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BSc, MSME, ScD, MASME, MAICHE, MACS, MSPE, MSME, MAFS, MINDEFI

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Areas of Specialization and Research Interest:

Product engineering and development, physicochemical hydrodynamics, vibration, separation technologies, membrane separations and processes, rheology, renewable energy, environmental and centrifugation.

Brief Description:

Wallace WF Leung received his BSc (with distinction) in Mechanical and Aerospace Engineering from Cornell University in 1977 graduating with the highest GPA in his engineering class of 1977 with 432 graduates. He was awarded respectively MSc in 1978 and ScD in 1981 both in Mechanical Engineering from MIT. His MSc research at MIT with Prof. Ronald Probstein involved determining hydrodynamics conditions (laminar and turbulent flow) on concentration polarization and liquid permeation in ultrafiltration of protein solution. His doctoral research at MIT involved sedimentation and flow stability of suspension in steeply inclined channels. In 1981, he worked as research engineer at Gulf Research & Development Company in Pittsburgh, PA modeling and simulating naturally fractured reservoirs with dual-porosities and dual-permeabilities. He won the 1987 Society of Petroleum Engineers' Ferguson medal based on his two publications. In 1984, he joined Schlumberger Technology Houston, TX developing finite element flow model on three-dimensional perforations of wellbore. During 1986-2004, he joined Bird/Baker-Hughes in Boston, MA as Senior Research Scientist and later as Director of Process Technology responsible for R&D and applications. He worked closely with the late Dr. Ascher H. Shapiro, Institute Professor of MIT and consultant to Bird, on fluid mechanics of high-speed rotating centrifuges. Over 10 new products and technologies, numerous publications, and patents have evolved from the analytical, experimental, and computational research effort of Dr. Leung and his colleagues. Dr. Leung became quickly the leading authority in the world on separation and centrifugal technologies. During 1995-2000, Dr. Leung was the course director for The Center for Professional Advancements, New Brunswick, NJ conducting two short courses respectively in Amsterdam, Holland and New Jersey, USA. In 2004, Dr. Leung started Advantech Company in Sherborn, MA focusing on separations in biotechnology and separation of fine particle slurries for the coating industry. He has developed a new course and AT-SPIN simulation software (modeling fluid flow with particles sedimentation in high-speed rotating centrifuges) on bioseparation delivered to many biopharmaceutical companies worldwide. Dr. Leung also taught a mechanical vibration course to the Mech. Eng. seniors at Northeastern University, Boston, MA. In summer of 2005, he joined the Hong Kong Polytechnic University as Chair Professor of Innovative Products and Technologies responsible for developing and engineering innovative products with multidisciplinary approach and interdepartmental collaboration. He has written a McGraw-Hill text – *Industrial Centrifugation Technology*, held 35 United States patents and many foreign patents, contributed to 4 handbooks, edited 2 conference proceedings, and published numerous technical peer reviewed papers. He is currently authoring a new Elsevier text entitled *Centrifugal Separation in Biotechnology*, and editing 3 new handbooks for John Wiley & Sons on Separation Sciences and Technologies. He has chaired the Am. Filt. & Sep Society (2000) and the International Delegation on Filtration (2000-2004), organized many large technical conferences, and have delivered keynote speeches, respectively, in Japan, Germany, Switzerland, Finland, and USA. In 2004 he was the Chairman of the prestigious World Filtration Congress held at New Orleans, USA (second time held in USA since 1983) from which participants from 38

countries have made over 300 presentations. He serves on the editorial board of the Filtration Transactions, UK. He is a scientific committee member for several major engineering conferences to be held respectively in Germany, France, and USA.

Publications:

(A) Patents

United States Patents

1-4 Feed Accelerator System Including Feed Slurry Accelerating Nozzle Apparatus (Leung)

US Patent 5,423,734, June 13, 1995
US Patent 5,651,756, July 13, 1997
US Patent 5,658,232, June 13, 1997
US Patent 5,683,343, Nov 4, 1997

5 A method for Accelerating a Liquid in a Centrifuge (Leung)

US Patent 5,527,474, June 18, 1996

6-11 Feed Accelerator System Including Accelerator Vane Apparatus (Leung and Shapiro)

US Patent 5,520,605, May 28, 1996
US Patent 5,551,943, Sept. 3, 1996
US Patent 5,632,714, May 27, 1997
US Patent 5,769,776, June 28, 1998
US Patent 5,840,006, Nov 24, 1998
US Patent 6,077,210, June 20, 2000

12 Feed Accelerator System Including Accelerator Disc (Leung and Shapiro)

US Patent 5,401,423, Mar 28, 1995

13, 14 Feed Accelerator System Including Accelerator Cone (Leung and Shapiro)

US Patent 5,380,266, Jan 10, 1995
US Patent 5,527,258, June 18, 1996

15 Accelerator System in a Centrifuge (Leung)

US Patent 5,403,486, April 4, 1995

16 Decanter Centrifuge with Adjustable Gate Control (Leung, Shapiro and Yarnell)

US Patent 5,643,169, July 1, 1997

17-19 Decanter Centrifuge and Associated method for Producing Cake with Reduced moisture Content and High Throughput (Leung and Shapiro)

US Patent 5,695,442, December 9, 1997
US Patent 5,840,007, November 24, 1998
US Patent 6,110,096, August 29, 2000

