



Gensets and cogeneration

Combined heat and power applications from Alfa Laval

The full benefits of energy efficiency

Cogeneration or combined heat and power application is a very effective and efficient form of power generation, allowing total energy utilization to reach 90%. This efficiency doesn't just happen by itself – it's the know-how behind it that produces such great results.

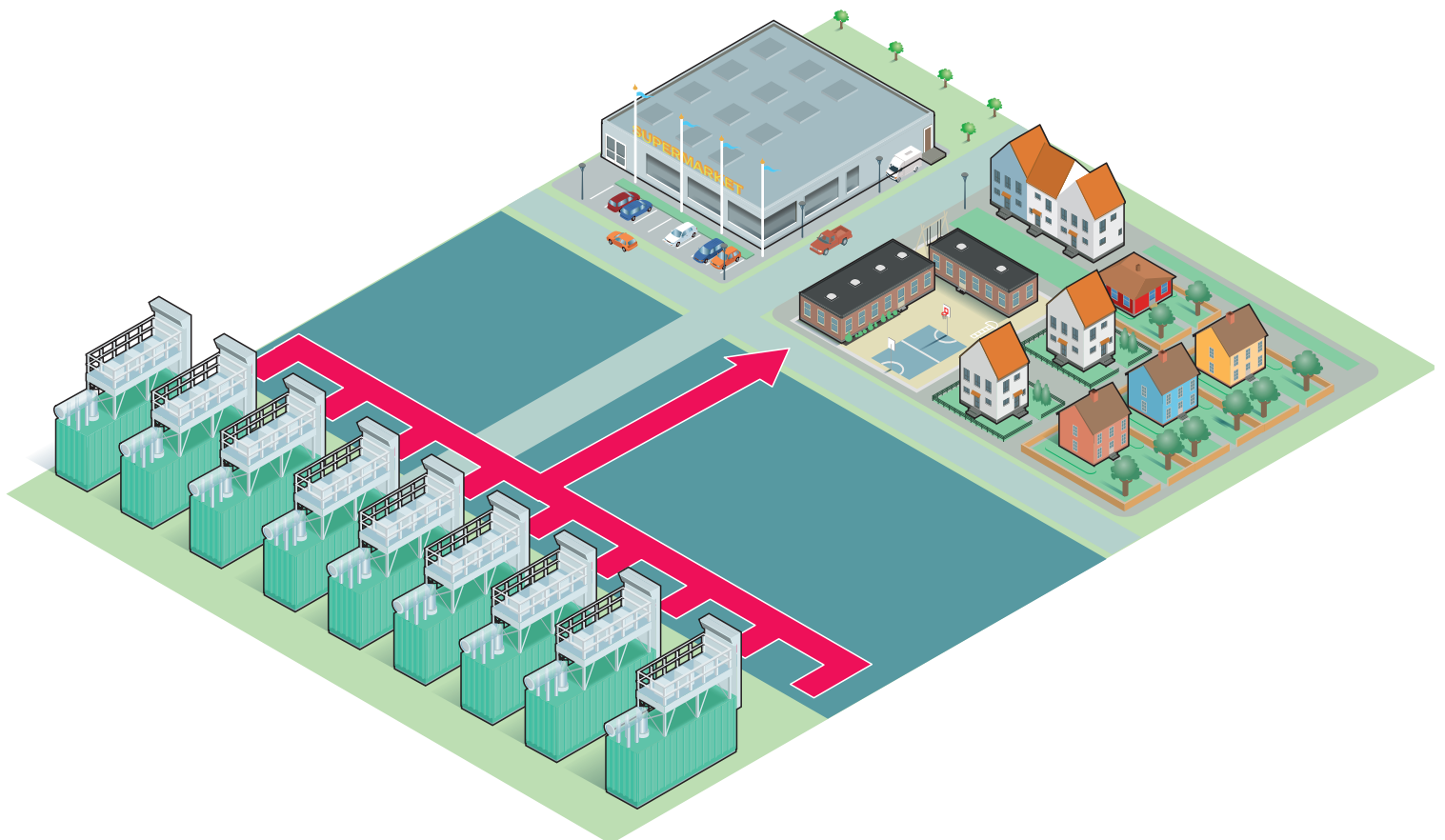
Alfa Laval offers a complete range of cooling solutions for both gensets and combined heat and power systems.

With an extensive focus on R&D, air heat exchangers (AHEs), gasketed plate heat exchangers (GPHEs) and brazed plate heat exchangers (BPHEs) have been developed to ensure lower emissions and substantial cost savings year after year due to their cost-effective, highly engineered designs.

