The PTF Newsletter

This Year's PTF Awards

Each year we honor those who have shown distinction and leadership in particle technology. In a process where these individuals are nominated by their peers with at least three supporting letters and then vetted by a team of previous awardees, this years recipients of the PTF Awards are as follows:

GEORGE KLINZING BEST PHD IN PARTICLE TECHNOLOGY. This award recognizes an outstanding dissertation by an individual who has earned a doctoral degree under the criteria of an outstanding original dissertation with relevance to particle technology in the last three calendar years. This year's recipient is Prof. Jia Wei Chew of Nanyang Technological University in Singapore. Dr. Chew received his PhD from University of Colorado at Boulder and received this award for her experimental investigation on the impact of polydispersity on fluidized bed systems.

PARTICLE TECHNOLOGY FORUM AWARD. This award recognizes a forum member's lifetime outstanding scientific/technical contributions to the field of particle technology, as well as leadership in promoting scholarship, research, development, or education in this field. This year, the PTF Award goes to Prof. Dimitri Gidaspow from the Illinois Institute of Technology for his contributions in his unparalleled and exceptional lifetime achievements and pioneering research contributions to the field of computational and experimental multiphase flow and fluidization.

SHELL GLOBAL SOLUTIONS THOMAS BARON AWARD. This award recognizes an individual's recent outstanding scientific/technical accomplishment which has made a significant impact in the field of fluid-particle systems or in a related field with potential for cross fertilization. This year, Prof. Norman Wagner (Alvin B. and Julia O. Stiles Professor of Chemical Engineering) from the University of Delaware is the recipient of the Thomas Baron Award. Prof. Wagmer is being recognized for his excellence in colloidal suspension rheology fundamentals, developing new instrumentation, and translating these into breakthrough applications.

DOW CHEMICAL FLUIDIZATION PROCESSING RECOGNITION AWARD. This award recognizes a Forum member who has made significant contribution to the science and technology of fluidization in the commercialization of fluidized processes, and who has shown leadership in the engineering community. This year's recipient of the Fluidized Processing Award is Dr. Rathna Davuluri of ExxonMobil. Dr. Davuluri is being recognized for his significant contribution to the science and technology of fluidization or fluidized processes related to fluid catalytic cracking.

PARTICULATE SOLID RESEARCH, INC. (PSRI) LECTURESHIP IN FLUIDIZATION AWARD. This award recognizes an individual's outstanding scientific/technical research contributions with impact in the field of fluidization and fluid-particle flow systems. The Group 3B nomination committee (Fluidization and Fluid Particle Systems) has given this award to Prof. Franco Berruti of the University of Western Ontario for his exceptional contribution in the field of hydrodynamics of conventional and fast fluidized beds, and to their application to catalytic and thermal cracking processes.

PARTICLE TECHNOLOGY FORUM SERVICE AWARD. This is the PTF's newest award and give to those individuals who have shown unparalleled dedication to the AIChE and PTF. This year's recipient of the PTF Service Award goes to Dr. Manuk Colakyan, Chief Science Officer and Chair of the Scientific Advisory Board for Renmatix. Dr. Colakyan as dedicated countless hours in ensuring the PTF programing is in order. No small task when working with the AIChE. In addition, he continues to provide the PTF leadership with advise and guidance for the PTF Leadership.

The PTF is honored to recognize all these individuals and we wish to continue to do so for all those who show inspiration and leadership in particle technology. So, remember those nominations and contribute to next years awardees. In addition, thank you to all our award sponsors that make this recognition possible.

LETTER FROM THE CHAIR

To keep the Particle Technology Forum alive and well, we all need to be active in recruiting new members to PTF. In addition, current PTF members need to yearly renew their PTF membership. Since PTF members experience quality technical and professional information in the field of particle technology through PTF (whether it's from the PTF newsletters, PTF workshops or through PTF meeting programming), the yearly $15 PTF membership is truly a minimal dues payment. In addition, PTF offers great opportunities for communication, networking and professional development.

