The DMX™ Process

Important R&D research efforts have been undertaken at IFPEN in order to identify new solvents and to develop associated processes to come up with solutions with lower energy penalty and with no or little operational drawbacks. With those two main drivers, among others as discussed in Raynal et al[7] , IFPEN has developed the DMX™ process[8] . This process is based on the particular property of demixing solvents to form, for specific CO_2 loadings or temperature conditions, two immiscible liquid phases respectively characterized by different densities and different CO_2 loadings. The heavier phase has a particular high CO_2 loading, while the lighter phase is almost free of CO_2. From the difference in densities and the further possibility of separation by decantation, it allows to consider an important decrease of solvent mass flow at regeneration. Indeed, the use of a decanter, preferably positioned downstream the amine/amine heat exchanger, enables to take advantage of the liquid/liquid separation property of the solvent with the simultaneous effect of CO_2 charge and heat. Only the dense phase having a high CO_2 concentration is injected in the regenerator. The light phase is mixed with the regenerated solvent coming from the stripper and injected to the absorber as can be seen from the simplified process flow diagram below.

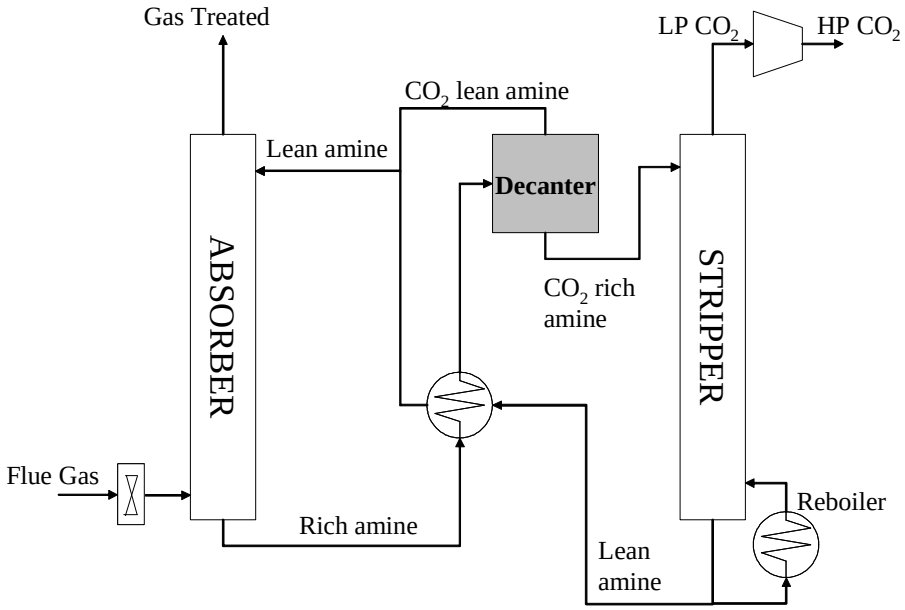

Figure 1: Simplified process flow diagram of the IFP DMX™ process.

The solvent used in the DMX™ process is characterised by excellent thermodynamic properties which, when combined with the demixing advantage, further induce an energy consumption at reboiler as low as 2.3 GJ/tCO_2. With this technology potential of CO_2 capture cost reduction should be between 20 and 30 %. and an efficiency gain of 2 points net yield is expected for a coal power station equiped with DMX™ as CO_2 capture process compared to the reference process (MEA 30 wt%).

The DMX™ solvent is also characterised by very low degradation and corrosion rates. Impact on emissions should be drastically reduced with this process. The demixing of the solvent brings other advantages, in particular possible original plant water balance management and possible original reclaiming section.

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[7] L. Raynal, P-A. Bouillon, A. Gomez and P. Broutin, From MEA to demixing solvents and future steps, a roadmap for lowering the cost of post-combustion carbon capture, article in Press, Chem. Eng. J., article in press, doi:10.1016/j.cej.2011.01.008

[8] L. Raynal, P. Alix, P-A. Bouillon, M. le Febvre de Nailly, M. Jacquin, J. Kittel and P. Mougin, The DMX™ process: an original IFP solution for lowering the cost of post-combustion carbon capture, accepted for presentation at GHGT-10 conference with further publication in Energy Procedia