

A Novel, Low Cost Polyacrylamide-Piperazine Hydrogel for Efficient Purification of Biogas

1. Technology:

The invention developed is a formulation of polyacrylamide hydrogel along with piperazine surfactant which makes the formulation more efficient for simultaneous absorption of CO₂ and H₂S from raw biogas. Firstly, Aqueous solution of polyacrylamide was prepared by adding 1.5 grams of partially hydrolyzed polyacrylamide (PHPA), 1.0 gram of NaCl, 1.5 gram of piperazine in 96 gram of distilled water and mixed uniformly in a mechanical stirrer at 600 rpm. 400 ppm of Chromium (III) acetate was added to resultant solution as crosslinker and mixed for 10 minutes. The gel time was found to be 5 hrs. Figure 1 describes the flow chart of the proposed biogas purification process. The prepared hydrogel is poured into the absorption column and biogas is allowed to flow through the gel at a flow rate of 10 ml/min with the help of low flow pump. The raw biogas is allowed to interact with the hydrogel where CO₂ and H₂S present in the raw biogas is absorbed by the gel and methane gas is allowed to pass through the top of the absorber. The purified methane gas is collected in the collection container and gas analyser is used to measure the composition of purified gas. Figure 2 describes the experimental set up for biogas purification using polyacrylamide-piperazine hydrogel absorber. The composition of purified biogas is claimed to contain 91.78% of methane and 4.32% of CO₂. The purified biogas can be used as bio CNG in the automobile sector. Considering its physicochemical and biodegradation properties, this polyacrylamide gel may qualify as a suitable absorbent for biogas purification. Table 1 describes the numerical values of the compositions present in the biogas before and after purification.

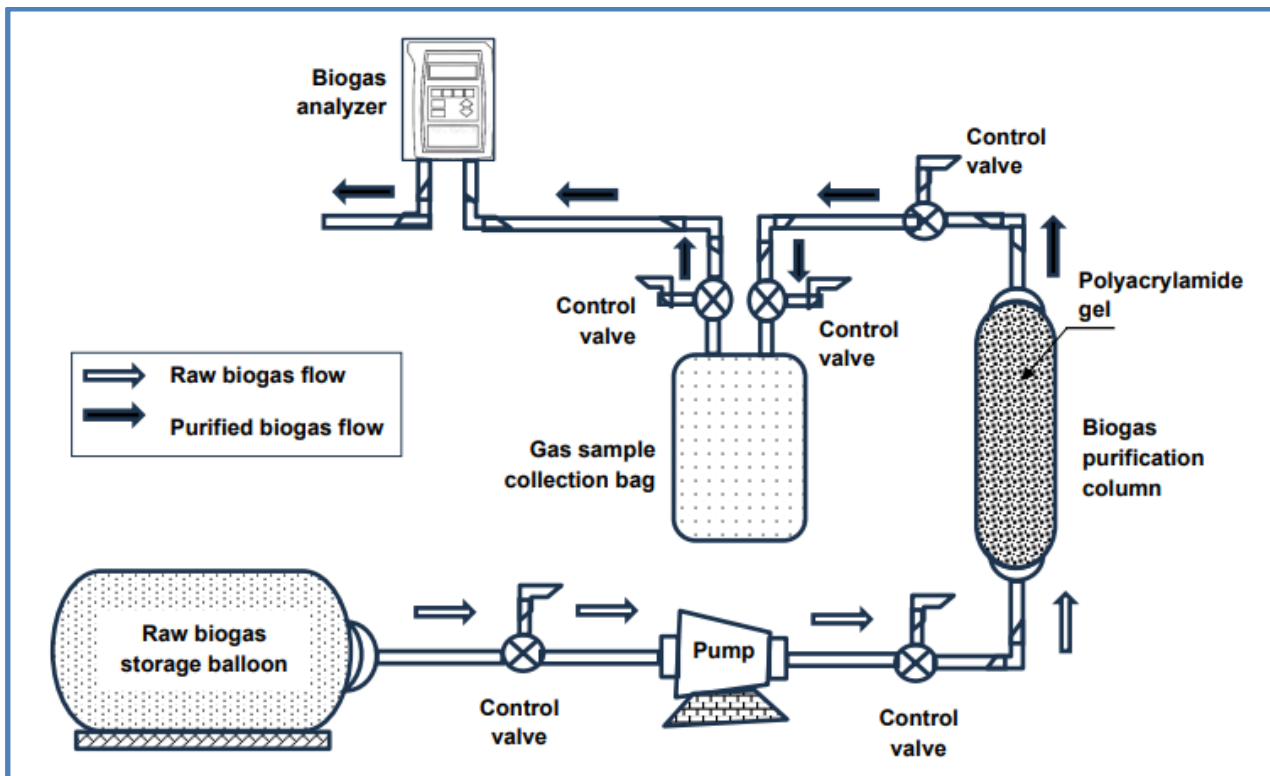


Figure.1. Schematic of Biogas purification experiment

2. Problem Addressed:

The already developed technologies show purification of biogas but it requires more power consumption, more water consumption, high cost of material and low purification efficiencies. In our technology, quantity of polyacrylamide and piperazine used for preparation of hydrogel is very less as the gel contains 97% of water in the formulation. Simple passing of N₂ gas into the absorption tower can regenerate the absorbed polyacrylamide gel.

3. Industrial Applications:

1. Biogas purification
2. Carbon dioxide sequestratin

4. Patent Application Number: 202441012591