European Federation of Chemical Engineering
Europäische Föderation für Chemie-Ingenieur-Wesen
Fédération Européenne de Génie Chimique

NEWS AND EVENTS APRIL 2022

The European Chemical Engineering Skills Pipeline

**David Bogle, University College London,
EFCE Scientific Vice President 2018–2021**

The Need for Chemical Engineers

Chemical Engineering skills are core to the success of the process industries which enable so many everyday products expected by consumers – transportation fuels, plastic goods, personal products, medicines, foodstuffs etc. - to be manufactured. They also have a vital role at the heart of many of the world's greatest challenges: developing a sustainable future and tackling the pandemic to name just two. Chemical Engineers are employed by many industrial sectors as well as in regulatory authorities, arms of government, the charitable sector, and education. The salary premium for Chemical Engineers is high[1] demonstrating that they are held in high regard.

This article aims to explore whether the ecosystem for developing Chemical Engineers in Europe is optimal and consistent to ensure that demand is satisfied. The European Federation of Chemical Engineers represents more than 100,000 chemical engineers in Europe giving it a particular interest in the pipeline of Chemical Engineers across Europe. It was formed in 1953 to promote scientific collaboration and support the work of chemical engineers in 30 European countries. Over the years student recruitment has depended on economic cycles and the

[1] *interestingengineering.com/chemical-engineering-salaries-worldwide*

Dear Readers,

Welcome you to the second 2022 issue of EFCE News!

This issue contains much information about next EFCE activities and events and hopefully it will inspire you to actively participate to them.

If you have any comments/suggestions, please contacts us.

With kind regards

Giorgio Veronesi
EFCE President

In this issue:

performance of the relevant industrial sectors. Currently student recruitment is buoyant in many countries but age profiles within the academic community are quite diverse across Europe. By bringing together some statistics of age profiles and student to staff ratios this article aims to build a picture of good practice. This will help national Member Societies in EFCE member countries and Universities to argue for more academic recruitment to maintain a strong discipline basis for Chemical Engineering in each country, if it is out of line with best practice. Consistent data is difficult to get. There is some information on Eurostat but the definitions and processes used were very out of line with how the Chemical Engineering community sees itself. The article first outlines the methodology used, presents the results, and then discusses them in the context of the assumptions made and the different conditions in countries across Europe. Data was not available for all countries with EFCE member organisations but comparisons can be made across the majority of countries. Finally some conclusions are drawn about the consistency across Europe and what might be done to address inconsistencies.

Methodology

Member Societies were asked to give five numbers about teaching for Chemical Engineering degrees in Universities (including Universities of Applied Science where appropriate) in their country:

1. Numbers of teaching staff (Full Time Equivalent) in Chemical Engineering Departments (or in some cases broader Schools or Faculties) – including academic staff, assistants, and teaching fellows but not postgraduates and postdocs who teach unless it is a major part of their responsibilities. The aim was to get the number who really have responsibility for teaching and assessment of Chemical Engineering studies.
2. Average age of the Chemical Engineering teaching staff (as defined in 1)
3. Total number of students within Chemical Engineering Departments in all years (all students i.e. including Bachelor, Masters and PhD but not post experience short courses) for the most recent year available.
4. The number of graduating Chemical Engineers with degrees (only Bachelor and Masters level) for the most recent year that was available.

The way Chemical Engineering education is organized differs between countries. Chemical Engineering can embrace Chemical Technology, Process Chemistry, Process Biotechnology etc. but some do not include the same elements as others. The approach used here was to allow countries to define for themselves how they would draw the envelope around Chemical Engineering. Societies were asked to include those courses that graduate what they recognize broadly as Chemical Engineers and not those that include only a small element of Chemical Engineering. This means that definitions may vary across the member countries and organisations and may depend on the strategic needs of the country as to where Chemical Engineers are mostly deployed.

Data was collected for eighteen countries: Croatia, Czech Republic, Denmark, France, Germany, Greece, Italy, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom and Ukraine. It was surprisingly difficult to collect the data as most Societies do not collect this information and so in some cases it was necessary to contact staff within the education systems. It was not possible to obtain figures for Bulgaria, Estonia, Finland, Hungary, Latvia, Russia, Serbia, Turkey, and Norway and only partial figures were available for Ireland and were not sufficient to be comparable.

Germany is a particularly complex case but the numbers are large given the significance of the German chemical industry. In data collected by German agencies Chemical Engineering is not disaggregated from Mechanical Engineering. A dedicated survey was undertaken through a partnership between EFCE, ProcessNet and the Dechema Fachgemeinschaft Biotechnology with the purpose of capturing a first impression of the situation in Germany and this data is included here.

Results

Table 1 shows the data that were obtained. It is data mostly for 2018 with some more recent and the degree of accuracy is variable. However we are looking for significant trends so the data can be considered accurate as an Engineering approximation to allow drawing some conclusions.

The raw data obtained (shown in Table 1) gives numbers of teaching staff (Full Time Equivalent) for whom teaching is a major part of their responsibilities; their average age; the total number of students within Chemical Engineering Departments in all years; and the number of graduating Chemical Engineers with

	Teaching staff	Average age of staff	Students (B,M&D)	Student/ staff ratio	Graduates (B,M)	ChE Grads per 100K population	ChE Grads per 1000 Chem Ind workforce
Croatia	69	46	1032	15.0	179	4.2	3.0
Czech R	409	49.5	4296	10.5	550	5.3	4.2
Denmark	67	44	442	6.6	171	3.1	16.0
France	550	49	4360	7.9	1550	2.3	9.3
Germany	1272	50	22167	17.4	4050	4.9	8.8
Greece	62	54	1079	17.4	135	1.2	10.0
Italy	400	55	5500	13.8	1375	2.3	12.5
Lithuania	40	45.2	248	6.2	55	1.9	8.7
Netherlands	166.3	48	2900	17.4	974	5.8	17.1
Poland	533	46	4881	9.2	1114	2.9	8.7
Portugal	302	53.4	2853	9.4	565	5.3	38.7
Romania	360	46.2	3010	8.4	770	3.9	34.2
Slovakia	22.5	49	158	7.0	52	2.5	1.1
Slovenia	35	45	600	17.1	150	7.3	4.8
Spain	900	43-47	11600	12.9	2500	5.3	12.7
Sweden	135	45	1300	9.6	202	2.1	3.9
Switzerland	110	46	810	7.4	260	3.3	3.7
UK	1028	45	16030	15.6	4206	6.3	27.5
Ukraine	194	57	462	2.4	70	0.17	Not available

Table 1 – Staff and student figures for Chemical Engineering

Bachelors or Masters degrees.

