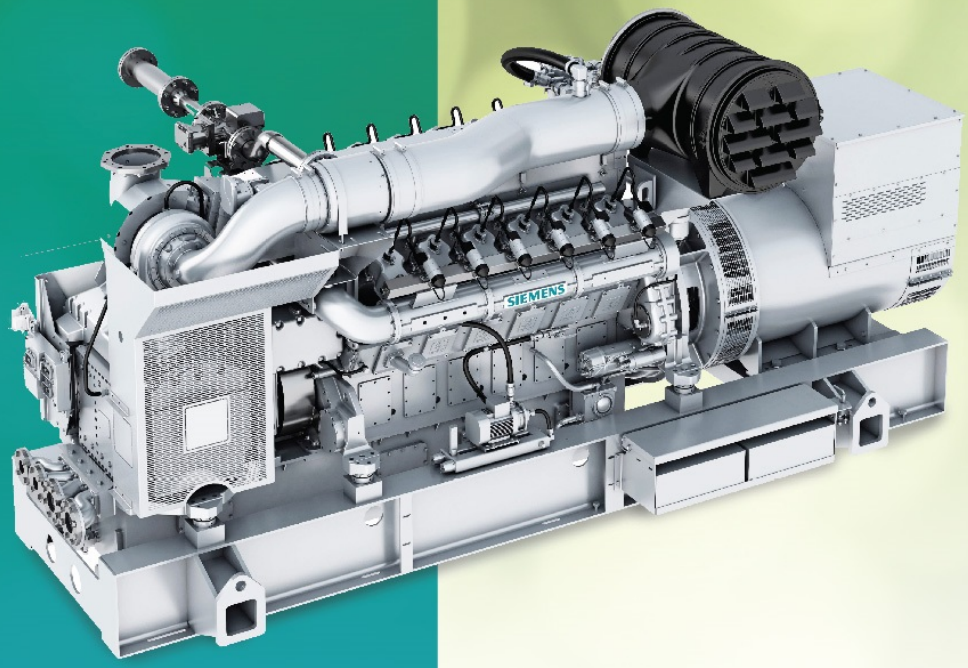
GAS ENGINE

POWER GENERATION

GAS ENGINE



Since 2008, Green Energy Resources (GER) has been specialising in providing energy solution by utilising biogas, sewer gas, natural gas and syngas. Due to higher cost of diesel fuel and global warming issues, our products are receiving greater recognition and acceptance.

We have many years of proven experiences in successful implementation of conversion projects for major corporations in the palm oil industries, environmental, energy management, oil and gas industries and agricultural sectors. We help our clients to utilise the alternative sources of energy from their waste by-products to further optimise their productivity, as well as reducing their overall operational cost.

We are proud to be partnered with MAN and SIEMENS, brands of prime mover, to become a local gas engine's assembler and packager. We are also appointed as the sole distributor for MOTORTECH®, suppliers of gas engine control and engine management system. As an authorised agent, we provide our clients with the supports and services of the essential components of gas engines and the stocking of key components in gas engine system. Also, as a MOBIL™ lubricant partner, we ensure that all our clients' engines are maintained in prime condition using the best lubrication system for different engine applications.

GAS ENGINE RANGE

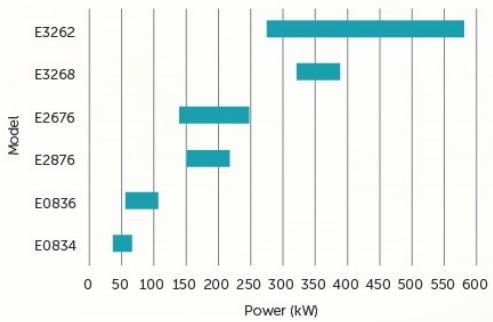
GER-specified gas engine range is adapted and designed to help meet our clients' requirement in an ever-changing economic environment.

Our model ranges from 37 kW to 2 MW power output; MAN gas engine is recommended for power 550 kW or less, and SIEMENS gas engine is offered for power in excess of 550 kW. The available selections ensure optimal efficiency, flexibility, practicability and compatibility in a broad span of applications and environment factors.

