

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) Natural 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, ppm	410
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	100 -105	
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 -170	

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

HYDROGENATOR

305-R01	Hydrogenator	φ1400xH2045mm; H0: ~9007mm
		Operation Pres. : 3.63MPa(G)
		Operation Temp. : 380°C
		Design Pres. : 4.0MPa(G)
		Design Temp. : 435°C
		Catalyst Volume: 2.21m ³
		Insulation: HC

CATALYST DETAILS:

CATALYST NAME	Item No.	Operating	Type	Composition	Hight of Bed mm	Density kg/m ³	Quantity m ³ (Note 5)
CATALYST	305-R01	3.63Mpa(G)	CoMox		1530		2.21
		380°C					

NO.	Support	Item No.	Operating	Type	Ball's Diameter	Hight of Balls mm	Equipment Diameter	Quantity m ³ (Note 1/2)	Remark
Support Balls Summary List is as below:									
1	Balls	305-R01	3.63Mpa(G)	Alumina Silicate	1"	153	1400	0.235	
			380°C	Alumina Silicate	0.24"	153	1400	0.235	
				Alumina Silicate	0.75"	350	1400	0.36	

Note:

Bed Life: Minimum 5 years guaranteed, to be specified by vendor

Organic S slip: < 0.1 ppmv @ 5 years for all cases