

HyNet Hydrogen Production Plant 1 – Technical Note

EPR Response 5a – Desulphurisation of Feed Gas

Summary

Background

Table 3-6 of the Environmental Permit Application refers the reader to Table 2-1 where the incoming gas composition is given. It also notes that “The ROG has a design H₂S concentration of 13.6 ppmv. The HPP has been designed to handle impurities in the gas of up to 20 ppmv total sulphur ... If the impurities exceed these levels for any appreciable time, the ROG will not be imported.”

However, the sulphur-free nature of the PSA tailgas sent to the heater and boiler is actually a function of the upstream desulphurisation. This is described in Application paras 2.2.4 – 2.2.6.

Problem Statement

The EA have asked to advise the specification of sulphur content in the desulphurised gas fed to the reformer, in support of the qualitative statement that the combustion of the PSA tail gas will not result in atmospheric emissions of SO₂ (reference: Table 3-6 of the Permit Application Supporting Document).

Action

Process team to confirm

Details

The worst case for the environmental performance is a 100% ROG case (i.e. not diluted by natural gas). The composition at the tail gas sent to combustion (i.e. the point at which sulphur would be released as SO₂) is envisaged to be 0.00ppmv.

A desulphurisation system which contains a Hydrosulphurisation vessel [V-101] using propriety catalyst “Puraspec 2571” and a Desulphurisation vessel [V-102A/B] using propriety catalyst “Katalco 32-4” has been installed as part of the plant design, upstream of the reforming section of the plant.

This aims to reduce/eliminate the Sulphur species within the feed gas to an acceptable level for the downstream reforming section of the plant. Once the feed gas has passed through the reforming section of the plant, it enters the Isothermal Shift Convertor [V-106] which is designed to accept sulphur levels of less than or equal to 0.1ppmv. Sulphur entering the Isothermal Shift Convertor shall be contained within the catalyst bed (as a poison) however at these levels of Sulphur, the Isothermal Shift Convertor can be maintained in operation for a period of 4 years before any catalyst changeover is required.

If any Sulphur does present itself downstream of the Isothermal Shift Convertor, then the CO₂ Capture Unit shall remove the S species to provide a clean treated hydrogen stream. This treated hydrogen stream is sent to the PSA where a clean PSA tailgas is produced for combustions purposes.