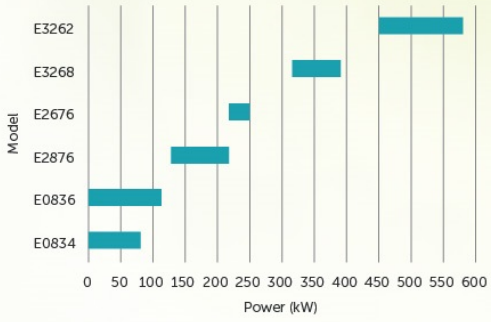
MAN GAS ENGINE

OPERATION MODE		NATURAL GAS		SPECIAL GAS[1]	
Engine Speed	Rpm (hz)	1500 (50)	1800 (60)	1500 (50)	1800 (60)
MODEL	CYLINDER	POWER (kW)			
E0834	4L	37-68	45-68	80	80
E0836	6L	56-110	64-110	110	110
E2876	6L	150-220	170-210	130-220	130-200
E2676	6L	140-220	160-250	220	250
E3268	8V	320-370	340-390	320-370	390
E3262	12V	275-550	300-580	450-550	450-580

Power generated from natural gas (50/60 Hz)



Power generated from special gas (50/60 Hz)



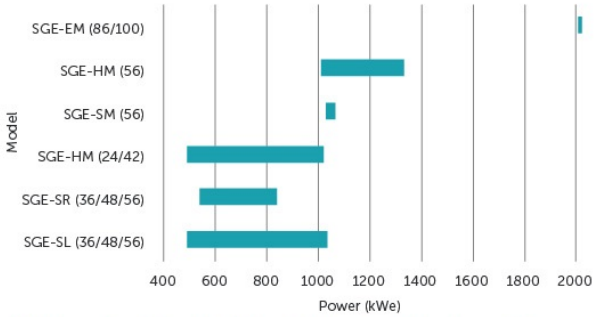
Client Advantages:
- Low space requirement due to compact design
- Reliable and low emissions
- Long service life

[1] Special gas (biogas, landfill gas, sewage gas).

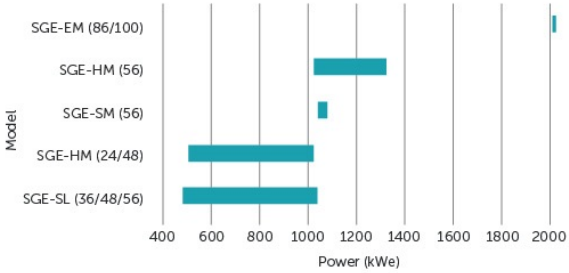
SIEMENS GAS ENGINE

OPERATION MODE		NATURAL GAS			SYNTHETIC GAS			BIOGAS		
Engine Speed	Rpm (hz)	1200 (50)	1500 (50)	1800 (60)	1200 (50)	1500 (50)	1800 (60)	1200 (50)	1500 (50)	1800 (60)
MODEL[2]	CYLINDER	POWER (kWe)[3]								
SGE-SL (36/48/56)	12V/16V	484-762	610-954	676-1030	401-639	508-801	544-849	484-762	610-954	676-1030
SGE-SR (36/48/56)	12V/16V	-	-	539-839	-	-	-	-	-	-
SGE-HM (24/42)	8L/12V	-	501-1011	499-1007	-	-	-	-	501-1011	499-1007
SGE-HM (56)	16V	1011	1315	1305	-	-	-	1011	1315	1305
SGE-SM (56)	16V	-	1025	1063	-	-	-	-	1025	1063
SGE-EM (86/100)	12V	2007	2013	-	-	-	-	2007	2013	-

Power generated from natural gas (50/60 Hz)



Power generated from biogas (50/60 Hz)



[2] Display number in brackets indicate different models with specific power outputs, but range is shown here.
[3] Generator efficiency is approx. 96% acc. to SIEMENS genset.

Remarks: - Engine performance data acc. to ISO 3046, part 1.
- The values provided are for information purposes only and are non-binding.

POWER GENERATION FROM BIOGAS FOR PALM OIL MILL

Biogas is produced naturally when the palm oil mill effluent (POME) is digested in an oxygen-free environment. The unharnessed biogas has the potential to contribute hazardous consequences towards global climate change, where the liberation of methane, CH4 enhances the greenhouse effect. Meanwhile, untreated POME when discharged is harmful to the nature and therefore, biogas capturing plant is necessary to take advantage of this natural decomposition process to reduce the climate change impacts of palm oil production.

The conventional industry practice of treating POME is to keep the waste liquid in either a covered lagoon or a digester tank system that subjected to anaerobic digestion. The biogas system helps capturing the methane gas in a storage holder which subsequently uses to generate electricity for the mills or feed-in tariff (FiT) system.

SOLUTION:
For the past few years, top private millers and reputable plantation groups' owner in Malaysia had engaged with our services to implement biogas capture and treatment system and power generation facility for their palm oil mills. The power plant was thought to be built for the Clean Development Mechanism (CDM) project to promote sustainable development and reduce GHG emission.