From this were calculated the student/staff ratio, the number of Chemical Engineering Graduates per 100,000 population and the number of graduates per 1000 in the national Chemical industry workforce as reported to CEFIC. These are shown in the subsequent tables (Tables 2-5) presented in rank order for each particular indicator. Table 6 gives the number of people employed in the Chemical industry as reported to CEFIC for the year 2018.

Discussion

It is possible to make some comparisons on the basis of these indicators although comparisons between countries need to be made with care. The total numbers of staff and students for each country needs to be considered with respect to the breadth of courses considered, the industrial base of the country, the duration of the courses and the extent of recruitment of Chemical Engineers to employment beyond the traditional industries of chemicals, pharmaceuticals, oil and gas. While bearing these issues in mind and recognising that there is no ideal profile, we can look at some overall trends.

Tables 2 (age) and 3 (student/staff ratio) give an indication of the investment in Chemical Engineering education by the countries over recent decades. Lead times for seeing the effects of new staff investment are long since academics with substantive responsibility are often appointed in their early 30s. For those countries where the average age is high it means that over the last 20 years or so there has been less investment in young staff leading to an aging staff profile. Of course averages can hide unusual age distributions but mostly staff are appointed rarely and in a steady fashion except where a new institution or Department is started.

Denmark, Slovenia, Sweden, U.K and Lithuania are at the lower end. The case of the UK is interesting since there is now no

	Average age of staff
Denmark	44
Slovenia	45
Sweden	45
UK	45
Spain	43-47
Lithuania	45.2
Croatia	46
Switzerland	46
Romania	46.2
Netherlands	48
Slovakia	49
Czech Republic	49.5
Germany	50
Portugal	53.4
Greece	54
Italy	55
Ukraine	57
France	N/A

Table 2 – Average age of staff

	Student/staff ratio
Greece	17.4
Netherlands	17.4
Germany	17.4
Slovenia	17.1
UK	15.6
Croatia	15
Italy	13.8
Spain	12.9
Czech Republic	10.5
Sweden	9.6
Portugal	9.4
Poland	9.2
Romania	8.4
France	7.9
Switzerland	7.4
Slovakia	7
Denmark	6.6
Lithuania	6.2
Ukraine	2.4

Table 3 – Student/staff ratio

retirement age so staff can continue in post for much longer so we could expect a higher average. It indicates that there has been a continual renewal leading to a low average. UK Universities have complete freedom in recruitment. This is not the case in some other countries where national competitions are organised, staff are appointed as public servants employed by the state, and Ministries can control the number of posts that are opened. This is the case in Spain and Italy and others although there is increasing pressure for more institutional freedom in recruitment. Ukraine reported the oldest average and colleagues there confirmed that there has been little recruitment in recent years. Italy has had recruitment freezes in the last decade. The financial situation in Greece has affected recruitment in Universities across all disciplines and Chemical Engineering is no exception.

The student/staff ratio varies very considerably from around 17:1 to 6:1 (the figure for Ukraine is a clear outlier based possibly on a rather different organisation of the studies). Some of this may reflect how teaching staff are defined but the range is striking. This is affected by the stage in the curriculum at which Chemical Engineering academics included here begin to teach. In some cases they teach little in the early years of the study programme. In Greece there is very strong demand for places to study Chemical Engineering but the number of institutions is low. The Netherlands figure seems surprisingly high perhaps reflecting structural change in Engineering education in recent years with merging of Institutes. It seems that across Europe there are broadly two traditions: one with a ratio of around 16 and the other around 8. It is likely this reflects a different organisation of studies and of the staff that teach them.

It is interesting to see how the numbers

	Graduates per 100K population
Slovenia	7.3
UK	6.3
Netherlands	5.8
Czech Republic	5.3
Portugal	5.3
Spain	5.3
Germany	4.9
Croatia	4.2
Romania	3.9
Switzerland	3.3
Denmark	3.1
Poland	2.9
Slovakia	2.5
France	2.3
Italy	2.3
Sweden	2.1
Lithuania	1.9
Greece	1.2
Ukraine	0.17

Table 4 – Graduates per 100k population

	Graduates per 1000 Chemical Industry workforce
Portugal	38.7
Romania	34.2
UK	27.5
Netherlands	17.1
Denmark	16
Spain	12.7
Italy	12.5
Greece	10
France	9.3
Germany	8.8
Lithuania	8.7
Slovenia	4.8
Czech Republic	4.2
Sweden	3.9
Switzerland	3.7
Poland	3.5
Croatia	3
Slovakia	1.1
Ukraine	N/A

Table 5 – Graduates per 1000 Chemical Industry Workforce

compare with the size of the population as shown in Table 3 (graduates per 100,000). Comparisons must be tempered with the knowledge that the size of the industrial base varies significantly. However the formation of Chemical Engineers prepares graduates for a wide range of careers such as environmental management, energy regulation, water treatment, medical applications and many others where there is chemical and physical transformation of materials. Traditional career routes are in the chemical and energy sectors. CEFIC provides figures for employment on the chemical industry and Table 4 gives the number of graduates per 1000 employed and table 5 the CEFIC figures from which Table 4 was derived. It should be noted that the CEFIC figures include the chemical and petrochemical industry but not the pharmaceutical industry or oil refining.

Countries are producing very different numbers per head of population and per 1000 in the chemical industry workforce. Portugal's industry is relatively small but is producing graduates going into a wide range of industries and careers with a significant proportion being recruited as consulting engineers. Romania has a long tradition of producing Chemical Engineers because of the long standing size of the oil and gas sector. The UK figure is also high possibly because academic programmes and the research base have promoted the value of Chemical Engineering skills well beyond the traditional employment sectors.

Countries with relatively low numbers such as Slovakia, Croatia, Poland, Switzerland, Sweden, Czech Republic and Slovenia and could reflect whether they are indeed producing enough Chemical Engineers for the wide range of career options that are available. The figure for Switzerland is surprisingly low but, although the process industry is large, much of it is in the pharma sector and this industry does recruit

	Numbers employed in Chemical Industry (CEFIC)
Croatia	5987
Czech Republic	129500
Denmark	10657
France	166650
Germany	462553
Greece	13500
Italy	109600
Lithuania	6300
Netherlands	57000
Poland	315000
Portugal	14604
Romania	22500
Slovakia	46143
Slovenia	31000
Spain	196800
Sweden	51300
Switzerland	70000
UK	153000
Ukraine	Not available

Table 6 – Graduates per 1000 Chemical Industry Workforce

heavily from Chemistry graduates. The same may be the case for Sweden.