Alfa Laval offers more than just products, we offer a partnership based

on our long experience, resources, and engineering proficiency.

Having delivered optimal heat transfer solutions for more than a century, Alfa Laval meets a wide range of needs and offers unparalleled expertise – ensuring future-proof solutions that can be relied on time and time again.





Gensets

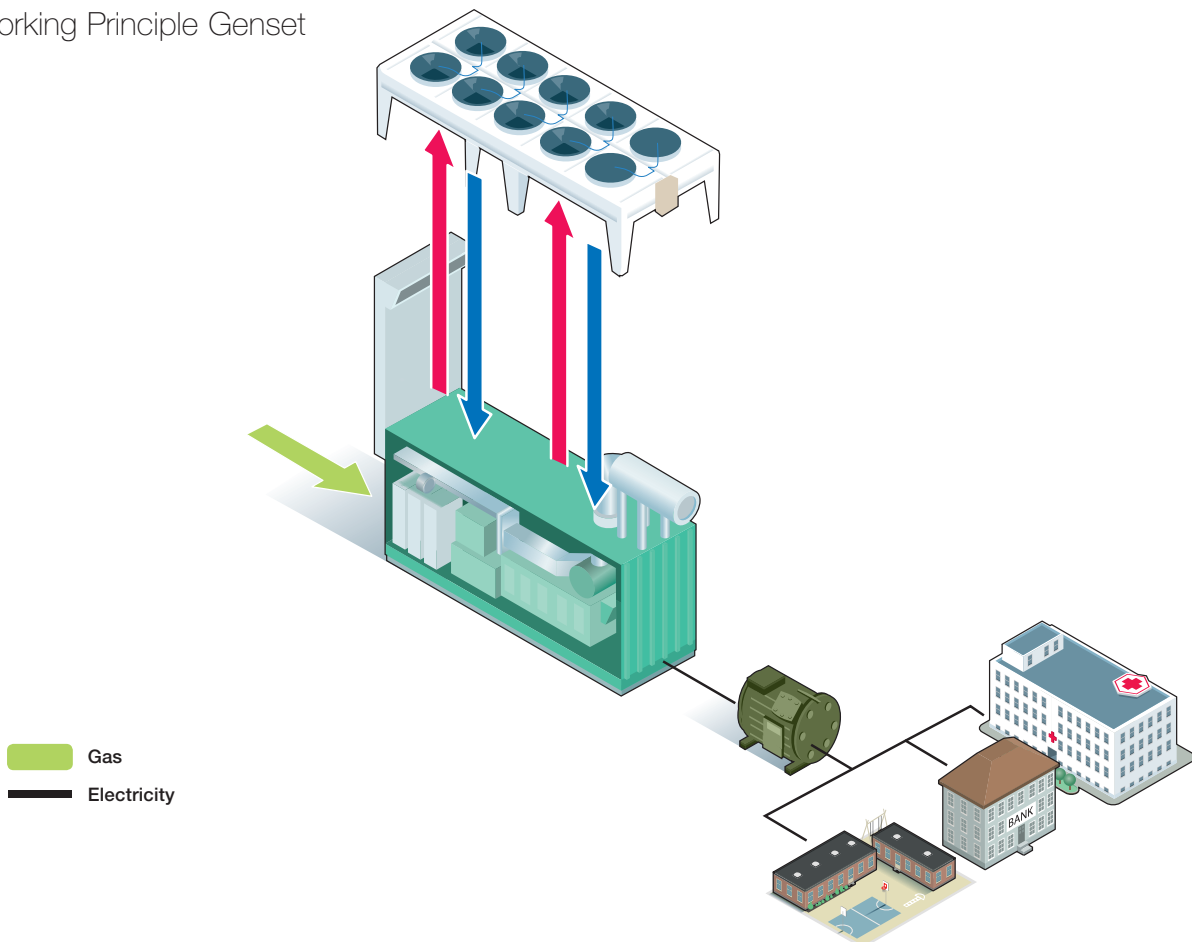
A generating set or genset is a system that generates electricity. The purpose of a genset is to provide back-up or redundancy electricity when the primary systems go offline. Thus, if the standard supply of electricity fails, then the genset will still fulfill the need and a blackout is avoided. Gensets are often used for critical social functions, such as industries, agriculture, water treatment plants, heating plants/district

heating systems, shopping centres and banks.

