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Area 1.3 Biorefineries Syngas Platform Technologies

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Introduction

This work presents the first results of a newly commissioned biomass-to-liquid Fischer-Tropsch (FT) pilot plant. A 1 MW_{th} dual-fluidized bed (DFB) steam gasifier, a 55 Nm³/h 4-step gas cleaning plant and a 250 kW slurry bubble column FT synthesis reactor (SBCR) form the full process chain.

Methods

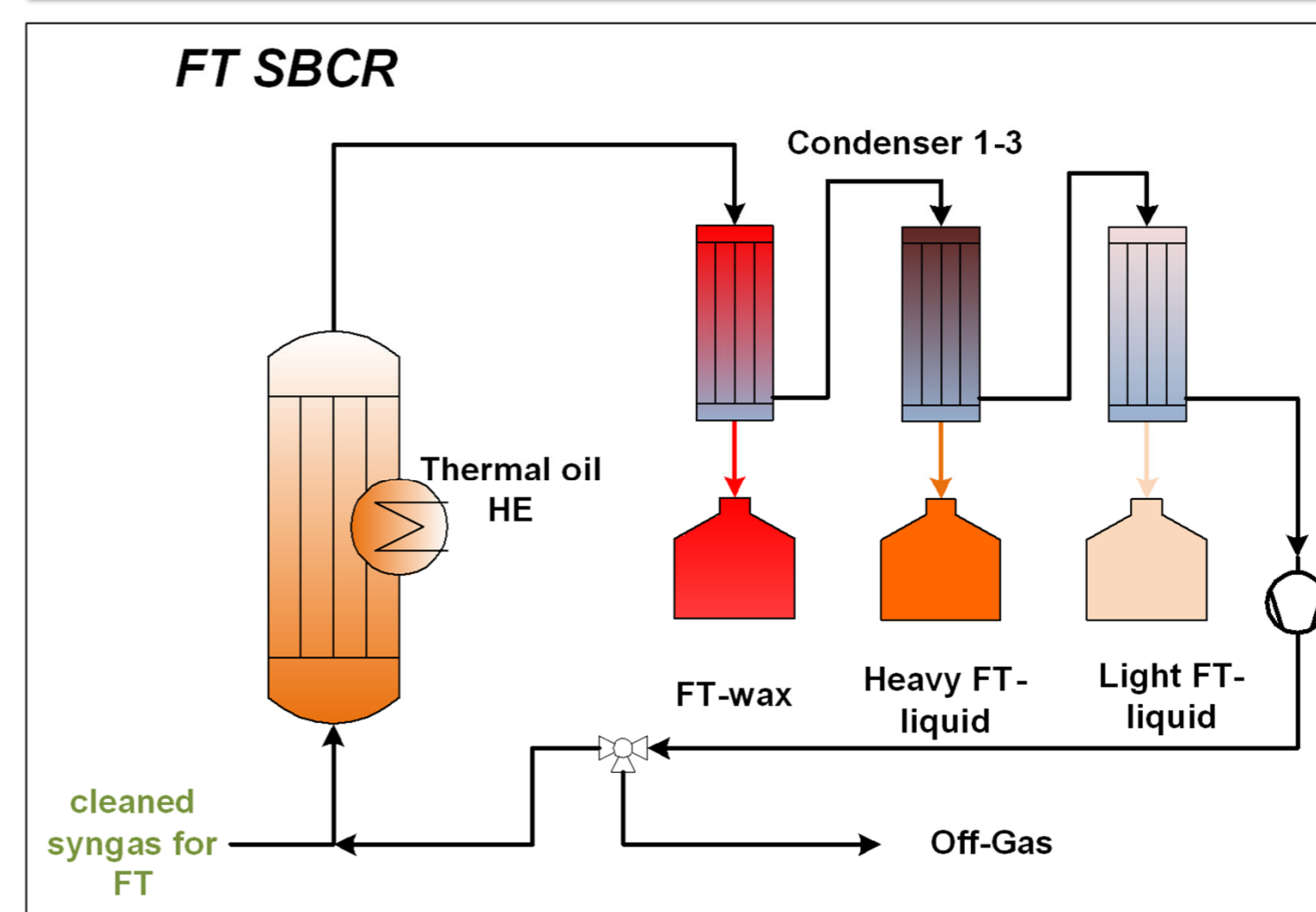
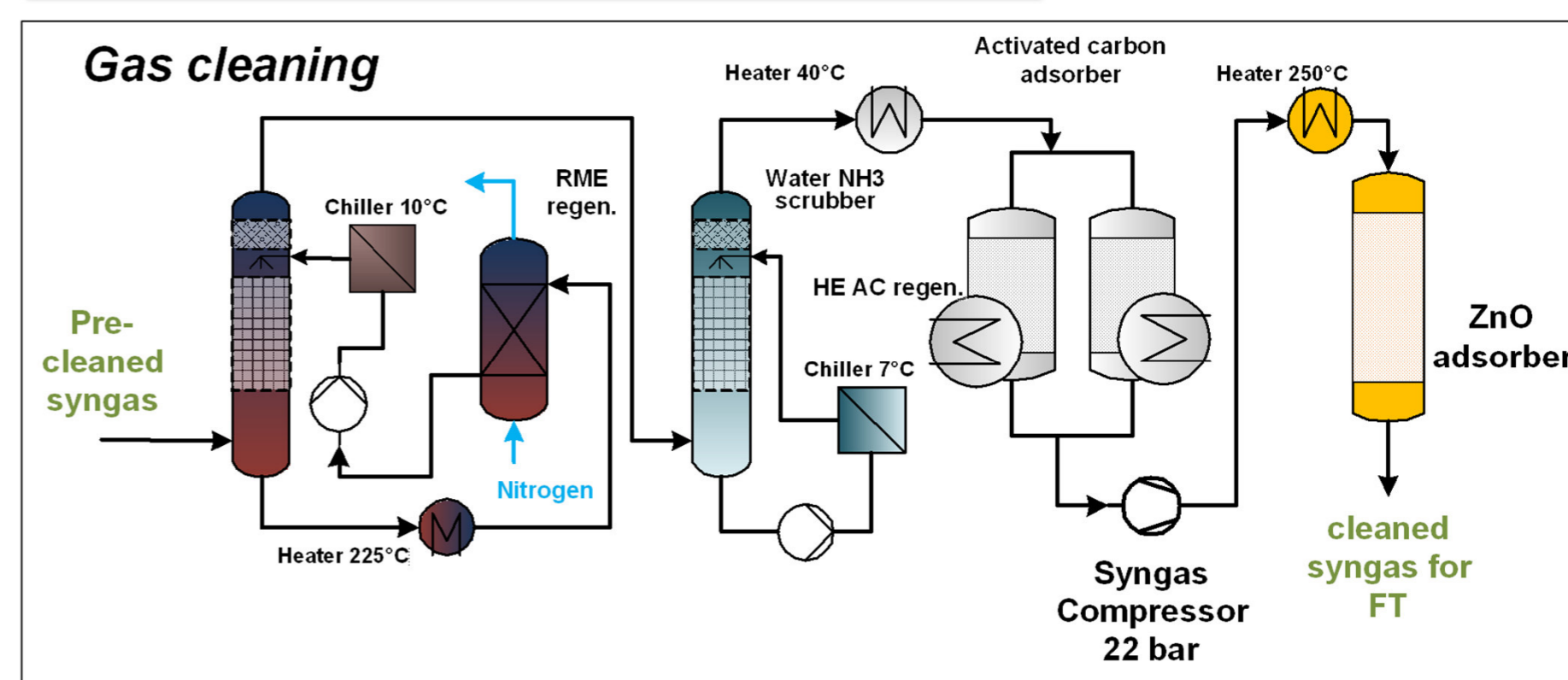
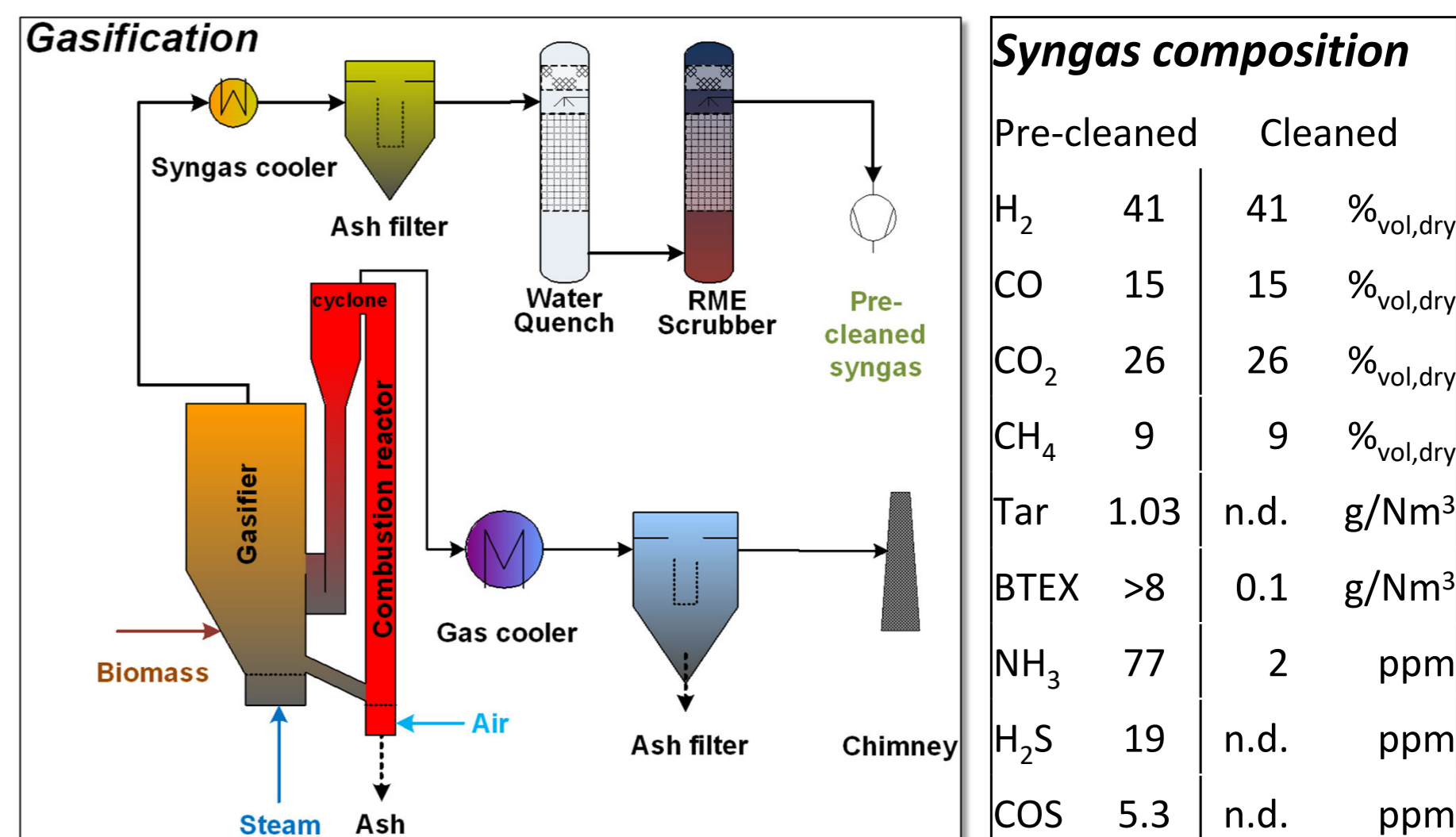
This synthesis gas (syngas) was supplied from the DFB gasification plant situated at the Syngas Platform Vienna. The gas was pre-cleaned in the coarse gas cleaning