

PE11: Fluid Mixing and Agitated Mixing Tank Reactor Design, Engineering and Scale-Up

This course examines the technical issues associated with transforming a chemical process from small scale (e.g. laboratory) to commercial operation. The teaching approach is methodology-oriented. The course outline is shown below.

Date: 2 Days Course - Check upcoming dates in www.chemengedu.com

Time: 9:00-17:00

Price & Promotions: See rate and promotions in www.chemengedu.com

Venue: Check venue in www.chemengedu.com

Registration: By Training Registration Page in www.chemengedu.com or contact Khun Piyarat 089 118 6531, chemengedu.training@gmail.com

Agenda & Course Outline:

Day 1:

8:00 AM – 9:00 AM Register

9:00 AM – 12:00 PM

1. **Introduction to fluid mixing**
2. **Mixing tank: Agitation equipment**
 - Configuration and size of mixing tank
 - Standard mixing tank
 - Flow pattern in mixing tank
 - Type of impellers
 - Selection of impellers
 - Standard gear output rpm

12:00 PM – 13:00 PM Lunch Break

13:00 PM – 17:00 PM

3. **Introduction of Scale-Up**
 - What happens during scale up ?
 - Methods of process scale up
 - Systematic methods for process scale up

Day 2 (July 2, 2019):

8:00 AM – 9:00 AM Register

9:00 AM – 12:00 PM

4. Scale up of Agitated Mixing Tank

- Design practices and considerations of mixing without reactions
- Scaling up mixing processes
- Concepts of geometric, kinematic, dynamic similarity
- selection and use of dimensionless numbers to quantify important mixing parameters and characteristics
- different types of agitation and agitators
- overview and guidelines for approaching scale up of mixing processes

12:00 PM – 13:00 PM Lunch Break

13:00 PM – 17:00 PM

5. Scale up of Agitated Mixing Tank Reactor

- Design practices and considerations of mixing with reactions
- What is the different between Ideal reactor design and reactor scale up
- Understanding of the reaction and mixing
- Systematic tank reactor scale up with example cases

This course has been proven by our participants from BEIERSDORF (Thailand), Johnson and Johnson (Thailand), Greentech Solution, Dynamica Engineering, Rayong Engineering & Plant Service, Troy Siam Company, PPG Coatings (Thailand), SFC Excellence, Defence Technology Institute, Thai Industrial Business, BIOTEC, Global R&D and Bangkok Synthetics.

Your Instructor:

Assoc. Prof. Dr. Apinan Soottitantawat



PROFILE

- Outstanding Student Award from The Society of Chemical Engineering, Japan (SCEJ)
- Japanese Government Scholarship to study in Japan
- Gold Medal Honor Award in Chemical Engineering from The Engineering Institute of Thailand Under H.M. The King's Patronage (E.I.T.), Thailand
- Outstanding Student Award (Gold Medal Honor) Chemical Engineering from Faculty of Engineering, Chulalongkorn University, Thailand
- Honor Student Award, Faculty of Engineering, Chulalongkorn University, Thailand
- Senior licensed chemical engineer in Thailand, license no. ๗๓ 149
- Young Researcher Award, Faculty of Engineering, Chulalongkorn University, Thailand
- Holds 14 patents (2016)
- Hold 53 Research publications in ISI database (2016)
- Hold 3 review articles (2016)
- More than 100 Proceedings papers with some invited speaker
- Advisor for more than 30 graduated master students and 1 graduated doctoral student
- Problem solving/Process improvement via advisor of internship students
- Current research activity in encapsulation process improvement, spray drying process improvement, chemical process scale up
- Working Committee to design and set up a new curriculum for bachelor degree in Chemical Engineering, Faculty of Engineering, Chulalongkorn university FY 2011 and 2016
- Working Committee to design and set up a new curriculum for master degree in Chemical Engineering, Faculty of Engineering, Chulalongkorn university FY 2013 and 2016
- Working Committee to design and set up a new curriculum for master degree in Chemical Engineering, Faculty of Engineering, Chulalongkorn university FY 2014

CAREER EXPERIENCES

June 27, 2011 - Present

Assistant Professor
Department of Chemical Engineering, Faculty of Engineering
Chulalongkorn University, Thailand

August 01, 2007 – June 26, 2011

Instructor
Department of Chemical Engineering, Faculty of Engineering
Chulalongkorn University, Thailand

May 01, 2006- July 31, 2007

Researcher
National Nanotechnology Center (NANOTEC)
National Science and Technology Development Agency (NSTDA), Thailand

April 01, 2005- March 31, 2006

AIST Research Staff

National Institute of Advanced Industrial Science and Technology (AIST),
Tsukuba Central 5, Tsukuba, Japan

September 4-30, 2002

Visiting researcher at VTT Biotechnology,
Technical research centre of Finland.

