EFCE Spotlight Talks

10 Webinars

from
23 November
to
4 December
2020

EFCE
European Federation of Chemical Engineering

The European Federation of Chemical Engineers (EFCE) is organising a series of free virtual spotlight talks on significant topics in Chemical Engineering. Eleven of our technical groups (Working Parties and Sections) are delivering short sessions of three or four talks by leading industrial and academic experts on:

> **Chemical Reaction Engineering, Education, Energy, Loss Prevention and Process Safety, Mechanics of Particulate Solids, Mixing, Multiphase Flow, Process Intensification, Quality by Design, Static Electricity in industry, Thermodynamics and Transport Properties.**

Each session will focus on key topics in the area and the series enables attendees to sample topics in areas that they find interesting but may not otherwise have had the opportunity to attend to encourage cross fertilisation between specialist areas.

Energy talks will address the role of carbon capture and storage as we move to a negative carbon society bringing a Chemical Engineering approach to the discussion. The Thermodynamics webinar will focus on thermodynamic tools for CO2 capture. The Chemical Reaction session will address the role of electrification in the chemical industry. Quality by Design will discuss tools for the optimization of (bio)pharma processes such a system modelling, machine learning and digital twins. The Multiscale Flow and Mixing session will explore a promising modelling approach using of macroscale "compartments" which differ in certain properties of the flow, concentration and particle characteristic while the Mechanics of Particulate Solids considers common problems with conventional solid materials and renewable feedstocks. Process Intensification will focus on embedding life long learning of this now relatively mature topic. Electrostatics in Industry will discuss some specific cases where practical lessons can be drawn. Loss Prevention and Safety discusses resilience and safety of industrial clusters. Education session will focus on the changes brought about by Covid-19 on teaching methods and the new tools put in place.

The EFCE promotes scientific collaboration and supported the work of chemical engineers and collaborating professionals in 30 European countries representing more than 100,000 chemical engineers in Europe. With its Working Parties and Sections it covers all areas of Chemical Engineering.
EFCE's **Working Parties & Sections are at the core** of the organisation and form the scientific engine that drives many of EFCE's activities. Each of its 20 Working Parties focuses on a specific aspect of Chemical Engineering. They provide an important forum for networking among chemical engineers in Europe. Membership to the Working Parties is drawn from among EFCE's Member Societies. The five Sections are open to any professional chemical engineer, or a specialist in a related field, who is willing to contribute to the activities of an EFCE Section and of the Federation.

Further details and the registration links will soon be available at:
https://efce.info/Spotlight_Talks.html

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EFCE Spotlight Talks

Working Party on Static electricity in industry

23 November

13:00 • 15:15 CET

Electrostatics in industry: risks, measurements and materials

Static Electricity is present in many industrial processes, very often unnoticed, until something happens surprisingly, normally a spark apparently coming from nowhere. In other occasions materials stick to each other and difficult their handling or processing. And, even more, in some applications like electronic components or circuits production there is no apparent evidence of its presence but many components are damaged and become unusable because of static voltages. Static Electricity is often misunderstood due to its complex nature. It is not easy to identify neither the generation process nor its dissipation or accumulation mechanisms. In this Webinar we will give some insights on four aspects of the Static Electricity in Industrial situations from electrostatic incidents in industry to measurement techniques and material's properties.

There are never enough lessons learned from incidents in industry, many of them are not completely explained. ***Dr. Simon Egan*** *will describe, analyze and draw conclusions from five electrostatic incidents in industry. The root causes, the physical process and its consequences will be shown.* ***Dr. Philippe Molinié*** *will present the basis of electrostatic measurements to make them comprehensible. Very often reading some hundreds Volts in an electrostatic meter requires an interpretation to fully understand the meaning of this magnitude. Some measurement setups in standards will be analyzed in order to explain their physical basis and meaning.* ***Dr. Jeremy Smallwood*** *will focus on some aspects of practical measurements often needed for ATEX atmosphere Zone areas. An overview of the IEC 60079-32-2 standard will be given. Finally,* ***Dr. Paul Holdstock*** *will describe the electrostatic properties of materials for personal protective equipment, its importance and applications. Again, measuring correctly electrostatic properties of materials in its final application situation is a real challenge. Development of new full garment test methods will be presented. This proposed measurement method can inspire solutions in other situations.*

