

Biogenic residues as potential feedstock for green energy carriers in urban areas – Gasification and synthesis demonstration in Vienna

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Abstract

Wien Energie is Austria's leading energy supplier, providing 2 million people with power, gas as well as district heating and cooling energy in the urban area of Vienna. Furthermore, Wien Energie utilizes 1 million tons of waste (MSW, sewage sludge and hazardous) thermally each year.

The successful energy transition is one of the main challenges to reach climate neutrality, especially in urban areas since cities with their high population density pose a particular challenge for renewable and CO₂-free energy supply for all sectors. To achieve the City of Vienna's CO₂ net zero 2040 target, new technological options and pathways must be developed and implemented into the energy system and the existing infrastructure. For this purpose, close cooperation and a shoulder-to-shoulder approach with mutual understanding of the different points of view between research and industry is required, for example in the fields of green energy carriers like hydrogen and sustainable methane, CO₂ utilization and energy storage.

One example of such an application-oriented collaboration is the multi-firm research project Waste2Value, a consortium led by BEST – Bioenergy and Sustainable Technologies, aiming at the demonstration of an innovative process chain of biomass and waste gasification with subsequent synthesis.

The first pathway to be demonstrated is the gasification of different biogenic residues (e.g. waste wood, sewage sludge, rejects from waste paper recycling) in a 1 MW dual fluidized bed gasification unit, followed by a multi-step syngas cleaning process and, finally, Fischer-Tropsch synthesis in a slurry reactor and product separation into a wax, middle distillate and naphtha fraction. Since start-up of the demonstration plant in early 2022 several testing campaigns have been performed, providing numerous data for balancing and simulation purposes of the gasifier as well as the whole process chain. Main research aspects from Wien Energie's point of view are gaining know how regarding continuous process operation (ash handling, syngas cleaning challenges, etc.) as well as obtaining data for techno-economic assessment for future upscaling considerations.

Wien Energie's mid-term perspective is the commercialization of this innovative technology for different synthesis product applications – e.g. green fuels, methane and methanol – in Vienna's energy and mobility sector.