PILOT PLANT FOR SUPERCRITICAL WATER GASIFICATION OF SUGARCANE BAGASSE

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Introduction

Supercritical Water Gasification has a great potential for recycling of biomass for the production of new products as hydrogen production. The supercritical water gasification does not require drying, thus, the problem of drying is largely avoided by the gasification in supercritical water and can be used for biomass with high percentage of moisture (55-75%). The conversion efficiency of gasification in supercritical water (50-55%) is generally higher when compared with conventional gasification technologies. The objective of this work was to assemble semi-continuous equipment for sub/supercritical gasification technology using water as solvent.

Material and Methods

The system was designed to work with pressures up to 22.1 MPa and temperatures up to 673 K. The pilot plant unit contains a water pump, check valve, micrometric valve and backpressure valve, thermocouples and temperature indicators, a 790 mL tubular flow reactor gasifier (reactor 2) inserted in an electric heating jacket, heating coil, separator liquid-gas, flowmeter and gas sampler. The biomass is introduced in a semi batch hydrolysis reactor (reactor 1). The process starts and the water begins to flow through the reactor at temperature and pressure in subcritical or supercritical conditions. The system was validated using as raw material sugarcane bagasse with and without steps for previous hydrolysis in subcritical water (temperature of 250ºC and 20 MPa).

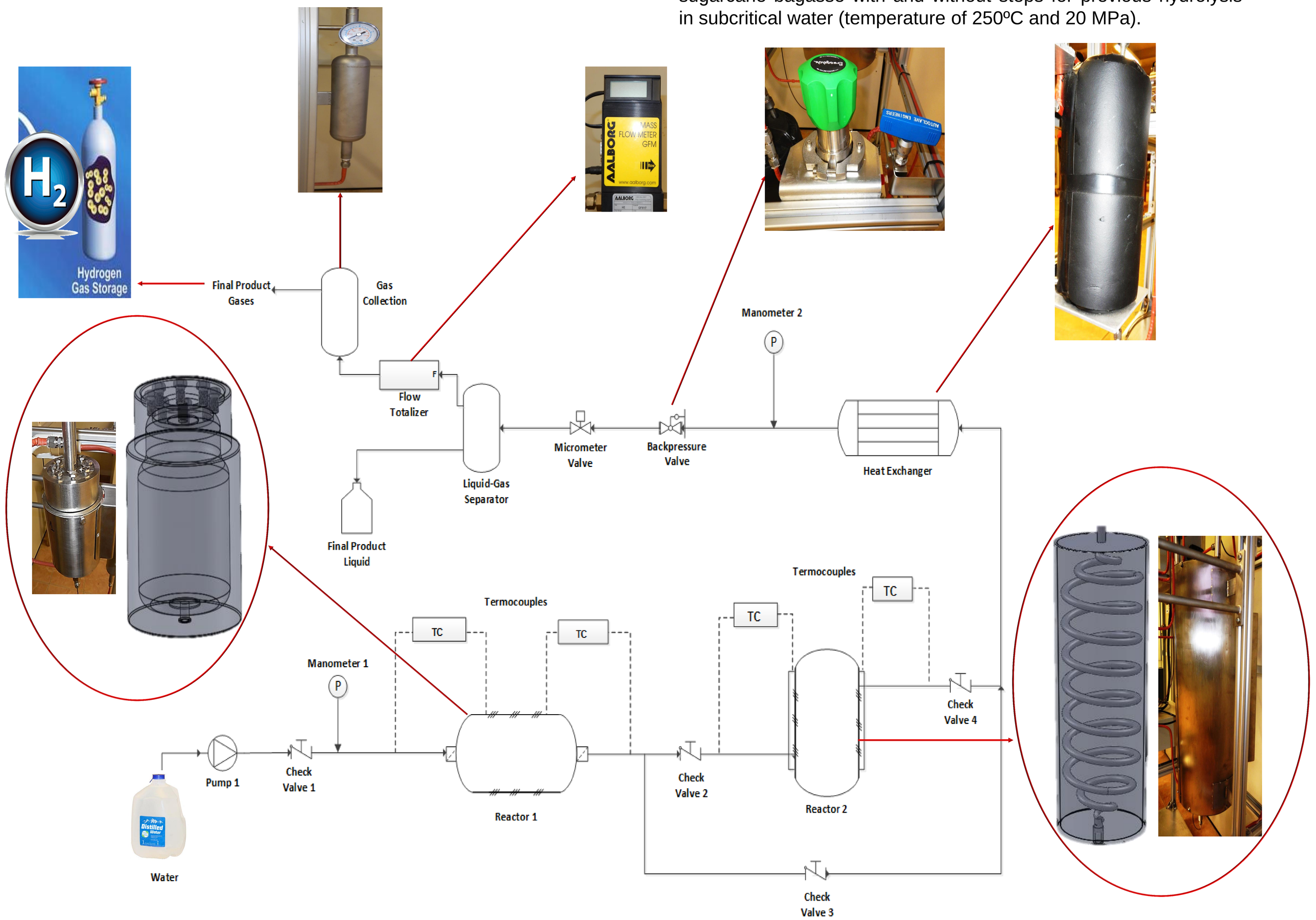

Figure1. Pilot plant for supercritical water gasification

Results

In the design and assembly process of pilot plant all influence factors in the process as temperature, pressure, residence time, concentration, effect of catalyst, effect of reactor geometry, reactor design, of heating rate of particle of biomass and of type of biomass was revised.

Conclusion

The expectations of this work are obtain a high yield of Hydrogen from SCWG of bagasse from sugar cane, thus giving a higher value-added product.

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