

Integration of oxygen membranes for oxygen production in cement plants - DTU Orbit (08/11/2017)

Integration of oxygen membranes for oxygen production in cement plants

The present paper describes the integration of oxygen membranes in cement plants both from an energy, exergy and economic point of view. Different configurations for oxygen enrichment of the tertiary air for combustion in the pre-calciner and full oxy-fuel combustion in both pre-calciner and kiln are examined. The economic figures of merit are compared with those from a standard cryogenic plant. Both oxygen enriched air and full oxy-fuel cases allow for an increase in clinker production, use of alternative fuels as well as on-site electricity production. In addition, the full oxy-fuel cases generate a concentrated CO₂ source that can be used for enhanced oil recovery, in combination with biomass gasification and electrolysis for synthesis gas production, or possibly sequestered. The cases with oxygen enriched air provide very promising economic figures of merit with discounted payback periods slightly higher than one year. The full oxy-fuel cases have a discounted payback period of approximately 2.3 years assuming a CO₂ selling price of 35 US\$/ton. The sensitivity analysis of full oxy-fuel cases clearly shows that for the discounted payback period, the most sensitive parameters are the CO₂ price and the clinker selling price.

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