An interesting point is that the German figures, which were obtained for several years in succession, showed a very significant variation from year to year. The total number of students studying in 2019 was 2650, in 2020 it was around 8000 and in 2021 only 4500. The German report states 'This can be explained with the delay in curriculum and potentially unfinished data preparation due to the Corona pandemic'. Some participants stated that classes could not be carried out in 2020 causing a shift to the subsequent year 2021.' 35% of the students graduated in 2019, only 25% in 2020, and in 2021 less than 10% which supports this hypothesis. In Germany it is relatively easy to delay taking the assessment for a course thereby delaying graduation. The employment market has been relatively weak encouraging students to delay graduation. The authors of the German report's analysis reported a carefully justified average to reflect a historical trend.

Conclusions

The results show a significant variation in the various indicators across European nations. The average age of staff is not so wide but it does reflect the lack of investment in new academic staff that has been reported by colleagues in Ukraine, Italy and Greece. Student to staff ratios show a very wide range and, although some could be because of different academic structures and the way the curriculum is delivered, it should provide some ammunition to seek for greater investment in new academic staff in countries particularly as there is growing demand for Chemical Engineers in a wide range of roles beyond the process industries.

The figures in proportion to the population are harder to interpret and need to be considered by the Member Societies in each individual country to explore whether the figures indicate that there could or should be increased student recruitment. The best way might be to compare with countries of a similar industrial profile. In countries where the numbers are small it could also indicate an opportunity to promote the skills of graduate Chemical Engineers more widely. The comparisons against the Chemical industry employment numbers also need interpreting carefully but again if the number is low and there are reports of shortages by the main employers the figures would provide support for the need for more graduates. The numbers are worth considering by the main process industry employer organisations since their interest is in productivity which can be hampered by lack of skilled engineers.

It is hoped that these comparisons can help them make a stronger case for investment in new teaching staff at Universities and where appropriate for more student places. Chemical Engineering is a very portable qualification so where skills are in short supply they can be filled from other countries in Europe or beyond if the employment conditions are sufficiently attractive. The EFCE is keen to ensure that the skills base does meet the needs of the sectors that can benefit from the very powerful skill set the graduate Chemical Engineers have acquired and are valued by the traditional process industries and many new areas of employment.

Acknowledgements

The author wishes to thank the many colleagues who helped in collecting and assembling these data.

EFCE Spotlight Talks 2022

We would like to cordially welcome you to the **SPOTLIGHT TALKS 2022**, organised by the European Federation of Chemical Engineering and already the third in the series.

This year there are eight SPOTLIGHT TALKS hosted by seven EFCE Working Parties, and one EFCE Section, all scheduled at the end of April. The contributing Working Parties and the Section are: **CAPE, Crystallization, Drying, Education, High Pressure Technologies, Mixing, Multiphase Fluid Flow, Membrane Engineering.**

The webinars are completely free to attend, and promise a very inspiring and stimulating treatment of Chemical Engineering science issues!

Do not miss the **SPOTLIGHT TALKS 2022**.

Programme:

19 April 2022, 9:30 CEST
Focus on current drying research within EFCE
Working Party on Drying

20 April 2022, 9:30 CEST
Population balance modeling in gas-liquid flows: a key to more reliable process design
Working Party on Multiphase Fluid Flow

21 April 2022, 9:30 CEST
Impact of membrane engineering on the process engineering progresses
Section on Membrane Engineering

26 April 2022, 9:30 CEST
Innovative Chemical Engineering Education
Working Parties on Education

26 April 2022, 15:00 CEST
Overcoming challenges in mixing processes with evolving rheology
Working Party on Mixing

27 April 2022, 9:30 CEST
CAPE ideas for biomass uses
Working Party on Computer Aided Process Engineering (CAPE)

27 April 2022, 15:00 CEST
Technology to improve conventional chemical engineering processes
Working Party on High Pressure Technology

29 April 2022, 9:30 CEST
Role of crystallization in the production of battery materials and in battery recycling
Working Party on Crystallization

The full programme and registration are available on the event website at https://efce.info/Spotlight_Talks.html

Register NOW!

We look forward to seeing you in one of our **Spotlight Talks** soon.

EFCE Awards 2022 – Calls for nominations

2022 EFCE Excellence Award Comminution and Classification

The European Federation of Chemical Engineering (EFCE) and its Working Party on Comminution and Classification are pleased to announce the call for nominations for its first **Excellence Award in Comminution and Classification**. The Award has been instituted to recognise a PhD thesis or paper(s) of a researcher or engineer which demonstrate(s) an outstanding contribution to research and/or practice in the field.

The Award is generously sponsored by NETZSCH Grinding & Dispersing

The award consists of a certificate, a cash prize of 1,500 EUR, and a travel grant and fee waiver to attend the 17th European Symposium of Comminution & Classification (ESCC 2022) where the award will be presented. The Symposium will be held in Toulouse, France, on 27 to 29 June 2022. Furthermore, the successful candidate will be invited to make a presentation at ESCC 2022.

Nominations may be submitted by any PhD supervisor at a PhD-awarding institution in an EFCE member country or by a member of an EFCE member society. The nominated PhD thesis or paper(s) must address a topic relevant to the field of Comminution and Classification. Only PhD theses or paper(s) published between October 2019 and April 2022 are eligible for nomination.

The closing date for nominations is **30 April 2022.**

Further information about the nomination procedure, eligibility, supporting documentation and the online submission can be obtained from the EFCE website at:
https://www.efce.info/ExcellenceAward_ComminutionClassification

About the sponsor:

***NETZSCH Grinding & Dispersing** is the global leader in fine grinding and dispersing applications, in liquid as well as dry processes. Our innovative material processing solutions enable our customers to create exciting products for a sustainable world. The scope of our products ranges from laboratory machines for smallest amounts samples to machines with highest capacities in the market. We offer not only single units but also complete solutions from single process lines to turnkey plants. NETZSCH G&D is the most passionate team, bringing the future state of the art to customers across all industries. To be as close as possible to our customers we have localized our production and we are running a total of eleven laboratories around the world. Our sales and service teams are covering all global industrial regions. Innovation is the key to our future, for this reason we are aware of the importance of continuous top quality development, so it was easy for NETZSCH to decide to support this excellence award with our sponsorship.*

The following call for nomination is still open:

EFCE Excellence Award in Mechanics of Particulate Solids 2022

Closing date for nominations: **30 April 2022**

The Excellence Award is generously sponsored by **Jenike & Johanson Inc.**

Further information:
http://www.efce.info/ExcellenceAwardMPS.html

Working Party News

2022 Summer School on Crystallization

Tu Dortmund, Germany, 29 June – 2 July 2022

Organized by the EFCE Working Party on Crystallization

Each lecture will be delivered by two speakers: one from industry and one from academia. The names of the speakers will be communicated shortly.

