MEMBRANES FOR CO2 CAPTURE – REPORT ON PILOT PLANT TESTS

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Although the main part of the world has now accepted the fact that the global climate change is due to human activities, we will not be able to switch gear and only go for “green energy” without fossil fuels for still many decades. One way of contributing to combat the climate change is hence to capture the CO_2 from fossil fuel flue gases, and either find ways to utilize the CO_2 or sequestrate it in aquifers or depleted oil fields, while we slowly develop a “green way of living”.

Membranes will for sure represent one of the emerging technologies to be used for CO_2 capture. Today there are a few pilot installations around the world using different types of membranes, to demonstrate and learn the best way of optimize such a capture plant – in Norway there are two of such kind; one at a cement factory in Brevik in South Norway and one at a test center at Tiller in Trondheim. At the cement plant the CO_2 concentration in the flue gas can be close to 20 vol%, while at the Tiller plant there is a possibility to vary the CO_2 concentration over a range of 8 – 12vol%. At the cement plant the flue gas contains quite a few unwanted components, while at Tiller the flue gas is relatively “clean”. The type of membrane installed at these two sites is hollow fiber modules where the support fiber is polysulfone (PSf) and the coated mebrane is a polyvinylamine (PVAm). The technique for applying the coating is not straight forward, and an efficient flue gas separation depends strongly on a successful coating procedure. Going from lab tests using a few cm^2 up to several m^2 of a commercial scale module is extremely challenging. The tests are being performed with 2 or 3 modules in parallel or series, but not yet as a complete two-stage process. Based on obtained results, a full scale process will be simulated. Preliminary results using only one stage at Tiller are already documenting an encouraging 58% CO_2 in permeate from 7% CO_2 in feed line.

The PVAm membrane is based on facilitated transport of the CO_2 through the membrane, which means that water needs to be handled in the separation process – this has again a large influence on the engineering design of the process and process operation parameters.

The presentation will highlight and report some results and challenges from these two tests sites.

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