

Optimization of CBM Liquefaction Process Adopting Mixed Refrigerant Cycle

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Coalbed methane (CBM) is a type of important energy resource in the world. Liquefaction is a good option for recovery of CBM. Different from ordinary natural gas, CBM usually consists of a lot of nitrogen, which cannot be removed by ordinary purification technology of LNG. Nitrogen can be separated from CBM by adsorption before liquefaction, or by distillation after liquefaction. For the liquefaction-distillation process, nitrogen will be liquefied together with methane, and the liquefaction system performance changes along with the nitrogen content of the CBM feed gas. The liquefaction process of a mixed refrigerant cycle with propane precooling is discussed in this paper, which has the advantages of high efficiency and relative simplicity, and is suitable for small-scale liquefaction plants. The mixed refrigerant usually consists of nitrogen and hydrocarbons from methane to pentane, which are all natural refrigerants. To realize optimal system performance, the composition of the mixed refrigerants may vary significantly with different CBM conditions. Taking unit product liquefaction power consumption as the major index for analysis, the optimal component of mixed refrigerant is worked out and corresponding system performance is obtained at different nitrogen content of CBM feed gas when the liquefaction rate and methane recovery rate are fixed.