NAME: **Kumar Perumal**

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ACADEMIC QUALIFICATIONS

PhD (*Chemical Engineering*), 1997, ICT, Mumbai, INDIA, (www.ictmumbai.edu.in)

M.Tech (*Plant Design*), 1991, NIT, Trichy, INDIA, (www.nitt.edu)

B.Tech (*Chemical Engineering*), 1989, CIT, Coimbatore, INDIA, (www.citindia.com)

Computer Science Certificate (Software), 2001, Carleton University, Ottawa, CANADA

EMPLOYMENT HISTORY

1/2009 – present: **Senior Lecturer**
Curtin University, Sarawak, MALAYSIA

08/2008 – 11/2008: **Associate Professor**,
VIT University, INDIA

06/2002 – 07/2008: **Assistant Professor**
VIT University, INDIA

09/1998 – 09/2000: **Postdoctoral Research Associate**
École Polytechnique, Montréal, CANADA

01/1997 – 12/1997: **Lecturer**, Institute of Chemical Technology, Mumbai, INDIA

PROFESSIONAL AFFILIATION AND MEMBERSHIP

- Application for CEng, MIChemE submitted to IChemE, UK
- Application for membership to Indian Society for Heat and Mass Transfer (ISHMT) submitted
- Associate member, Institution of Chemical Engineers (IChemE, UK)
- Member Institution of Chemical Engineers, INDIA
- Member, Indian Society for Technical Education

FELLOWSHIP & SCHOLARSHIPS

- 1998: Postdoctoral Research Fellowship, École Polytechnique, Montréal, CANADA
- 1992-97: Research Fellowship, Institute of Chemical Technology, Mumbai, INDIA
- 1983-85: Government of India Scholarship

ACADEMIC LEADERSHIP PORTFOLIO

- **Board of Studies Coordinator**, 2006 & 2007. VIT University, INDIA
- **Final Year project Coordinator**, 2007 & 2008. VIT University, INDIA
- **Faculty Advisor,** 2006 & 2007. VIT University, INDIA
- **Internal Quality Assurance Cell (IQAC) coordinator**, 2007. VIT University, INDIA
- **Program Manager & Accreditation team member** for M.Sc Process Engineering offered at Caledonian College of Engineering, Muscat, OMAN in affiliation with VIT University
- **School Website Development Committee (Member),** 2009, Curtin University, MALAYSIA
- **School Industrial Relation Committee (Member),** 2010 & 2011, Curtin University, MALAYSIA
- **Deputy Returning Officer, 2010,** Students Council Elections, Curtin University**,** MALAYSIA
- **Returning Officer, 2011,** Students Council Elections, Curtin University**,** MALAYSIA

SCHOLARLY AND PROFESSIONAL ACTIVITIES

- **Coordinator**, Seminar on Modeling and Simulation 2003, held at VIT University, INDIA
- **Member, National Advisory Committee**, International Conference on Modeling and Simulation (CITICOMS 2007) held at CIT Coimbatore, INDIA
- **Vice Secretary**, CUTSE – 2009 held at Curtin University, MALAYSIA
- **Member, Scientific Committee,** CUTSE – 2011 held in Curtin University, MALAYSIA
- **Session Chair**, CUTSE – 2011 held in Curtin University, MALAYSIA
- **Organising committee member,** Enhancing Learning : Teaching & Learning Conference 2011, Curtin University, MALAYSIA
- **Session Chair**, Enhancing Learning : Teaching & Learning Conference 2011, Curtin University, MALAYSIA
- **Organising committee member,** 7th Malaysian Chem E Car Competition, Universiti Malaysia Sabah

- **Reviewer** for the following journals: *Measurement* - Journal of the International Measurement Confederation (IMEKO), *Chemical Engineering Research and Design*, *Chemical Product and Process Modeling*; and international conferences such as *CUTSE 2009, 2010 and 2011, CHEMECA - 2010* and *ISHMT – ASME* Heat and Mass transfer conference, 2011

