

INTEGRATED PROJECT WITH FOCUS ON ENERGY TRANSITION AND CIRCULAR ECONOMY FOR DEVELOPING ENGINEERING STUDENTS' SOFT SKILLS



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Abstract

We report the experience of an integrated project for master students in chemical engineering to **acquire soft skills** and address **challenges related to energy transition**.

Different teaching techniques were used and they did not perform equally well. This project represented **challenges for students** that had to master technical and soft skills, **but also for the teaching team** that needed to work together to follow up and assess students.

Objectives of the integrated project

The case study was to make Reunion Island as energy independent and CO₂-neutral as possible by 2030.

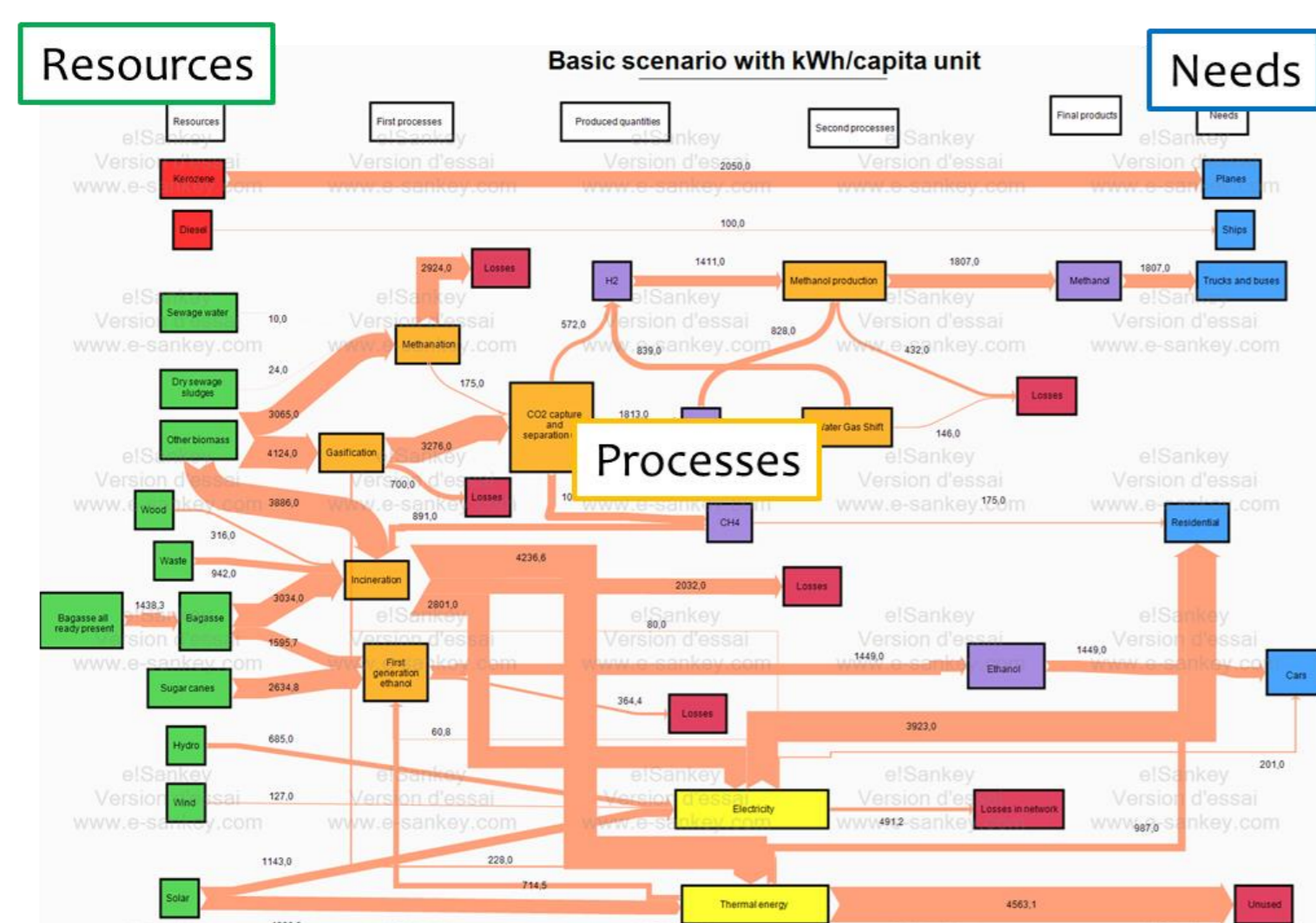


Two **constraints** were set: wastewater treatment and use of synthetic liquid fuel. The targeted **soft skills** included:

- **Work in groups** ≥ 4 students
- Efficient **written and oral communication**
- **Integration of knowledge** from various disciplines
- Development of **critical mind**
- Demonstration of **independent and creative thinking**.

The 10-ECTS project was divided in two parts (1/semester):

- Propose a Sankey diagram of energy flows on Reunion Island in 2030.
- Model two processes identified in the first part, namely the synthesis of bio-ethanol and bio-methanol from biomass.



