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Expert Workshop on Innovative Synthesis Routes for 2nd Generation Biofuels

22 April 2021

Q&A – Session 1 (1)

	Session 1	
09:45-10:00	***"R&I policy on bioenergy and biofuels: the European viewpoint"***	T. Schleker, *European Commission*
	• *What are the upcoming strategies & policies related to bioenergy & circular economy in your opinion – with indicative schedules including now the delays due to COVID-19?* • *Negative Emissions play a crucial role in all climate change mitigation scenarios. Which approaches/technologies do you see contributing in large scale towards this goal in the future?* • *If I understood you correctly, you mentioned a global or at least international biomass market? Is the low energy density not to great of a hurdle or did you refer to the products?* ➢ For elaborate answers to all questions please refer to 1:21:00 in the workshop recording.	

Q&A – Session 1 (2)

	Session 1	
10:00-10:15	***„The role of gasification technologies in 2nd generation biofuels value chains from an industry perspective“***	C. Aichernig, *Aichernig Engineering*

- *Which CO_2 separation concept is used in the “Winddiesel” concept?*
  - Amine scrubbing is used for CO_2 separation.
- *Are there economic calculations for the ”Winddiesel” concept? If so, how do they look (e.g. in terms of €/$l_{Diesel/Gasoline}$)?*
  - *Elaborate answer is given* at 1:25:45 in the workshop recording.
- *What is the oxidation medium in the “Winddiesel” concept?*
  - Steam (base load) or CO_2 (“Winddiesel” mode) are used for oxidation.
- *Do you have plans to consider involving Chemcial Looping Concept for air & energy supply during gasification?*
  - Yes, our motivation to participate in the CLARA project is to integrate CLG in the process to further improve the carbon efficiency and realize a carbon-negative BtL process chain.
- *Gasification has been around for quite some time now. What were the obstacles preventing big players from the energy and refinery sector from investing in this technology more intensively in the past? What needs to be done to further promote this technology, leading to its large-scale implementation?*
- *Is there a CO_2 purge/slip in the “Winddiesel” concept or is all the CO_2 recycled back to the gasifier?*
  - *For the conventional gasification process we would always have a CO_2 slip of about 20 % of the total feed going to the combustion side*

Q&A – Session 1 (3)

	Session 1	
10:15-10:30	***"Interest and potential of 2nd generation biofuels in petro-chemistry from an industry perspective"***	J. Lederer, *Orlen UniCRE*
	• *Do you see any technical issues when co-processing bio-based FT-waxes with conventional fossil-based feedstocks?* • *What share of green ethylene/propylene do you think is achievable in the near future (e.g. by 2030)?* • *Do you see promise in any raw materials suitable for biofuel production, which do not have the problem of resource allocation/competition for resources?* • *What incentives/changes do you believe are required for refineries to increase their share of non-fossil crude oil in their production capacities?* ➢ For elaborate answers to all questions please refer to 1:30:45 in the workshop recording.	

Q&A – Session 1 (4)

	Session 1	
10:30-10:45	***"Compact gasification and synthesis process for biofuels: outcomes from COMSYN project"***	J. Kihlmann, *VTT*
	• *In the COMSYN project the reformer serves a dual purpose (reforming & adjustment of H_2:CO-ratio). Is there an inherent trade-off between achieving both: the desired H_2:CO-ratio and full reforming of all longer hydrocarbons?* • *What is the size for the techno-economic studies? Similar to the business case (150-200 MW_{th})?* • *Can you give an estimate of the ratio between feedstock input and district heating output for the business case (150 MW_{th})?* • *What were your biggest challenges in the COMSYN project?* ➢ For elaborate answers to all questions please refer to 1:34:40 in the workshop recording.	

