

# Secrets of Batch Process Scale-Up

Ensuring Effective Translation of Laboratory Processes to Pilot Plant Scale

26-28 APRIL 2017



**San Diego, USA**  
Island Palms Hotel  
& Marina

A 3 day course taught by  
**Francis X. McConville**  
Impact Technology Consultants  
Author of "A Unique Handbook for the  
Chemical Process Industry"

"There are so many interesting ideas presented in this course that I never would have thought of on my own. I'm excited to take these ideas back to my company to optimise our processes".

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# Secrets of Batch Process Scale-Up

A 3 day course taught by Francis X. McConville,  
Impact Technology Consultants

**26 - 28 April 2017** Island Palms Hotel & Marina, San Diego, USA

Multiple  
attendees  
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available

## INTRODUCTION

**Operating a commercially viable chemical process requires a good chemical synthesis to start with, but is also subject to the interplay of a myriad of important physical phenomena – heat transfer, mass transfer, fluid flow, etc. which are traditionally the realm of the chemical engineer. An understanding of these scale-up phenomena is crucial for the laboratory development of processes that will scale successfully.**

This course presents an overview of these issues and examines their impact on process operation in the pilot plant and beyond, including scale-up considerations for route selection, raw material charging, reaction steps, workup, crystallization, product isolation, drying, etc. Common bench techniques for each of these steps are contrasted to the safety and operability criteria for successful pilot plant operation. Numerous examples and case histories are presented, along with tips and techniques for operators and experimenters. Heavy emphasis is placed on process safety.

## VENUE

Best Western Plus Island Palms Hotel & Marina  
2051 Shelter Island Drive  
San Diego  
CA 92106  
T: 001 619 222 0561  
[www.islandpalms.com](http://www.islandpalms.com)

This waterfront resort hotel is located on Shelter Island, San Diego's Hawaiian isle and 3 miles away from San Diego International Airport.

A limited number of bedrooms have been reserved at the hotel for the special rate of \$158 per night plus breakfast and taxes. Details about making your reservations directly with the hotel will be sent to you when you register.

## COURSE OUTLINE

### Process Design for Scale-Up

- > Process development strategies
- > Importance of engineering in PD

### Scale-Up – An Overview

- > Role of the Pilot Plant
- > Overview of scale-up issues
- > Technology transfer issues

### Batch Reactors

- > Typical plant operations and equipment
- > Characteristics of batch operations

### Raw Materials

- > Raw material and route selection
- > Large-scale charging methods and issues

### Temperature Control

- > Large scale temperature control
- > Heat transfer in batch reactor
- > Controlling exothermic reactions

### Following Reaction Progress

- > Reaction endpoint determination
- > Sampling methods/issues
- > On-line analytical techniques

### Agitation and Mixing

- > Large scale mixing equipment
- > Mixing limited reaction
- > Mixing scale-up/scale-down

### Quench & Work-Up

- > Liquid-liquid extractions
- > Phase continuity issues and emulsions

### Distillation & Stripping

- > Differential distillation
- > Azeotropes and solvent exchange

### Crystallization and Precipitation

- > Basic principles/yield estimation
- > Controlling supersaturation
- > Scale-up issues

### Product Isolation and Drying

- > Large-scale solid-liquid separations
- > Filtration and drying equipment
- > Filtration and drying modeling

### Process Hazards and Safety Assessment

- > Common hazards in large-scale processing
- > Process hazard assessments and evaluations

## WHO SHOULD ATTEND?

This course has been designed for synthetic chemists, process development chemists and process engineers in the pharmaceutical and fine chemical industries with limited pilot plant experience, who wish to learn more about the potential pitfalls of process scale-up and ways to avoid them.

## COMPLIMENTARY LITERATURE

As part of the registration fee of this course, each participant will receive a copy of The Pilot Plant Real Book – A Unique Handbook for the Chemical Process Industry, authored by Mr. McConville. In addition, a course binder containing the full content of the course materials will be provided.

