HyNet North West

VERTEXHYDROGEN

HyNet Hydrogen Production Plant 1 – Technical Note

EPR Response – 4a - Composition of PSA Tail Gas and Carbon Balance

Summary

Background

Emissions data sheets were prepared for the purposes of modelling, and list the required information. Data was taken from Process Data Sheet - Feed Fired Heater [5194812-100-49ED-3-0006 Rev 1] and Process Data Sheet – Steam Boiler [5194812-100-49ED-3-0005 Rev 3].

Problem Statement

Advise the flow rate of PSA tail gas fed to the combustion equipment in each operating scenario.

Response

Four mass balance cases for the gasification section of HPP1 were generated. The PSA tail gas is combusted in the Feed Fired Heater F-101 and the Steam Boiler B-101.

The mass balance cases differ in molar rate of PSA Tail gas generated and feed gas composition (stream 603 in the mass balance documents).

The flow rate and composition in each operating scenario is summarised in Table 1 below.

Table 1 PSA Tail Gas flow rates and composition range for mass balance cases indicated

Document Number		**5194812-100-49EC-3-0003**	**5194812-100-49EC-3-0006**	**5194812-100-49EC-3-0005**	**5194812-100-49EC-3-0004**
Case		Nat Gas Feed Case (BOL)	ROG only Feed case (EOL)	Nat Gas + ROG case (BOL)	Nat Gas + ROG case (EOL)
Mass flow	t/h	3.2	3.6	5.2	5.1
molar flow	kNm3/h	16.4	8.2	17.6	16.6
vapour fraction		1	1	1	1
pressure	bara	1.5	1.5	1.5	1.5
temperature	oC	45.2	45.2	45.2	45.2
molecular weight	kg/kmol	4.3	9.1	6.6	6.9
density	kg/m3	0.3	0.5	0.4	0.4
Composition		mol%	mol%	mol%	mol%
Methane		2.20	1.85	1.80	2.27
Ethane		-	-	-	-
Ethylene		-	-	-	-
Propane		-	-	-	-
Butanes		-	-	-	-
Pentanes		-	-	-	-
Hydrogen		89.20	71.11	80.70	79.24
Carbon Monoxide		4.16	3.16	3.91	4.11
Carbon Dioxide		0.06	0.04	0.05	0.05
Oxygen		-	-	-	-
Nitrogen		1.86	21.73	11.15	11.81
Argon		-	-	-	-
Water		2.47	2.01	2.30	2.44
Methanol		0.02	0.02	0.02	0.01
Ammonia		0.03	0.08	0.06	0.06
Total		100.0	100.0	100.0	100.0