High Performance Gasification with the Two-Stage Gasifier

Based on more than 15 years of research and practical experience, the Technical University of Denmark (DTU) and COWI Consulting Engineers and Planners AS present the two-stage gasification process, a concept for high efficiency gasification of biomass producing negligible amounts of tars. In the two-stage gasification concept, the pyrolysis and the gasification processes are physical separated. The volatiles from the pyrolysis are partially oxidized, and the hot gases are used as gasification medium to gasify the char. Hot gases from the gasifier and a combustion unit can be used for drying, air preheating and pyrolysis, hereby very high energy efficiencies can be achieved. Encouraging results are obtained at a 100 kWth laboratory facility. The tar content in the raw gas is measured to be below 25 mg/Nm3 and around 5 mg/Nm3 after gas cleaning with traditional baghouse filter. Furthermore a cold gas efficiency exceeding 90% is obtained. In the original design of the two-stage gasification process, the pyrolysis unit consists of a screw conveyor with external heating, and the char unit is a fixed bed gasifier. This design is well proven during more than 1000 hours of testing with various fuels, and is a suitable design for medium size gasifiers.

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