

A P O L L O E N E R G Y S Y S T E M S , I N C .



# Fuel Consumption

## For Model 106 - B

FUEL CELL OPERATING COST - PRELIMINARY  
for Apollo power Plant Hybrid Model 106-B

FUEL	Hydrogen (Liquid)	Hydrogen (Liquid)	n-Butane	Methanol	Ammonia Anhyd.	Ammonia 29.0%	Methane	Natural Gas	LPG (Propane)
Chemical Symbol	H	H	C <sub>4</sub> H <sub>10</sub>	CH <sub>3</sub> OH	NH <sub>3</sub>		CH <sub>4</sub>	96% CH <sub>4</sub>	96% C <sub>3</sub> H <sub>8</sub>
Power consumption (kW h/day)	131.3	131.3	131.3	131.3	131.3	131.3	131.3	131.3	131.3
System efficiency (%)	66.0	66.0	40.0	42.0	50.0	45.0	40.0	40.0	40.0
Fuel consumption (kW h/day)	199.0	199.0	328.3	312.7	262.7	291.8	328.3	328.3	328.3
Fuel consumption (MJ/day)	716.3	716.3	1182.0	1125.7	945.6	1050.6	1182.0	1182.0	1182.0
(1 kW h = 3.6 x 10 <sup>6</sup> J)									
High Heat Value (HHV) (MJ/kg)	143.4	143.4	49.5	21.8	20.9	5.8	56.1	56.1	48.0
Fuel (kg)	5.0	5.0	23.9	51.6	45.2	181.0	21.1	21.1	24.6
Fuel (ft <sup>3</sup> as gas)	2114.2	2114.2	338.0		2075.0		1096.6	1096.6	468.0
Fuel (liters as liquid)	72.8	72.8	41.5	65.3	74.3		49.5	49.5	49.5
								Values = Methane	Value = Propane
Fuel Cost Information	\$0.320 per lb.	\$1.00-\$1.40 per lb.		\$0.185 per liter (\$ .70/gal)	\$0.09-\$0.10 per lb.	\$0.04-\$0.06 per lb.		\$5-\$10 per 1000 ft <sup>3</sup>	\$0.90-\$0.95 per gal.
	H2 Info Net as Liquid at producer site	H2 Info Net as Liquid delivered and stored		Methanol Barge Price FOB port	CF Ind. In 40,000 lb. Tanker FOB dist	LaRoche In 44,000 lb. Tanker FOB dist		EIA Charts Ave. Resid. 96% CH <sub>4</sub>	Teco Bulk undelivered 96% C <sub>3</sub> H <sub>8</sub>
Calculation	\$0.32	\$1.20		\$0.185	\$0.095	\$0.05		\$7.50	\$9.25
Cost Per Day	\$3.52	\$13.20		\$12.08	\$9.45	\$19.95		\$8.23	\$12.10
Cost Per 30-Day Month	\$105.60	\$396.00		\$362.42	\$283.50	\$597.30		\$246.74	\$363.00



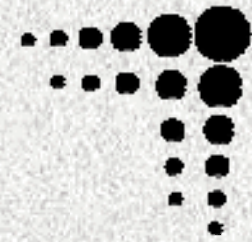
# Fuel Consumption Table

	Hydrogen	Butane	Propane	Methanol	Ammonia
Power consumption [kW h/day]	131.3	131.3	131.3	131.3	131.3
System eff. [%]	66	40	40	42	50
Fuel consumption [kW h/day]	199.0	328.3	328.3	312.7	262.7
Fuel consumption [MJ/day]	716.3	1,182.0	1,182.0	1,125.7	945.6



# Fuel Consumption Table

	Natural Gas	Ammonia 25%	Ammonia 40%	Ammonia anhydr.
Power consumption [kW h/day]	131.3	131.3	131.3	131.3
System eff. [%]	40	45	45	50
Fuel consumption [kW h/day]	328.3	291.8	291.8	267.7
Fuel consumption [MJ/day]	1,182.0	1,050.6	1,050.6	945.6



# Fuel Consumption Table

	Hydrogen	Butane	Propane	Methanol	Ammonia anhydr.
Power consumption [kW h/day]	131.3	131.3	131.3	131.3	131.3
Fuel consumption [MJ/day]	716.3	1,182.0	1,182.0	1,125.7	945.6
HHV [MJ/kg]	143.4	49.5	48.0	21.8	20.9
Fuel [kg]	5.0	23.9	24.6	51.6	45.2
Fuel [ft <sup>3</sup> ]	2,114.2	338.8	468.0	-	2,075.0
Fuel [liter]	72.8	41.5	49.3	65.3	74.3



