HyNet Hydrogen Production Plant 1 – Technical Note

EPR Response – 6a – BAT for CO_2 Capture

Summary

Explain the amine solvent selection process and the implications of the composition of the solvent on the overall energy efficiency of the carbon capture and solvent regeneration strategy.

Response

The selection of the solvent was determined by gas composition and pressure of the feed gas. The design was based on BASF's OASE® White formulation. This uses an activated MDEA which is the latest in BASF's CO_2 capture solvent technologies. Activated MDEA speeds up the chemistry of CO_2 capture unit process.

The solvent was optimized for:

- The defined gas composition: this required a higher activator concentration (described by ratio Amine/Activator).
- CO concentration: high CO concentrations would have led to degradation of the active components and therefore the choice of solvent would have been different to cover Start of Run and End of Run Scenarios (SOR and EOR).
- A low CO_2 slip: to achieve high purity hydrogen in the treated gas stream.
- The limited amount of energy available from the upstream process: used for solvent regeneration and hence reboiler duty.
- Implementation of an LP Flash: this reduced energy consumption by using process conditions to improve CO_2 loading.
- The use of welded plate and frame heat exchangers for heat recovery: this reduces energy consumption by allowing smaller approach temperatures.

Typical energy consumption for similar CO_2 capture units using a single stage absorption column is in the region of 3MJ/tonne of CO_2. This plant achieves approximately 1.6MJ/tonne of CO_2, which provides a best in class in terms of energy consumption for BASF.

Overall, the lowest possible energy consumption design for the plant using a single stage absorber design.