Combined Heat and Power (CHP)

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When you generate your own electricity you pay for the fuel for the generator. For every 1kW of electrical power produced approximately 2kW of heat from the engine is thrown away. Roughly half goes into the engine water jacket and is dissipated by the fan blown radiator and the other half is blown out of the exhaust.

The CHP system is designed to recover most of that wasted heat and use it for space heating and hot water. The heat is a by-product of producing electricity and is already paid for.

The CHP system is designed to be efficient, reliable and affordable.

It is designed round a well insulated specially designed water tank that becomes an efficient heat-store. The concept behind a heat-store system is that heat can be produced intermittently from more than one source and stored ready to be used when heat or hot water is required.

The sketch below shows a typical system.

Overview

CHP systems reduce fuel costs and are efficient and reliable. They are complete systems and include: pipe-work, thermal sensors, pumps, valves, thermostatic valves, variable valves, heat-store, feed and expansion tank, heat dump, heat exchangers and a clever control system.

The CHP system is just connected to the hot water and space heating circuits in the property.

Offset against the cost of the system is the cost of the alternative which may include: bulk storage facilities for an alternative fuel such as LPG and boiler, pumps, tanks etc.

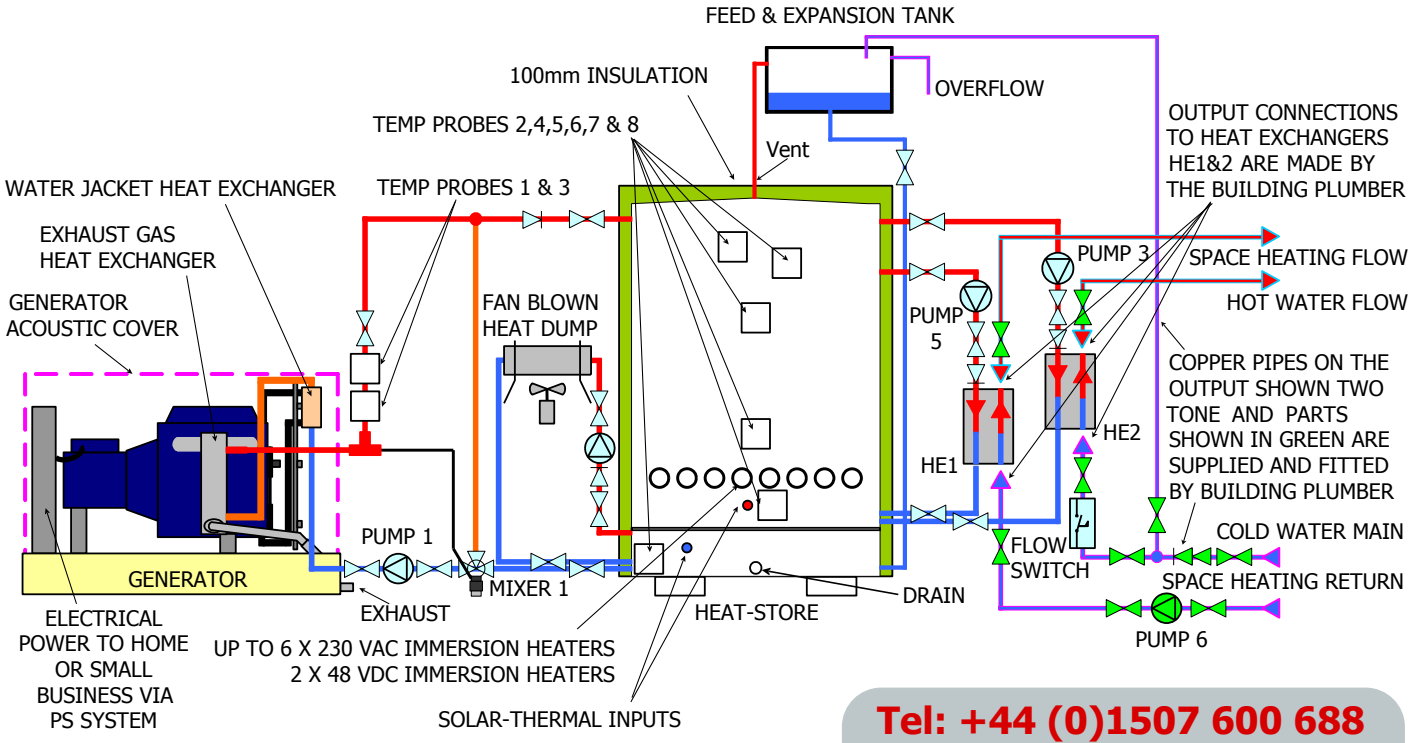
A PS System can increase the efficiency of a generator dramatically during the 24 hour daily cycle. It is a very big improvement on a stand alone generator. However engines still run hot and waste a lot of heat. If a large proportion of the waste heat is recovered and used to provide hot water then the efficiency of the system can increase to more than 80%.

