Project Name:	BorsodChem HyCO	Project Number:	38312-40

	Pressure bar(g)	Temp. °C				Pressure bar(g)	Temp. °C	
Natural Gas Feed (1) (2)	32.0	10	21,077 Nm³/h	>>	H_2 Product (10)	25.0	43	48,000 Nm³/h >>
	LHV		36,777 kJ/Nm³			Purity		> 99.9 vol%
Natural Gas Fuel	32.0	10	3,658 Nm³/h	>>	CO Product (10) (11)	7.0	40	12,000 Nm³/h >>
	LHV		36,777 kJ/Nm³			Purity		> 99.03 vol%
HP Steam (3) (4)	28.0	280	0.0 t/h	>>	HP Export Steam	30.0	370	43.9 t/h >>
	Enthalpy		2,946 kJ/kg			Enthalpy		3,161 kJ/kg
					CO_2 Vent (12)	0.1	45	8.6 t/h (wet) >>
						Purity (dry)		98.90 vol% (dry)
Liquid Nitrogen (5)	4.0	-182	0 Nm³/h	>>	total CO_2 Emission (13)			26.9 t/h >>
								(as pure CO_2)
H_2 Import (6)	24.0	amb.	200 Nm³/h	>>				
Demin. Water	4.0	28	66.0 t/h	>>	Process Waste Water (14) (15)	2.0	40	2.1 t/h >>
Cooling Water (7)	3.4	28	1,360 m³/h	>>	Cooling Water Return	2.0	38	1,360 m³/h >>
Electricity (8)			4,864 kW	>>				
LP Nitrogen (9)	4.0	amb.	300 Nm³/h	>>	Flue Gas (16)	amb.	134	119,796 Nm³/h >>
Instrument Air	6.0	amb.	390 Nm³/h	>>	Vent (17)	amb.		2.6 t/h >>

Case 1B

HyCO Plant
(SMR based, OASE CO_2 removal, Cold Box, PSA)
48,000 Nm³/h H_2
12,000 Nm³/h CO
with CO product firing

Feed: Natural Gas

Fuel: Natural Gas + Coldbox Offgases + PSA Offgas + CO Product

H_2 Capacity: 100 %
CO Capacity: 100 %
SOR conditions
Expected Production and Consumption Figures

Data only for HyCO ISBL

For all figures: Normal conditions: 0 °C, 1.013 bar a, 1 kmol = 22.414 Nm³

Notes:

(1) Figures valid for "Design" NG composition with a N_2 content of 0.8 vol%
(2) Including 12 Nm³/h for flare pilot burners
(3) HP Steam import to speed-up Steam Reformer start-up (import via export steam line). Expected demand during start-up: 18.3 t/h
(4) HP Steam import to cover demand during start-up (e.g. for Deaerator, Air Preheater, import via export steam line). Expected demand during start-up: 5.0 t/h.
Provided consumption figures are based on internal letdown of HP steam for continuous process users.
(5) Required amount during normal operation. Amount during start-up for cool down of Cold Box: 50 m³ (demand covered by ISBL LIN tank)
(6) Import H_2 from client's H_2 network for intital start-up and catalyst reduction for appr. 36-48 hrs (import via H_2 product line, tie-in on ISBL side of BL). Secondary import source is from external H_2 tube trailers via ISBL unloading / letdown station. Required amount: 50 Nm³/h for 24-36 hrs. For plant restarts after trips /maintenance and in case no import H_2 is available, the plant can be operated without import H_2 for a limited time until hydrogen is produced ISBL (bypassing the cold box, not more than 24-36 hrs, provided that only low levels of H2S and organic sulphur are present in the feed).
(7) Stated CW flowrate considers max. demand of all consumers, incl. stand-by and intermittent consumers. CW flowrates will be adjusted during comissioning and will remain constant in all operating cases, return temperature will change according to actual load / heat input from CW consumers. Stated return temperature is max. allowable dT between supply and return.
(8) Consumed power @ feeder for process drives and utilities (e.g. HVAC, heat tracing, lighting, DCS, etc).
Rotating equipment estimated running under normal process conditions. For a detailed overview refer to "T30 - Overview Electrical Consumers". Assumed power factor: **0.97**
(9) Estimated flow for flare line purging, cold box purging, and compressor seals. Required amount of N_2 during Steam Reformer start-up: 820 Nm³/h
(make-up to circulation compressor). Demand during exceptional operating scenarios (e.g. CB deriming, exceptional TSA regeneration, PSA purging): 4000 Nm³/h
(10) Flowrates as pure contained product (H_2/CO), excl. impurities.
(11) Expected CO purity for design N_2 content in NG feedstock without CO/N_2 separation in Cold Box.
(12) CO_2 vent from amine wash unit. No HP Flash stage considered, expected composition (dry): CO_2: 98.90 vol%, H_2: 0.76 vol%, CO: 0.17 vol%; CH_4: 0.07 vol%
(13) Total CO_2 emission (as pure CO_2, combined CO_2 emission from Steam Reformer Flue Gas and CO_2 Removal Unit)
(14) Waste Water from amine wash unit (potentially amine contaminated under upset conditions) can be collected in a separate collection pit.
(15) Waste water: boiler blow down from Steam Drums and waste water from amine wash unit.
(16) Flue Gas from Steam Refomer. Expected compositon: CO_2 6.95 vol%. N_2: 69.47 vol%, O_2: 1.38 vol% H_2O: 20.43 vol%, NOx < 100 mg/Nm³ (in dry flue gas @ 5 vol% O_2)
(with ultra-low NOx burners, no DeNOx unit considered)
(17) Blow Down & Deaerator Vent