TESTING AN INTEGRATED BIO SYNTHETIC NATURAL GAS (BIO-SNG) SYSTEM

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ABSTRACT: The substitution of natural gas by a renewable equivalent is an interesting option to reduce the use of fossil fuels and the accompanying greenhouse gas emissions, as well as from the point of view of security of supply. One of the renewable alternatives for natural gas is the so-called Synthetic Natural Gas (SNG). SNG is produced via gasification of biomass and subsequent cleaning, conditioning and methanation of the product gas.

1 INTRODUCTION

The substitution of natural gas by a renewable equivalent is an interesting option to reduce the use of fossil fuels and the accompanying greenhouse gas emissions, as well as from the point of view of security of supply. One of the renewable alternatives for natural gas is the so-called Synthetic Natural Gas (SNG). SNG is produced via gasification of biomass and subsequent cleaning, conditioning and methanation of the product gas.

The technology for SNG production, however, is still under development and realisation of the first semi-commercial plant is not expected before 2010.

2 TECHNICAL FEASIBILITY

The technical feasibility of the production of SNG from biomass is demonstrated at ECN by tests with integrated biomass gasification, gas cleaning, and methanation experiments. In the experiments upgrading of the raw product SNG, i.e. water and CO_2 removal, was not included for practical considerations. Furthermore, water and CO_2 removal are well-known and commercially available technologies.

2.1 Experimental bench-scale line-up

The experimental bench-scale line-up is based on atmospheric gasification in combination with atmospheric methanation as shown in the figure below. The methanation section was constructed and operated on full capacity of the cleaned product gas. Water condensation was avoided by operating the gas cleaning and gas conditioning section above the water dew point of 50 to 80°C.

The bubbling fluidized bed gasifier is operated at 850°C. A mixture of oxygen and steam was added as gasification agent to avoid N_2 dilution of the product gas. A Hot Gas Filter (HGF) downstream the gasifier reduces the dust concentration in the product gas.

Subsequently, the OLGA technology developed by ECN removes heavy and partly the light tars in two separate columns. The SACHA technology was installed for the removal of chlorine (HCl) and sulphur compounds (H_2S, COS, CS_2, "mercaptanes"). Unsaturated hydrocarbons were catalytically converted in the gas conditioning section to avoid soot formation in the methanation section.

2.1 Functional testing

Three functional tests were performed with the experimental system line up. In the 1st functional test the gas cleaning was tested for the removal of tar, sulphur and chlorine compounds. The 2nd test was performed to test the gas conditioning section. The 3rd test was done with the integrated installation to obtain the performance of the methanation section.

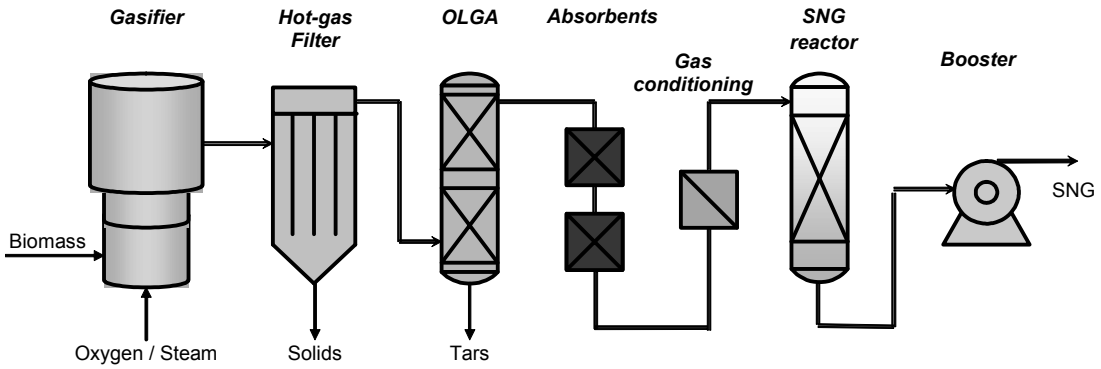

Figure 1: Experimental bench-scale line-up

3 CONCLUSIONS

Following operational problems related to carbon deposition, the integrated atmospheric gasification installation with atmospheric methanation has run properly. The impurities like dust, sulphur and chlorine have been removed sufficiently. To meet the SNG specification, the system (OLGA and methanation section) must be optimised in tar, H_2 and CO removal. In future development the process will be optimised by the application of an additional methanation reactor or by changing the methanation conditions.