



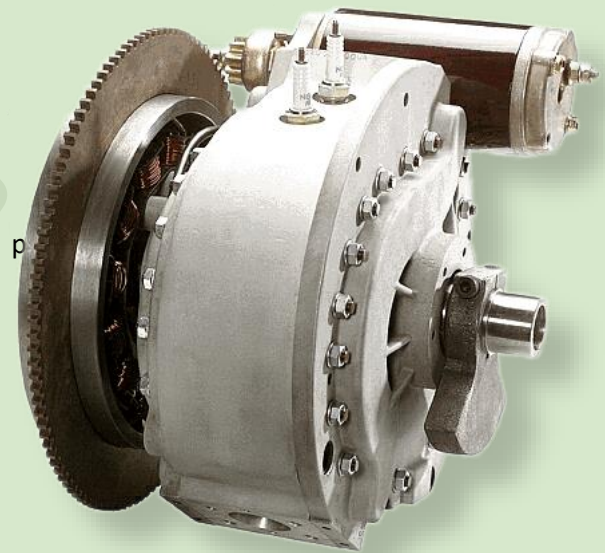
Biogas Energy Conversion With The Rotapower Engine

Cost 66% lower than existing solutions*

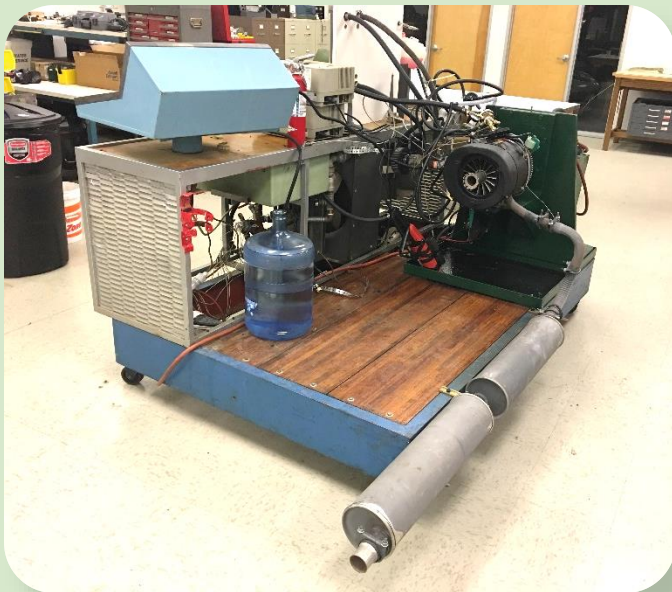
*See Reverse

The Rotapower® Engine is uniquely effective and low cost.

- ✓ 50 to 200 kW generator configurations
- ✓ Runs on biogas as low as 40% CH₄
- ✓ Does not require siloxane filtering
- ✓ Resistant to H₂S in biogas
- ✓ Emissions 5X below biogas NSPS std.
- ✓ Run time > 20,000 hours
- ✓ Full warranty on gen-set components



Freedom Motors 530cc Rotapower Engine



530cc Rotapower Engine on Biogas Dyno Testbed

Freedom Motors is currently seeking industry partnerships and investment funding to bring our biogas generator technology to market.

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Cost per Kilowatt Comparison for 200 kW Generation Systems

	200 kW Microturbine \$ per kW*	200 kW I.C. Engine for biogas \$ per kW*	200 kW Rotapower® Genset \$ per kW
Equipment Cost	\$2152	\$1562	\$877
Biogas Conditioning Cost	\$744	\$387	\$0
Emissions Control Cost	\$0	\$645	\$0
TOTAL	\$2896	\$2594	\$877

*Data from "2015 Self-Generation Incentive Program Cost Effectiveness Study [Final Report]" for the California Public Utilities Commission, SGIP Working Group, Oct 5, 2015.

Rotapower Emission Test Results (no fuel/exhaust conditioning)

Test with 50% Natural Gas (Methane) and 50% CO ₂				
Emissions	Test Results (No Water)	Test Results (With Water**)	NSPS Standard* (Natural Gas)	NSPS Standard* (Biogas)
NO _x (ppm)	< 100	< 55	82	250
CO (ppm)	< 120	< 120	270	610
HC (ppm)	< 1	< 1	60	80

*EPA New Source Performance Standards

**Small amount of water added to the air/fuel charge