



In-service training course

Downstream Processing: Unit Operations in the Chemical and Biochemical Industry

4 - 6 November, 2020

Online course

**Now as
online course**

Outcome

Through presentations, exercises and plenum discussions participants will acquire solid knowledge of downstream processing and the numerous associated unit operations with focus on the design principles, operations and equipment setup. Participants will further be introduced to simple calculations and estimations of benefit in the daily work.

Main subjects taught in the course

(see also last pages of flyer for the detailed program)

- Introduction to unit operations and Downstream processing
- Engineering principles and theories
- Solid/liquid separation—principles and equipment
- Filtration and membrane processes
- Mixing of liquids/Mixing of solids
- Process economy and bottle neck identification
- Drying processes and heat transmission
- Case examples from industry
- Calculation exercises and first-principle models

Target group

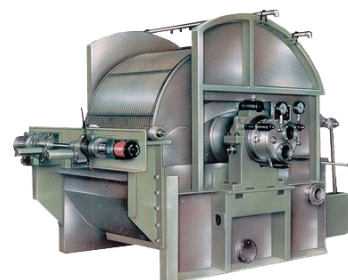
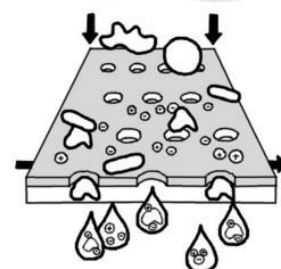
The course addresses technicians as well as process engineers working in the chemical, pharmaceutical, biotech and/or food industry.

Form

The online course runs for three consecutive days with alternating presentations, exercises and plenum discussions. All course material is available for download in advance of the course.

The course is held online via an online conference tool in real-time allowing questions and discussions to be facilitated in real-time.

There will be sufficient amount of breaks and time to ask questions in between the different sessions.



Registration and further information: Please see the next pages

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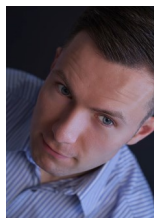
Teachers

Søren Beier, M.Sc. (Chem. Eng.), Ph.D.



- Sen. Manager in the Biotech. industry
- People management experience from the Biotech. and Pharmaceutical Industry
- Teaching experience from Technical University of Denmark
- Founder and co-owner of Bagsværd Liquorice

Peter Dybdahl Hede, M.Sc. (Chem. Eng.), Ph.D.



- Director in Pharma R&D
- Teaching experience from The Danish Society of Engineers, Technical University of Denmark and numerous in-service training courses
- Co-founder of Seydlitz United Consultants. Provides consultancy and engineering training courses and seminars

(Guest speakers)



Fee

The course fee is payable in advance either via direct deposit (details included in the invoice) or via credit card payment available upon online registration at our homepage.

The course fee includes all course presentations, calculation exercises and solutions, selected scientific papers as well as course diploma (all in PDF format).

All course material is available for download well in advance of the course.

Per delegate EUR 1975,- plus VAT. VAT is reclaimable.

Registration

Binding registration at www.seydlitz.dk/courses no later than 15th of October 2020.

In case of any questions please contact Info@seydlitz.dk or phone **+45 44 10 87 00**.

The course may be subject to cancellation in case of too few participants.

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Course contents

CET time zone

Day 1: Subject

10.00 - 10.15	Course introduction, participant introduction and setting the scene for expectations. Introduction of the scientific pocket calculator with small examples.
10.15 - 12.00	Introduction to "downstream processing", What does "Unit Operations" cover and what is the overall goal? (quantity or quality?), Introduction to the four main processes (First separation, product concentration, purification, polishing). Fundamental calculations for correct equipment dimensioning: mass balances, notations and flow diagrams, batch and continuous systems.
12.00 - 13.00	Lunch
13.00 - 14.00	Introduction to liquid and gas flow: Reynold's number, Ideal fluids, Bernoullis' equation, Poiseulles law, friction factor and coefficient, hydraulic diameter, how to measure flow.
14.00 - 15.00	Theory of pumps: Designs and principles of operation, advantages and disadvantages of the different types.
15.00 - 16.30	Novel innovations in pump designs - case stories presented by 

Day 2: Subject

9.00 - 10.00	Mixing and stirring of fluids, stirrer types and their use: advantages/disadvantages. Mixing and blending of solids, segregation issues and how to solve them.
10.00 - 12.00	Filtration: Introduction to filtration processes and principles, Filtration theory, Equipment principles, capacity and what to consider when optimising and finding the right filtration method, Examples from industry.
12.00 - 13.00	Lunch
13.00 - 15.00	Membrane processes, Reverse Osmosis, Ultrafiltration, Microfiltration, Electrodialysis, Equipment and areas of use, Membrane materials and efficiency, What to consider when optimising the process, Examples from the industry.
15.00 - 16.30	Novel innovations in the separation industry - case stories presented by 

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Course contents - continued



CET time zone

Day 3:	Subject
9.00 – 10.45	Solid/fluid separation, Sedimentation processes, Particle terminal velocity and Stokes law, Thickeners, Sieving, Solid/gas separation, Cyclones and fluidisation
10.45 – 12.00	Solid/fluid separation continued: Centrifuges, Decanters, Drum filtration and mechanical separators
12.00 – 13.00	Lunch
13.00 – 13.30	Process economy in Downstream Processing.
13.30 – 15.00	Drying processes, Moisture in air, Mollier diagrams (H-X diagrams), Conditioning of air, Introduction to drying equipment, principles of operation and calculation of drying velocity
15.00 – 16.00	Heat transmission. Theory and terms, heat conduction & convection, heat exchangers, equipment and design principles General transport phenomena analogies to mass, volume and momentum transport
16.00	Final remarks, Course diplomas, Course evaluation

Please see all of our courses at:

www.seydlitz.dk/courses