section. Tars were removed in a RME scrubber, NH₃ in a water scrubber, sulfuric components over an activated carbon bed and a ZnO adsorber. The cleaned syngas is supplied to the Fischer-Tropsch unit and converted at 215 °C and 15 bar(g). The FT product was condensed in 3-stages. Distillation, hydro isomerization and blending was done by a project partner to meet the standards for drop-in diesel fuels. Gas impurities and composition were monitored by gas chromatographs.

Results

Syngas was produced at a H₂:CO ratio of 2.66 with a cold gas efficiency of ~65 % from wood chips. Organic and inorganic impurities could be reduced to a sufficient level for synthesis (Tab. 1). RME consumption was reduced by regeneration at 225 °C in a stripper column, the activated carbon adsorbers were regenerated at 125 °C. Commissioning was done over the course of 6 days. 150 kg of the FT-SBCR product was sent for distillation. The gathered FT diesel was hydro-processed, two blends between fossil and FT diesel (with a share of 15 and 25 %wt FT diesel) were delivered for tests on a public transport bus from WIENER LINIEN GmbH & Co KG.

Discussion and outlook

The commissioning showed promising results for the further development of SBCR in an intermediate scale. Further automation of the gas cleaning is being implemented and adaptations for higher diesel fraction output in the FT are planned. Campaigns on a variety of feedstock (e.g. sewage sludge) are in progress.



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