The genset system consists of an engine, fueled often by diesel or natural gas, which drives a generator. The generator then creates the electricity to be used by the site. When the engine is running it becomes heated and needs to be cooled. A typical engine will have two circuits, one high

temperature (HT) and one low temperature (LT) circuit, which need to be cooled to ensure the continued performance of the engine and, in turn, the genset. Alfa Laval's wide portfolio of air heat exchangers, AHE, can offer both combined and single circuit configurations in one compact unit, making the installation more compact.

Working Principle Genset





Combined heat and power – natural gas/diesel

Combined heat and power systems, CHP, utilize the heat created when an engine is running. The heat can be recovered and used via Alfa Laval plate heat exchangers, PHE's. This type of system is used either as a primary source of energy or as a secondary source for critical social functions, such as hospitals, schools, hotels and retirement homes. The benefit of using it as a primary source is that the

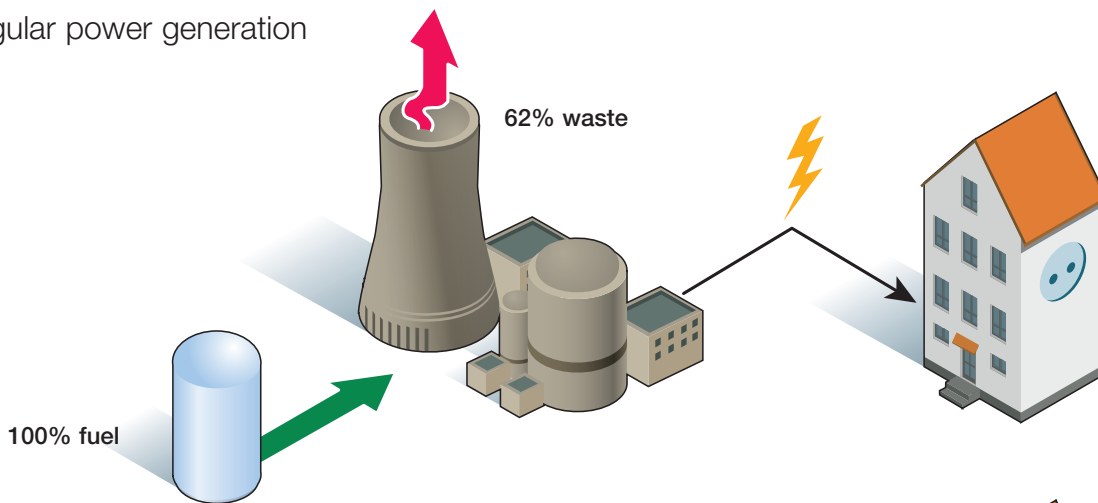
installation is self-sufficient and full control of uptime and downtime is possible. When used as a secondary source of energy the benefits are the redundancy of the central energy grid and the security it provides against power shortages.

CHP's offer many benefits:

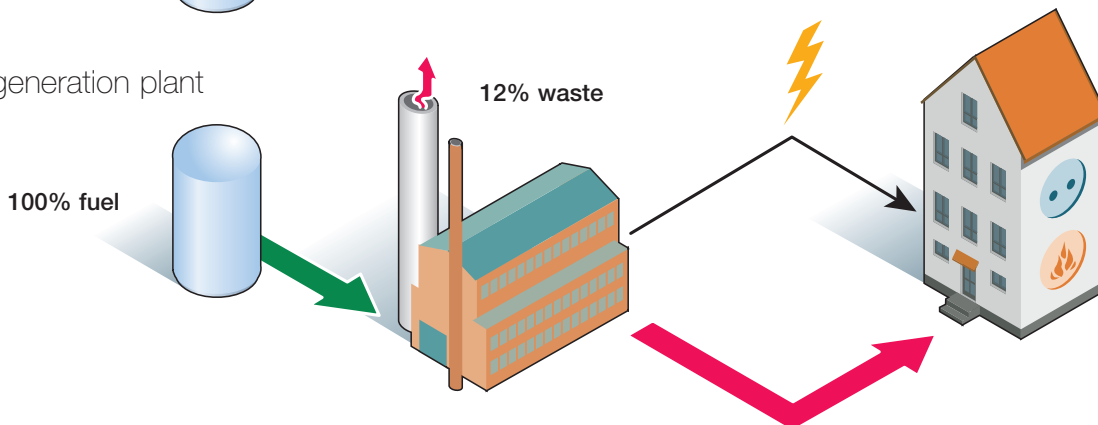
- More efficient utilization of input energy.

