

Effect of pressure and temperature on boil-off gas formation in the liquefied CO₂ storage tank and its construction cost

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Generally accepted operating pressure and temperature of CO₂ storage tanks for CCS carriers are 7bar and -50°C. This is because when CO₂ under high pressure is combined with water molecules. When liquid CO₂ is injected into the subsea stratum through an unloading flexible hose, these solid particles block the hose and become an obstacle to CO₂ injection process. Hence it would be natural to consider higher pressure than 7 bar as an option for the CO₂ tank pressure, however the reason why this approach is uncommon is that the cost of tanks construction should be rising as the pressure limit of tanks rises. In this study the cause of economic loss is assumed to be the maintenance of temperature of tank. Safety maintenance cost for solid-hydrates should be considered too but since it is hard to analyze that cost in a reliable manners it is left out. Two 12,500m³ tanks with pressures of 7bar and 20bar undergo a PI control scheme with the manipulated variable being the mass flow rate of liquefied CO₂ into the tanks. Later the difference of liquefying energy cost is used to calculate how much cost rise is allowed for a 20bar tank.