



NOTES

Note 1: In each cycle, 944 kg of biomass are processed.

Note 2: The ball mill Z-101 is used for both, biomass and catalyst. Biomass and catalyst are milled separately.

Note 3: A complete cycle consists in 3 stages of pyrolysis (7,85 min/stage) and 1 stage of gasification (6,5 h). The initial amount of biomass is divided in 3 equal parts. The char formed in these 3 pyrolysis processes is subjected to gasification.

Note 4: The reactor C-100 is used first for pyrolysis and after for gasification.

Note 5: Reactor C-100 works at 750 °C and 1 bar in pyrolysis. N₂ is introduced during this process.

Note 6: Reactor C-100 works at 850 °C and 1 bar in gasification. Steam is needed in this stage.

Note 7: N₂ is first heated by pyrolysis gases up to 700 °C and then by flue gases up to 750 °C.

Note 8: H₂O is first heated by gasification gases up to 730 °C and then by flue gases up to 850 °C.

Note 9: The reactor C-100 is heated by flue gases.

Flow Summary Table for Syngas Production from Biomass

Steam n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Temperature (°C)	25	25	25	700	750	750	25	730	850	850	273	45	25	25	25	25	1000	720	1000	750
Pressure (bar)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Vapor fraction	-	-	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Mass flow (kg/h)	-	-	900	900	900	1573,03	76,66	76,66	76,66	155,84	1573,03	155,84	1573,03	155,84	1573,03	155,84	106,27	106,27	48,24	48,24
Mole flow (kmol/h)	-	-	32,13	32,13	32,13	72,43	4,26	4,26	4,26	10,99	72,43	10,99	72,43	10,99	72,43	10,99	3,98	3,98	1,81	1,81
Biomass per load (kg)	944	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Catalyst per load (kg)	-	189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Component mole flow (kmol/h)																				
Nitrogen	-	-	32,13	32,13	32,13	32,13	-	-	-	-	32,13	-	32,13	-	32,13	-	-	-	-	-
Carbon dioxide	-	-	-	-	-	4,92	-	-	-	2,08	4,92	2,08	4,92	2,08	4,92	2,08	1,33	1,33	0,60	0,60
Carbon monoxide	-	-	-	-	-	13,76	-	-	-	1,78	13,76	1,78	13,76	1,78	13,76	1,78	-	-	-	-
Hydrogen	-	-	-	-	-	19,66	-	-	-	7,13	19,66	7,13	19,66	7,13	19,66	7,13	-	-	-	-
Methane	-	-	-	-	-	1,97	-	-	-	1,09·10 ⁻²	1,97	1,09·10 ⁻²	1,97	1,09·10 ⁻²	1,97	1,09·10 ⁻²	-	-	-	-
Water	-	-	-	-	-	-	4,26	4,26	4,26	-	-	-	-	-	-	-	2,66	2,66	1,21	1,21

PROCESS FOR THE PRODUCTION OF SYNGAS FROM BIOMASS (UNIT 100)

Title : Process Flow Diagram

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Revision : 0

Drawing n°: 001

Process Flow Diagram (PFD) for the Production of Syngas from Biomass (Unit 100)

Norm: UNE-EN ISO 10628 2001

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