

## **SACHIN V. JANGAM**

Minerals, Metals and Material Technology Centre (M3TC),

Blk EA, #06-15, 9 Engineering Drive 1,

National University of Singapore, Singapore-117576,

**HP. +65-92391421**

E-mail: [mpejsv@nus.edu.sg](mailto:mpejsv@nus.edu.sg), [sachinjangam1@gmail.com](mailto:sachinjangam1@gmail.com).

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### **Current Occupation**

- Currently working as a Research Fellow at Minerals, Metals and Materials Technology Centre (M3TC), Mechanical Engineering Department, National University of Singapore since September 15, 2009 - till date.
- I am working on a project entitled "Development of a cost-effective and energy efficient technique for drying Low Rank Coal (LRC)" which involves pilot scale experimental studies of two dryers namely Screw Conveyor Dryer (SCD) and Vibrated Bed Dryer. The project also involves numerical study of solid flow in SCD using Discrete Element Modeling.
- I am also involved in various other projects such as mine ventilation, heat and mass transfer in coil heat exchangers, use of phase change materials.

### **Educational Qualification**

- **Ph. D.(Tech.) in Chemical Engineering**, (2005-2009)

*Chemical Engineering Department, Institute of Chemical Technology, University of Mumbai.*

Thesis : **Design and Experimental Analysis of Industrial Drying Systems**

Supervisor : **Professor B. N. Thorat**

- **Master of Chemical Engineering**, (2003-2005)

*Chemical Engineering Department, Institute of Chemical Technology, University of Mumbai.*

First class with distinction (71.5 %)

Thesis : **Application of Drying Technology in Pharmaceutical Industry**

Supervisor : **Professor B. N. Thorat**

- **B. Tech. (Petrochemical Engineering)** (1999-2003)

*Dr. Babasaheb Ambedkar Technological University, Lonere, Maharashtra.*

First class with distinction (81.25%)

### **Publications (Journals)**

- Hui, A.; Li, A.; Kurnia, J.C.; Sasmito, A.P.; **Jangam S.V.**; Mujumdar, A.S. Computational Fluid Dynamics analysis of micro-reactor performance: Effect of various configurations. *Chemical Engineering Science*, Under Review.

- Kurnia, J.C.; Sasmito, A.P.; **Jangam S.V.**; Mujumdar, A.S. Numerical evaluation of laminar heat transfer enhancement in coiled square tubes with microencapsulated phase change material (MEPCM), *Applied Thermal Engineering*, Under Review.
- Kurnia, J.C.; Sasmito, A.P.; **Jangam S.V.**; Mujumdar, A.S. Enhancement of mixing in micro-reactors. *Chemical Engineering Journal*, Under Review.
- Shaker, M.; Ghaedamini, H.; Sasmito, A.; Kurnia, J.; **Jangam, S.V.**; Mujumdar, A.S. Numerical Investigation of Laminar Mass Transport Enhancement in Gaseous Microreactors. *Chemical Engineering and Processing*, Under Review.
- Tunçal, T.; **Jangam, S.V.**; Güneş, E. Abatement of Organic Pollutant Concentrations in Residual Treatment Sludges: A review of selected treatment technologies including drying, Accepted for *Drying Technology* **2011**, 29(14), 1601-1610.
- **Jangam, S.V.** An overview of recent developments and some R&D challenges related to drying of foods. Accepted for publication in *Drying Technology* **2011**, 29(12), 1343-1357.
- Osman, H.; **Jangam S.V.**; Mujumdar, A.S. Review of recent patents on coal drying, *Recent Patents on Engineering*, Accepted for publication in *Drying Technology* **2011**.
- **Jangam S.V.**; Karthikeyan M. and Mujumdar, A.S. A critical assessment of industrial coal drying technologies: Role of energy, emissions, risk and sustainability. *Drying Technology* **2011**, 29(4), 395-407.
- Chaughule, V.A.; **Jangam S.V.**; Thorat, B.N. Formulation, drying & nutritional evaluation of ready-to-eat Sapota (*Achras zapota*) extrude, *International Journal of Food Engineering* **2010**, 7(1), art. No. 13.
- **Jangam S.V.**; Thorat, B.N. Optimization of spray drying of ginger extract, *Drying Technology* **2009**, 27(11), 1217-1228.
- **Jangam S.V.**; Mujumdar, A.S.; Thorat, B.N. Design of air distribution system for fluidized bed dryers, *Drying Technology* **2009**, 27(11), 1217-1228.
- **Jangam S.V.**; Joshi, V.S.; Mujumdar, A.S.; Thorat, B.N. Studies on dehydration of sapota (*Achras zapota*), *Drying Technology* **2008**, 26(3), 369-377.