Topics:

- Solid forms and their thermodynamics
- Nucleation and Molecular Growth
- Aggregation and Breakage
- Modelling and Control

The school will be closed by a discussion driven by the participants on the future challenges in crystallization!

Deadline and registration: The school is free of charge, but potential participants should show interest in the school by **15 April 2022**

Website for further information and registration: https://efce.info/WPC.html

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

Join the 17th International Symposium on Loss Prevention and Safety Promotion in the Process Industries – Loss Prevention 2022 *(EFCE Event No. 765)*

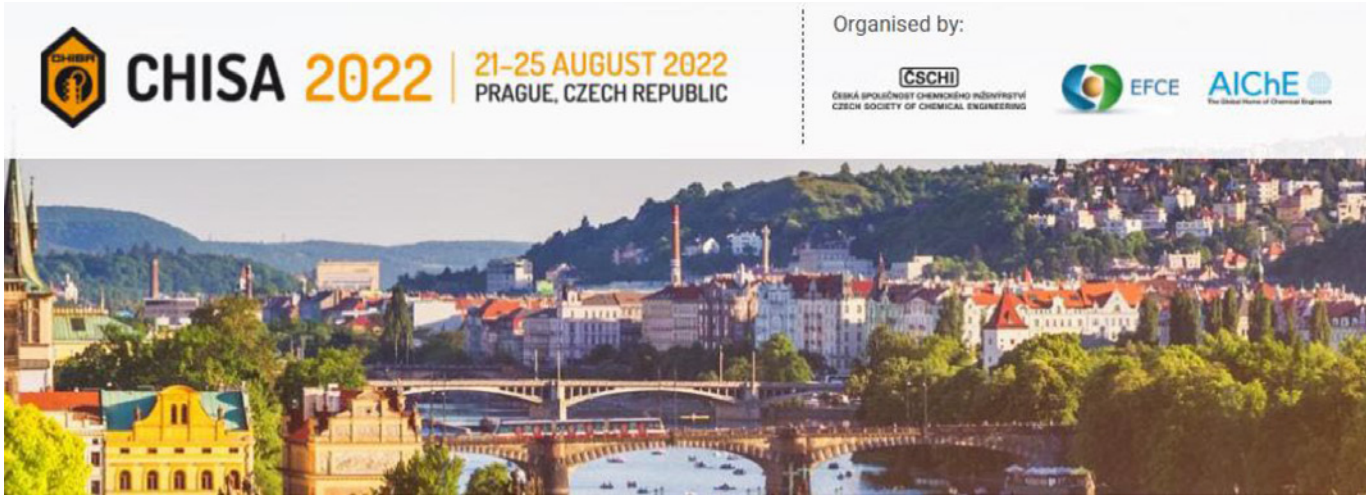
The Symposium will be held in hybrid format (online and in Prague, Czech Republic) on 5-8 June 2022

Loss Prevention 2022 is organised by the Faculty of Safety Engineering - VSB Technical University of Ostrava and the EFCE Working Party on Loss Prevention.

More than 200 submitted abstracts promise an interesting and valuable program, as well as 6 very attractive keynote lectures to be presented by the renown colleagues Stewart Behie, Valerio Cozzani, Nikos Markatos, Manfred Müller, Arjan van Dijk, and Vladimír Vlček.

Register now!

For further details, see "EFCE Events" below or visit the Symposium website at: http://www.lossprevention2022.org



Member Society News

Czech Society of Chemical Engineering (CSCHE)

The Czech Society of Chemical Engineering (CSCHE) invites you to the upcoming **CHISA 2022 – 26th International Congress of Chemical and Process Engineering** to be held in Prague, Czech Republic on 21 to 25 August 2022 (EFCE Event No. 787).

In 2022, CSCHE celebrates 60 years of CHISA Congresses under the motto "The place, where people meet people and science meets culture"

Watch the special CHISA invitation at: https://m.youtube.com/watch?v=weamBh-VAcA&feature=youtu.be&cbrd=1

Posters may be accepted up to the beginning of the Congress but only those received before 31 May 2022 will be included in the final program.

Register now!

The deadline for standard and presenting author's registration is **30 April 2022**.

For further details, see "EFCE Events" below or visit the Symposium website at: https://2022.chisa.cz/

Publication Medals of the official EFCE journals

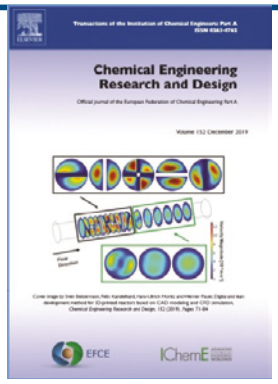
The winners of the annual publication medals have now been announced and you can currently read the winning papers for free at:

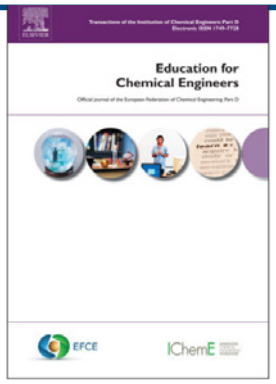
Moulton Medal - awarded to the author, or authors, of the most meritous papers published by IChemE in the last year.
https://www.sciencedirect.com/science/article/pii/S0960308521000249

Junior Moulton Medal - awarded to the author, or authors, of the most meritous papers published by IChemE in the last year. Authors witing 10 years of graduation.
https://www.sciencedirect.com/science/article/pii/S2352550921000452

Hutchison Medal - recognises an author for a contribution to the literature that has stimulated debate within the chemical engineering community.
https://www.sciencedirect.com/science/article/pii/S2352550921000956

For more information about the medals see
https://www.icheme.org/knowledge/medals-and-prizes/publications/





News about the official EFCE journals

For the latest updates on published papers, freely available content and editor and author interviews please follow the journals on Twitter:

Chemical Engineering Research and Design
https://twitter.com/ChemEngResDes

Digital Chemical Engineering
https://twitter.com/DChEJournal

Carbon Capture Science & Technology
https://twitter.com/CCSTJournal

Education for Chemical Engineers
https://twitter.com/ECEJournal

New to Twitter:

Process Safety and Environmental Protection
https://twitter.com/PSEPJournal

Read journal papers for free

The following articles / issues are set for free access periods. In addition to these, articles that are published via the open access route in the journal are also freely available to all. These are identified in ScienceDirect by a green dot. It is possible sign up to an RSS alert specifically to inform when a new open access article is published in the journal – see individual journal pages to set this up.