Sankey diagram of energy flows on Reunion Island by 2030¹

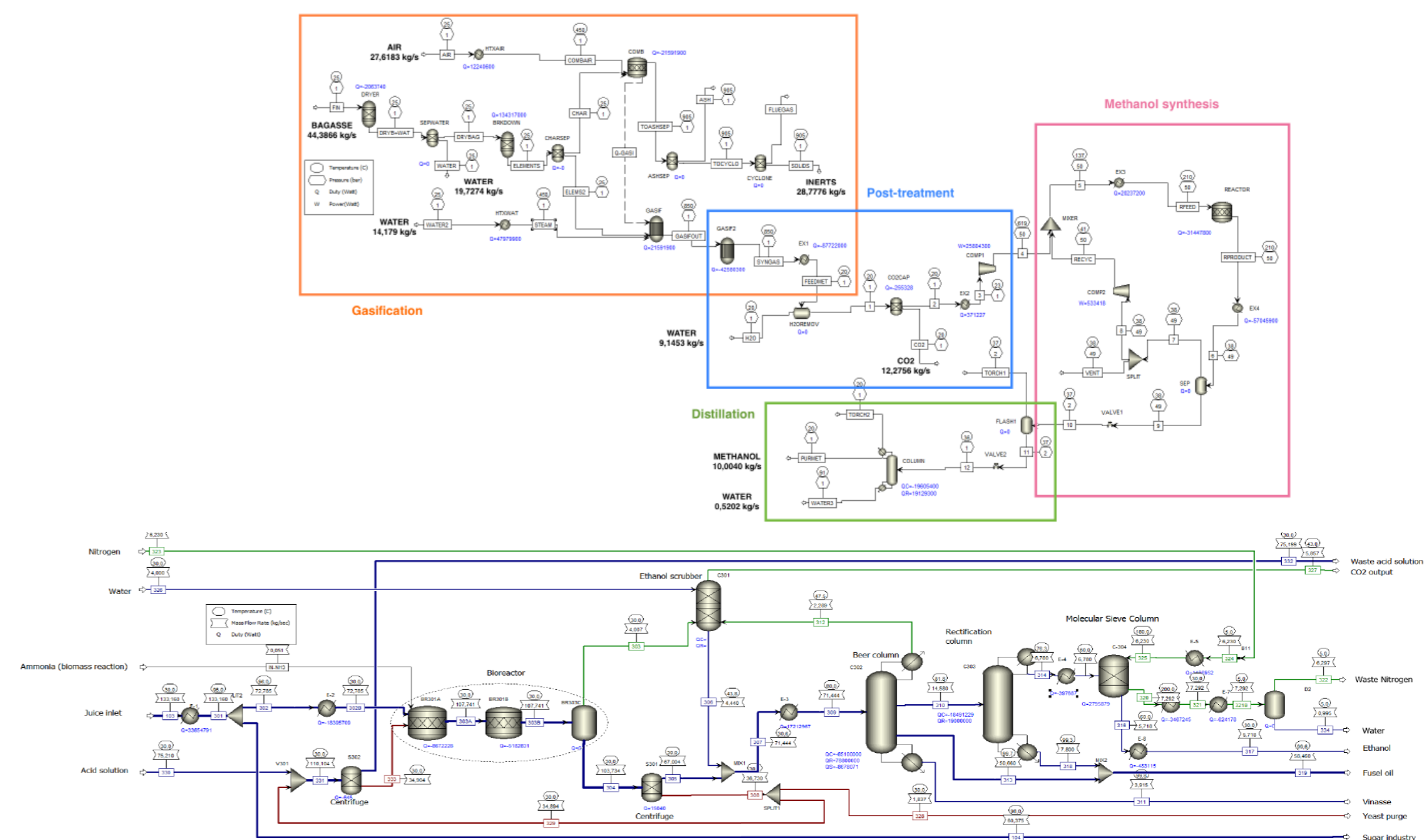
Mentoring and assessment

8 professors and scientists mentored and assessed the project. Different tools to ease the mentoring and encourage the acquisition of soft skills were proposed:

Impact of following idea on:	Students	Teachers
Shared on-line portfolio	Good for internal communication	Not really used
Presentations of progress reports every two weeks	Work overload for presentations	Good for internal communication
Agreement of field experts to be contacted	Students rather relied on internet	No impact
New team leaders in turn every fortnight	Prevented clear group structure	No impact
Work tables with teachers	Efficient work	Efficient work
Help in group organization from PSGO (Psychology of groups and organizations)	Useful feedback	No impact

The assessment was based on **technical results for 60%**, and **soft skills for 40%**:

- Evaluation of technical skills was partly done by all teachers equally, partly by respective teachers in their field of expertise.
- Efficient communication, creativity, links with conventional lectures were assessed by all teachers, as well as critical thinking. Group work was self-assessed by students.



Process flow diagrams of the bio-methanol and bio-ethanol processes¹

Conclusions and perspectives

This project gave students a first opportunity to improve their soft skills along with their technical knowledge. Perspectives for next year's project include experimental work in addition to simulation work. Moreover, the assessment may be modified by evaluating soft skills all year long so both the final result and the improvement contribute to the grade.

Reference

¹ Blanjean Q., Graindorge N., Hardy W., Hendrickx H., Rocca C., Lekeane J., Van Callemont Q., 2015&2016. Reunion Island to an energy independent island, Project reports. University of Liege