Biological Hydrogen Methanation Systems – An overview of design and efficiency.

**Authors**

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# Supplementary data

The purpose of Box S1 is to provide a comparison for use of methane (CH4) and hydrogen (H2) as an energy carrier gas. An energy transmission of 1GWth was chosen as an arbitrary value of energy required to be transmitted

**BOX S1**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Methane | Hydrogen |
| Density  | kg/m3 | 6.585 | 0.8085 |
| Viscosity | CP | 1100 | 880 |
| LHV | MJ/kg | 50 | 119.9 |

Gas grid pressure: 1MPa

Temperature: 25°C

Energy transmission: 1,000MWth (Arbitrary number chosen for comparison.)

**Hydrogen**

Mass Flow:
$$\frac{1000}{119.9} =8.34\frac{kg}{s}$$

Volume Flow:
$$\frac{8.34}{0.8085}=10.315\frac{m^{3}}{s}$$

Pressure Drop:
$$=4.0156\frac{kPa}{km\_{pipe}}$$

Specific work:
$$\frac{4.0156}{0.8085}= 4.967\frac{kJ}{kg\_{H2} . km\_{pipe}}$$

Power:
$$4.967\*8.34=41.42\frac{kW}{km\_{pipe}}$$

**Methane**

Mass Flow:
$$\frac{1000}{50}=20\frac{kg}{s} $$

Volume Flow:
$$\frac{20}{6.585}=3.037\frac{m^{3}}{s}$$

Pressure Drop:
$$1.477\frac{kPa}{km\_{pipe}}$$

Specific work:
$$\frac{1.477}{6.858}=0.224 \frac{kJ}{kg\_{CH4} . km\_{pipe}}$$

Power:
$$0.224\*20=4.48\frac{kW}{ km\_{pipe}}$$

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