So, please remember to renew your PTF membership for 2014. There is no time like the present to do this renewal. Just call AIChE Customer Service at 1 (800) 242-4363 or 1 (203) 702-7660. Or, If you prefer to renew your PTF membership online, just go to

http://www.aiche.org/community/divisions-forums/ptf

and click on "JOIN PTF NOW". There is a price for AIChE members – which is $15 – and a price for non-members, designated as "list price", which is also $15. For AIChE members….don't forget to add AIChE membership to your PTF renewal in order to expand your benefits to include a wider array of educational offerings, networking opportunities, and career support.

Normally, the PTF newsletter is sent out only to PTF members, but to encourage membership, we will be sending out the Fall 2013 PTF newsletter issue to a broad range of technical contacts. These contacts will include those who once were a member of PTF but have not renewed their membership. Our goal is to bring them back into the PTF fold.

We also want to see more undergraduate and graduate students joining the PTF ranks. For undergraduates at US and Canadian universities, membership in AIChE is completely FREE – thanks to the generous support of many industrial sponsors. Along with the free AIChE membership, comes free membership in TWO divisions or forums. Let's work to make one of them PTF! For graduate students, membership is AIChE is $50, and along with that graduate student membership, comes free membership in two divisions or forums. So, undergraduate and graduate students can basically join PTF for free.

Finally, coming very soon, will be an option to join PTF for life! PTF lifetime membership will be available to those over 40 and will involve a one-time membership payment of $150 or ten times the regular annual membership dues. This lifetime option will be listed on the same web page as for the regular online $15 yearly renewal (website given above). One great part about PTF lifetime membership is showing your strong commitment to PTF and the field of particle technology. Another is to never have to remember to renew your PTF membership again. And, especially, if you are a life member of AIChE, you need never see another membership renewal notice again from AIChE!

Jennifer Curtis, PTF Chair

AIChE Annual Meeting: Register Early This Year

The AIChE Annual Meeting will be held at the Hilton San Francisco Union Square in San Francisco, CA. This location tends to get the highest attendance. Hotel and and flight availability tend to fill up quickly. Details can be found at http://www.aiche.org/conferences/aiche-annual-meeting/2013

Sophisticated Italian For Our Next PTF Dinner

PALIO

So don't forget to sign up now for this years PTF Dinner to be held at Palio d' Asti Restaurant on 640 Sacramento Street in San Francisco. The mission of Palio d'Asti has been to honor this glorious cultural and culinary tradition; utilizing traditional techniques and authentic ingredients in a way that connects yesterday and today. The cost is $75 USD per person.

KNOW FLOW'S KORNER

RETROFITTING SOLIDS PROCESSES: CHALLENGES AND OPPORTUNITIES

Shrikant V. Dhodapkar, Dow Chemical
Lyn Bates, Ajax Equipment, Ltd.
George E. Klinzing, University of Pittsburgh

Rapid shifts in raw material availability and geographical cost variances, coupled with evolution of demand, cost of energy and scarcity of capital, has titled the scale in favor of retrofitting existing production plants as compared to building grassroots plants [1, 2]. While the concept of retrofitting is not new in the chemical process industry, there is a paucity of systematic studies pertaining to solids processes. It is possible to leverage general framework from chemical processes; however, solids processes do not always adhere to conventional process optimization tools.

In the life cycle of large manufacturing plants, where one must operate the plant for a sufficient length of time to recoup the investment, various external and internal factors incentivize retrofitting options [2-4]. Some of the needs that drive retrofitting activity can be -

- Increase the production rate,
- Reduce conversion cost or to improve cost efficiency & total operating cost,
- Make new products or have greater flexibility in production cycle,
- Improve product quality,
- Improve reliability and operability,
- Improve controllability (less off-grade, more prime),
- Improve environmental or ecological efficiency, reduce emissions,
- Accommodate new raw materials or alternate feedstock,
- Improve energy efficiency or carbon footprint
- Improve process safety and industrial hygiene
- Replace worn out or outdated equipment,
- Implement new process technology (or equipment design upgrade) for competitive reasons, and
- Reduce long term maintenance costs and unscheduled downtimes.

