

Chemical Engineering Seminars – MT 2011

Week 8, Tuesday November 29th 2011, 4:00PM-5:00PM
Lecture Room 3, Thom Building, Engineering Science

Fluid Dynamic Gauging: A Surface Layer Probe

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Abstract

Measuring the thickness and strength of soft-solid layers on solid or membrane substrates in a liquid environment under process conditions is a demanding task, yet vital for explaining the deposition, removal or swelling behaviour of such materials in the food, chemical, biological and medical sectors. For example, the removal of unwanted fouling layers from process surfaces, i.e. cleaning, is a mundane but critically important task in many applications where hygiene is often the key consideration. Product contamination, impairment of heat transfer, and enhancement of corrosion are critical to many industries: in dairy heat exchangers, thermal denaturation of whey proteins causes acute fouling and requires regular cleaning-in-place, while cake build-up in membrane/filtration systems increases downtime for cleaning and impacts the availability and profitability of such units directly. Often the understanding of the dynamical and mechanical behaviour of such layers is needed to optimise operating protocols or to design cleaning regimes; such understanding is rarely available.

Fluid dynamic gauging (FDG) is a non-contact technique developed for the measurement of the **thickness** and **strength** of soft deposit layers on solid surfaces immersed in a liquid environment, *in situ* and in real time. This talk presents the evolution of the FDG technique since its invention and also highlights its potential applications in the food, chemical, biological and medical sectors.

Background:

- i. **Current:** John Chew is a Lecturer in the Department of Chemical Engineering at Bath.
- ii. **Previous:** John completed his PhD in the Department of Chemical Engineering at Cambridge in 2005 and was a Royal Academy of Engineering/EPSRC Post-doctoral Research Fellow in Cambridge from October 2005 to August 2010. He moved to Bath in 2010 and he continues to co-supervise work at Cambridge.
- iii. **Research:** His research is centred on understanding the formation and removal of surface layers on process surfaces. He combines experimental work with numerical modelling of the deformation of these layers and the main part has been the continual development of the fluid dynamic gauging technique. He is particularly interested in soft layers commonly found in the food, polymer and membrane industries.