Chemical Engineering Research and Design

https://www.sciencedirect.com/journal/chemical-engineering-research-and-design

Freely available content:

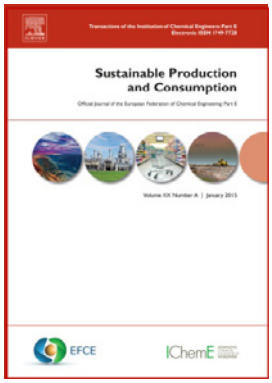
- January 2022 issue (Volume 177) https://www.sciencedirect.com/journal/chemical-engineering-research-and-design/vol/177/suppl/C
- **NEW** Development and Application of Membranes for Challenging Environments https://www.sciencedirect.com/journal/chemical-engineering-research-and-design/special-issue/10W9MH3L1X1
- **NEW** International Symposium of Reaction Engineering, Catalysis & Sustainable Energy (RECaSE 2021) https://www.sciencedirect.com/journal/chemical-engineering-research-and-design/special-issue/10GXCFJ1FWX

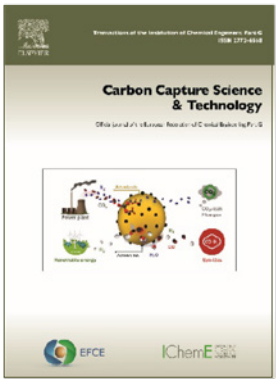
Process Safety and Environmental Protection

https://www.sciencedirect.com/journal/process-safety-and-environmental-protection

Freely available content:

- January 2022 issue (Volume 157) https://www.sciencedirect.com/journal/process-safety-and-environmental-protection/vol/157/suppl/C





- **NEW** Safety, environmental and risk management related to Covid-19

  https://www.sciencedirect.com/journal/process-safety-and-environmental-protection/special-issue/10D5W6RGHXZ

- **NEW** Emerging Trends in Thermocatalytic, Photocatalytic, Electrocatalytic, Photoeletrocatalytic and Biological Conversion of Harmful Gases into Benign Compounds for Environmental Protection

  https://www.sciencedirect.com/journal/process-safety-and-environmental-protection/special-issue/108DDZFFT5Q

- **NEW** Air Pollution Prevention and Pollution Source Identification of Chemical Industrial Parks

  https://www.sciencedirect.com/journal/process-safety-and-environmental-protection/special-issue/10CBFZHN2P2

- Data Analytics in Process Safety

  https://www.sciencedirect.com/journal/process-safety-and-environmental-protection/special-issue/10QCVQMKQ1W

PSEP – Editor's Choice Paper – Read for Free

https://www.sciencedirect.com/science/article/abs/pii/S0957582022000179

Food and Bioproducts Processing

https://www.sciencedirect.com/journal/food-and-bioproducts-processing

Freely available content:

- January 2022 issue (Volume 131)
  https://www.sciencedirect.com/journal/food-and-bioproducts-processing/vol/131/suppl/C

Education for Chemical Engineers

https://www.sciencedirect.com/journal/education-for-chemical-engineers

Freely available content:

- January 2022 issue (Volume 38)

  https://www.sciencedirect.com/journal/education-for-chemical-engineers/vol/38/suppl/C

Sustainable Production and Consumption

https://www.sciencedirect.com/journal/sustainable-production-and-consumption

Freely available content:

- January 2022 issue (Volume 29)

  https://www.sciencedirect.com/journal/sustainable-production-and-consumption/vol/29/suppl/C

Digital Chemical Engineering

Gold Open Access – APC (Author Processing Charge) fully waived on all submissions received before 29 May 2022

Freely available content:

- **NEW** All content freely available at:

  https://www.sciencedirect.com/journal/digital-chemical-engineering

Carbon Capture Science & Technology

Freely available content:

- **NEW** All content freely available at:

  https://www.sciencedirect.com/journal/carbon-capture-science-and-technology

Invitation to submit papers

We have a number of special issues planned that are currently open for submission. Submissions from all welcome! If you require any further information then please contact Managing Editor Catherine Cliffe ccliffe@icheme.org

Details as follows:

Chemical Engineering Research and Design

NEW Special Issue: Chemical Engineering in Latin America: Challenges and Opportunities (Manuscript submission deadline **31 May 2022**)

https://www.journals.elsevier.com/chemical-engineering-research-and-design/call-for-papers/special-issue-chemical-engineering-in-latin-america-challenges-and-opportunities

NEW Special Issue: Intelligent Green Oil and Gas Engineering (Manuscript submission deadline **31 May 2022**)

https://www.journals.elsevier.com/chemical-engineering-research-and-design/call-for-papers/special-issue-intelligent-green-oil-and-gas-engineering

Special Issue: Extended Application of Biomass-based Activated Carbon in Water and

Wastewater Treatment (Manuscript submission deadline **30 June 2022**)

https://www.journals.elsevier.com/chemical-engineering-research-and-design/call-for-papers/special-issue-extended-application-of-biomass-based-activated-carbon-in-water-and-wastewater-treatment

NEW Special Issue: Enabling Technologies for Biopharmaceutical Process Development and Manufacturing (Manuscript submission deadline **30 September 2022**)

https://www.journals.elsevier.com/chemical-engineering-research-and-design/call-for-papers/special-issue-enabling-technologies-for-biopharmaceutical-process-development-and-manufacturing

Process Safety and Environmental Protection

NEW Special issue: Aqueous Emerging Pollutants and Treatment (Manuscript submission deadline **30 June 2022**)

https://www.journals.elsevier.com/process-safety-and-environmental-protection/call-for-papers/special-issue-aqueous-emerging-pollutants-and-treatment

Special issue: Resilience Assessment and Management (Manuscript submission deadline **31 August 2022**)

https://www.journals.elsevier.com/process-safety-and-environmental-protection/call-for-papers/special-issue-resilience-assessment-and-management

