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EURECHA Process Design Contest 2027

This Process Design Contest (PDC) is organized by the European Committee for the Use of Computers in Chemical Engineering Education (EURECHA), with the support of the Computer-Aided Process Engineering (CAPE) Working Party and the Energy section of the European Federation of Chemical Engineering (EFCE). The contest accepts submissions in two categories: Bachelor and Master level. The participants have a few months to prepare and submit solutions to an open problem that involves Energy and Chemical Engineering, while using tools of Computer Aided Chemical Engineering. The deadline for submission is **April 15 2027, 23:59 CET**. Solutions can be prepared by individuals or by teams.

A jury consisting of academics from EURECHA and the EFCE Energy Section, as well as our sponsor AVEVA will select the best solution based on seven equally weighted technical and writing skills: (1) scope of the proposal, (2) relevance of assumptions, (3) overall technical consistency, (4 and 5) relevant use of Computer Aided Process Engineering tools for simulation & optimization, (6) creativity of the proposed solution and (7) quality of the written report. The jury will also take into account the size of the team. If no satisfying solutions are received, the EURECHA PDC committee may decide not to award any prize.

The awards for the best submissions include monetary prizes of up to 1000€, as well as invitations to present at conferences such as the European Symposium on Computer-Aided Process Engineering (ESCAPE-37, to be held in Trondheim, Norway).

The winning contributions, including process models and supporting documents, will be published in the Living Archive for Process Systems Engineering (LAPSE, <https://psecommunity.org/lapse>) under an open-access license, as well as on the EURECHA website (<https://cape-wp.com/eurecha>). Additionally, invitations may be extended to submit an extended version of the work to journals such as Computers & Chemical Engineering.



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Submission procedure:

The written report should consist of a **pdf** file written in **English** and not exceeding **15 pages** (including figures and references; minimum font size 11). The process flowsheet and runnable simulation files must also be provided. As described above, for the winning submissions, these documents will be shared in an open repository.

The **written report**, the runnable simulation files and any **other support files** (annexes, spreadsheets, simulation input files, etc.), as well as a support letter from an academic supervisor at your home university, should be packed (zip format) and sent, before the established deadline, as e-mail attachment to eurecha.secretariat@gmail.com.

In the body of this e-mail you **must** include the following information:

- Complete names (for all authors);
- Level (Bachelor/Master) and current year of your studies (for all authors). If available, please provide a link to a web page at your home institution related to one of the courses you are currently enrolled;
- Complete name and address of your home institution (School/Department/Research Center, etc.).

If a university has three or more submissions, we ask that the academic supervisor recommend the best two for our consideration. However, all submissions can still be sent.

Supplementary mentoring and training:

Participants are assigned a member of EURECHA or an expert from our sponsor AVEVA as mentor. The role of the mentor is to provide feedback and suggestions a few times throughout the contest. Please note that this is intended as an addition, and not a replacement, to potential supervision at your home institution.

Additionally, our sponsor AVEVA offers an exclusive online training to contest participants in the use of AVEVA software solutions. However, content participants remain free to use any software tools they choose when preparing their submission.

Please **register** via e-mail to eurecha.secretariat@gmail.com as soon as you decide to participate in the contest, such that we can assign you a mentor and inform you about training possibilities.



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2027 Challenge

Utilization of industrial or other useful wastes to chemicals, fuels or energy

Project description

The goal of the project is to investigate novel and alternative process designs that convert waste materials into useful products through chemical transformations. This project follows Topic 3 of the Energy Section of the EFCE (The waste-water-energy nexus).

Purpose

Waste valorization processes, also called Waste-to-X processes, convert waste materials into useful or valuable products, such as chemicals, fuels, or energy in various forms. Burning municipal trash for district heat is one such example, but more valuable products are possible by using chemical or energy conversion pathways. Waste resources can be very challenging to use depending on their chemical makeup, consistency, availability, volume, and where they are physically located. The benefits of waste valorization can be monetary, but often waste valorization is not incentivized strictly by economics. Rather, their value often lies in the form of landfill diversion, effective waste “disposal”, emissions/dumping avoidance, fossil fuel or virgin resource avoidance, product replacement or displacement, better use of space, and all the environmental and societal benefits associated with these in terms of greenhouse gas emissions, energy use, water and soil impacts, sanitation, contamination, human health, and human comfort. It is usually better to think about waste valorization in terms of whether the environmental and societal benefits are worth the extra cost and effort of the valorization process compared to the status quo. Common recycling processes such as thermal plastic or paper recycling are a form of waste valorization, but this project should focus on ideas that expand beyond what is routinely done at present.



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Activities

The challenge will be to propose a waste valorization process design that demonstrates value in terms of the trade-off between economics, environment, and society. The process must use some kind of chemical or energy conversion other than ordinary combustion. Contributions in form of process designs covering the following aspects are welcome:

- Choice of the key resources
- Choice of the reaction and process pathways
- Choice of additional sources of energy
- Process simulation and synthesis
- Process energy and material balance and energy system integration
- Key performance indicators in terms of technical, economic, environmental, and societal impacts relevant to the situation.

The source of the waste, including flowrate and composition, should be specified and justified in the proposal. To help narrow the choice, we recommend focusing on large-source industrial wastes such as used tires, petroleum coke, unsorted/unwashed/mixed plastics, or on wastes from bio-related industries such as wastes from pulp and paper production, agricultural wastes, or bio-energy industries. Tables 10.6 and 10.7 in the book Exergy Tables (McGraw Hill, 2023) may be helpful for lists of possible wastes, their compositions, and energetic potentials.

In order to give some additional context to the challenge, it is required to consider that the selected process will be implemented in the country organizing the next ESCAPE conference. For the 2027 edition of the PDC, the selected process will thus have to use the boundary conditions of the Norway (for instance in terms of energy sources).

The report shall be written as a technical and business plan, describing and justifying the technological and economic assumptions. It is left free when the process implementation should take place.

Acknowledgement: We thank Prof. Dr. Stavros Papadokonstantakis (TU Wien) for providing the suggestion for this topic.



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