PROGRAM

13:00	**Welcome and introduction** Pedro Llovera-Segovia, Chair of WP Static Electricity in Industry
13:15	**Learning lessons from five electrostatic incidents** Simon Egan, Solvay - France
13:45	**Understanding Electrostatic measurements: basic principles and standards** Philippe Molinié, Centrale Supélect - France
14:15	**Practical measurements for working in ATEX Zones: application of IEC 60079-32-2** Jeremy Smallwood, Electrostatic Solutions - UK
14:45	**Electrostatic properties of PPE and development of new full garment test methods** Paul Holdstock, Holdstock Technical Services - UK
15:15	**Conclusions and closing** Pedro Llovera-Segovia, Chair of WP Static Electricity in Industry

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EFCE Spotlight Talks

Working Party on Loss Prevention and Safety Promotion in the Process Industries

24 November

13:30 • 15:30 CET

Engineering Loss Prevention and Safety 4.0

Loss Prevention and Process Safety are matters that continuously demand attention and improvement; these must continuously renovate and innovate, every day again following scientific research and developments. Many challenges are still to be addressed in order to make further progress in safety and sustainability of plants and processes in a full transition towards Safety 4.0. From one side, the emphasis on digitalisation is about identifying the benefits of this technology to the management of major hazards, from the other side it is connected to the need of ensuring the risks of the technology are understood and correctly managed. This webinar will provide you a vision of new approaches needed to re-engineering process safety and the way technological risk should be managed.

World class experts in the field will address four main challenges:

- *how resilience analysis covering both plant and management system level should hedge for the unexpected and unknown, thus contributing to loss prevention, business continuity and sustainability;*
- *challenges in process safety related to NaTech scenarios, an emerging risk in close relation with climate change and increase in frequency, intensity, duration and spatial extent of extreme weather events;*
- *new concepts and tools for asset integrity, including probabilistic digital twins, information theory based probabilistic risk assessment and machine learning based approaches;*
- *how cluster-thinking for safety and security improvement is the way forward for resilient and profitable chemical clusters.*

PROGRAM

Introduction
Bruno Fabiano, Chair of Working Party on Loss Prevention

What is Plant Resilience, and Why is it a necessity ?
Hans J. Pasman, Texas A & M University, Texas - USA

Natech Scenarios due to the Interaction of Chemical and Natural Hazards: a new Challenge for Process Safety
Valerio Cozzani, University of Bologna – Italy

Condition monitoring-based Asset Integrity Management in the Process Industries
Ming Yang, TU Delft - The Netherlands

Safety and Physical Security in (Petro)Chemical clusters: a part of Engineering Loss Prevention of the Future
Genserik Reniers, TU Delft - The Netherlands ; KULeuven – Belgium

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EFCE Spotlight Talks

Section on Energy

25 November

11:00 • 13:00 CET

CCU(vs.)S:
How chemical engineering can shed light on challenges and opportunities of carbon capture and storage (CCS) and carbon capture and utilization (CCU) in a climate positive society ?

EFCE

This webinar addresses the role of carbon capture storage and utilization in the transition to a CO2 negative society, and discusses the different challenges and opportunities of storing the captured CO2 vs. reusing it. The need to achieve net-zero global CO2 emissions by around 2050 and to effectively remove CO2 from the atmosphere later, lest allowing for an average temperature increase above 1.5 C, has brought carbon capture solutions under the spotlight in many climate mitigation plans. Not only do they allow for abating CO2 emissions in hard-to-decarbonize industrial processes, e.g. cement and steelworks, but also for tackling emissions from existing fossil fuel assets, e.g. coal plants in Asia.

