BASIC PARAMETERS OF THE PILOT PLANT FOR THE PRODUCTION OF 2ND GENERATION BIOETHANOL

Ewelina Olba-Zięty, Michał K. Łuczyński, Kamila Orlińska, Janusz Gołaszewski

[a]Authors affiliations: Centre for Renewable Energy Research, University of Warmia and Mazury. Olsztyn, Poland (e.olba-ziety@uwm.edu.pl)

ABSTRACT

The obligations arising from European legislation, and thus implementation of the National Indicative Target to increase the share of bio-components in liquid fuels imply that the technologies of the production of 2nd generation bioethanol attract the interest of not only research teams, but also of entrepreneurs. In this paper the basic parameters of the pilot plant including the modules such as: substrate preparation (fragmentation), pretreatment, enzymatic hydrolysis, fermentation and distillation were presented. The substrate tested in the plant is energetic willow (Salix spp.). According to the adapted strategy, lignocellulosic biomass is fragmented to obtain a fraction of < 1.0 mm, and then subjected to pretreatment and enzymatic hydrolysis in a reactor built for this purpose, with a capacity of 300 L, resistant to acid environment, and the conditions of high pressure (approx. 10 bar) and high temperature (approx. 140°C) characteristic for the pretreatment. Three reactors were planned as a part of the pilot plant in order to ensure continuity of production. Enzymatic hydrolysis is preceded by a process of detoxification and neutralization of the reaction medium. The combined time of reaction related to the initial and enzymatic hydrolysis is approx. 60 hours. The next step involves separation of the hydrolysate, using a fraction separator, from where the liquid fraction containing monosaccharides is transported to one of two digestion tanks with a capacity of 100 L, after a prior concentration. The water recovered in the osmosis is collected and returned to the reactors for pretreatment and enzymatic hydrolysis. The separated solid fraction is automatically collected for a further utilization for biogas purpose. Fermentation is conducted at a temperature of <38°C for approx. 48 h. The last step comprises distillation in order to obtain a product of the highest possible concentration of ethanol. In the course of balance analyses of the efficiency of processing Salix sp. chips to obtain 2nd generation ethanol it was concluded that it is necessary to consider parallel processes, including those related to the utilization of post-process residues, leading to other market bioproducts.

Acknowledgement: This work has been financed by the strategic program of the National (Polish) Centre for Research and Development (NCBiR): „Advanced Technologies for Energy Generation. Task 4: Elaboration of Integrated Technologies for Production of Fuels and Energy from Biomass, Agricultural Waste and other Waste Materials".