Methane dry reforming process with syngas recovery using Pressure Swing adsorption

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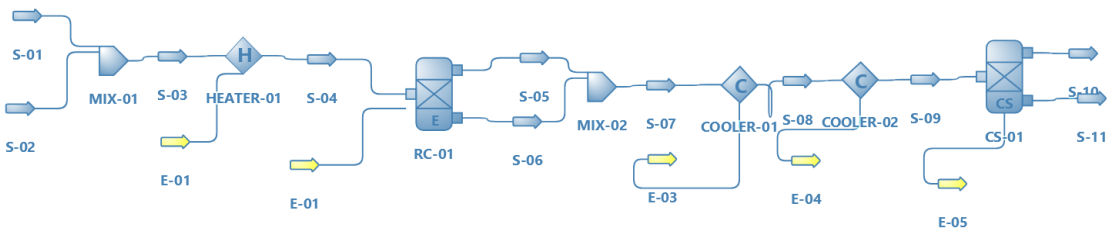
Background & Description: Methane dry reforming process is slowly becoming popular because of its capacity to recover syngas. When combined with pressure swing adsorption, reasonable yield of high- purity syngas is obtained. The flow sheet contains simulation of methane dry reforming process for syngas recovery, along with reverse water- gas shift reaction and both happen in an equilibrium reactor. Feed streams are mixed in a mixer and heated to 700 degree celsius using a heater, while maintaining the pressure at 1 bar, as the reaction can be carried out without a catalyst only at such high temperatures. Since both the methane reforming and reverse water- gas shift reactions are equilibrium reactions, an equilibrium reactor is used. The stream from the reactor is cooled using coolers and the syngas thus produced is subjected to drying in a separator. However the mixture still contains traces of water and is subjected to pressure swing adsorption, where the mixture is further purified by pressure swing adsorption. Pressure swing adsorption requires a catalytic bed and a mathematical model of an adiabatic PSA system must be used, since it cannot be depicted on a DWSIM flowsheet.

Flowsheet:



Results:

Dry methane reformation for syngas production												
Object	**S-11**	**S-10**	**S-09**	**S-08**	**S-07**	**S-06**	**S-05**	**S-04**	**S-03**	**S-02**	**S-01**	
Temperature	25	25	25	35	700	700	700	700	24.9975	25	25	**C**
Pressure	1	1	1	1	1	1	1	1	1	1	1	**bar**
Mass Flow	21.9678	0.270842	22.2386	22.2386	22.2386	-9.87594E-15	22.2386	22.2386	22.2386	21.6186	0.620001	**kg/h**
Molar Flow	0.736336	0.015034	0.75137	0.75137	0.75137	-Infinity	0.75137	0.734086	0.734086	0.719998	0.0140879	**kmol/h**
Molar Flow (Mixture) / Hydrogen	0.0022506	0	0.0022506	0.0022506	0.0022506	NaN	0.0022506	0	0	0	0	**kmol/h**
Mass Flow (Mixture) / Hydrogen	0.00453695	0	0.00453695	0.00453695	0.00453695	0	0.00453695	0	0	0	0	**kg/h**
Molar Flow (Mixture) / Carbon monoxide	0.0323187	0	0.0323187	0.0323187	0.0323187	NaN	0.0323187	0	0	0	0	**kmol/h**
Mass Flow (Mixture) / Carbon monoxide	0.90525	0	0.90525	0.90525	0.90525	0	0.90525	0	0	0	0	**kg/h**
Molar Flow (Mixture) / Carbon dioxide	0.350411	0	0.350411	0.350411	0.350411	NaN	0.350411	0.374087	0.374087	0.359999	0.0140879	**kmol/h**
Mass Flow (Mixture) / Carbon dioxide	15.4214	0	15.4214	15.4214	15.4214	0	15.4214	16.4634	16.4634	15.8434	0.620001	**kg/h**
Molar Flow (Mixture) / Methane	0.351357	0	0.351357	0.351357	0.351357	NaN	0.351357	0.359999	0.359999	0.359999	0	**kmol/h**
Mass Flow (Mixture) / Methane	5.63663	0	5.63663	5.63663	5.63663	0	5.63663	5.77527	5.77527	5.77527	0	**kg/h**
Molar Flow (Mixture) / Water	6.245E-18	0.015034	0.015034	0.015034	0.015034	NaN	0.015034	0	0	0	0	**kmol/h**
Mass Flow (Mixture) / Water	1.12506E-16	0.270842	0.270842	0.270842	0.270842	0	0.270842	0	0	0	0	**kg/h**