### Book Review / Guest Editorials

- **Jangam S.V.** Conference Report: International Symposium on Processing and Drying of Foods, Vegetables and Fruits, April 11–12, 2011. *Drying Technology* **2011**, 29(9), 1120.
- **Jangam S.V.** A book Review of: “Fundamentals of Superheated Steam Drying, Hiromichi Shibata. 2011Kyushu University Press: Fukuoka, Japan, 164 pp., ¥7400, hardcover. (ISBN 978-4-7985-0040-9). *Drying Technology* **2011**, 29(5), 606-607.
- **Jangam S.V.** Guest Editorial: Chemical Heat Pumps to Enhance Drying Efficiency—Some Thoughts for New R&D Opportunities. *Drying Technology* **2011**, 29(6), 610-611.
- Four more guest editorials are submitted for publication.

### Publications (Books/Book chapters)

- **Jangam S.V.**; Mujumdar, A.S. Heat pump assisted drying technology– Overview with focus on energy, environment and product quality in *Modern Drying Technology - Volume 4*, Ed. Tsotsas I. and Mujumdar A.S., 2011.
- **Jangam S.V.**; Mujumdar, A.S. Drying of food products. Submitted for “Advances in Food Process Engineering Research and Applications”, Springer Publication.
- Chapters in e-books – more than 6

### Books/e-books edited

- **Jangam S.V.** (Ed.) of Perspectives on Innovation, Globalization and R&D by Arun S Mujumdar, Published in 2010.
- Kurnia, J.C.; Sasmito, A.P.; **Jangam S.V.** e-book on Matheatical Modeling of Transport Processes, 2011.
- **Jangam S.V.**; Mujumdar, A.S. e-book on Coal Dehydration - A Compilation of Relevant Publications and Technical Reports, 2011.
- **Jangam S.V.**; Law, C.L.; Mujumdar, A.S. e-book on Drying of Foods, Vegetables and Fruits, Volume 3, 2011.
- **Jangam S.V.**; Law, C.L.; Mujumdar, A.S. e-book on Drying of Foods, Vegetables and Fruits, Volume 2, 2011.
- Kurnia, J.C.; Sasmito, A.P.; **Jangam S.V.**; Poh, H.J. e-book on Selected Topics in Heat and Mass Transfer - A Compilation of Selected Presentations, 2011.
- **Jangam S.V.**; Law, C.L.; Mujumdar, A.S. e-book on Drying of Foods, Vegetables and Fruits, Volume 1, 2010.
- **Jangam S.V.**; Thorat, B.N. e-book on R&D Needs, Challenges and Opportunities for Innovation in Drying Technologies by Arun S. Mujumdar, 2010.

### International Conference Proceedings

Total Number of publications: 25 +  
Oral Presentations: 15 +

### Industrial Experience

1. Worked as **Design Engineer** for three months in Vinyl Chemicals Limited, Mahad, Raigad, Maharashtra, India.
2. Successfully completed 45 days intensive Industrial Training at Rashtriya Chemicals and Fertilizers Ltd., Chembur, Mumbai.
3. Worked on an industrial project for 45 days at PT Sampoerna, Indonesia.

### Software skills

1. C, FORTRAN, MatLab, Visual Basic, Design expert, Symprosys
2. Fluent, Gambit, COMSOL, EDEM

### Scholastic Achievements

- Appointed as **Assistant Editor** for **Drying Technology – An International Journal** (With Impact Factor of 1.66 for 2010) - Appointment from Aug 2011 to Dec 2015.
- **Special Certificate of Merit for "Contribution to Industrial Drying and Developing Sustainable Technologies"**; Presented at International Symposium on Processing and Drying of Foods, Vegetables and Fruits, held at Kuala Lumpur, Malaysia, April 2011.
- **Young Scientist Award for excellence in drying R&D in Asia-Pacific Region**, Awarded during 6th Asia Pacific Drying Conference held at Bangkok, Thailand, October 2009.
- **Professor S. B. Chandalia award for the Best Research Student** for the academic year 2007-2008
- IICHe's **Ambuja Cement Young Researcher's Award** during CHEMCON-2006.
- **Professor M. M. Sharma Senior Research Fellow** for the period 2005-2009.
- **Best Scholar Hostelite** award for the year 2007-2008.

- **First rank** in Master of Chemical Engineering at UICT.
- **Gold Medal** for standing first in undergraduate studies at Dr. BATU, Lonere, Raigad, India.
- Founder Member of World **Forum for Crystallization, Filtration and Drying (WFCFD)**, since 2006, U.I.C.T., Mumbai, India.