Q&A – Session 2 (1)

	Session 2	
11:15-11:30	***"Development of a concept for pre-treatment of straw"***	I. Funcia, *CENER*

- *You mentioned the additivation of wheat straw with 2 wt.-% of $CaCO_3$ improves the gasification behavior. Can you provide the difference in ash melting temperature between raw wheat straw and additivated wheat straw?*
  - ➢ According to thermochemical calculations (Factsage) at CLG conditions the slag percentage in straw at 950 ºC is reduced from 95% up to 55%. On the other hand HSM measures changes in height for ash samples with temperature; at 950 ºC additived straw show as light againts raw straw.
- *Did you assess the effect of pre-treatment on the storability of the biomass? We expect significant economic added value of the pre-treatment steps in the storage part of the supply chains.*
  - ➢ No, but there are data on the better performance of torrefied material concerning water absorption during storage. Counterpart, other issues like safety need to be take into account like dust generation since torrefied biomass is in disadvantage to non-torrefied ones.
- *Geographically, where do you see the biggest potential for the sourcing and pre-treatment of wheat straw for the production of 2nd generation biofuels?*
  - ➢ Highest cereal straw potential is in France, Germany, Poland and Ukraine.
- *Which players do you believe will enter the market of pre-treatment of wheat straw?*
  - ➢ The market will be driven by CO_2/tn price, the European policy about cascade use of clean wood and the future increasing demand of solid biofuels for power and heat generation in the Industrial sectors (according to JRC publications Europe has no growing potential for wood generation). Engineering companies (pelleting, gasification, torrefaction, etc.) and large industries consuming solid fossil fuels will be the key players

Q&A – Session 2 (1)

	Session 2	
11:30-11:45	**"*Oxygen carrier selection for chemical looping gasification of biomass based on the results of continuously operated units in the kW-range*"**	A. H. Soleimani Salim, *Chalmers University*
	• *What is the Technology Readiness Level (TLR) of CLC and CLG?* ➢ The TRL for CLG is 5-6 and the aim in CLARA project is to move the TRL to 7. For CLC, the TRL is 7. • *Which problems during CLG operation did you encounter during the operation of your units in the kW-range? Do you consider them to be barriers for roll-out in the industrial size?* ➢ Heat pretreatment of some of oxygen carriers, i.e. LD slag, before using in 10 kW was challenging in our lab. We need about 100 kg of material in the right size range for the operation and then we needed to calcine and sieve about 150 kg of OCs in the lab. The heat treatment of material in industrial scales should be possible, too, as it is a common procedure in industry. Also, we had problems with gas conditioning units during the operation as tar condensation happened and it blocked the sampling lines.	

Q&A – Session 2 (2)

	Session 2	
11:45-12:00	**"*Innovative H_2O_2–based sour gas cleaning concept – basic ideas and status*"**	F. Buschsieweke, *RWE*
	• *Do you plan to investigate the novel sour gas cleaning concept with $KMnO_4$ in pilot scale in case the experiments in the test rig are promising? If so, what is your approximate timeline?* ➢ Yes, this is our intention, maybe with partners from / suppliers gas cleaning technologies. The timeline isn't fixed at the moment. • *Which role would the novel gas cleaning concept play inside the RWE corporation, in case it is economically viable? Where would it be applied?* ➢ As RWE is interested in not only produce power from solid fuels but also basic chemicals in the future, we as an applicant of technology are interested in using economical technology. So our first intention is to create and evaluate new ideas and if successful transfer them to technology providers for further development. ➢ Depending on the sources the technology could be applied either on already existing sites (former power stations) or new ones.	
12:00-12:15	**"*Preparation of a 1 MW_{th} pilot plant for full-chain 2nd generation biofuel production tests based on chemical looping gasification*"**	F. Marx, *TU Darmstadt*
	• *From your previous knowledge from the project and elsewhere: Do you anticipate any major issues during 1 MW_{th} CLG operation? If so, which?* ➢ Experimental endeavors in this scale always are accompanied with problems. Yet, we believe these problems will be technically solvable. One inherent challenge with our pilot scale setup is that heat losses are relatively high (when compared to industrial settings), yet autothermal operation is required. Hence, the cold gas efficiency and consequently the syngas quality in our CLG unit will be not match the ones that can be achieved in externally heated lab or pilot scale setups.	

Thank you!