As carbon capture is reclaiming a key role for a timely decarbonization of our society, an intense debate has sparked on the specific role of carbon capture and storage (CCS) vs. carbon capture and utilization (CCU) or probably an ingenious combination of both. While the former aims at permanent storage of CO2 – injected in the deep underground or fixed in stable composites on the ground – the latter aims at reusing CO2 as (carbon) source for a further production process combination.*

A sound chemical engineering approach to the discussion, where the analysis of technology details is intertwined with a system perspective from materials selection to the integrated plant level, has the potential of bringing clarity on the challenges and opportunities of the two routes and any potential amalgamation of short- to medium-term carbon storage with utilization. With this webinar, we bring together world-class experts in the field, who share different opinions of CCU and CCS, yet having in common a technology and system perspective.

**International Energy Agency: Energy Technology Perspectives 2020*

PROGRAM

11:00 am	**Welcome and introduction** Matteo Gazzani, Copernicus Institute of Sustainable Development - Utrecht University - The Netherlands
11:05 am	**Systems engineering considerations in deploying CCUS** Nilay Shah, Imperial College London - United Kingdom
11:30 am	**The Chicken-and-Egg problem with carbon capture and utilization** Andrea Ramirez, TU Delft - The Netherlands
11:55 am	**The role of CCU and CCS to enable a net-zero-CO2 emissions chemical industry** Marco Mazzotti, ETH Zurich - Switzerland
12:20 am	**A net-zero goal or 100% renewables? Environmental trade-offs for a future chemical industry** André Bardow, ETH Zurich – Switzerland
12:45 am	**Last round of questions and conclusions** Panos Seferlis, Aristotle University of Thessaloniki – Greece

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EFCE Spotlight Talks

Working Party on Chemical Reaction Engineering

26 November

10:30 • 11:30 CET

Electrification of the chemical industry

EFCE

With more solar and wind energy being produced, sustainable electricity supply is constantly increasing. This could offer great opportunities for the chemical industry. The supply of sustainable energy today would bring increases in energy costs, but it can also offer numerous opportunities to develop new, more efficient processes.
Process intensification (PI) methodologies are key to establishing these new designs in our process industries. Considering the applicability available, we may innovate industrial processes from idea to commercial-scale implementation.
This webinar addresses the main issues of electrification and process innovation practices, plus, aims to identify the main bottlenecks to go to a CO2 neutral chemical industry.

PROGRAM

Welcome and introduction
Pr. Olaf Hinrichsen, Chair of Working Party Chemical Reaction Engineering

Electrification of the chemical industry
Kevin Van Geem, Ghent University- Belgium

In this 60-minutes webinar, you'll learn of the benefits of applying industrial innovation practices and the many applications of electrification and process intensification in process industries.

key words:
electrification, process intensification, base chemicals, CO2 utlization, CO2 neutral chemical industry

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EFCE Spotlight Talks

Working Party on Mechanics of Particulate Solids

27 November

13:30 • 15:00 CET

Handling of particulate solids

Handling of bulk solids in process industries can often be the bottleneck for the reliability of plant operations and for the quality of the final granular product.
Segregation and caking are among the key issues affecting the properties of products made of conventional granular solids and fine powders.
Recent efforts towards sustainable technologies included the development of bioprocesses and power plants using biomass particulate solids. These materials can cause critical handling operations due to particle elasticity and extreme particle shape.
These webinars aim at addressing these issues by presenting industrial case studies, current practices and future challenges.

PROGRAM

Biomass - SNAFU (Situation Normal, All Fouled Up!)
Michael Bradley, Professor and Director of The Wolfson Centre for Bulk Solids Handling Technology at the University of Greenwich - UK

Caking of powders in product bags during transport
Jairo Paternina, Senior Consultant at Jenike & Johanson - USA

Prediction and Mitigation of Powder Segregation in Bulk Handling Systems
Kerry Johanson, Chief Operations Officer at Material Flow Solutions Inc. - USA

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EFCE Spotlight Talks

Working Party on Education

30 November

10:30 • 12:00 CET

Chemical engineering education in Covid-19 era - experiences in ensuring distance learning achieves the necessary learning outcomes ?

EFCE

The world is dealing with an unprecedented crisis, which has forced us to profoundly change our ways of working and teaching in particular. We all had to rapidly introduce new tools into our courses, tutorials, labs, projects... and exams within a distance teaching delivery, with varying degrees of ease, and questions about their effectiveness in achieving the learning outcomes. This Webinar will present some examples, taken from experiences of members of the Working Party Education, on the implementation of active teaching methodologies in a distance learning setting.

