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Editorial

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Product Engineering is a crucial competence for a modern engineer. The jobs in the Chemical Engineering sector have been evolving from commodities production to product development. So, the universities changed the *curricula* of Chemical Engineering to keep up with industry needs. Product development is particularly relevant in Portugal, where Small to Medium companies dominate the industrial sector, both in terms of number and job creation.

More than a decade ago, in 2009, the Master in Chemical Engineering Programme at the Faculty of Engineering of the University of Porto (FEUP) started a course on Product Engineering. Prof. Alírio E. Rodrigues initially introduced this course based on the methodology of Cussler and Mogridge (2001, 2011). A detailed analysis of the implementation of Product Engineering in Chemical Engineering *curricula* was later published by Rodrigues and Cussler (2016).

In a nutshell, the chemical product development methodology lays in four cornerstones:

1. Identification of market NEEDS;
2. Coming up with several technical solutions to meet those NEEDS (IDEAS);
3. The process of screening a small set of the best IDEAS (SELECTION);
4. The study of implementation of the IDEAS, considering aspect as time to market, industrial processes design, regulation, Intelectual Property protection and economic analysis (MANUFACTURE).

In 2015 the course was lectured by Prof. José Carlos Lopes, who kept the base methodology and oriented it to Product Development projects based on Portuguese natural raw materials. The main goal was to motivate the students to create value in our country from endogenous resources. A significant focus was placed on raw materials from rural regions, which could leverage the local economies.

Currently, the Product Engineering course is lectured by Claudia G. Silva, Ricardo Santos and Yaidelin Manrique, keeping the overall philosophy based on a Project Based Learning methodology. Overall, the students show great commitment and enthusiasm working on these projects, which enable the integration of competencies acquired in the Chemical Engineering course to create products while developing important soft skills like teamwork and communication.

Over the years, the exciting projects developed by the students also motivated us to increase the visibility of their work. This was the primary motivation for editing this Special Issue, which includes a series of articles reporting the development of products from Portuguese endogenous raw materials carried out by the students in the course of Product Engineering of the Master in Chemical Engineering of FEUP during the academic years of 2020/21 and 2021/22. The raw materials used in those case study projects were forest trees and aromatic plants residues from Cork Oak, Eucalyptus, Chestnut trees, Olive trees and Rosemary plants,

and fruit and vegetable farming residues from Kiwifruit, Lettuce, Strawberry and Tomato. The valorization of vegetable and fruit residues, in particular, are of special interest for the ongoing S4Hort_Soil&Food Project, a Project coordinated by Ruth Marques from GreenUporto at FCUP, that is coordinated at FEUP by our colleague Berta Estevinho. In addition to ALiCE's researchers from LSRE-LCM and LEPABE, S4Hort also involves researchers from CIQUP. One of the S4Hort goals was the involvement of the Chemical Engineering students in valorizing raw materials that could bring value to rural economies.

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