

A Comparative Assessment of Membrane Bioscrubber and Classical Bioscrubber for Biogas Purification

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Abstract : Raw biogas is a valuable renewable energy source however it usually needs removal of the impurities. The presence of hydrogen sulfide (H₂S) in the biogas has detrimental corrosion effects on the cogeneration units. Removal of H₂S from the biogas can therefore significantly improve the biogas quality. In this work, a conventional bioscrubber (CBS), and a dense membrane bioscrubber (DMBS) were comparatively evaluated in terms of H₂S removal efficiency (RE), CH₄ enrichment and alkaline consumption at gas residence times ranging from 5 to 20 min. Both bioscrubbers were fed with a synthetic biogas containing H₂S (1%), CO₂ (39%) and CH₄ (60%). The results show that high RE (98%) was obtained in the DMBS when gas residence time was 20 min, whereas slightly lower CO₂ RE was observed. While in CBS system the outlet H₂S concentration was always lower than 250 ppmv, and its H₂S RE remained higher than 98% regardless of the gas residence time, although the high alkaline consumption and frequent absorbent replacement limited its cost-effectiveness. The result also indicates that in DMBS when the gas residence time increased to 20 min, the CH₄ content in the treated biogas enriched upto 80%. However, while operating the CBS unit the CH₄ content of the raw biogas (60%) decreased by three fold. The lower CH₄ content in CBS was probably caused by extreme dilution of biogas with air (N₂ and O₂). According to the results obtained here the DMBS system is a robust and effective biotechnology in comparison with CBS. Hence, DMBS has a better potential for real scale applications.

Keywords : biogas, bioscrubber, desulfurization, PDMS membrane

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