PHILADELPHIA MIXING SOLUTIONS LIMITED

www.philamixers.com

INDUSTRIAL FLUID MIXING

Engineering Theory and Practice

Classroom

University level lectures lead by PMSL Director of Mixing Technology, Richard K. Grenville PhD.

Lab

Complement lectures with physical demonstrations of phenomena that have been discussed.

After attending the course, you will be able to:

Select appropriate impellers to effectively achieve the desired "process result"

Identify mixing problems and techniques to address them

Perform calculations for sizing agitators (power, speed, etc.)

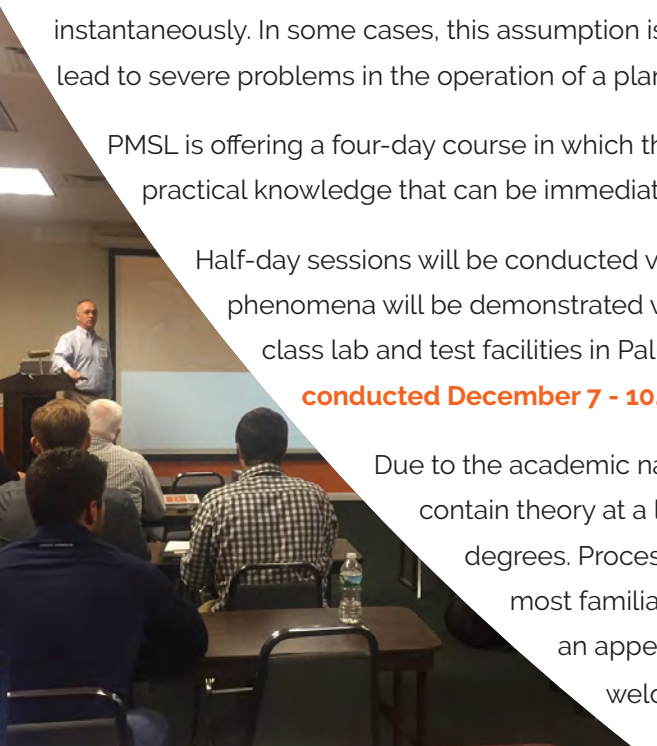
Identify problems where advanced modelling techniques can be reliably applied and when lab-scale, physical testing should be performed.

Discuss process requirements with vendors and assess their proposals

Overview

Mixing is an important, sometimes critical operation for the process industries but it is rarely taught in the traditional chemical engineering curriculum. Most engineers are taught the contents of a stirred tank are uniformly mixed and that this happens instantaneously. In some cases, this assumption is valid and in others, when it is not, it can lead to severe problems in the operation of a plant.

PMSL is offering a four-day course in which the science of mixing will be demystified, providing practical knowledge that can be immediately put into use.



Half-day sessions will be conducted virtually with live lectures, and mixing phenomena will be demonstrated via videos produced in PMSL's world-class lab and test facilities in Palmyra, PA. **The next course will be conducted December 7 - 10, 2020.**

Due to the academic nature of the course its contents will contain theory at a level found in BS level engineering degrees. Process and mechanical engineers will be most familiar with the content; all others with an appetite for interpretive equations are welcome! **Register at philamixers.com**

Want More Info?

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1221 E. Main St.
Palmyra, PA 17078

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Test Lab

PMSL is dedicated to mixing, and so is our extensive test lab. Videos of projects in our test lab apply directly to subjects discussed in our lectures.

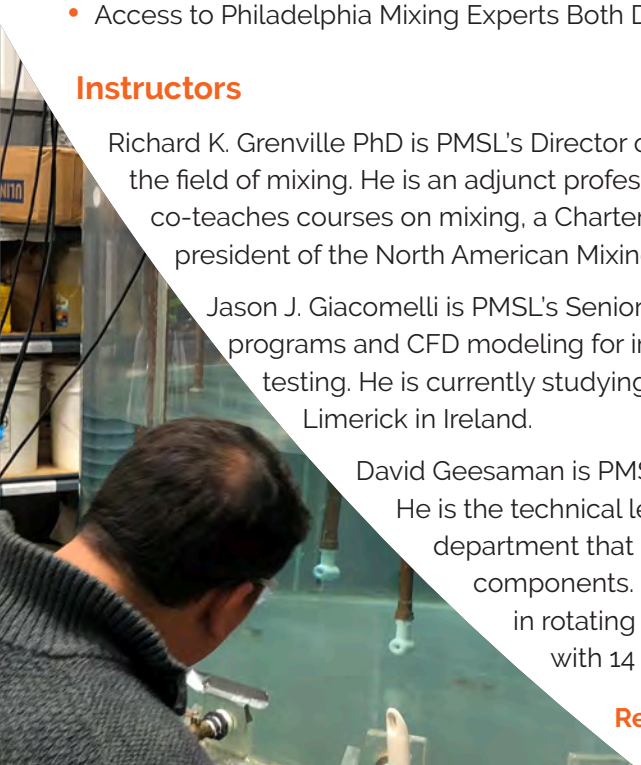
Course Content

1. Introduction to mixing
   Defining mixing. Characterizing the performance of impellers.
2. Blending of low / medium viscosity fluids
   Review of common agitator design rules. Estimation of blend times.
3. Blending of high viscosity / non-Newtonian fluids
   Measurement of viscosity. How viscosity affects mixing. Impeller selection. Estimation of blend times.
4. Mixing and chemical reactions
   How mixing affects the yield / selectivity of fast, competitive reactions. Lab testing and scale-up. Precipitation.
5. Solid-liquid mixing
   Degree of suspension versus distribution. Impeller selection and agitator sizing. Mass transfer. Attrition. Feeding and wetting light solids.
6. Gas-liquid mixing
   Equipment selection. Flooding versus complete dispersion. Impeller selection and agitator sizing. Impeller design for gas draw-down from reactor head space. Mass transfer.
7. Heat transfer
   Mixing and process side heat transfer. Effect of viscosity. Impeller selection. Overall heat transfer coefficient.
8. Mechanical considerations
   Design of agitator components. Gearboxes, seal, shafts and impeller blades. Agitator mounting.
9. Computational fluid dynamics
   What is CFD? The underlying mathematics. Time-averaged versus time-dependent. Validation of code predictions. Examples of "real world" applications.

Course Fee: $995 per person include:

- Course Materials
- Links to Each Day's Session
- Access to Philadelphia Mixing Experts Both During and After the Training

Instructors



Richard K. Grenville PhD is PMSL's Director of Mixing Technology and has over 30 years' experience working in the field of mixing. He is an adjunct professor at Rowan University and the University of Delaware where he co-teaches courses on mixing, a Chartered Engineer and Fellow of the Institution of Chemical Engineers and president of the North American Mixing Forum (2016 – 2018).

Jason J. Giacomelli is PMSL's Senior Process Engineer and runs lab programs and CFD modeling for impeller development and customer testing. He is currently studying for his PhD with the University of Limerick in Ireland.

David Geesaman is PMSL's Principal Mechanical Engineer. He is the technical leader within the Order Engineering department that designs custom mechanical mixing components. David has 20 years of experience in rotating equipment and mechanical design, with 14 at PMSL.

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