- **External / Internal PhD / M.Tech Thesis examiner**:
    a. A. Subathira, (PhD) Annamalai University, INDIA
    b. T.Sathya, (M.Tech) VIT University, INDIA
    c. V.T.Perarasu (M.Tech) VIT University, INDIA
    d. D.Dhanesh (M.Tech) VIT university, INDIA
    e. G.Vijay (M.Tech) VIT University, INDIA
    f. M.Ashok (M.Tech) VIT University, INDIA
    g. Bipin Lal (M.Tech), VIT University, INDIA

RESEARCH PORTFOLIO

RESEARCH INTERESTS

- ***Experimental and Computational Fluid Dynamics and Heat transfer***
    - ***Process intensification studies***

Process intensification is an effort to improve the rate transfer processes towards making chemical processes cheaper, safer and environment friendly. Multifunctional Heat exchanger – Reactor (MFH-R) is a relatively new type of equipment which efficiently accomplishes several unit operations such as mixing, heat, mass transfer and chemical reaction together in the same equipment, thus making the process cheaper. Process control is made easier because of efficient heat removal in case of exothermic reactions. Reduced inventory makes the process safer in case of hazardous reactants and / or products. Moreover, conversion, yield and product quality are also improved.

The thermal and chemical performances of these devices are determined by the mixing capacity of these devices which occurs at three levels namely macro, meso and micro scales. Macro mixing is the large scale motion caused by the mean flow which convects fluid particles between high and low momentum regions. This can be generally measured by the Residence Time Distribution (RTD) of the fluid particles. The intermediate or meso mixing is caused by the

turbulent fluctuations and can be characterized by the turbulent kinetic energy. Mixing on the molecular scale or the micro mixing which is responsible for reduction of local concentration gradients is related to the turbulent kinetic energy dissipation rate. Currently, the performance of MFH-R employing different designs of inline mixers is being investigated through CFD modeling.

- ***Wet gas measurement***

Wet gas measurement using differential pressure meters such as venturi and orifice is attractive to the oil and gas industry for reasons of low cost and ease of operation. Currently, optimization of the "slotted orifice meter – a modified version of the standard orifice meter and the venturi meter for various flow condition and pressure is being done with the aid of CFD modeling

- ***Heat Transfer studies in Duct flow***

Laminar flow mixed convection heat transfer in horizontal and vertical ducts using air as the medium plays an important role in the design and operation of several industrial equipment involving heat transfer and fluid flow phenomena. Mixed convection heat transfer requires the consideration of both free and forced convective heat exchange mechanisms involved in the transfer of heat. The presence of free convection leads to the onset and growth of secondary flows, which interact with the forced convection heat transfer rate, and thereby affect the overall heat removal rates from a duct. Surface radiation in the presence of mixed convection is found to affect both free and forced convection heat transfer rates. Therefore, a combination of the above heat transfer modes presents an interesting situation. Based on an extensive review of published work on duct heat transfer rates carried out so far, it is found that all studies have neglected the effect of surface radiation heat transfer among the inside surfaces of the walls of the duct, and its effect on the overall heat transfer rates. Due to the emissivity of the walls of the duct, surface radiation from the walls of the duct will affect the overall heat transfer phenomena. Hence, it is important that the effects of surface radiation are properly understood, and accounted for, in the design and analysis of flow and heat transfer through ducts. The present experimental study therefore focuses on the interaction of surface radiation on the free and forced convective heat transfer phenomena occurring in airflow through a duct.

RESEARCH SUPERVISION

I have successfully supervised **Six** Master students and **twenty** undergraduate (final-year) students. Currently, I am co supervising **two** PhD and **one** Masters and **two** (honours/final year) students.