The power supply in these plants was generally for internal mill operation, which includes powering the plant equipment, office buildings and lighting. Biogas engine from MAN for example the E3262 model can generate capacity of around 530 kWe. Under the SEDA scheme, MAN gas engine generator set qualifies for the local assembly bonus scheme. With our support, we ensure our client's equipment are on high availability and have minimum downtime to guarantee a constant feed rate to the power grid. Besides, with the SIEMENS high efficiency SGE-86EM model series, we can deliver power output of 2 MWe from natural gas or biogas with lowest fuel consumption per cubic metre of gas and achieve an electrical efficiency of 45%.

ADVANTAGES:
- Promote waste-to-energy principles.
- Greenhouse gases reduction.
- Provide clean energy source.
- Contribute to sustainable agricultural and animal husbandry practice.
- Increased revenue selling electricity to the grid.

ANIMAL WASTE IN POWER GENERATION

Nowadays, poultry, dairy or animal farms in general have been piling up a decent amount of manure and agricultural waste where it would be sent to the landfill or applied as land-use fertiliser. However, the flushed wastewater may contaminate the groundwater and additionally, it will allow the liberation of methane gas, a strong contributor to global warming, to escape into the atmosphere. Thus, to harness the biogas energy, the waste is processed in anaerobic digester and the produced biogas powers the gas engine generator sets to generate electricity for the farm to use for its own needs or sell to the grid.

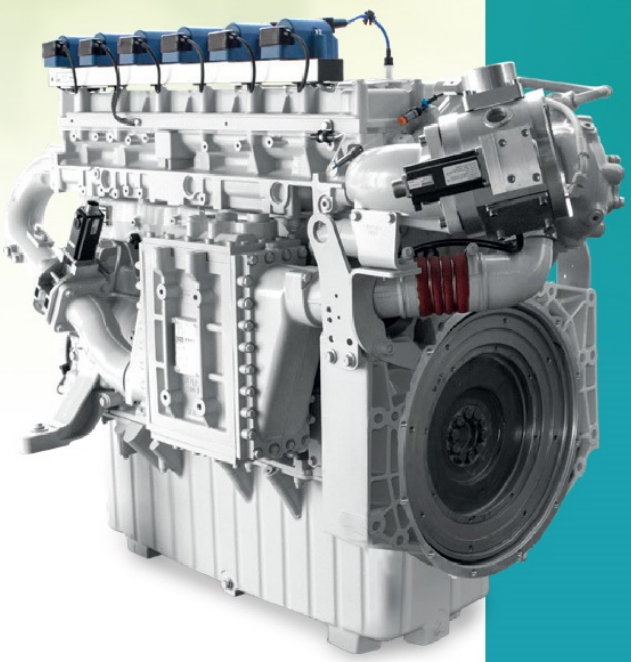
ADVANTAGES:

- Resolve the unpleasant odour problem in the village area.
- Create new jobs due to the newly constructed digester system.
- Biogas is a renewable energy source.

In this case, environmental, economic and social sustainability has achieved.

SOLUTION:

Our branch operation in Taiwan has managed to generate power to supply to Tai-power with swine manure collected from swine farms in local villages located in Yunlin County and Pingtung County. The manures are being treated anaerobically in a tank system at the waste-to-energy plant to lower carbon emissions, disease transmissions and odours. The procurement of the MAN biogas engine E2676 model was made to give a power output of around 200 kWe and supplied to the local power grid, which is managed and owned by Tai-power. Besides, some animal manure or agricultural waste with low moisture content can be treated by our thermolysis solution to eradicate contamination and smell problems, and the produced renewable fuel gas can then generate sustainable energy to either the farm or the electrical grid as well.



ACOUSTIC ENCLOSURE

Our 20 and 40 foot containers follow the standard design footprint of shipping containers, while customisation can be done for marine environment, explosion-proof and corrosion resistance with the following features;

- An engine compartment that has a base module consisting of the genset, heat recovery and exchanger system, cooling pumps, lubrication system and soundproofing.
- A cooling fan system and louvre windows for maximum ventilation.
- Top mounted area for exhaust silencer with sound pressure level of 85 dB or lower and completed with exhaust scavenging system.
- Designed for the standard ambient temperature from -18 °C to 40 °C.
- Thermal insulation along with sound attenuation with Rockwool material.
- Dimension: (L) 6096 mm, (W) 2438 mm, (H) 2591 mm for 20 footer, other sizes are customisable upon requests.

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