray chamber configuration (see Huang et al) are some applications of model-based innovation in dryer design. Indeed, the use of superheated steam as the drying medium instead of hot air or direct combustion gases has also been evaluated using these models. Furthermore, the effects of lower pressure operation were also studied as discussed in the selected references cited below. Much more remains to be accomplished, of course.

It is hoped that this methodology will lead to newer more advantageous dryer designs in the coming years. This will have to be an inter- and multi-disciplinary approach with significant input from industry to ensure potential applicability of the new designs in practice. This is another justification of industry-academia cooperation.

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References

- Huang, L., and Mujumdar, A.S., Development of a new innovative conceptual design for horizontal spray dryer via mathematical modeling, *Drying Technology*, Vol. 23, No. 6, pp. 1169-1187, 2005.

- Huang, L., Kumar, K. and Mujumdar, A.S. Use of Computational Fluid Dynamics to Evaluate Alternative Spray Chamber Configurations, *Drying Technology*, 21(3), p385-412, 2003
- Huang, L., Kumar, K. and Mujumdar, A.S., A Parametric Study of the Gas Flow Patterns and Drying Performance of Co-current Spray Dryer: Results of a Computational Fluid Dynamics Study, *Drying Technology*, 21(6), p957-978, 2003
- Huang, L., Kumar, K. and Mujumdar, A.S., Simulation of Spray Evaporation using Pressure and Ultrasonic Atomizer – a Comparative Analysis, *TSTU Trans (English Version)*, 10 (1A), pp83-100 ,2004.