- **PhD Students**

  On Going at Curtin University

  1. Liew Wan Teng, Modelling and control of non-ideally mixed bioreactors (2008 -2011), Thesis submitted
  2. Rajamohan Ganesan, Experimental Investigation of Surface radiation and Mixed convection heat transfer in Duct flows (2007 –)

- **Master Students**

  On Going at Curtin University

  1. Jameson Malang, CFD Studies of Simultaneous heat and mass transfer in supercritical extraction (2011 –)

  Completed at VIT University

  1. T. Sathya, Comaprison of Kenics and SMX static mixer designs, 2004
  2. D.Dhanesh, Optimization of a Helical static mixer, 2004
  3. V.T.Perarasu, CFD modelling of hydrodynamics in liquid solid circulating fluidized bed (LSCFB), 2004
  4. G.Vijay, Hydrodynamic studies of a LSCFB through CFD modelling : Effect of liquid viscosity on solid hold up, 2005
  5. M.Ashok, Hydrodynamic and mass transfer studies in Kenics and SMX static mixers, 2005

COMPETITIVE RESEARCH GRANTS

Position	Project Title	Total Amount No of years	Funding Source
Chief Investigator	Hydrodymic and heat transfer studies in static mixers	Rs. 0.4 million 2003- 2005	All India Council of Technical Education (AICTE), Government of India
Chief Investigator	Hydrodynamic studies in Liquid Solid Circulating Fluidized Bed	Rs. 0.8 million 2003-2006	Department of Science and Technology (DST), Government of India
Chief Investigator	Rheological and Forced convective heat transfer characteristics of some metal oxide nanofluids	RM 10000 2010 – 2011	Curtin University, Sarawak, Malaysia
Co Investigator	Improved method for Green house gas capture using solvent systems	RM 20000 2010 – 2012	Curtin University, Sarawak, Malaysia
Co Investigator	Enhancing undergraduate transport phenomena teaching and learning through combined inductive and deductive approaches	RM 2000 2011 - 2012	Curtin University, Sarawak, Malaysia

LIST OF REFEREED PUBLICATIONS

Refereed Journals

1. Heat transfer enhancement with CuO nanofluid in turbulent pipe flow, P.Kumar and Norman Ket Fung, Submitted to The Chinese Journal of Chemical Engineering
2. Mixing studies with multifunctional heat exchangers, P.Kumar and Sylvia Chai Siaw Ting, Submitted to The International Journal of Chemical and Environmental Engineering
3. Heat transfer enhancement in Pipe flow with Al2O3 nanofluid, P.Kumar, under review in *Super lattices and Microstructures*
4. A CFD study of the effect of venturi geometry on wet gas metering, P.Kumar and Hari Prasad Raman under review in *Measurement*
5. Heat Transfer Enhancement with Modified Designs of Twisted Tape Pipe Inserts, P.Kumar and Low Yong Chin, *Pertanika J.Sci & Tech*, under review
6. A CFD study of heat transfer enhancement in pipe flow with AL2O3 nanofluid, P.Kumar, Proceedings of World Academy of Science, Engineering and Technology, 81, 746-750, 2011
7. Study on mixed convection heat transfer in vertical ducts with radiation effects, G.Rajamohan, N.Ramesh and P.Kumar, Proceedings of World Academy of Science, Engineering and Technology, 81, 737-741, 2011

8. Wet gas measurement with Slotted Orifice Meter – Effect of Geometry of Slots and Pressure, P.Kumar, Chai Boon Foo and Michael Wong Ming Bing, *Chemical Product and Process Modeling*: Vol. 6: Iss. 1, Article 35, 2011
9. Biodiesel from pungam seed oil and its effects on engine performance with a computerized engine test rig, T.Mohan Raj, K.Murugu Mohan Kumar and Perumal Kumar, *Pertanika J.Sci & Tech,* 19 (1), 117-127, 2011
10. A CFD study of low pressure wet gas metering using slotted orifice meters, P.Kumar and Michael Wong Ming Bing, Journal of Flow Measurement and Instrumentation, 22, 33-42, 2011
11. CFD modelling and mixing in stirred tanks, A.K.Sahu, P.Kumar, A.W.Patwardhan and J.B.Joshi, *Chem.Eng.Sci*, 54, 2285-2293, 1999.
12. Simulation of flow in stirred vessel with axial flow impeller: Zonal modelling and optimisation of parameters, A.K.Sahu, P.Kumar and J.B.Joshi, *Ind.Eng.Chem.Res*, 37, 2116-2130, 1998.
13. LDA measurements and CFD Simulations of flow generated by impellers in mechanically agitated reactors, J.B.Joshi, A.K.Sahu and P.Kumar, *Sadhana, Proceedings of the Indian Academy of Sciences*, 23 (Parts 5 & 6), 505-539, 1998.
14. LDA measurements of flow generated by multiple pitched blade turbine impellers, V.P.Mishra, P.Kumar and J.B.Joshi, *ICheme symposium series* no: 136, 465, 1993.
15. Flow generated by a disc turbine: Effect of addition of a drag reducing polymer, V.P.Mishra, P.Kumar and J.B.Joshi, *Chemical Engg J.*, 71, 11-21, 1998**.**