For any retrofit project, these incentives (or needs) must be prioritized and balanced with total project cost, time required for implementation, and associated process technology risks. It is possible that a globally optimum technical solution may be practically infeasible or unaffordable. On the other hand, a higher capital cost solution may result in much lower operating cost, higher reliability and controllability, efficiency and product quality. It is a complex decision which must not be made ad-hoc.

Retrofitting typically involves the following activities that are listed in order from the simplest to the most complex:

- Changing operating discipline, process parameter optimization, change in operational logic, automation and improvement to process control code,
- Reconfiguration of process via change in piping or connectivity without changing the unit operations (reconfiguration of process not always easy or cheap due structural and spatial constraints),
- Internal changes to equipment without changing tie points or process connections,
- Installation of new equipment with same or updated technology,
- Install equipment with new process technology in existing process layout, and
- Replace current process or sub-process with new process technology and design philosophy.

Mathematically, a retrofit problem is an open-ended problem. The number of possible solutions can far exceed the time or the resources available to evaluate them. Therefore, a strategic approach of combining practical knowledge, screening methods and process optimization with clear understanding of the objective function must be applied to reduce the problem to a manageable size. With the designing of a plant with new process technology, the technology selection is made at an early stage in the process development. Such a key decision is often made with little operational experience (probably with some pilot scale runtime). The equipment sizing with safety factors must then account for uncertainties. In case of retrofits, extensive process knowledge exists; however, one is primarily locked into a given process technology with significant space or resource constraints (supply chain, automation, utilities, personnel, etc.).

Retrofitting can be done at various scales: at plant/process level, sub-process level (e.g. dryer, grinding circuit, granulation) or equipment level (e.g. silo, feeder). It is important to understand that the changes can be local but the ramifications can be much more far-reaching. For example, changes in grinding circuit to reduce particle size can result in reduced flowability in silos or flow through chutes.

The need for good models to rate various unit operations and processing risks is critical for screening various options [2,3,5]. These models need to be fundamental and predictive, and not simply based on interpolation of process data. It is possible that some of the unit operations may need to operate outside their design parameter to achieve the overall objective. Development of such models requires seasoned expertise and then good process data for validation. In many solids processes, such data on stream composition is often lacking.

Another unique challenge in solids processing plants is that the unit operations can be highly specialized where acquisition may be limited on only a few or one manufacturer. The expertise largely resides with them, and they are not readily willing to part with the key details. An engineer is therefore required to understand and bring these technologies together in a coherent fashion. Flow sheeting tools, such as SolidSim (now acquired by AspenTech) can come in handy to explore and visualize various options. However, these tools are in their early stages of evolution. Much work needs to be done to populate it with models that have sufficient breadth and depth; so they can be used to "rate and predict" specific unit operations.

Bates [6] has proposed ten rules for retrofits in bulk material handling which address the non-technical yet equally important aspect of such projects. We will review them in the next newsletter.

With this article, we hope to pique interest amongst academicians and industrial researchers regarding the challenges and opportunities for retrofitting in solids processing plants. Much work needs to be done to develop proven strategies and develop useful tools on this front.

References:

1. Gundersen, T., Retrofit Process Design – Research and Application of Systematic Methods, In Foundations of Computer Aided Process Design, (J.J. Siirola, I.E. Grossman, G. Stephanopoulos, Eds.), CACHE Elsevier, 1990, pp. 213-240
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6. Bates, L., Rules for retrofits in bulk material handling, Chemical Technology, pp. 25-28, May 2013.

