



Highly Cost-effective Cryogenic Capture of Industrial Emissions for Clean Energy-Environment

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ABSTRACT: *In this paper we disclose very briefly, for the first time, methods of our newly invented state-of-the-art cryogenic technology for the most cost-effective and energy efficient capture of each known component of entire emissions (nearly 100%) such as carbon dioxide (CO₂), sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), any other acid vapor, mercury, steam from industrial plants (coal and natural gas fired power plants, cement plants etc.), in a liquefied or frozen/solidified form, such that each of the components is captured separately and is industrially useful. This new technology includes a novel NH₃ power plant to generate auxiliary electrical power from the heat energy of the flue gas to further improve the energy efficiency and cost effectiveness of the capture processes. It uses turbine expansion to cool N₂ gas of the flue gas to temperature ~-194 C, which is used to cool the incoming flue gas under pressure. The turbine expansion work is utilized to drive some of the compressor pumps and thus to reduce the net energy expenditure to 235 MJ or \$8 per ton of CO₂ avoided from coal power plant and nearly zero per ton of CO₂ avoided from natural gas power plant. For natural gas plant the technology turns out to be profitable at -234 MJ per ton of CO₂ avoided. It is the most cost effective of all existing emission capture technologies. It does not require use of any chemicals/reagents/external cryogenes, unlike the current technologies. It uses only a fixed amount of water needed for the cooling process which can be used repeatedly. It does not need any chemical/reagent for the said capture.*

Keywords: *Cryogenic technology; most cost-effective; energy efficient; carbon capture; toxic components; auxiliary energy generation; turbine expansion work; cold N₂ gas.*

Full paper

Introduction

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