PROGRAM

Introduction
Eric Schaer, Chair of Working Party on Education

Teaching chemical engineers advanced modelling skills in the post-Covid-19 era
Jarka Glassey, School of Engineering, Newcastle University – UK

Student-generated exams with added constraints
Marcel Liauw, RWTH Aachen University – Germany

Learning innovative thinking and teamworking: virtual conference and pear-assessment for chemical engineering master students
Edit Szekely, Budapest Univ. Technology and Economics – Hungary

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EFCE Spotlight Talks

Working Parties on Mixing and Multiphase Fluid Flow

1st December

9:00 • 11:30 CET

Multiscale Mixing in Multiphase Flows

Multiscale mixing processes play a dominant role in all multiphase flows. From molecular heat- and mass transfer within boundary layers at each particle (bubbles, droplets, solids) dispersed in a continuous liquid phase and effects on the micro- and mesoscale such as Marangoni convection, particle wake and turbulent mixing, up to mixing on the industrial scale. Limitations occur at all scales and affect the yield and selectivity of many processes in the chemical, biopharmaceutical, petrochemical and related industries. A particular challenge in the experimental investigation and modelling of such multiphase, multiscale mixing processes is the need for high temporal and scale resolution. A promising approach to bridge scales and to overcome such difficulties is the use of macroscale "compartments", which differ in certain properties of the flow, concentration and particle characteristics. However, the detection and characterization of such compartments is not trivial and needs high sophisticated experimental and numerical methods to obtain detailed information at smaller scales.
This highly interdisciplinary topic between the disciplines of "mixing" and "multiphase flows" will be addressed in this webinar. Participants from both academia and industry are very welcome.

PROGRAM

9:00 am	**Welcome and introduction** Joelle Aubin, Chair of Working Party Mixing
9:10 am	**Interscale Multiphase Mixing - from Micro to Large Scale - an interdisciplinary approach** Michael Schlüter, Chair of Working Party Multiphase Fluid Flow
9:30 am	**Mixing and mass transfer in bubble columns for industrial applications** Dale McClure, University of Sydney - Australia
10:00 am	**Challenges in Scale-up of Cell Culture Processes - Gentle Mixing vs. Mass Transfer Performance** Thomas Wucherpfennig, Boehringer Ingelheim Pharma GmbH & Co. KG, Germany
10:30 am	**Recent Advances and Challenges in the Multi-Scale Modeling of Multiphase Flows with Deformable Interfaces** Hans Kuipers, TU Eindhoven - The Netherlands
11:00 am	**Bubble Column Fluid Dynamics: a novel perspective for flow regimes** Giorgio Besagni, Ricerca sul Sistema Energetico - Italy
11:30 am	**Conclusion** Joelle Aubin, Chair of Working Party Mixing

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EFCE Spotlight Talks

Working Party on Process Intensification

2 December

10:30 • 12:30 CET

Lifelong Learning of Process Intensification for an Innovative industry

EFCE

In this seminar we turn the spotlight on the importance of lifelong training of Process Intensification (PI) to ensure continued innovations in the chemical industry. We review how PI is being taught at universities and how it stirs innovation- and sustainability-oriented thinking with the students. But also during industrial careers PI training remains important as it is intimately linked with the drive to innovation in process technology. Finally an example of PI in an industrial process is shown. This seminar is oriented at both academia and industry interested in new technology development.

