

PC FLUE GAS: IMPACT ON THE CO₂ PERMEATOR

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The Carbozyme, enzyme catalyzed, dual hollow fiber, contained liquid membrane (CLM) permeator is a highly effective device for capture and enrichment of carbon dioxide (CO₂) from mixed gas streams. These include both artificial mixtures (ersatz streams) and methane and propane streams, for the following operating conditions: CO₂ – 0.05-40%, T – 15-85°C (59-185°F), RH – 0-100%, Feed P – 90-200kPa (13-29psi), Permeate P – 10-110kPa (1.45-16psi).

Inasmuch as coal now provides a large fraction of electric power and is expected to be the fuel of choice for the foreseeable future, and inasmuch as coal flue gas (CFG) is a more complicated mixture than any of those tested heretofore, our next engineering step was to examine the possible interactions between the permeator and the CFG stream. Each CFG is idiosyncratic due to the use of given ranks of coal, specific boilers, given secondary combustion, and the presence and operation of particular cleanup technology.

Our focus was on the effects of SO_x, NO_x, haloacids, particulates and mercury. Measured CFG composition was obtained from various power plants. Analysis was carried out on a “typical” CFG stream to examine three classes of adverse interactions – 1) obstruction of the polymer membrane, 2) acidification of the CLM, and 3) inhibition of the enzyme. These interactions could decrease performance of the permeator. We addressed the strategies of avoidance, i.e., preventing the event, remediation, i.e., repair, and replacement. The data indicate that current SCR, baghouse and FGD technologies are not sufficient to satisfy our acceptance standards. New approaches are needed to achieve near-zero pollution.