CO_2 Capture from Post-Combustion Flue Gases Using VPSA Process: Experiment and Simulation Case Study

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This study aims to develop a CO_2 capture process to mitigate the CO_2 concentrations in our atmosphere. CO_2 emissions from flue gases of large stationary sources such as power plants and energy-intensive industries (cement, steel, etc.) have been recognized as responsible causes of global warming and environmental change. In this context, a vacuum pressure swing adsorption (VPSA) process is adopted, but fine-tuning the adsorption materials (adsorbents), process configurations, and operation conditions is essential for promoting an efficient carbon capture process. Therefore, testing different VPSA configurations, and operating conditions have been implemented experimentally and by ASPEN simulation to maximize the CO_2 purity and recovery in the product stream. VPSA seems to be an effective choice for CO_2 capture from flue gases due to its advantages such as low energy demands, low capital investment cost, low environmental impacts, and ease of achieving an automated operation [1-2]. Furthermore, the extensive development of effective adsorbents has aided in the improvement of the adsorption process in recent years. So, lab-scale testing of the VPSA process is necessary to obtain valuable feedback for the modeling: model improvement, and further optimization of the process.

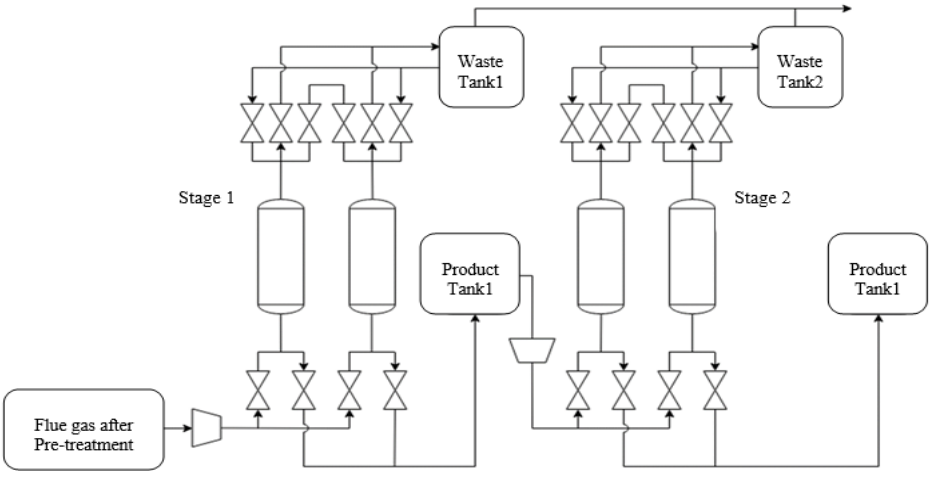

Fig. 1. Scheme of two-stage VPSA process

Références :

[1] Aaron D., and Tsouris C, *Sep.Sci. Technol.*, 40, 321-348 (2005).
[2] Ben-Mansour R. *et.al.*, *Applied Energy*, 16, 225-255 (2016).