

Introduction:

The Hydrogen Production Unit (HPU – Unit305) is designed to produce 12837.6 Nm³/h of hydrogen (expressed as pure hydrogen) with a minimum purity of 99.9 vol%. The hydrogen production unit uses Natural Gas and Heavy Naphtha Arabian Light as feedstocks according to the following cases at 100% plant capacity:

Operating feed cases:

Operate feed Case 1 100% Natural Gas feedstock

Operate feed Case 2 100% Heavy Naphtha Arabian Light feedstock

Operate feed Case 3 Natural gas mixed with Heavy naphtha Arabian Light in any relative proportions provided that each feedstock is above the minimum capacity 30%.

Feed Flowrate:

SN	Feed Item	Case 1	Case 2	Case 3	Notes
1	Natural Gas	4997.3 Nm ³ /h	0	2454.2 Nm ³ /h	
2	Light Arabian Naphtha	0	4022 kg/h	2044 kg/h	

Feed Specification:**(1) Natrual Gas Specification 天然气**

Temperature/°C	26~45
Pressure/MPaG	0.21
Natural Gas composition	
COMPONENT	Mole %
C ₁	84.1334
C ₂	1.9900
C ₃	0.4451
iC ₄	0.1036
nC ₄	0.2804
iC ₅	0.0239
nC ₅	0.0255
C ₆	0.0704
C ₆₊	0.1407
C ₇	0.0704
CO ₂	1.6552
N ₂	11.0581
NEOC ₅	0.0033
Sulfur	Max 10 ppm-vol (1)

(2) Heavy Naphtha Arabian Light Specification 石脑油

Heavy Naphtha (Arabian Light)	
Temperature/°C	36
Pressure/MPaG	0.35
Sp.Gravity	0.7529
Color	30
R.V.P. @ 38°C,psi	0.5
Sulphur,	410 ppm
Components of PONA	Composition (Vol%)
P	60.9
O	0.4
N	22.5
A	16.2
Total	100

Distillation ASTM D86		
Arabian Light		
Distillation	Standards, °C	
IBP	105-110	
10%	114-118	
20%	119-120	
30%	120-124	
40%	125-126	
50%	126-128	
60%	129-133	
70%	134-137	
80%	138-140	
90%	140-144	
FBP	160-168	

PRODUCT SPECIFICATION

Quality		Note
Hydrogen	99.9 % v min	
CO	< 1 ppmv	1
CO + CO ₂	< 10 ppmv	1
Conditions		
Flowrate (as pure H ₂)	12837.6 Nm ³ /h	
Pressure normal/maximum at B.L.	2.07/2.41 MPaG	2
Temperature at B.L.	45 °C	2

REFORMER SPECIFICATIONS

Primary reformer type = Top-fired

Number of tubes = 40

Number of tube rows = 2

Number of tubes per row = 20

Tube ID = 100 mm

Tube pitch = 0.270 m

Row spacing = 2.200 m

Furnace length = 7.3 m

Furnace width = 5.12 m

Steam to carbon ratio (mol/mol) = Vendor to specify

Required CH₄ Slip @ EOR

≤ 4 mol% (dry) (all cases)

Tube wall thickness = 9.0 mm

Tube OD = 118 mm

Heated length = 13.5 m

Loaded length = 13.94 m

Tube material = KHR35CT (micro-alloy)

Specifications for Sulphur Guard Bed:

Feed Sulphur: 410 ppm

S slip: ≤ 0.1 ppmv guaranteed (Specify Number of Years)

Bed pressure drop: ≤ 6.0 psi guaranteed – all cases

Bed Life: To be specified by vendor

Specifications for Chloride Guard Bed:

Feed Chloride: 1 ppm

Cl slip: ≤ 0.1 ppmv guaranteed– all cases (Specify Number of Years)

Bed Life: To be specified by vendor

Specifications for Reformer Catalyst:

CH₄ Slip: ≤ 4.10 mol% (dry) guaranteed (Specify Number of Years)

Bed Pressure Drop: ≤ 54 psi guaranteed (Specify Number of Years)

Bed Life: To be specified by vendor