

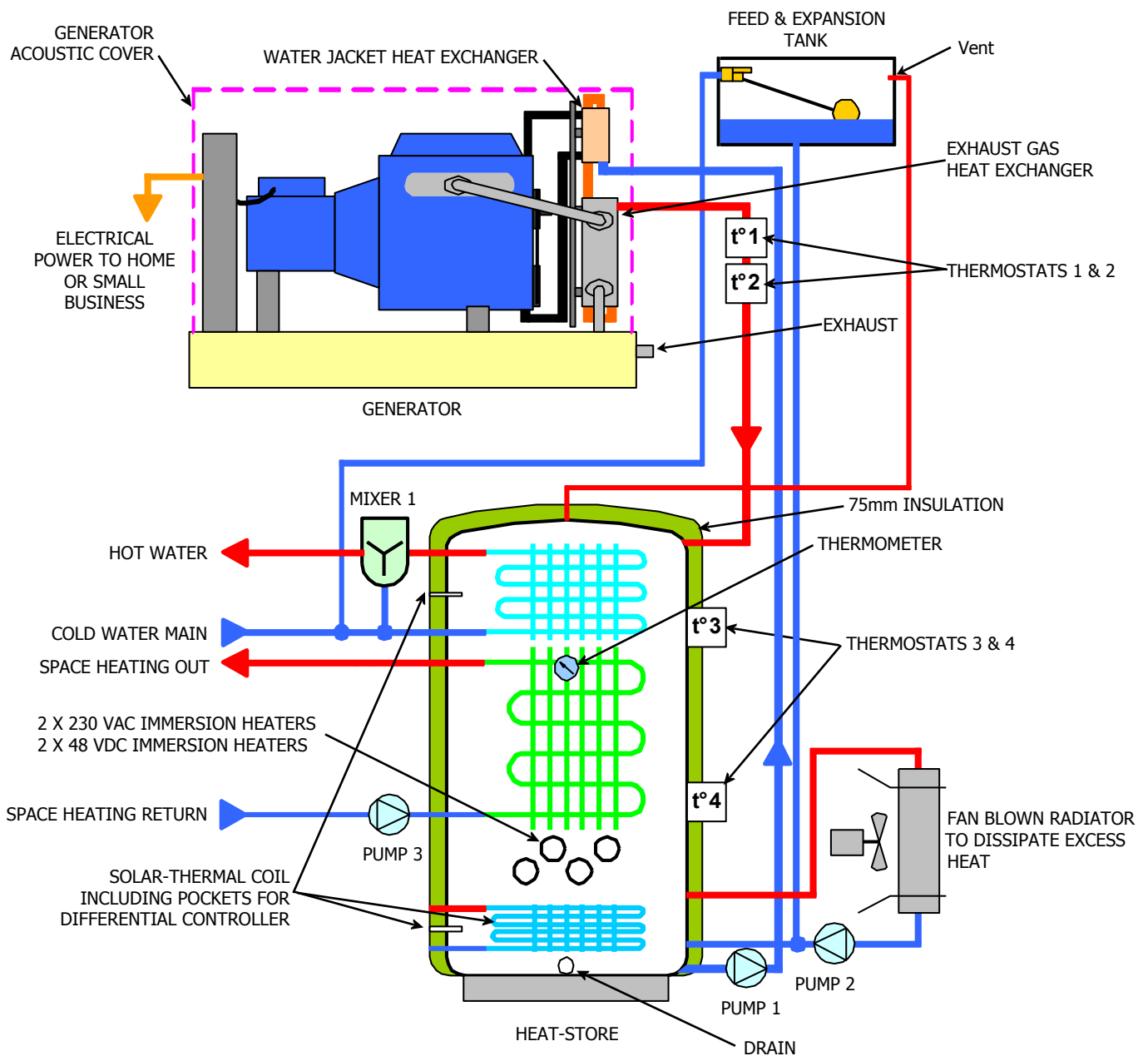
Combined Heat and Power (CHP)

When you generate your own electricity you have to pay for the fuel for the generator. What you may not realise is that for every 1kW of electrical power you produce you throw away approximately 2kW in heat from the engine. Roughly half of which 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 Powerguard CHP system is designed to recover most of that heat so that you can use it for space heating and hot water. You have already paid for it.

The Powerguard CHP system is designed to be reliable, efficient 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 and there is a more detailed explanation overleaf.



Overview

Powerguard CHP systems are very efficient reducing fuel costs and often removing the need for another fuel source such as LPG.

A generator is used to provide electrical power to an off-grid domestic property or small business. If it is combined with a Powerguard PS System then the efficiency can be increased by a factor of three reducing fuel and maintenance costs.

Although the PS System is a big improvement on a stand alone generator we cannot get away from the fact that a typical diesel engine is only about 35% efficient. For every 1kW of power that is converted into electricity approximately 2kW are thrown away as heat.

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 we require electricity and heat for space heating and hot water. 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. Sometimes if there is excess electricity available it is exported into the main supply.

When heat is not required the electricity comes from the mains supply.

The Powerguard PS System gets over this problem by making the local generator much more efficient by reducing generator run-time. 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 can be reduced to a minimum.

Combining the Powerguard 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-Store

The Powerguard CHP system is designed to be effective and efficient but also affordable. The system is based around a heat-store which is a large very well insulated water tank. The heat is stored as hot water ready to be used at any time of the day. 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 via 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 adding to the heat store.

The heat-store is also designed with a dedicated solar-thermal heat exchange coil to facilitate easy and efficient integration to a solar water heater.

Hot water for space heating is produced by a heat exchange coil installed in the heat-store. The water is pumped round the coil to radiators or under floor heating.

Hot water for washing is also produced by a heat exchange coil installed in the heat-store. Cold water is fed into the coil from the main and is heated. It is then mixed with cold water to make sure the water is not too hot.

Lastly the heat-store has connections for a circuit to a fan blown radiator to take heat out of the bottom of the tank. This may seem a perverse thing to do but it is vital to make sure the engine is cooled properly and there will be times when all of the heat being produced will not be required.

Environmental

The Powerguard 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 alternative sources of power both straight forward and practical.