Methanol Steam Reforming Hydrogen Yield

Hydrogen, carbon dioxide and water balance and the heat duty of methanol steam reforming at a conversion and steam-to-methanol ratio.

Method: Methanol steam reforming stoichiometry

Input parameters

Unit system: SI

Parameter	Value	Unit
Methanol feed	100.00	kg/h
Methanol conversion	98.000	%
Steam-to-methanol molar ratio	1.5000	

Calculated results

Parameter	Value	Unit
Hydrogen produced	18.498	kg/h
CO_2 produced	134.60	kg/h
Water fed	84.335	kg/h
Hydrogen per kg of methanol	0.18498	kg/kg
Reaction heat duty at 25 °C	41.888	kW
H_2 in dry product gas (no CO formed)	74.619	%

Notes for this case

• $CH_3OH + H_2O \rightarrow CO_2 + 3H_2$, ΔH ≈ +49 kJ/mol with vapour reactants (NIST formation enthalpies); about 0.19 kg of hydrogen per kg of methanol. Small amounts of CO form by reverse shift and must be cleaned up for PEM cells.

Formula and method

$$CH_3OH + H_2O \rightarrow CO_2 + 3H_2, \quad \dot{n}_{H_2} = 3X\dot{n}_{MeOH}$$

Variables

$\dot{m}_{MeOH}$	Methanol feed	kg/s
X	Methanol conversion	-
S/C	Steam-to-methanol molar ratio	-
$\dot{m}_{H_2}$	Hydrogen produced	kg/s
$\dot{m}_{CO_2}$	CO_2 produced	kg/s
$\dot{m}_{H_2O}$	Water fed	kg/s
m_{H_2}/m_{MeOH}	Hydrogen per kg of methanol	kg/kg
$\dot{Q}$	Reaction heat duty at 25 °C	W
$y_{H_2,dry}$	H_2 in dry product gas (no CO formed)	-

Method and standards

Methanol reforming.

Assumptions and limits

- No CO or methane formed; heat at 25 °C.

References

Methanol steam reforming stoichiometry

Report details

Report reference	FCC-XCPC-K9S7 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/hydrogen-fuel-cells/methanol-steam-reforming

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.