- Waste heat is a positive byproduct.
- Possible to sell surplus electricity and heat back to the grid.
- Low emissions and environmentally friendly (especially with natural gas).
- Efficiencies in biogas production help cogeneration development from an agricultural perspective.
- Possibility of government subsidies.
- Payback time 3-5 years, depending on system set-up

Regular power generation



Cogeneration plant





Working principle

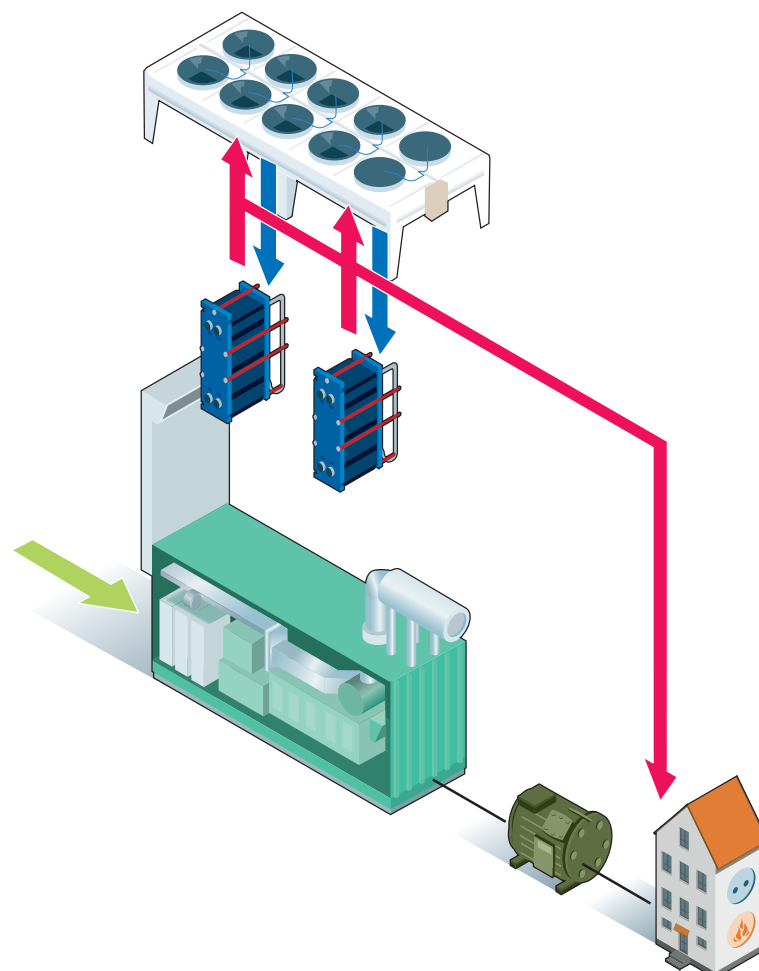
The concept of CHP is built on “simultaneous generation of two useful forms of energy, electricity and heat, from the same plant using one single primary energy source”.

An engine generates heat from the lube oil, low temperature circuit and from

the jacket water, high temperature circuit. If these circuits are connected to Alfa Laval plate heat exchangers, PHE's, the heat can be recovered and used. This is done by having the secondary sides connected to separate water circuits from which you can extract the heat for any purpose,

typically tap water or an indoor heating system. When the engine is producing more heat than is needed, the heat stored in the secondary circuits needs to be dissipated. This is preferably handled by an Alfa Laval air heat exchanger, AHE, also called a dry cooler.

