

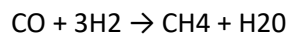
## *Production of Methane from Carbonmonoxide and Hydrogen*

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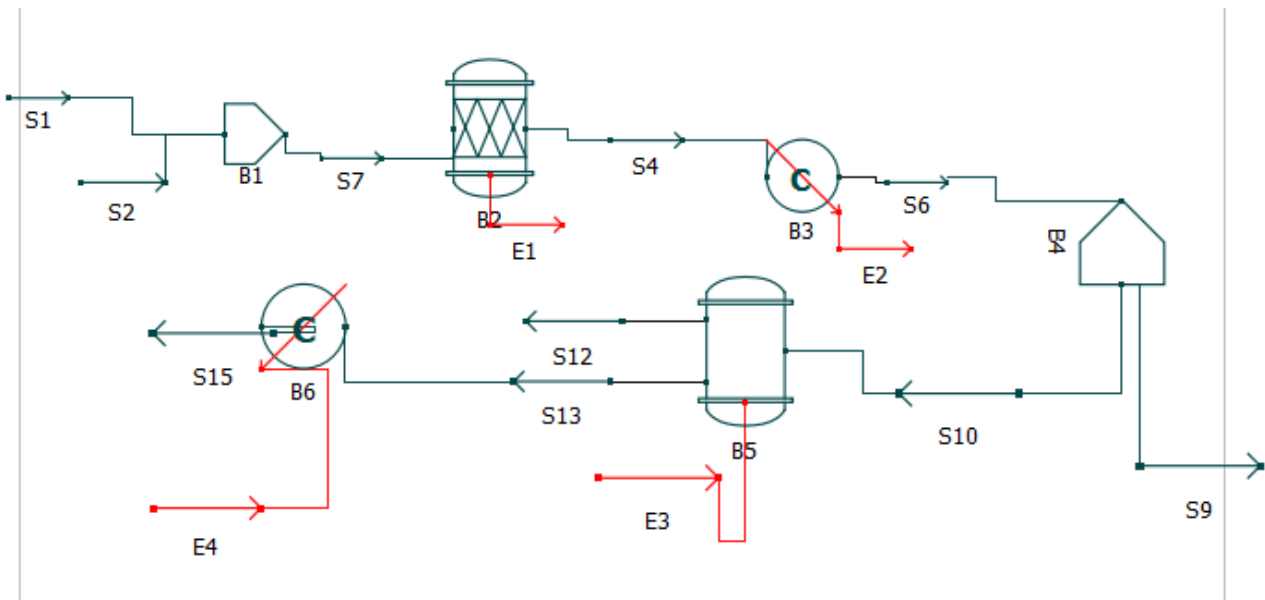
### Background & Description:

A synthesis gas containing CO, H<sub>2</sub>, and a small amount of CH<sub>4</sub> with a CO to H<sub>2</sub> ratio of 1:2.9 is upgraded to a higher methane content via the reaction



The reactor is operated adiabatically with a maximum outlet temperature of 681.431 K to produce a product stream containing almost 50% CH<sub>4</sub> and 12% CO. The heat removal rate in the Cooler is adjusted to cool the reactor effluent stream to 367 K. The separator is operated so as to result in a gas stream containing almost 1% H<sub>2</sub>O and a pure liquid water stream, both at 367K. The recycle gas stream is sent back to mix with feed and enters the reactor. The entire system is operated at 92350 Pa. Separation in Open Modelica has been achieved by using compound separator.

### Flowsheet:



### Results:

Object	S1	S2	S7	S4	S6	S10	S9	S12	S13	S15
Temp(K)	366.483 3	310.9277 8	326.568	681.431	366.982	366.98	366.982	366.98 2	366.982	311.473
Pressure(Pa)	92350	92350	92350	92350	92350	92350	92350	92350	92350	92350
Molarflow(mol/s )	54.6161	122.9582 5	177.574	156.656	156.656	132.218	24.4383	8.9233 1	123.294	123.94
X <sub>co</sub>	.244177	.1205471	.113679	.113679	.113679	.113679	.113679	0	.121906	.121906
X <sub>H2</sub>	.71394	.3025454	.28679	.28679	.28679	.28679	.28679	0	.306784	.306784
X <sub>CH4</sub>	.039883	.5668998	.525622	.525622	.525622	.525622	.525622	0	.563663	.563663
X <sub>H2O</sub>	0	.0100096	.074620 2	.074620 2	.074620 2	.074620 2	.074620 2	0	.0076967 3	.0076967 3