20 Decanter Centrifuge with Discharge Opening Adjustment Control and Associated Method of Operating (Leung)

US Patent 5,653,674, Aug 5, 1997

21 Method and Apparatus for Wellbore Construction (Donovan, Johnson, Turick, Watkins, Leung)

US Patent 5,762,149, June 9, 1998

- 22 **Solid-Bowl Centrifuge with Beach having Dedicated Liquid Drainage (Leung)**
US Patent 5,942,130, August 24, 1999
- 23, 24 **Method and Apparatus for Controlling and Monitoring Continuous Feed Centrifuge (Wardwell, Leung, and Hales)**
US Patent 5,948,271, September 7, 1999
US Patent 6,143,183, November 7, 2000
- 25 **Continuous-Feed Filtering- or Screening-Type Centrifuge with Reslurrying and Dewatering (Leung)**
US Patent 5,958,235, September 28, 1999
- 26, 27 **Centrifuge with Cake Churning (Leung)**
US Patent 5,948,256, September 7, 1999
US Patent 6,145,669, November 14, 2000
- 28 **Apparatus for Controlling and Monitoring a Downhole Oil/Water Separator (Shaw, Johnson, Leung)**
US Patent 5,996,690, December 7, 1999
- 29, 30 **Method and Apparatus for Controlling Vertical and Horizontal Basket (Leung)**
US patent 6,063,292, May 16, 2000.
US patent 6328897 B1, Dec 11 2001.
- 31, 32 **Centrifuge with Partial Wear Resistant Basket (Leung & Frohlich)**
US patent 6,109,452, August 29, 2000
US Patent 6,267,250, July 31, 2001.
- 33 **Centrifuge with thickened feed accelerator between Inner and Outer Bowl Sections (Leung)**
US patent 6,241,901 June 5, 2001.
- 34 **Method for Separating a Liquid-Solid Slurry (Leung and Frohlich)**
US Patent 6514421B2 Feb 4, 2003
- 35 **Centrifuges for Mechanical Draining and Thermal Drying of Sludges (Denuelle, Koppe, Leung)**
US Patent 6823605 B2 November 30, 2004

United States Patent Publications

1. **Method for Improving Separation Operation of Centrifuges and Associated Improved Separation Designs (Leung)**, September 9, 2004, US Patent Application Publication, US 2004/0176234 A1.
2. **Rotating-Bowl Machine Assembly with Flow Guide (Leung)**, December 4, 2003, US Patent Application Publication, US 2003/0224920 A1.
3. **Centrifuge Discharge Port with Power Recovery (Leung and Shapiro)**, April 15 2004, US Patent Application Publication, US 2004/0072667 A1.
4. **Liquid Phase Discharge Port Incorporating Chamber Nozzle Device for Centrifuge (Leung)**, April 15 2004, US Patent Application Publication, US 2004/0072668 A1.

(B) Textbooks and Handbooks:

Industrial Centrifugal Technology 17 chapters and 430 pages, published by McGraw-Hill, New York, NY 1998.

(NEW) **Centrifugal Separation in Biotechnology** – under preparation, to be published by Elsevier.

3 Handbooks (Editor-in-Chief):

(NEW) **Membrane Separation Handbook** – collected contributions to be edited by Wallace Leung, under preparation to be published by John Wiley & Sons.

(NEW) **Solid-Liquid Separation Handbook** – collected contributions to be edited by Wallace Leung, under preparation to be published by John Wiley & Sons.

(NEW) **Solid-Gas Separation Handbook** – collected contributions to be edited by Wallace Leung, under preparation to be published by John Wiley & Sons.

Handbook Contributor:

Contributor of 4 Engineering Handbooks:

(1) **Perry's Chemical Engineers Handbook**, 7 ed., pp. 18-106 to 18-125, McGraw-Hill publication, 1997.

(2) **Handbook on Separation Techniques for Chemical Engineers**, pp. 4-63 to 4-96, McGraw-Hill publication, 1997.

(3) **Plant Design Handbook for Mineral Processing**, pp. 1262-1288, published by Soc. of Min. Eng., 2002.

(4) **Filtration Processes – Equipment Scale-Up**, edited by Prof. Richard Wakeman, to be published by Elsevier in 2005.

(C) Some Recent Publications

W. W. F. Leung, *Centrifugal Separation in Biotechnology* to be published by Elsevier, under preparation

W. W. F. Leung, "Sedimenting Centrifuges" in *Solid-Liquid Separation: Scale-up of Industrial Equipment*, pp 375-441, ed. by Richard Wakeman, under preparation by Elsevier, 2005.

W. W. F. Leung, "Classification of Fine Particles by Size and Distribution in the Range of 200 nm to 2 microns", the Am. Filtr. & Sep. Soc. Annual Conf., Atlanta April 2005.

W. W. F. Leung, "Centrifugal Membrane Separation for Bioseparation", the Am. Chem. Soc. Annual Conf., Anaheim, CA Mar. 2005.

W. W. F. Leung, "Performance Prediction and Scale-up for Disk Centrifuge for Bioseparation", the Am. Chem. Soc. Annual Conf., Anaheim, CA Mar. 2005.

W. W. F. Leung, "Small Feasibility Study to Pilot and Production Scaleup of Primary Recovery Separation by AT-SPIN Simulation", the Filtech Europa, Wiesbaden, Germany, Oct. 2005.

W. W. F. Leung, "Nanofiber in Capturing Submicron Particles", AIChE Annual Conf., Cincinnati, OH, Nov. 2005.

W. W. F. Leung, "Experimental and Theoretical Study of Flow and Sedimentation of Tubular Centrifuge for Bioseparation", AIChE Annual Conf., Cincinnati, OH, Nov 2005.

W. W. F. Leung, "Separation of Dispersed Suspension in Rotating Tube", *Separation & Purification J.*, Vol 38, pp 99-119, 2004.