### Invited Lectures

- Invited as a **keynote speaker** at International Symposium on Processing of Foods Vegetable and Fruits to be held at Kuala Lumpur, Malaysia (June 20-21, 2012).
- Delivered a **keynote lecture** at Mine Managers Show Asia 2011 at Bali, Indonesia (December 2011)
- Delivered **guest lectures** at National University of Singapore for following modules  
ME5202 – Industrial Transfer Processes  
ME6203 – Mass transport  
ME6204 – Convective heat transport
- Delivered **Invited lecture** at Sriwijaya University, Palembang Indonesia (August 2011).
- **Speaker** at International Symposium on Processing and Drying of Foods, Vegetables and Fruits, held at Kuala Lumpur, Malaysia, April 2011.  
**Topic:** Solar drying and heat pump drying advances
- **Principal speaker** during an industrial training program for Reliance industries limited, Mumbai.  
**Topic:** Humidification and Dehumidification
- Conducted **lectures and tutorials** for the subjects “Chemical Reaction Engineering” and “Unit Operations” at the Institute of Chemical Technology (Formerly known as UDCT), Matunga, Mumbai, India
- **Principal speaker** at 3<sup>rd</sup> International Workshop on Crystallization, Filtration and Drying, February 2008.  
**Topic:** Advanced Drying Systems for Heat sensitive products
- **Principal speaker** of 2<sup>nd</sup> International Workshop on Crystallization, Filtration and Drying, February 2007.  
**Topic:** Heat Pump Drying Technology: Fundamentals and Applications

### International Visits (for conferences and academic collaboration)

1. Tianjin University of Science and Technology (TUST), Tianjin, China, September 2011
2. Sriwijaya University, Palembang, Indonesia, August 2011
3. University of Nottingham, Malaysia Campus, April 2011
4. University of Magdeburg, Germany, August 2010
5. University of Ghent, Ghent (Belgium), 2008
6. Hong Kong University of Science and Technology, Hong Kong, 2007
7. Godollo University, Budapest (Hungary), 2006
8. M/s Sampoerna, Surabaya (Indonesia), 2005
9. King Mongkut University of Science and Technology, Bangkok – Thailand, 2005

### Co-Curricular Activities

- Assistant Editor, Drying Technology – An International Journal
- Secretary, International Advisory Panel for e-book Series started by Transport Processes Research (TPR) group at National University of Singapore.
- Secretary, Scientific Committee for e-book Series started by Transport Processes Research (TPR) group at National University of Singapore.
- Co-chair, Workshop on Mathematical Modeling of Transport Processes, held at National University of Singapore, April 09, 2011.
- Mentored 3 Final Year Project students and one Vacation Internship Project student at National University of Singapore.
- Organizing committee member of the 16<sup>th</sup> International Drying Symposium (IDS2008) held at Ramoji Film city, Hyderabad – India.
- Core committee member of “Young Researcher’s Conference-2008”, January 2008, U.I.C.T., Mumbai-India.
- Organizing Committee member of the “International Workshops on Crystallization Filtration and Drying”, 2006, 2007 and 2008, U.I.C.T., Mumbai, India.
- Organizing committee member of the “Refresher course in chemical Engineering” held at UICT Mumbai in December 2005.
- Organizing committee member of the “International Workshop and Symposium on Industrial Drying” – 2004, Mumbai.
- Member, Technological Association of U.I.C.T. during the academic year 2005-2006.
- FYPs guided - 5

### Extra-curricular activities

- Member of Technological Association at Institute of Chemical Technology for the academic year 2005-2006.
- Student’s In-charge for the blood donation camp organized at ICT on 27/09/2005 with the help of L.T.M.G. Hospital, Sion, Mumbai and collected a record 166 units of blood.

### Personal Details

<b>Name (As in passport)</b>	: Jangam Sachin Vinayak
<b>Date of Birth</b>	: April 20, 1982
<b>Hobbies &amp; Interests</b>	: Reading books, Singing
<b>Father’s Name</b>	: Vinayak Vishwanath Jangam
<b>Sex</b>	: Male
<b>Marital Status</b>	: Married
<b>Languages Known</b>	: English, Hindi and Marathi.
<b>Nationality</b>	: Indian
<b>Passport No.</b>	: F3992033
<b>Singapore VISA status</b>	: Employment pass (FIN – G6317585X)