Refereed Conference Proceedings

1. Optimization studies on SMX static mixer, poster presentation in CHEMCON 2011 held during Dec 27 – 29, 2011 in Bangalore, India
2. On the Complementary role of CFD Simulations in Chemical Engineering Curriculum, *P.Kumar*, Agus Saptoro and Ujjal Kumar Ghosh, Enhancing Learning: Teaching and Learning Conference Nov 25-26, 2011, held in Curtin University, Sarawak, Malaysia
3. Study on mixed convection heat transfer for hydrodynamically developed and thermally developing flow in horizontal ducts with radiation effects, G.Rajamohan, N.Ramesh and P.Kumar, 21st National & 10th ISHMT-ASME Heat and Mass Transfer Conference, December 27-30, 2011, IIT Madras, India

4. Study on mixed convection heat transfer in vertical ducts with radiation effects, G.Rajamohan, N.Ramesh and P.Kumar, International Conference on Fluids and Thermal Engineering, 2011 (ICFTE 2011), Singapore, September 28-30, 2011
5. A CFD study of heat transfer enhancement in pipe flow with AL2O3 nanofluid, P.Kumar, International Conference on Fluids and Thermal Engineering, 2011 (ICFTE 2011), Singapore, September 28-30, 2011
6. An Experimental Study on Mixed Convection Heat Transfer for Thermally Developing Flow in Horizontal Ducts with Radiation Effects, Rajamohan Ganesan, Ramesh Narayanaswamy, Alexander Gorin and Kumar Perumal, ASME/JSME 8th Thermal Engineering Joint Conference held in Honolulu, Hawaii, USA from March 13-17, 2011.
7. Computational Fluid Dynamics of Mixing in Aerated Bioreactors, L.W.T.Emily, P.Kumar and Y.Samyudia, presented in ICBEC 2010, held in Hong Kong, China
8. A CFD Study of The Effect of Venturi Geometry on Wet Gas Metering, P.Kumar, presented in CHEMECA 2010 held in Adelaide, Australia
9. Heat Transfer Intensification in the Laminar Regime with Modified designs of Twisted tape Inserts – A CFD study P.Kumar and Rajamohan Ganesan, presented in CUTSE 09, held at Curtin University, Miri, Sarawak, Malaysia
10. CFD modeling of Cross flow membrane filtration - Integration of Filtration Model and Fluid Transport Model E.H.Khor, P.Kumar and Y. Samyudia, presented in CUTSE 09 held at Curtin University, Miri, Sarawak, Malaysia
11. CFD approach for nonideally mixed Bioreactor modelling, L.W.T.Emily, P.Kumar and Y.Samyudia, presented in CUTSE 09, held at Curtin University, Miri, Sarawak, Malaysia
12. Analysis of Thermal energy extraction from solar flat plate collector, Rajamohan Ganesan and P.Kumar, presented in CUTSE 09, held at Curtin University, Miri, Sarawak, Malaysia
13. Hydrodynamic studies of gas–liquid flow in a Kenics static mixer using CFD, Rajarshi Chakraborti, Priodarshi Chaudhury, Ronack Somani, G.S.Nirmala and P.Kumar, presented in CHEMCON – 2008 held in Chandigarh, India
14. CFD analysis of heat transfer to laminar non-Newtonian pipe flow with and without twisted tape inserts, Vinod, B., Sathya, T., and Kumar.P presented in the Indian Chemical Engineering Congress, CHEMCON-2007 held in Kolkata, India