A typical diesel engine is about 35% efficient.

For the more technically minded the following figures give an idea of where the heat goes in a typical small diesel engine used for a 12kVA generator:

Total available heat from fuel burnt: 36.3kW
Heat used to make useful power: 12.2kW
Heat into the water jacket: 11.6kW
Heat into the exhaust: 9.3kW
Heat given up to radiation: 3.2kW

In most applications electricity and heat for



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space heating and hot water is required. By utilising the heat produced when the electricity is generated we make use of a resource we have already paid for.
This makes the system very efficient and cost effective with costs per 1kW of power substantially below the cost that has to be paid to one of the big energy companies.

Combining the PS System with CHP

Most CHP systems available are expensive and are inefficient when the heat is not required. To get over this problem they usually operate with the mains supply. Generating local power when electricity and heat are required and using electricity from the mains when heat is not required. If there is excess electricity available it can be exported into the main supply.
The PS System gets over this problem by making the local generator much more efficient. Making sure that when the generator is running it is loaded and working efficiently. This means that when less heat is required during the summer the generator run-time will be reduced to a minimum.
Combining the PS System with CHP is a very efficient and cost effective solution to providing electrical power, space heating and hot water to a domestic or small business property.


HEAT DUMP & OUTPUT HEAT EXCHANGERS

Heat-Store

The CHP system is designed to be effective and efficient. The system is based around a large very well insulated heat-store. The heat is stored as hot water ready to be used on demand. The advantage of this approach is that heat can be added to the store at any time from a number of different sources. When the generator is running the heat recovered from the water jacket and exhaust heat exchangers is added directly to the store.
When the batteries are fully charged the energy from a wind turbine or solar-photovoltaic panels is diverted to immersion heaters in the heat-store.
The heat-store is designed with a dedicated connection for a solar water heater.
Hot water for space heating is taken out of the heat-store when required via an efficient plate heat exchanger. The water is pumped through the heat exchanger and fed to the heating circuit. The temperature of the water going into the heating circuit is not regulated as standard.
Hot water for basins, showers, baths and appliances is also produced on demand by pumping water through an efficient plate heat exchanger. Cold water is fed into the heat exchanger from the main and is heated. The temperature of the hot water is not regulated as standard.
The engine has a bypass circuit controlled by a bypass valve. This is to ensure that the engine gets up to temperature quickly. The engine temperature is maintained by the control ensuring high efficiency and negligible thermal shock.
The heat-store is designed to stratify the water so that the hottest water stays at the top of the tank. Only one of the output pumps is active at a time reducing the churn. The hot water demand takes priority over the space heating .
The heat dump is included to dissipate excess heat. This may seem a perverse thing to do but it is vital to make sure the engine is cooled properly. There will be times when all of the heat being produced will not be required.

WIND TURBINE & CHP CONTROL

Environmental

The CHP system makes very good use of the fuel used by the generator and dramatically increases the overall efficiency of the system. It also makes the interface with renewable sources of power both straight forward and practical.