

HyNet Hydrogen Production Plant 1 – Technical Note

EPR RESPONSE – 5cii – BAT for Amine Emissions – Charcoal Filter

Summary

Advise what measures will be in place to ensure the charcoal filter is not saturated, or any alternative measures remain effective, so that there is no excessive carry-over of amines to the combustion equipment fired on PSA tail gas, with a potential to cause increased emissions of NO_x from the Feed Gas Heater and Steam Boiler.

Response

The Permit Application states within Table 3-9:

“A downstream charcoal filter has also been recommended to further reduce amine carry-over. The benefits conferred by such a filter will be evaluated at the Project’s EPC stage. Preventing losses not only reduces the chemical’s consumption, but also prevents its transfer to the Feed Fired Heater and Steam Boiler (via the PSA Unit and its tail gas production), and thus limits NO_x production through amine combustion.”

Therefore, the benefits of this charcoal filter and its operational setup shall be fully evaluated at the EPC stage.

However, the following is noted to provide some initial guidance on the topic and to what shall be considered during the EPC stage:

To avoid and minimise the risk of the charcoal filter (activated carbon) being saturated, the pore characteristics of the activated carbon used shall be selected based on the levels of impurities (amines) that could be present themselves within the treated gas stream (hydrogen to the Pressure Swing Absorption unit) and thus require to be removed.

If the diameter of the activated carbon bed is too small then the Mass Transfer Zone (MTZ) shall be stretched, which could lead to a quick break through time of the activated carbon filter. If the diameter is too large, then the MTZ shall become too flat, which could lead to longer lifetime of the activated carbon, although a larger diameter results in a low vapour load (low vapour velocities in the activated carbon bed), which runs the risk of the fluid being channelled, which should be avoided as the activated carbon bed is not in contact with the fluid throughout the charcoal filter – lower performance.

Hence, a suitable break through time, based on the pore characteristics of the activated carbon, shall be selected which shall avoid the charcoal filter becoming saturated, and allowing time for operator intervention to correct any possible issues or bringing online another activated carbon filter.

The charcoal filter supplier shall provide sizing details based on flow conditions and composition along with any additional in-line instrumentation and / or analysis required to identify breakthrough.