15. CFD modeling of hydrodynamics in a liquid solid circulating fluidized bed, Perarasu, V.T. and Kumar, P. 734 – 740, Proceedings of the 8th International conference on circulating fluidized beds held from May 10 – 13, 2005 in China
16. Slurry Make-down in a Coaxial Mixer, Tanguy, P. and Kumar.P Mixing XVIII, North American Mixing Forum (2001) held at Pocono Manor, Pennsylvania, USA.
17. CFD modelling and mixing in stirred tanks, A.K.Sahu, P.Kumar, A.W.Patwardhan and J.B.Joshi, ISCRE 15 (1998), held at Newport Beach, CA, USA.
18. Computational fluid dynamics and Design, J.B.Joshi, R.B.Desai, A.K.Sahu, P.Kumar, D.V.Phanikumar, A.W.Patwardhan, S.S.Thakre, Ch.V.Prasad and V.Raju, International conference on mixing and crystallisation held in Malaysia, 1998.
19. LDA measurements and CFD simulations of flow generated by impellers in mechanically agitated reactors, A.K.Sahu, P.Kumar and J.B.Joshi, Proceedings of the 7th Asian congress of fluid mechanics (1997), IIT Madras, India.
20. Reynolds Stress Measurements in Stirred Reactors, P.Kumar, A.K.Sahu and J.B.Joshi, Proceedings of the International conference on Advances in Chemical Engineering (ICAChE-96), IIT Madras, India.
21. LDA measurements of flow generated by multiple pitched blade turbine, V.P.Mishra, P.Kumar and J.B.Joshi, Proceedings of the 8th European conference on mixing, Cambridge (UK), 465-472, 1994.

TEACHING PORTFOLIO

TEACHING PHILOSOPHY

I believe that a teacher has to evolve himself by continuous reflections on his teaching. This is because students from different backgrounds and cultures differ in their learning styles. I usually conduct a mid semester feedback and make changes to the delivery. I have found this exercise very useful wherever I have taught. This has also helped me to improve my rating in the end semester “Teacher Evaluation”.

TEACHING & LEARNING PROFESSIONAL DEVELOPMENT

- Participant, workshop on “Curriculum development and Evaluation of Students” at VIT University, INDIA
- Participant, Weekly *T&L Workshop*, 2009 onwards Curtin University, Sarawak, MALAYSIA

- Participant, Foundations of Teaching and Learning *Workshop*, 2009, Curtin University, Sarawak, MALAYSIA
- Enrolled in the *Graduate Certificate in Tertiary Teaching (GCTT*) - A post graduate diploma offered by the Open Universities, AUSTRALIA – Graduating in April, 2012

List of Courses in *GCTT*

1. Foundations of Teaching and Learning
2. Adult Learning and Assessment
3. Course Design, Delivery and Evaluation
4. Improving Practice through Action Learning and Research

LIST OF COURSES TAUGHT AT UNDERGRADUATE LEVEL

- Chemical process principles
- Chemical reaction Engineering
- Mass transfer
- Heat transfer
- Process equipment design
- Chemical process integration
- Pilot plant and Scale up Methods
- Computational Fluid Dynamics (CFD)
- Fluid and particle processes
- Risk management
- Process plant Engineering
- Advanced Particle Processes
- Applied Mathematics

LIST OF COURSES TAUGHT AT POSTGRADUATE LEVEL

- Chemical Process Synthesis
- Advanced Chemical Reaction Engineering
- Pilot Plant and Scale up Methods
- Mathematical Modelling and Simulation

REFERENCES

1. **Professor J. B. Joshi**
Former Director
DAE - Homi Bhabha Distinguished Chair Professor
Institute of Chemical Technology
Mumbai, India
Email: jb.joshi@ictmumbai.edu.in

2. **Professor Yudi Samyudia**
Dean
School of Engineering and Science
Curtin University, Sarawak Campus
Malaysia
Email: yudi.samyudia@curtin.edu.my

3. **Dr. Hari Vuthaluru**
Associate Professor
Department of Chemical Engineering
Curtin University
Australia
Email: H.Vuthaluru@exchange.curtin.edu.au

4. **Dr.Ramesh Narayanaswamy**
Senior Lecturer
Department of Mechanical Engineering
Curtin University
Australia
Email: r.narayanaswamy@curtin.edu.au