Working principle combined heat and power system





Combined heat and power – biogas

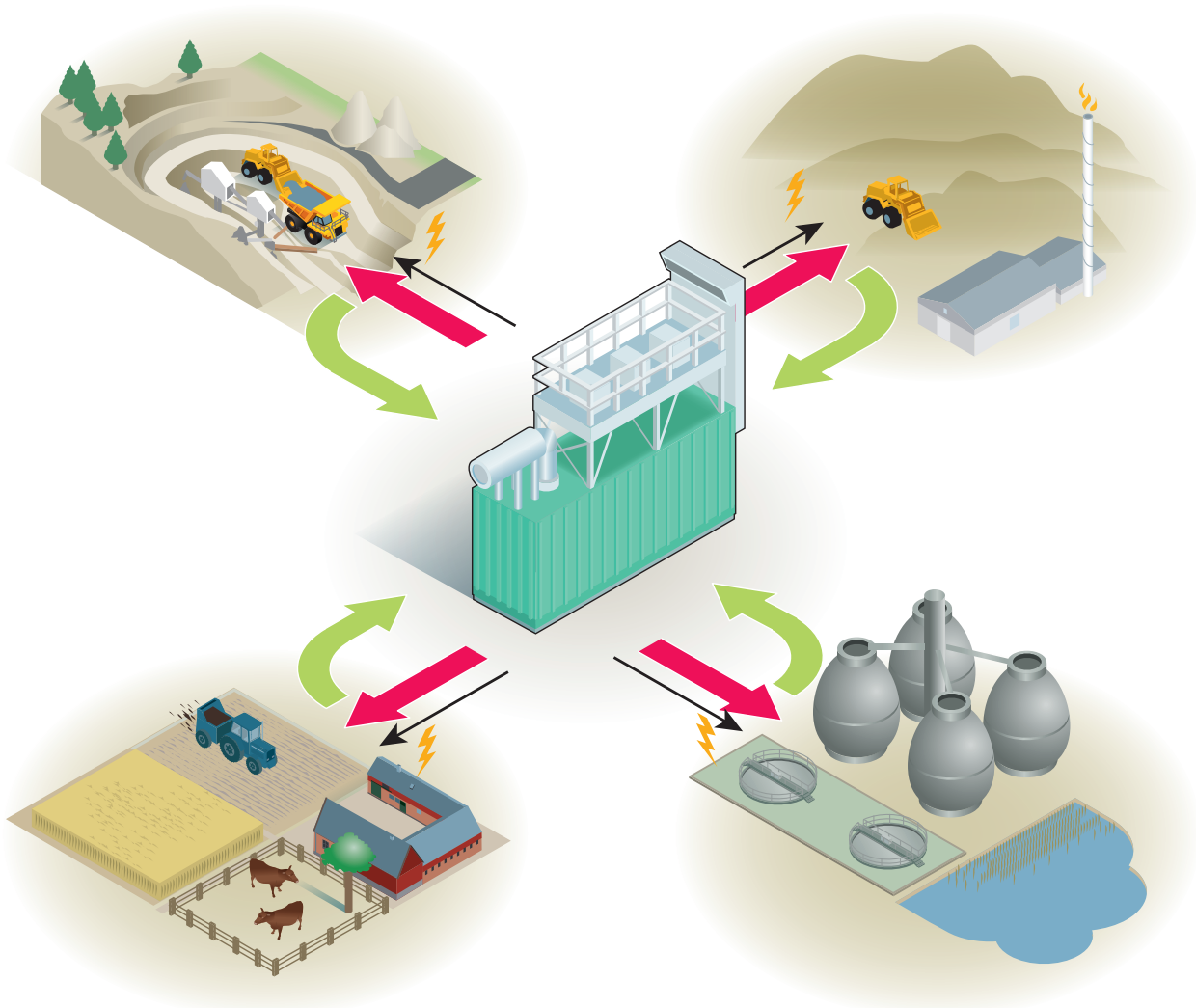
For areas or sites that produce their own biowaste, there is a profitable opportunity to convert this into biogas that can be used to fuel a combined heat and power system. Thus, sites such as farms, wastewater treatment plants (wwtp), landfill waste and mines, can be self-sufficient in terms of energy

and create their own independent, sustainable energy cycle, where all energy consumed is also created via their own waste.

Since it is only the engine fuel that is different, the working principle of the biogas CHP is the same as the CHP

system fueled by natural gas or diesel, as described in an earlier section.

Alfa Laval's extensive portfolio includes PHE's suitable for heat recovery in the LT and HT circuits, and AHE's for dissipating excessive heat.





Organic Rankine Cycle (ORC)

The Organic Rankine Cycle (ORC) is named for its use of an organic, high molecular mass fluid with a liquid-vapor phase change, or boiling point, occurring at a lower temperature than the water-steam phase change. The fluid allows Rankine cycle heat recovery from lower temperature sources such as biomass combustion, industrial waste heat, geothermal heat, solar ponds, etc. The low-temperature heat is converted into useful work, that can itself be converted into electricity.

The working principle of the organic Rankine cycle is that the working fluid is pumped to a boiler where it is evaporated, passes through a turbine and is finally re-condensed. The system is fuelled by adding energy into the evaporator at high temperatures and useful energy is extracted from the turbine/expander, as electricity, and from the condenser, as hot water/heat. To improve the efficiency of the system a regenerator can be added into the cycle.

Typical usage areas for an ORC system are different types of power sources, such as biomass power, geothermal plants, solar thermal power and waste heat to power systems. All these types of system are considered renewable and environmentally sound.