Start 09.00am - Wednesday 26 April  
Finish 3.00pm - Friday 28 April  
Course dinner 7.30pm - Wednesday 26 April

**Course Fee: \$2,095**

Which includes comprehensive course manual, refreshments throughout the day, lunch and one course dinner.

**Course Fee: \$2,095**

## COURSE TUTOR

### Francis X. McConville



Francis X. McConville holds a B.Sc. degree in Chemistry and M.Sc. degrees in both Chemical Engineering and Biotechnology from Worcester Polytechnic Institute in Massachusetts. He has some 35 years of experience in the chemical and related industries, including positions at the Worcester Foundation for Experimental Biology and New England Renewable Fuels, where he was involved in such varied projects as oil recovery and biomass conversion.

He also spent 14 years at Sepracor, Inc. (now Sunovion) in the U.S. as a pharmaceutical process development engineer. His duties there included the design and operation of the company's kilo-labs, as well as the scale-up and transfer of many proprietary API processes to pilot and manufacturing sites in Taiwan, Japan, England, Scotland, and Canada. He was closely involved in the development and optimization of processes based on a variety of technologies including

selective biocatalysis, fermentation, ultrafiltration, and asymmetric crystallization.

For the past 12 years, Mr. McConville has worked at Impact Technology Development, Inc. in Devens, Massachusetts as a consultant, technology specialist and senior team leader. At Impact, Mr. McConville has been involved in such diverse projects as biomass conversion, emulsion polymerization, medical adhesives development, novel molten metal technology, and pharmaceutical crystallization optimization.

Mr. McConville is perhaps best known as the author of the popular manual for process development personnel entitled "The Pilot Plant Real Book – A Unique Handbook for the Chemical Process Industry". This highly practical handbook has garnered praise from readers in the fine chemical and pharmaceutical industries worldwide. Interested readers can learn more about the book at



[www.pprbook.com](http://www.pprbook.com)

## REGISTRATION

You can either use our fast online booking system or mail or fax the attached registration form to:

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East Sussex, TN20 6EW, UK  
Fax Number +44 1435 872734

### How to Pay

When you register online, you can have the option to pay via credit card (Amex, Mastercard or Visa) For email payments please include course title, card number, expiry date and security code. A receipted invoice will be automatically generated once paid and sent via email. Should your company wish to pay by cheque or bank transfer bank details will be supplied with an invoice.

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Should your company wish to pay by cheque or bank transfer, on booking you can choose between paying in either £ or €. All bank details will be supplied with an invoice.

### Group Discounts

Group discounts are available on multiples of 2 or more attendees – see registration form. This offer only applies if bookings are made simultaneously and from the same billing address.

### Confirmation of your registration

Confirmation and your invoice will be sent via email.

### Late Applications

For late applications, please register on-line or fax the completed registration form, including credit card payment information.

### Cancellations/Refunds

Should you be unable to attend and cancel in writing no later than 1 month before the start of the course, Scientific Update will refund your registration less £300 processing fee. Unfortunately refunds are not possible after that date. Substitutions can be made at any time.

## Course Aims and Objectives

To teach the practical aspects of designing a scaleable fine-chemical batch process and successfully implementing it at the kilo-lab and pilot plant scale, through an examination of the effects of large-scale operating methods and equipment limitations on process safety, operability, yield, selectivity and product quality.

Upon completion of the course, participants will be better equipped to:

- > Assess process safety and scaleability
- > Identify process operations that may be problematic on scale-up
- > Design processes that will minimize or avoid scale-up issues
- > Select operating methods and equipment for effective scale-up
- > Calculate heat removal rates and safe rates of addition of reagents
- > Determine mixing requirements for scale-up
- > Design crystallizations which can be successfully operated at scale
- > Predict the filterability of solid products upon scale-up
- > Minimize the effects of scale-up on yield, selectivity and product purity

# Secrets of Batch Process Scale-Up



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