NETL SMALL SCALE CHALLENGE PROBLEM

NETL is pleased to announce that the Small Scale Challenge Problem (SSCP) has been posted online at https://mfix.netl.doe.gov/challenge/index.php

The problem involves simulating a flow in a small scale Rectangular Fluidized Bed (0.076 x 0.23 x 1.22 m^3) with ~ 3 mm nylon beads of Geldart Group D Classification. Data will be measured for three different gas flow rates. We will be comparing the submitted velocity and pressure data with accurate high speed PIV and pressure transducer measurements.

The "Small Scale Problem description (Zip file)" is the main file and contains all information required to participate. For your convenience we have also provided CAD drawings to setup the problem under "Rectangular bed model (Zip file)." Also as one of the goals of this SSCP is to provide users with all raw data that we are measuring, we have included the raw data for particle property measurements in "Particle properties (Zip file)". However, we would like to note that the Small Scale Problem description (Zip file) in itself has all required particle property data.

If you have any questions, please contact NETL at challenge@mfix.netl.doe.gov or call us at (304) 285 - 4162.

IN MEMORIAM DEREK GELDART,
Professor at Bradford University

Derek Geldart, renowned in particular for his diagram classifying powders according to their fluidization behavior, and respected member of the worldwide particle technology community, died recently at the age of 81. Derek was Emeritus Professor of Powder Technology at Bradford University in the UK. He graduated from Newcastle University, UK and worked as a researcher with the UK Atomic Energy Authority before joining Bradford University, where, as a faculty member, he started his research in fluidization and he gained his PhD in 1971. His early publications included his "Classification of Powders", which after an initial struggle for acceptance, became one of the most cited works in the field. Derek was a regular contributor to international conferences, consulted widely and gave continuing education courses for industry in the USA and Europe. Through these activities he made lifelong friends amongst researchers around the world.

On a personal note, when in 1983, I had an urge to embark on an academic career, it was Derek who gave me the opportunity to study fluidization under his supervision. We got along really well together and within a year I joined the faculty as a lecturer. From that point on Derek made every effort to launch me on my career. He encouraged me to go to conferences with him and introduced me to the fluidization community. The powder technology scene at Bradford at that time was truly inspirational; alongside Derek were John Williams, Norman Harnby, Nayland Stanley-Wood and Lado Svarovsky. However, Bradford University was not good at recognising its own people. John Williams was never made professor at Bradford University and Derek was only awarded that honour a few years before his retirement. When I tell this to colleagues around the world, they are always amazed that Derek, who was at the top of his field and highly acclaimed internationally, should not have been recognised by his own university. Derek's contribution to the fluidization and particle technology communities extends far beyond his seminal paper on the classification of powders. His abilities to spot patterns and trends and to devise simple, but comprehensive experiments were widely recognised among the community. Derek also had a presentation and writing style that meant that the message came across loud and clear. He put a lot of effort into his writing – he once told me that after spending a day working on a manuscript, he would be happy to have completed only two or three pages.

At the time of writing this, I am in the process of preparing a tribute to Derek for presentation to his family. It will be a compilation of photos, memories and thoughts on Derek from his colleagues around the world. Here are just a few snippets from that tribute, which give some idea of the ways in which Derek touched people's lives at a private level as well as a professional level:

"great sense of humour, gentleman, caring"; "one of the giants of our community and besides this he was truly a nice guy"; "modest with a keen wit that could defuse any differences"; "the Geldart Diagram turned out to be one of the most important tools when I was confronted with practical problems"; "a wonderful person - warm, thoughtful, fun-loving, perceptive"; "able to observe and synthesize results from different vantage points into a coherent picture and then write clearly about this, or describe it in simple terms, so that other would understand"; "quick to take advantage of new information"; "always kind and approachable, and eager to lend a hand to the new students to the fields"; "his pioneer works in the fluidization area will never be forgotten"; "a great researcher as well as a kind and generous-hearted person"; "His mild and unassuming manner belied his status in the field to which he made an enduring contribution"; "a pre-eminent contributor to the modern technology of particle systems and fluidization science".