## Projects Handled (During Ph D)

- 1. Reducing the drying time in fluidized bed drying of a proprietary pharmaceutical Product ( KDL Biotech, Khopoli – India)**  
*The existing batch fluidized bed dryers had problems with the uniformity of fluidization. The batch size was 300-350 kg with the batch drying time of around 6 hrs. The distribution system was modified by replacing the distributor plate. The power consumption was reduced from 14.2 KW. to just 10 KWhr.*
- 2. Design of Plug flow fluid bed dryer (PFFBD)**  
*For continuous drying of particulate matter the best dryer available is the PFFBD. In this project the batch fluid bed drying kinetic data was used to design PFFBD using various momentum and mass balances. The mathematical models were solved using Matlab 6.0 to evaluate the effect of various operating parameters on dimensions as well as the energy efficiency of dryer.*
- 3. Modeling and Simulation of heat pump drying system (HPD)**  
*Heat pump drying is one of the advanced drying systems used to dry heat sensitive products of biological origin as well as various food products. The performance of HPD was evaluated in terms of specific moisture extraction rate, coefficient of performance and drying rate. The mathematical models were solved using Matlab 6.0.*
- 4. Modelling of inactivation kinetics during drying of *Lactobacillus acidophilus***  
*The work involved modeling of inactivation kinetics of *Lactobacillus acidophilus* during drying using various drying methods and at variable drying conditions.*
- 5. Numerical study of pneumatic conveying drying system**  
*Pneumatic conveyor dryer (flash dryer) is basically used to remove surface moisture of very fine particulate material. Mass, momentum and heat balance equations for flash drying system were solved using Matlab code to study the effect of various parameters on drying kinetics, hydrodynamics and thermodynamic properties of particles and drying gas.*

## Salient features of research work

### Ph.D. in Chemical Engineering

**Thesis topic:** Design and Experimental Analysis of Industrial Drying Systems

The work was divided into five sections;

(i) In the first part it was attempted to dry cut cloves which are used in cigarettes. The aim was to minimize the loss of eugenol during the drying process. The dryer selection was done based on the analysis of following parameters; a) % loss of eugenol, b) % moisture content and c) expected final particle size distribution. Closed loop heat pump fluidized bed drying system resulted in minimum loss of eugenol.

(ii) Second part of the study focused on dehydration of a tropical fruit, Sapota which has high nutritional value. The main aim was to increase the shelf life of the fruit using suitable drying process without affecting the nutritional quality. Effect of different operating parameters such as air temperature, air velocity and additives was studied. During the process, the fruit pulp was converted either in the form of powder or pellets. Stability study was also carried out on the basis of water activity. The powder form of the fruit was much stable over the period of 3-4 months.

(iii) Most of the fluidized bed dryers fail, as the air distribution across the bed cross-section is non-uniform, hence, attempts were made to design an air distribution system and gas

chamber using experimental and computational approaches. Different packings were used in the gas distribution chamber which resulted in uniform fluidization. The effect of orifice plate design on uniformity in terms of maldistribution function was also studied.

(iv) The next part includes deoiling and drying of lecithin, a mixture of phospholipids. The solvent extraction process for deoiling was optimized and the continuous rotating disc contactor was developed for processing lecithin stream of 300 kg/hr. The batch drying data was obtained in a lab scale fluidized bed dryer, which was then used to design continuous vibrated bed dryer.

(v) Final part of the work dealt with the optimization of spray drying for ginger extract. 6-Gingerol the active component in ginger has wide medicinal application and further the powder form of ginger can go in many food recipes. The optimization of spray drying of ginger extract was carried out using response surface methodology. Effect of different factors such as, temperature, air flow, atomization pressure and liquid feed rate was studied on various responses such as physical properties, water activity and gingerol retention.

## References

### 1. Professor A.S. Mujumdar

Professor of Mechanical Engineering,  
Director, Mineral, Metal & Materials Centre (M3TC),  
National University of Singapore,  
9 Engineering Drive 1, Singapore 117576  
Tel. (65) 6516 4623  
E-mail: [mpeasm@nus.edu.sg](mailto:mpeasm@nus.edu.sg)

### 2. A/Prof. Rajasekhar Balasubramanian

Civil and Environmental Engineering Department,  
Director of Research, Mineral, Metal & Materials Centre (M3TC),  
National University of Singapore,  
9 Engineering Drive 1, Singapore 117576  
Tel. (65) 6516 4623  
E-mail: [ceerbala@nus.edu.sg](mailto:ceerbala@nus.edu.sg)

### 3. Professor V.G. Gaikar

Head of Chemical Engineering Department  
Institute of Chemical Technology (ICT)  
N. Parikh Road, Matunga,  
Mumbai – 400019.  
E-mail: [vg.gaikar@ictmumbai.edu.in](mailto:vg.gaikar@ictmumbai.edu.in)

### 4. Professor B. N. Thorat

Professor of Chemical Engineering  
Institute of Chemical Technology (ICT)  
N. Parikh Road, Matunga,  
Mumbai – 400019.  
Tel. +91-22-24145616 (Ext. 2022/2023)  
E-mail: [bn.thorat@ictmumbai.edu.in](mailto:bn.thorat@ictmumbai.edu.in)