Education for Chemical Engineers

NEW Special issue: Accreditation (Manuscript submission deadline **30 June 2022**)

https://www.journals.elsevier.com/education-for-chemical-engineers/call-for-papers/special-issue-accreditation

Sustainable Production and Consumption

Special issue: Digital Transformation for Sustainable Production and Consumption (Manuscript submission deadline **31 May 2022**)

https://www.journals.elsevier.com/sustainable-production-and-consumption/call-for-papers/special-issue-on-digital-transformation-for-sustainable-production-and-consumption

Special issue: Circular Economy as a Driver for Achieving Sustainable Production and Consumption (Manuscript submission deadline **31 July 2022**)

https://www.journals.elsevier.com/sustainable-production-and-consumption/call-for-papers/special-issue-on-circular-economy-as-a-driver-for-achieving-sustainable-production-and-consumption

Digital Chemical Engineering

Special issue: Emerging Stars in Digital Chemical Engineering (Nomination deadline **30 April 2022**)

https://www.journals.elsevier.com/digital-chemical-engineering/call-for-papers/emerging-stars-in-digital-chemical-engineering

Special issue: Advances in the Digitalisation of the Process Industries (Manuscript submis-sion deadline **15 May 2022**)

https://www.journals.elsevier.com/digital-chemical-engineering/call-for-papers/special-issue-on-advances-in-the-digitalisation-of-the-process-industries

NEW Special issue: Autonomy, Safety, and Security for Cyber-Physical Systems in the Process Industries (Manuscript submission deadline **30 November 2022**)

https://www.journals.elsevier.com/digital-chemical-engineering/call-for-papers/special-issue-autonomy-safety-and-security-for-cyber-physical-systems-in-the-process-industries

Carbon Capture Science & Technology

Special issue: Nanomaterials Tailored for CO_2 Science (Manuscript submission deadline **30 June 2022**)

https://www.journals.elsevier.com/carbon-capture-science-and-technology/call-for-papers/special-issue-on-nanomaterials-tailored-for-co2-science

Note new dates and formats!

Events organised by or on behalf of EFCE in 2022/23

An extended list of events is available at http://www.efce.info/events.html

PMB2022 – 7th International Conference on Population Balance Modelling

Lyon, France, 7–9 June 2022 (EFCE Event No. 785)

PBM2022 is organised by Université Claude Bernard Lyon with involvement of several EFCE Working Parties related to the field

Topics: Contribution and challenges of PBM in practical / novel applications; Identification and uncertainty analysis of PBM; Experimental approaches, monitoring; Solution methods of PBM, stochastic PBM; Multiscale coupling of PBM

'Last Minute Poster' submission deadline: 29 April 2022

Invited speakers: Dr. R. Bertrum Diemer, University of Delaware, USA; Prof. Rodney O. Fox, Iowa State University, Ames, Iowa, USA; Prof. Achim Kienle, Max Planck Institute and Otto von Guericke, University of Magdeburg, Germany

Register now!

Website: http://pbm2022.univ-lyon1.fr/en/pages/pbm-2022-home

15th European PhD Workshop on Food Engineering and Technology

Uzwil, Switzerland, 10-11 May 2022

The PhD Workshop is organised by the EFCE Section on Food and hosted by Bühler at its CUBIC Innovation Campus.This is a unique opportunity for your highly qualified PhD students and recently graduated Postdocs to present and discuss their projects and to strengthen their network in academia and industry.

Website: https://european-phd-workshop.com/

17th International Symposium on Loss Prevention and Safety Promotion in the Process Industries – Loss Prevention 2022

Hybrid format (online and in Prague, Czech Republic) 5–8 June 2022 (EFCE Event No. 765)

The 17th International Symposium on Loss Prevention and Safety Promotion in the Process Industries and accompanying exhibition is organised by the Faculty of Safety Engineering - VSB Technical University of Ostrava and the EFCE Working Party on Loss Prevention.

Topics: The topic matrix is available at: https://www.lossprevention2022.org/topics

More than 200 submitted abstracts promise an interesting and valuable program, as well as 6 very attractive keynote lectures.

More information and Registration and accommodation forms are available on the website.

The 2022 Symposium will be held in a new, **hybrid form** which offers even more opportunities for presentation.

Plenary speakers: Stewart Behie; Valerio Cozzani; Nikos Markatos; Manfred Müller; Arjan van Dijk; Vladimír Vlček

Register now!

Website: http://www.lossprevention2022.org

ESCAPE-32 – 32nd European Symposium on Computer Aided Process Engineering

Toulouse, France, 12-15 June 2022 (EFCE Event No. 778)

The ESCAPE-32 event is organized under the auspices of the EFCE Working Party on Computer Aided Process Engineering (CAPE-WP), Institut National Polytechnique de Toulouse (Toulouse INP) and Société Française de Génie des Procédés (SFGP).

Topics: Modelling and Simulation, Product/Process Synthesis and Design, Large Scale Design and Planning/Scheduling, On Line Model Based Applications and Control, Concepts, Methods and Tools, Digitalization and Artificial Intelligence, CAPE Applications Addressing Societal Challenges, Education in CAPE and Knowledge Transfer.

Plenary speakers: Sigurd Skogestad; Vincent Gerbaud; Jutta Valkenberg.

Register now!

Website: https://escape32.inp-toulouse.fr/en/index.html

17th European Symposium on Comminution & Classification – ESCC2022

Toulouse, France, 27–29 June 2022 (EFCE Event No. 784)

17th European Symposium on Comminution & Classification (ESCC) is organised by INP Toulouse on behalf of the EFCE Working Party on Comminution and Classification.

This event will combine the fundamentals of breakage, advanced models and comminution and classification processes on mineral processing, biorefinery, food, pharmaceutical, chemical and materials industries as well as recycling industries and waste processing.

Topics: Fundamentals of particle breakage; Innovative methods for particulate characterization; Coarse grinding and classification processes, especially for minerals, ores, cement, …; Grinding, dispersing and classification of fine particles, micro and nanomilling applied to pharmaceutical, chemical, material and electronic industries …; Cell disintegration and recovery of high value-added products in biorefinery, green processes, food industries, …; Grinding for recycling industries and waste processing : plastics, WEEE, construction and demolition wastes, agricultural wastes, solar panels, wind turbines, …; Mechanochemical and mechanofusion processes, mechanical bulk and surface transformations; Transport and process modelling across length scales (CFD, multiphase flow, DEM, PBM, …); Wear, erosion and product contamination; Plant operation, innovations in milling and classification technologies including automation, machine learning, in line sensors.

