

ACV-PROPABIO PROJECT: SIMPLIFIED LCA METHODOLOGY TAKING INTO ACCOUNT SCALING UP CONSIDERATIONS FOR THE DEVELOPMENT OF GREEN PROCESSES IN AGROINDUSTRY AND BIOTECHNOLOGY

Krasimir DIMITROV¹, Peggy VAUCHEL¹, Carolina COLLI¹, Delphine PRADAL^{1,2}, Didier LECOUTURIER¹, Pascal DHULSTER¹, Stéphane DECOSSIN², Jean-Michel RIGAUT², Jérôme BONY³, Grégory LAVERSIN³, Christine CHENE³, Guillaume DELAPLACE⁴

¹ Univ. Lille, INRA, ISA, Univ. Artois, Univ. Littoral Côte d'Opale, EA 7394 – ICV – Institut Charles Viollette, F-59000 Lille, France

² ICAM site de Lille, 6 rue Auber, 59016 Lille Cedex, France

³ ADRIANOR, rue Jacquart, ZI Est, 62217 Tilloy lès Mofflaines, France

⁴ UMET – équipe PIHM, 369 rue Jules Guesde, 59651 Villeneuve d'Ascq Cedex, France

Mail of project coordinator: krasimir.dimitrov@polytech-lille.fr

The decision about the choice of processes, as well as the operating conditions is usually based on economic criteria such as investment and exploitation costs. However, the optimization of processes could also allow to limit their environmental impacts. For French region Hauts-de-France it is very important to help the transition of industrial processes towards more eco-friendly processes. Nowadays, one of the major challenges of process engineering (scientific discipline which deals with conception, conduction, control and optimization of processes) is the necessity to include environmental criteria in order to develop sustainable processes (green processes). For these processes, it is very important to dispose of an adapted methodology allowing to evaluate the gains in terms of sustainability and environmental impacts. "Life cycle thinking" is a formalized approach largely used in the field of assessment of environmental impacts of various products, but it is still less used for such evaluation of processes, especially in the fields of food industry and biotechnologies.

This project aims to develop a new expertise within four research teams from Hauts-de-France region allowing to take into account environmental issues during research and innovation phases. The project aims to introduce life cycle thinking in the phases of research and process design, in order to integrate concepts of sustainability and environmental impact. The goal is to provide a simplified Life Cycle Analysis (LCA) methodology adapted to the stage of process development (laboratory scale) and allowing to consider the process scaling up and the environmental impacts of the process at large-scale (pilot and industrial scale). Two research axes are developed in ACV-ProPABio project. The first one concerns the use of LCA methodology as a tool helping to optimize processes. The idea is to use LCA methodology together with other tools specific for process optimization, allowing to make detailed analysis, integrating the influence of operating conditions on several environmental impacts. The final goal is to propose a mathematical model for multi-criteria optimization taking into account both technical efficiency, energy and environmental impacts of processes in order to develop green processes (sustainable processes). The second axe of the project concerns the studying of environmental impacts during the scale-up of the studied processes. It is very important to prepare the scale-up from small (laboratory) scale to pilot and industrial scales in regard to transfer of knowledge about processes efficiency but also concerning their environmental impacts at different scales. The target fields of processes in project ACV-ProPABio are processes of food industry and biotechnology.

Key-words: Sustainable bio-processes, LCA, Environmental impact, Multi-criteria optimization, Scaling-up