Master of Science in Circular Bioprocess Technology, the first educational program in Belgium for engineers that fully focusses on circularity in industrial processes

J Hogie *
* Laboratory for Circular Process Engineering, Department of Green Chemistry and Technology, Ghent University, Graaf Karel De Goedelaan 5, 8500 Kortrijk, Belgium
Keywords: education, circular processes, recycling, (bio)chemical engineering, sustainability
Presenting author email: joel.hogie@ugent.be

Introduction

Figure 1: Lab facility

Today, the impact of science on technological innovation is greater than ever and engineers play a crucial role
To fulfil the growing need of the chemical, biochemical and food processing industry **for engineers that are familiar with the latest techniques on circularity and sustainability**, the University of Ghent started a new and unique educational program in 2018.

Figure 2: Promo session

One of the main gaps of a lot of traditional educational programs is the fact that some of them focus on sustainability, ecological impact, life cycle analysis, etc. while other more technical & engineering orientated programs still treat processes in a linear way **This presentation is aimed at giving more visibility to this short come.**

Main goal: give inspiration, exchange ideas, on educational programs and give an overview of all related research that is imbedded into the courses, inducing cooperation and exchange of information between students and researchers.

Educational program

ACADEMIC BACHELOR

First Year		Second Year		Third Year	
SEMESTER 1	SEMESTER 2	SEMESTER 3	SEMESTER 4	SEMESTER 5	SEMESTER 6
Mathematics I 6	Mathematics II 6	Biochemistry 6	Biometrics 3	Environmental Technology II 5	Sustainable Materials 5
			Environmental Microbiology 3	Bachelor Thesis 6	
Mechanics 3	Mechanics 3	Statistical Data Analysis and Experimental Design 6	Plant and Animal Cells 3		
Materials 3	Physics 5		Physical Chemistry 5	Chemical Engineering 7	Biochemical Engineering 6
Electricity 6	Electronics 3	Applied Fluid Mechanics and Thermodynamics 6	Chromatografic Techniques 5	Environmental Technology I 6	Process controll 6
	Introduction to the Circular Economy 3				
General Chemistry 6	Organic Chemistry I 4	Sensors and Data Acquisition 5	Thermal and Mechanical Engineering 5	Biocatalysis 3	Sustainable Energy and Rational Use of Energy 4
Biology of Micro-organisms 6	Analytical Chemistry 3	Organic Chemistry II 4	Quality Assurance in the (Food) Industry 6	Bioprocess Simulations 5	Risk Assessment of Chemicals 4
	Microbial System and Virology 3	Spectroscopic Analysis 3			Business Administration 3

MASTER

First Year	
SEMESTER 1	SEMESTER 2
Sustainability Assessment 3	Business Management 6
Biorefineries 4	Internship 6
Resource Recovery 3	
Process Intensification 6	
Downstream processing 4	Master Thesis 20
Elective course 3	
Integral Process Design 5	
Thesis Preparation	

Figure 3: Green Chemistry program

First Year		Second Year		Third Year	
SEMESTER 1	SEMESTER 2	SEMESTER 3	SEMESTER 4	SEMESTER 5	SEMESTER 6
Mathematics I 6	Mathematics II 6	Biochemistry 6	Biometrics 3	Chemical Conversion of Biological Raw Materials 5	Hygienic Design 5
			Environmental Microbiology 3		
Mechanics 3	Mechanics 3	Statistical Data Analysis and Experimental Design 6	Plant and Animal Cells 3	Bachelor Thesis 6	
Materials 3	Physics 5		Physical Chemistry 5	Chemical Engineering 7	Biochemical Engineering 6
Electricity 6	Electronics 3	Applied Fluid Mechanics and Thermodynamics 6	Chromatografic Techniques 5	Environmental Technology I 6	Process controll 6
	Introduction to the Circular Economy 3				
General Chemistry 6	Organic Chemistry I 4	Sensors and Data Acquisition 5	Thermal and Mechanical Engineering 5	Biocatalysis 3	Sustainable Energy and Rational Use of Energy 4
Biology of Micro-organisms 6	Analytical Chemistry 3	Organic Chemistry II 4	Quality Assurance in the (Food) Industry 6	Bioprocess Simulations 5	Risk Assessment of Chemicals 4
	Microbial System and Virology 3	Spectroscopic Analysis 3			Business Administration 3

First Year	
SEMESTER 1	SEMESTER 2
Food Technolgy 4	Business Management 6
Food fermentations 4	
Packaging Technology 3	Internship 6
Food Process Technology 5	
Downstream processing 4	Master Thesis 20
Elective course 3	
Integral Process Design 5	
Thesis Preparation	

Figure 4: Food processing program

Both programs are traditionally engineering oriented but include a substantial amount of modules that focus on optimisation, sustainability and circularity

Research groups

LCPE: circular process engineering, chemical and physical polymer and organic waste recycling (https://www.ugent.be/bw/gct/en/research/greentech/research/chemtech/projects.htm).

LIWET : waste water reuse, advanced water treatment (https://www.ugent.be/bw/gct/en/research/greentech/research/liwet)

VEG-i-TEC : sustainability and circularity of food processing, packaging and the validation of food waste streams trough fermentation (https://www.ugent.be/veg-i-tec/en).

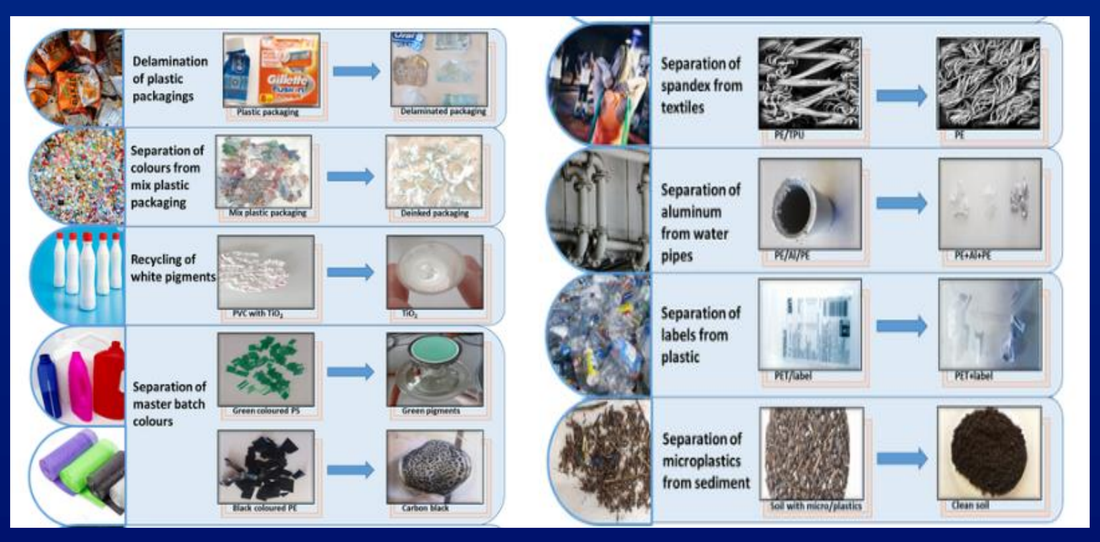

Figure 5: Some examples of polymer recycling lab results