Plenary speaker: Pr. Ecevit Bilgili, New Jersey Institute of Technology (NJIT), USA

Register now! Early-bird registration deadline: **1 May 2022**

Website: https://escc2022.sciencesconf.org

2022 Summer School on Crystallization

TU Dortmund, Germany, 29 June – 2 July 2022

The summer school is organised by Working Party on Crystallization. Each lecture will be delivered by two speakers: one from industry and one from academia. The names of the speakers will be communicated shortly.

Topics: Solid forms and their thermodynamics; Nucleation and Molecular Growth; Aggregation and Breakage; Modelling and Control

Deadline and registration: The school is free of charge, but potential participants should show interest in the school by **15 April 2022**

Website: https://efce.info/WPC.html

CHISA 2022 – 25th International Congress of Chemical and Process Engineering

Prague, Czech Republic, 21-25 August 2022 (EFCE Event No. 787)

The Czech Society of Chemical Engineering (CSCHE) invites you to the upcoming CHISA in the very beautiful city of Prague to celebrate 60 years of CHISA Congresses in 2022 under the motto "The place, where people meet people and science meets culture".

Topics:

I. GLOBAL THOUGHTS: Low to zero emission technologies; Carbon dioxide economy; Water supply, management, reuse, purification; Food in the focus; Sustainability and circularity; Healthcare, hygiene, medicine and pharmacology; The Covid outbreak and chemical engineering;

II. ENERGY: Energy to carbon footprint ratio; Low energy cost processes; Renewable energy and energy storage, hydrogen as a fuel; Energy self-sufficiency; Clean energy; Photochemistry, solar cells and solar powered technologies, fuel cells; Energy saving processes and technologies; Batteries;

III. MATTER IN MOTION: Continuous process design and optimization (batch to continuous, flow chemistry); Process intensification and miniaturisation; Fluid flow and microfluidics, multiphase flow; Microreactors for real-life products and scaled-up technologies; Mixing; Separation processes;

IV. NOT ONLY FASTER: Reaction engineering and kinetics; Homogeneous and heterogenous catalysis; Catalytic processes; Design, preparation and characterisation of catalysts;

Catalytic reactors;

V. PARTICLES: Advanced functional materials; Designed, printed, integrated, used materials, 3D printing; Particulate and microporous solids, low-risk advanced materials; Biomimetics; Functional films and nanostructures; Sensors and sensing objects and nano-objects; Hierarchical structures and nanoparticles; Polymers and polymer technologies, conductive polymers

VI. GREEN ISSUES: No waste technologies and zero waste plants; Production-trade-customer zero waste chains; Urban mining, waste management; Microplastics and endocrine disruptors; Biotechnologies, biomass and biomass processing; Membrane processes, adsorption; Air, soil and water pollution, pollution control; Green and supercritical chemistry, VOC reduction, ionic liquids; Processes for environment;

VII. YOU MUST KNOW: Chemical reactors – all aspects; Transport phenomena; Distillation, extraction, SCF extraction, S-L separation, crystallisation; Thermodynamics, phase equilibria, multiphase processes; Chemical engineering computations and modelling, molecular dynamics, ab-initio calculations, mathematical predictions, neural networks; New and improved technologies; Chemical engineering and safety, prevention and loss control; Elimination of health and environmental hazards;

VIII. COLLEGE: Educated chemical engineers; Teaching chemical engineering, new strategies, opportunities; Jobs in chemical engineering; Choosing chemical engineering as the field of studies – wright or wrong?; Competitiveness of chemical engineers on the job market;

XI. The Wiley-VCH Poster Session.

Plenary speakers: Prof. Robert Schlögl, Max Planck Institute for Chemical Energy Conversion, Berlin, DE; Prof. Christine Grant, North Carolina State University, USA; Prof. David Fernandez Rivas, University of Twente, NL; Prof. Matthias Kraume, Technical University Berlin, DE; Prof. Yoel Sasson, Hebrew University of Jerusalem, IL. For details see https://2022.chisa.cz/scientific-program/#plenary

Posters may be accepted up to the beginning of the Congress but only those received before 31 May 2022 will be included in the final program.

Website: https://2022.chisa.cz/

ACHEMA 2022

Frankfurt am Main, Germany, NEW DATE: 22–26 August 2022 (EFCE Event No. 775)

Feel the heartbeat of our industry! The process industry is the innovation driver of the world economy and the pacemaker for numerous industrial sectors

ACHEMA is the central arena of the process industry. Nowhere is the heartbeat of our industry faster, more intense, up-to-date, innovative and international than here.

Take this opportunity to forge new contacts, to build up business relations and find solutions for your current projects!

New exhibition group 'Digital Hub' (Hall 12.1) Venue for digital players at the heart of ACHEMA: https://www.achema.de/en/the-achema/digital-hub

ACHEMA Congress – from research to application: This year, for the first time, ACHEMA will fully integrate the congress into the exhibition programme. All congress sessions will take place either on stages directly in the exhibition halls or in the immediate vicinity of the exhibition groups. Another change to the Congress is that there will be **five theme days** instead of three this year. Daily highlight sessions within the respective themes will emphasize additional topics, ensuring that all topics driving the process industry are addressed.

On Monday (22 August 2022), the theme "Hydrogen Economy" will kick off the event: As we move towards a climate neutral future, hydrogen will play a central role in the transformation of the process industry, the transport sector and the energy system. The process industry is already the main user of hydrogen. The focus of the first theme day will be how to leverage its further potential in the future.

Production without the use of fossil raw materials is an important and ambitious goal to reduce greenhouse gas emissions in the process industry. The idea of fossil-free production is simple, but there are still many unanswered questions. These will be addressed by the **"Fossil Free Production" theme day on Tuesday (23 August 2022)**.

The focus topic of ACHEMA, "The Digital Lab", will be part of the **Wednesday (24 August 2022) theme day on "Perspectives in Laboratory & Analytics":** Data from all areas of research and production converge in

the laboratory. Modular, automated and fully networked, the digital laboratory is a central component for process development and quality assurance. The Highlight Session on this topic and the Congress will complement the theme day.

The continuous hot topic of **"Digitalisation in Process Industry"** can be found as part of the new exhibition group "Digital Hub" (Hall 12.1) and also as a focal point of the Congress programme agenda on **Thursday (25 August 2022)**: "Data is the new gold" is a phrase used often enough, but how can this treasure be harnessed? How can data be used in business models? And how can data security be guaranteed?

