

Electrolysis Hydrogen Costs and Membrane Reformer Hydrogen Costs

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Jan 11, 2010

Delivery Pressures:

Teledyne Brown Electrolyzer: 1 to 10 atm

REB Research Membrane Reactor: 1 to 5 atm

Purities:

Electrolyzer: 90% to >99.9% (typical impurities are O₂ and water)

REB Membrane Reactor: 99.9995 to 99.99995%

Capital cost for electrolyzer alone (2004): does not include transformer, rectifier, water-distillation/ deionization

20SLM	(40SCFH)	\$40,000	\$60,000 (2010 estimate)
200SLM	(400SCFH)	\$150,000	\$225,000 (2010 estimate)
1,500SLM	(3000SCFH)	\$375,000	\$500,000 (2010 estimate)
3,000SLM	(6000SCFH)	\$650,000	\$1,000,000 (2010 estimate)

Capital cost for REB Research membrane reactor (2010): no need for transformer, rectifier, or water-deionization. Still need 120- 240 V AC power and distilled water.
<http://www.rebresearch.com/me100.html>

0.5 SLM	(1 SCFH)	\$11,250
1.2 SLM	(2.5 SCFH)	\$14,500
2.8 SLM	(5 SCFH)	\$19,000
5 SLM	(10 SCFH)	\$25,000
10 SLM	(20 SCFH)	\$35,000
25 SLM	(50 SCFH)	\$60,000
75 SLM	(150 SCFH)	\$155,000

Life: For both systems, Basic equipment has about a 20 years life with periodic maintenance. Electrolysis cell and reactor core usually requires either rebuilding or replacement in the 3-5 year range.

Electric costs; AC in to H₂ out, overall for complete system:

Electrolysis: 5.4 to 6.1 kWh/Nm³ or 14.2 to 16.1 kWh/100cu.ft.

Membrane Reformer: 0.8 to 1.5 kWh/ Nm³ or 2.3 to 4.3 kWh/100 cu.ft.

Water + Methanol Costs:

For both systems, make-up water cost is usually negligible, <5% of electric cost.

Reformer requires about 0.7 kg/Nm³ (0.19 gal/Nm³) of methanol. At 2010 prices, that costs about 15¢/Nm³.

Maintenance Costs: Depends on usage, etc. Usually run about 5 to 10% of initial

capital per year. Cell replacement costs about 25% of initial equipment costs.

Facility and installation costs: These vary depending upon the application but they can be minimal, especially for membrane reactors, as these are basically plug-in units. Operational labor requirements are minimal for either system, except for maintenance.