Student Contest Problem 2018

This contest problem is open to Bachelor/Master/PhD level students. The participants have approximately three months to prepare and submit solutions to the problem (see below) no later than **December 31 2018, 23:59 CET**. Solutions can be prepared by individuals or by teams.

The jury will select the best solution, based on technical excellence (i.e. cost effectiveness, energy efficiency, environmental impact, social impact, operability, flexibility, etc.), quality of the report and originality. The jury will take also into account the size of the team and its academic level (Bachelor/Master/PhD).

The Award includes:

- First prize: One invitation to attend to the ESCAPE-29, to be held in Eindhoven, The Netherlands, 16 – 19 June 2019 to get the award. First-prize award also includes a money transfer of 1000 EUR, after the ESCAPE event, to cover the travel and accommodation expenses.

- Second prize: One invitation to attend the CAPE Forum, to be held in Liège, Belgium, 14-16 october 2019 to get the award. An oral communication slot will be granted to present the solution. Second-prize award also includes a money transfer of 750 EUR, after the CAPE-forum event, to cover the travel and accommodation expenses.

- Both first and second prizes: the publication of the selected solution on the EURECHA web site.

Submission procedure:

The written report should consist on a **pdf** file written in **English** and not exceeding **15 pages** (including figures).

This **written report**, any **other support file** (Annexes, Spread Sheets, Simulation Input files, etc.), and 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 name (for all authors).
- Level (Degree/Master/PhD) 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.). Please provide a link to the web page of your home institution and an official contact to eventually confirm your affiliation/enrolment.

Green diesel production

The ever-increasing energy demand coupled with depleting fossil fuel resources leads many researchers into investigation of alternative transport fuels. Together with biodiesel produced from well-established transesterification process, green diesel (also referred to as renewable diesel) constitutes the two renewably available alternatives for fossil diesel fuel today. Like biodiesel, green diesel can be made from a variety of sustainable feedstock, such as vegetable oils and animal fats. Production of green diesel requires hydro-treatment of oils or fats, which results in a significantly improved quality diesel fuel compared to biodiesel, with much better blending, cold flow, and emission characteristics. Therefore, the process is also known as hydro-treated vegetable oil (HVO) process in the literature. In the last 5 years, HVO production has seen a rapid increase, with more and more oil majors, such as ENI or TOTAL, as well as renewable fuel producers, e.g. Neste, UPM or Preem, investing in pure HVO production facilities.

In this open process design challenge, we are inviting all interested to perform preliminary (conceptual) design of the green diesel production process, along with technical and economical assessments as well as considerations made for heat integration. Feedstock choice should be made/justified among three alternatives: (1) rapeseed oil, (2) palm oil, and (3) sunflower oil. Trade-offs between pre-treatment steps and product quality should be investigated and decided by the designer. Production process should use hydro-treatment pathway. Upon successful completion of the challenge, the designer will submit a working process flow diagram (PFD) modelled in a popular process simulator, such as Pro/II, Aspen, or gProms, with mass and energy balances being closed. Other tasks to complete would also include, but not limited to the following,

- Literature review of the data regarding the process
- Market analysis of the product and selection of the targeted product quality and production capacity.
- Selection of the feedstock, required pretreatment steps/technologies, and the catalysts.
- Identification and modeling of main reactions taking place in the process along with a selection of an appropriate thermodynamic model for the process modeling
- Sensitivity analysis of the product quality to the key design parameters
- Economic evaluation of the process considering relevant metrics (such as payback period, NPV, etc.)

References

For process pathway:
Neste Renewable Diesel Handbook, 2016
https://www.neste.com/sites/neste.com/files/attachments/neste_renewable_diesel_handbook.pdf

For typical feedstock compositions:
http://doi.org/10.1002/ejlt.200600090