PROGRAM

10:30 am	**introduction** Prof. Tom Van Gerven, KU Leuven – Belgium Chairman of the EFCE Working Party on Process Intensification
10:45 am	**Process Intensification education review** Prof. David Rivas, University of Twente, Enschede - The Netherlands CTO BuBclean
11:15 am	*break*
11:30 am	**Process Intensification training for industry** Ir. Jan Harmsen, Harmsen Consultancy BV, Zuidplas - The Netherlands Prof. Maarten Verkerk, Maastricht University -The Netherlands
12:00 am	**Eliminating the need for liquid bromine by means of flow technology** Dr. Wim Dermaut, Agfa Gevaert NV, Mortsel – Belgium 2019 Process Intensification Award winner for Industrial Innovation

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EFCE Spotlight Talks

Working Party on Thermodynamics and Transport Properties

3 December

13:30 • 15:00 CET

Thermodynamic tools for CO2 capture

Energy efficient carbon dioxide capture has become one of the major industrial challenges of the coming decade. Today, the energy intensive absorption with amine solvents is the only proven solution. Yet other technologies are emerging, for which thermodynamic tools are being developed. This webinar will provide insight in these new technologies.

PROGRAM

Membranes for CO2 capture: thermodynamic aspects
Prof. Maria Grazia De Angelis, U. of Bologna (Italy)

Membrane separations appear as an economic and sustainable alternative to liquid-based processes in the removal of CO2 from gaseous streams in many industrial cases. In membrane processes, a leading role is played by the membrane material performance and its response to pressure, temperature, gas mixture composition and presence of impurities.
In the quest for the "Holy Grail" of membrane materials for CO2 capture, it is important to use accurate thermodynamic and transport models which can simulate the material behavior in a wide range of conditions, so to select the optimal polymeric membrane and enable an accurate design of the process.
In this webinar we will introduce and review the most advanced theoretical tools to simulate the membrane performance, in terms of selectivity and permeability, in realistic multicomponent conditions, taking the process of CO2 removal from natural gas and biogas as a case study.
In particular, the polymeric membrane performance, that follows the solution-diffusion mechanism, can be predicted with equilibrium and non-equilibrium models for solubility based on equations of state like the SAFT and PC-SAFT ones, coupled to free-volume based models for diffusion.

Thermodynamic approach of demixing solvents
Dr. Pascal Mougin, IFP Energies nouvelles (France)

In the context of post-combustion CO2 capture, the search for new solvents is a very active path of research with the aim of reducing the energy cost of the capture process. This separation is based on the principle of a basic solvent that absorbs the acid gas and is recycled at high temperature and this last operation gives the cost of the process. A recent innovation proposed by IFPEN is to use a demixing solvent. After the CO2 absorption stage, the charged solvent is heated which leads to a liquid-liquid phase separation and thus it is possible to regenerate only the solvent rich in acid gas which reduces the energy cost of regeneration.
A large part of the data necessary for the dimensioning of the process concerns thermodynamic data: phase equilibrium, enthalpies and volumetric properties. Obtaining such data requires the use of different equipment to obtain these experimental data and their modeling uses reactive equilibria combining physical phase equilibrium and chemical reactions in the liquid phase. Reactive equilibria are generally represented by activity approaches dedicated to electrolytes: Debye-Hückel, Deshmukh-Mather, e-NRTL... and the enthalpic aspects are derived from Gibbs-Helmholtz equations.
In this webinar, we will present the experimental means necessary for the development of simulation tools and will discuss the development of such models to provide process tools.

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EFCE Spotlight Talks

Working Party on Quality by Design

4 December

13:30 • 15:00 CET

Quality by Design tools for the Optimization of (Bio-)Pharma Processes System Modelling, Machine Learning and Digital Twins

EFCE

Pharmaceutical processes face economic challenges by product patent expiry or unmet product quality leading to fail batches. Hence, strategies for process optimization are of utmost interest, for which the Quality by Design concept provides a multitude of suitable methods. This webinar demonstrates, with industrial case studies with pharmaceutical and biopharmaceutical processes, how systems modelling, machine learning and digital twins can be used to accelerate gaining transferable process understanding in the development phase as well as to provide a robust manufacturing control strategy.

PROGRAM

Accelerating biopharmaceutical process scale-up/down through machine learning
Dr. Pierantonio Facco, University of Padova - IT

System modelling to assist the technical risk assessment and the control strategy definition of a dry granulation process for an immediate release tablet
Dr. Gabriele Bano, GSK - UK

Digital Twin Based Optimization of cell cultures
Dr. Christoph Herwig & Dr. Julian Kager, TU WIEN - AT

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