# Fuel Consumption Lib

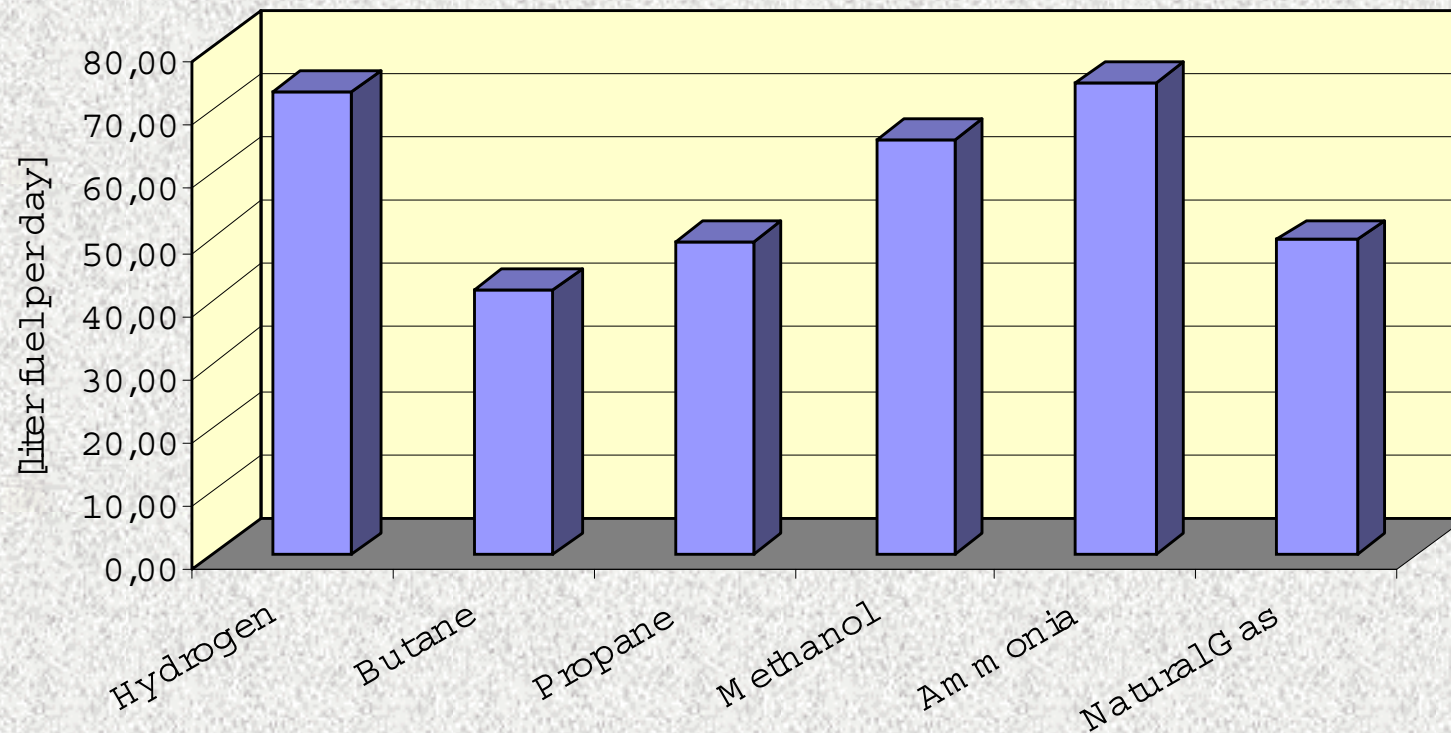
	Natural Gas	Ammonia 25%	Ammonia 40%	Ammonia anhydr.
Power consumption [kW h/day]	131.3	131.3	131.3	131.3
Fuel consumption [MJ/day]	1,182.0	1,050.6	1,050.6	945.6
HHV [MJ/kg]	56.1	5.2	8.4	20.9
Fuel [kg]	21.1	201.1	125.7	45.2
Fuel [ft <sup>3</sup> ]	1,096.6	-	-	2,075.0
Fuel [liter]	49.5	220.9	147.0	74.3

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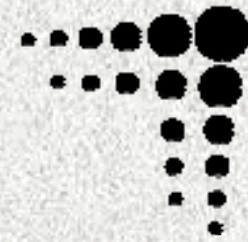


# Fuel Consumption

BASED ON POWER CONSUMPTION OF 131.3 Kwh/day



APOLLO ENERGY SYSTEMS, INC.



# Fuel Consumption

BASED ON POWER CONSUMPTION OF 131.3 kW h/DAY