Derek Geldart's passing is a great loss to those in the fluidization and powder technology community, who, like me, were proud to call him their friend. He leaves Margaret, his wife of 56 years, his children Jonathan and Andrew and three grandchildren.

Martin Rhodes, Monash University

IN MEMORIAM ROGER (EDWARD) PLACE,

IFPRI VP Academic/Industrial Liaison

We have all lost a dear friend.

Although Roger was diagnosed with esophageal cancer early January this year, he continued to work for IFPRI as normal. Roger was convinced that this was just one more battle to fight and win. I last met with him at the Nuremberg POWTE/PARTEC event just two weeks ago to discuss the final details of the planned 2013 workshop and talk about IFPRI's future. During dinner with Roger I did remark that he was really starting to show difficulties in swallowing. As always, Roger brushed it off and said that he was going to beat this problem. Last week I spoke over the phone with him and once again he assured me he was fine and was planning to attend the coming AGM. Unexpectedly and unfortunately, two hemorrhages ended Roger's battle with cancer and Roger died early in the morning of May 19th, 2013.

When Jacky, his wife, called and announced his death that morning Monique and I couldn't believe it. We were totally saddened and shocked by the unexpected news.

The relation of Roger and IFPRI was a long lasting story of mutual respect starting in 1989 when TIOXIDE became an IFPRI member and was represented, amongst others, by Roger. About at the same time period the IFPRI EC, under the pressure of a growing membership, felt the need to create the Vice Presidency of Academic/Industrial liaison to help Les Ford, then President, to manage the Institute more efficiently. The function was first filled by Gordon Butters. It caught my attention that Gordon, Richard Buscall and Roger were always the 3 musketeers, closing the bar in the evening, after another famous, networking happy hour(s). Unfortunately Gordon passed away unexpectedly in 1996 and Roger was able to immediately step into this role. IFPRI was blooming and so was Roger, using his social capabilities, natural kindness, and his keen awareness of particle technology to keep everybody in the IFPRI community happy. He was a masterful conciliator working to avoid or diminish clashes and build consensus. Clearly this has proven to be not an easy task when facing the raucous and willful individuals that make up the IFPRI membership, but Roger was undaunted and willing to go that extra mile to make IFPRI a better organization.

Roger loved traveling to meet people and to attend Particle Technology Meetings,being actively involved in both the American and British Particle Technology forum . Unfortunately the 2003 and 2008 financial/economic crises reduced that possibility enormously, but he was able to reorient his enthusiasm towards the organization,within the IFPRI framework, of Particle Technology Work Shops, which were used as the basis to generate new projects and reviews.

Of all the IFPRI Presidents I had the pleasure to work with Roger for the longest period and in my perception we were a good team. As a colleague and a friend I know that during his tenure in the IFPRI community, there was one aspect that saddened him a bit from time to time: the absence of an individual "thank you" at the end of another sometimes difficult year. At my age I fully realize that a pat on the shoulder is worth so much more than a fistful of dollars. I do wish that all of us had given Roger some of that thanks we all clearly felt rather than waiting until it is too late. Nonetheless, thank you Roger for having shared part of your professional and social life with us.

We will celebrate your life by trying to deliver an excellent Particle Formation Workshop together with an AGM to remember.But above all we will continue to practice the IFPRI spirit placing people, friendship, respect above the commercial side of our collaboration . Of course we offer or condolences and support to Jacky, your children and grandchildren.

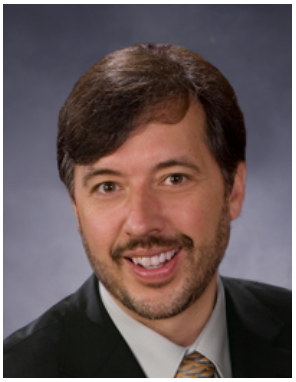
Farewell my friend,reflecting on the fragility of life, we add our memories and thoughts to the universal spirit who is carrying you on this your last journey.