The last day of the congress on **Friday (26 August 2022) will focus on "Novel Bioprocesses and Technologies"**: New biopharmaceuticals, bio-based fine chemicals or bio-technological recycling all require new (production) processes. Changes in these processes are especially driven by advances in synthetic biology, automated laboratory technologies, integrated bioprocesses, innovative bioreactor concepts, novel downstream technologies and advanced modelling. ACHEMA 2022 will serve as the global showcase for these developments.

Join us and register now!

Website: https://www.achema.de/en/

Distillation & Absorption 2022

Toulouse, France, 18–21 September 2022 (EFCE Event No. 780)

Distillation & Absorption 2022 will showcase the newest and best in distillation & absorption technology and will cover a broad range of fundamental and applied aspects. The conference is supported by the Société Française de Génie des Procédés (SFGP) working closely with the EFCE Working Party on Fluid Separation.

Topics: Basic data; Modelling, Simulation, IA methods (hybrid modelling, digital twin,…); Hybrid and Multifunctionnal Processes (modularity, flexibility, intensification,…); Equipment design, technology and innovation (additive manifacturing, centrifugal separation,…); Control, Process operation and troubleshooting; Energy and sustainability in separation processes (efficiency, renewable energy, new concepts, CO_2 capture,…); Biobased separation processes; Mobile/On-board separation processes (embedded processes in cars, ships, aircrafts, satellites); CO_2 capture.

Selected contributions will be published in a special issue of CHERD as a long version.

Associated with the conference, a call for nominations for the 2022 EFCE EXCELLENCE AWARD IN FLUID SEPARATIONS is open. The award is sponsored by the EFCE and Evonik.

Plenary speakers: Andreas Bode, BASF SE; Søren Bøwadt, Health and Digital Executive Agency (HaDEA); Veronique Pugnet, TOTAL; Bernard Saulnier & Mikaël Wattiau, Air Liquide R&D; Michael Schultes, Ruhr-Universität Bochum; & Daniel R. Summers, FRI's Design Practices Committee.

Register now!

Website: http://da2022.org/fr/index.html

9th World Congress of Particle Technology

Madrid, Spain, 18–23 September 2022 (EFCE Event No. 784)

WCPT9 is the world's most influential event for the particle technology community. It's where world-leading researchers and companies share the latest thought leadership about the progression and future of particle technology. And it's the best place for networking opportunities with your colleagues to share mutual professional goals.

For WCPT9, a unique collaboration has been established among 8 Working Parties of the European Federation of Chemical Engineering (EFCE). The following EFCE Working Parties are involved with the organisation of WCPT9: **Agglomeration, Characterisation of Particulate Systems, Comminution and Classification, Crystallization, Drying, Mechanics of Particulate Solids, Mixing, Multiphase Fluid Flow.**

WCPT9 main topic: Particulate solids handling; Particle and particulate systems characterization;

Save the date!

ECCE14 & ECAB8 - 14th European Congress of Chemical Engineering & 7th European Congress of Applied Biotechnology

Berlin, Germany, 17-21 September 2023 (EFCE Event No. 782)

Website: https://ecce-ecab2023.eu/

Particle processing; Particle-fluid systems: fluidization and multi-phase flow; Particle formation and design; Particle separation; Aerosol particles; Nanoparticles: production, characterization and applications; Modelling and simulation; Science, Technology, Engineering and Design in particle-based materials and products.

Beyond these main topics, **Joint Events (JE)** will be also organized in engineering, scientific or technically related fields, where particle technology is present. Three WCPT9-JE have been already confirmed:

- Challenges of microplastics: analysis and control.
- III ANQUE-DECHEMA Leading edge conference "Particle Technology. Shaping the future".
- Multidimensional particle properties: characterization, separation and application.

Plenary speakers: Aibing Yu, Australia; Wolfgang Peukert, Germany; Jesús Santamaría, Spain; Lidia Morawska, Australia; Willie Hendrickson, USA

Exhibition and sponsorship: Take advantage of this opportunity to showcase your company's/ organization's products, services and expertise. If you wish to participate to the Sponsorship Program of the Congress, please consult the sponsorship & exhibition guide at:

https://wcpt9.org/wp-content/uploads/WCPT9-Sponsorship-Opportunities-Exhibition-Guide_2.pdf

Deadline for abstract submission extended to 2 May 2022

Register now!

Website: https://www.wcpt9.org

Energy, Environment & Digital Transition E_2DT

Milano, Italy, 16–19 October 2022 (EFCE Event No. 781)

The conference aims to bringing together researchers, engineers, senior executives, policy makers and opinion formers to map the transition from an economy based on fossil fuels towards net zero carbon and fully renewable energy to meet the COP26 Glasgow Agreement targets. The objective is to provide a view on available, up-to-date evidence on positive and negative environmental effects of the energy transformation in a holistic way and on the opportunities for new technologies to drive accelerate the transition.

Topics: Technology process on renewable energy generation and use; Carbon capture and storage technology; Hydrogen energy: production and storage; Help energy consumers to make more sustainable decisions; Mobilizing industry for a clean and circular economy; Zero pollution ambition for a toxic-free environment; Preserving and restoring ecosystems and biodiversity; Energy storage and battery technology; Energy transportation and transmission; Mobilizing society for the energy transition; How digital evolution can help zero carbon footprint challenge

The call for papers is still open. **Deadline: 30 April 2022**

Selected papers will be presented during the conference and published into Chemical Engineering Transactions: https://www.cetjournal.it

The quality of this publication is valued by ISBN & ISSN numbers, reference by SCOPUS and SCHOLAR

Exhibition & Sponsorship: Spaces are available at Conference Venue for exhibition desks. A maximum surface that can be assigned to each booth is 3x2=6 m^2. Download the Sponsorship Guide here with sponsorship packages description and exhibition solutions.

Website: https://www.aidic.it/e2dt

17th European Conference on Mixing *(EFCE Event No. 773)*

The Mixing Conference is organised by the University of Porto on behalf of the EFCE Working Party on Mixing. **The physical conference in Porto, Portugal is postponed to 2023.**

Website: http://mixing17.eu

Contact

Follow us on social media:

facebook.com/theEFCE

bit.ly/EFCE_LinkedIn

@EFCE_Comms

www.youtube.com/channel/ UCxuvfbb5ST3DMHLAwZ6326w

Ines Honndorf, e-mail: ines.honndorf@dechema.de

Claudia Flavell-While, e-mail: claudia@icheme.org