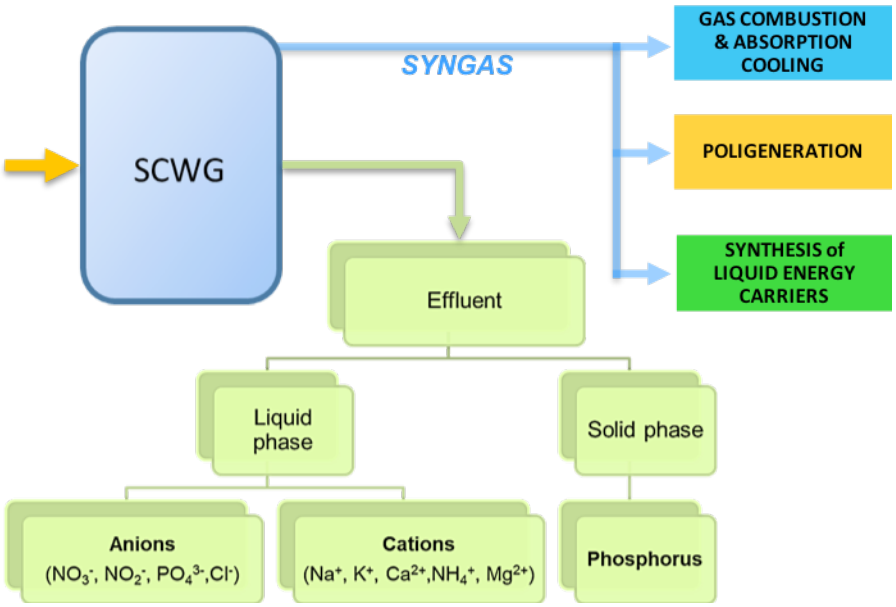
SUPERVALUE

SOLVING THE PROBLEM OF LOCALLY AVAILABLE WET RESIDUE STREAMS BY RECOVERING THE ENERGY CONTENT AND EXTRACTING THE VALUABLE ELEMENTS FROM THE INORGANIC PART USING A SMALL SCALE BIOREFINERY CONCEPT BASED ON THE SCWG PROCESS

An example of an organic residue problem as faced by our Industrial Partner: fruit processing waste (above) and its monthly amounts and disposal costs (below)



1° Call:	2017
Project period:	07/2018 - 06/2020
Topic:	Small-scale biorefineries
Keywords:	Biorefinery, supercritical water gasification, extraction of elements, case studies
Coordinator:	**Dr. Marcin Siedlecki** (Research and Innovation Centre Pro-Akademia, Poland)
	Email: marcin.siedlecki@proakademia.eu
Project partners:	Research and Innovation Centre Pro-Akademia, **Poland**; Technische Universiteit Delft, **the Netherlands**; Fresh World Int. Sp. z o.o., **Poland**.
Total funding:	357.000 €
Website:	faccesurplus.org/research-projects-2nd-call/supervalue

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BACKGROUND

- the need to provide a solution for the conversion of wet residues into energy...
- ... and the valorization of other valuable constituents;
- current situation: wet organic residues mainly treated in biogas installations, or dried and incinerated, or ... dumped;
- biogas is not an optimal solution;
- the need for innovation!

OBJECTIVE

- The modeling, process unit integration and optimization of the SCWG process;
- The development and optimization of methods for enhanced recovery of the resources from solid and liquid SCWG effluents;
- The development of a refining technology for the production of inorganic added-value products, like e.g. struvite;
- The generation of different energy carriers, while treating wet residues by means of the SCWG process, including heat/cold, electricity and organic liquids, like e.g. methanol;
- The identification of the outline and characteristics of the proposed system and the boundary conditions necessary to make the small-scale biorefinery based on the SCWG process economically attractive for the end user, that is the owner of the organic waste.

METHODOLOGY

Working with the real effluent originating from the bench-scale SCWG experiments the organic and mineral acid leaching of phosphate from the residual solid phase and mixing released P with the nutrient-rich filtrate, after the concentration process performed using e.g. microbial fuel cells were chosen for detailed investigation as a methods identified as cost-effective and suitable. The combustible product gas can be used either for polygeneration applications, or can be converted to another added value by-product (e.g. methanol fuel) for on-site storage and utilization, which is an alternative route to be tested within SUPERVALUE. Including the economic and ecological (LCA) assessment for the most common case studies as well as the inventory of possible added-value products formation in relation to their economic viability makes the study of the planned small biorefinery concept complete, interdisciplinary and multi-threaded.

RESULTS AND KEY FINDINGS

- mathematical models allowing a comparison between different system layouts targeting at proces optimization, environmental and economic performance for four different business cases;
- selection of suitable novel methods for nutrients (P, N, K, Mg) recovery from SCWG effluents and determination of the optimal production rates;
- a proposed method for fertilizer production from recovered elements;
- spreadsheet advisory tool for gas valorization options: compare different options (combustion, absorption cooling, synthesis) in terms of energy efficiency and Levelized Costs of Energy.