Nick de Jaeger, IFPRI President

Willie Henderickson, IFPRI President Elect

PTF AWARDS LECTURES

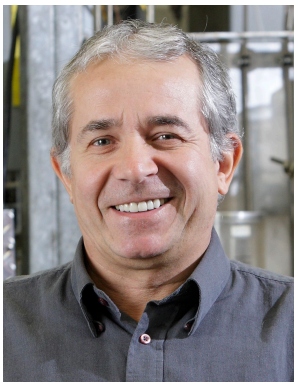
AIChE Annual Meeting
Hilton San Francisco Union Square
November 6, 2013



Shell Global Solutions Thomas Baron Award Lecture

"Shear Thickening & Gelation in Colloidal Dispersions - Nonequilibrium states and their applications in personal protective equipment"
By Norman J. Wagner

Colloidal gels and shear thickening fluids are challenging to formulate and process as they are often out of equilibrium states, but as will be shown, provide opportunities for engineering protective materials with a novel mechanical response. Developing fundamental structure property relationships for concentrated particle dispersions that exhibit shear thickening and/or gelation that derive from the properties of the particles that comprise the dispersion, their interparticle interactions, and their interactions with the suspending medium is scientific challenge with technological benefits. In this presentation I will discuss advances in measurement techniques that enable developing such relationships and demonstrate how this understanding can facilitate the development of novel personal protective equipment. Measurements of the microstructure commensurate with the viscosity and normal stress differences in shearing colloidal suspensions provide an understanding of how to control the viscosity, yield stress, shear thinning, and shear thickening rheological behavior. This is achieved through a combination of model system synthesis, rheological, and small angle neutron scattering (SANS) measurements under flow, as well as simulation and theory. Although many technological applications of concentrated suspensions are hindered by shear thickening behavior, novel field-responsive nanocomposites have been developed around shear thickening fluids (STFs). Ballistic, stab and impact resistant flexible composites are synthesized from colloidal & nanoparticle shear thickening fluids and gels for application as PPE. These rheological and microstructural investigations and micromechanical modeling serve as a framework for the rational design of STF-based materials to meet performance requirements.



Particulate Solid Research, Inc. (PSRI) Lectureship Award Lecture

"Wetting the Bed: Liquid Feed Injection and Dispersion in Fluidized Beds".
By Franco Berruti

The presentation will review the experimental and analytical techniques developed at the Institute for Chemicals and Fuels from Alternative Resources (ICFAR) for the characterization of the interaction between liquid feed jets and fluidized solid particles, especially in relation to the Fluid Coking™ technology for the upgrading of heavy oils extracted from the oil sands. The research and development work described will include the experimental methodologies developed using small scale simulated systems operated at room temperature as well as small scale fluid beds operating at reaction temperatures and large scale room temperature simulated systems employing full scale commercial nozzles.

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Conference Calendar

2013 AIChE Annual Meeting
November 17 - 22, 2013 , San Francisco, CA
http://www.aiche.org/conferences/aiche-annual-meeting/2013

International Conference on Powder, Granule and Bulk Solids Innovations and Applications (PGBSIA 2013)
November 28-30, 2013,Thapar University, Patiala, Punjab, India,
http://www.pgbsia2013.com

11th International Conference on Fluidized Bed Technology
May 14-17, 2014, Beijing China
http://www.cfb11.org
Abstracts Due Sept 15, 2013

The 7th World Congress on Particle Technology
May 19-22, 2014, Beijing, China
http://www.wcpt7.org
Abstracts Due Dec 31, 2013

29th International Symposium on Rarefied Gas Dynamics
July 13-18, 2014 , Xi'an, China
http://rgd29.org
Abstracts Due Feb 28, 2014

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Career Opportunities

DUPONT — Chemical Engineering Consultant in Solid-Liquid Separations

NETL — Post-doctoral Position in CFD

cpfd COMPUTATIONAL PARTICLE FLUID DYNAMICS — Project Engineer in CFD

Details can be found at http://www.aicheptf.org/activities/career-opportunities