TEACHING EXPERIENCES

Lecture Course in Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University

UNDERGRADUATE COURSES

- **Introduction to Chemical Engineering Thermodynamic** (Thermodynamic of pure components/ 1st-2nd Law of Thermodynamic/ Flow device/ Valve/ Compressor/ Thermal efficiency of chemical process/ Exergy) > 5 years teaching experience (Main instructor contribute to all of topics)
- **Unit Operation I** (Macroscopic Momentum transfer/ Fluid Flow/ Fluid Mechanic/ Pump/ Mechanical Separation/ Filtration/ Centrifugal Separation/ Cyclone/ Decanter/ Sedimentation/ Pneumatic conveying/ Fluidization/Fluid Mixing) > 7 years teaching experience (Main instructor contribute to all of topics)
- **Unit Operation II** (Distillation, Extraction, Absorption, Stripping, Adsorption, Crystallization, Leaching) > 7 years teaching experience (Main instructor contribute to all of topics)
- **Unit Operation III** (Heat transfer, Heat exchanger, Boiler, Condenser, Evaporator, Cooling tower, Dryer) > 5 years teaching experience (Main instructor contribute to all of topics)
- **Particle Technology** (Particle characterization, Bulk properties of powder, Flow properties, Bin-Hopper-Silo Design, Powder Mixing, Spray drying, Size Enlargement and Granulation, Size reduction and Milling, Crystallizer, Pneumatic conveying) > 5 years teaching experience (Main instructor contribute to all of topics)
- **Chemical Plant Design** (Process Design, general process design, mass balance, mass balance with recycle stream, conceptual process design, PFD, HEN, materials of construction, equipment sizing-costing, economic analysis, feasibility study) > 2 years teaching experience (Main instructor contribute to almost of topics)

GRADUATE COURSES

- **Chemical Process Scale Up** (Introduction to chemical process scale up, methods in process scale up, systematic methods in process scale up, mixing tank scale up, emulsification process scale up, introduction to reactor scale up, process understanding for scale up, ideal reactor calculation, tank reactors scale up, fixed bed reactor scale up) > 4 years teaching experience (Main instructor contribute to all of topics)
- **Advance Reaction Kinetics and Reactor Design** (Reaction kinetics fundamental, ideal reactor design (CSTR/PFR), non-ideal flow reactor with residence time distribution, catalytic heterogeneous reactor, isothermal/adiabatic reactor calculation, industrial reactor design) > 2 years teaching experience
- **Advance Particle Technology** (Particle formation by liquid and gas phase reaction, encapsulation technology, hydrothermal process, nanoparticle, spray drying process, emulsification process, scale up process for particle formation) > 5 years teaching experience (Main instructor contribute to all of topics)

PUBLIC TRAINING

- 2015: **Fundamental of crystallization process**, organized TechnoBiz Communications Co., Ltd.
- 2015: **Fundamental of mechanical separation process**, organized TechnoBiz Communications Co., Ltd.
- 2015: **Fundamental of distillation design**, organized TechnoBiz Communications Co., Ltd.
- 2015: **Fundamental of extraction process**, In-house training for IRPC Co., Ltd.
- 2015: **Fluid Flow**, In-house training for Thai Oil Co., Ltd.
- 2014: **Chemical Process Scale up**, organized by Center of Excellence in Particle Technology, Chulalongkorn University, with more than 30 registers
- 2014: **Fundamental of distillation design**, In-house training for Patum Vegetable Oil Co., Ltd
- 2013/2014: **Mixing tank and emulsification process scale up** for Thai Cosmetic Manufacturers Association (TCMA)
- 2011: **Mini-Chemical Engineering course: Absorber and Stripper Fundamental and Design**, In-house training for Siam Mitsui PTA Co., Ltd.
- 2008: **Sampling method for particle measurement**, In-house training for Siam City Cement Co., Ltd

SCIENTIFIC AND PROFESSIONAL SOCIETIES OF A MEMBER

Technology Promotion Association (Thailand-Japan), Life member
The Thai Institute of Chemical Engineering and Applied Chemistry, TIChE, Life Member
The Society of Chemical Engineers, Japan, (SCEJ), Member
Japan Society for Food Engineering (JSFE), Member
Thai Association of Particle Industries, Member

RESEARCH INTEREST

Encapsulation-Controlled Release, Chemical Process Scale-up, Particle technology, Drying technology, Porous Materials, Food Chemical Technology, Chemical Reaction Engineering