



Heat Recovery Systems

Identifying & Applying Heat Recovery Systems



What is Heat Recovery?

Heat recovery is the collection and re-use of heat arising from a process that would otherwise be lost or 'wasted'. To reclaim this wasted energy there needs to be a lower temperature 'heat sink' where the wasted energy can be effectively / economically used.

Typical applications where heat can be recovered are:

- + Boilers that provide heat for any process
- + Steam boiler blowdown
- + Flash steam
- + Steam de-superheaters
- + Heat rejection from process cooling systems
- + Air compressors
- + Hot exhaust air
- + Heat stored in products leaving the process
- + Heat in gaseous and liquid effluents leaving the process
- + Heat in cooling hydraulic oil systems.

Where can Heat Recovery be used?

Recovered heat is a valuable and flexible resource. The following is a list of the most common uses for recovered heat:

- + Heating of steam system make-up water
- + Heating of wash down water
- + Paint facilities / wash lines
- + Space heating / central heating
- + Domestic hot water i.e. toilets, kitchens, laboratories, showers etc
- + Boiler return water heating
- + Process heating
- + Combustion air pre-heating
- + Electrical generation (organic rankine cycle, steam turbine or expanders)
- + Absorption chillers
- + Drying

DENCO FLUID SYSTEMS

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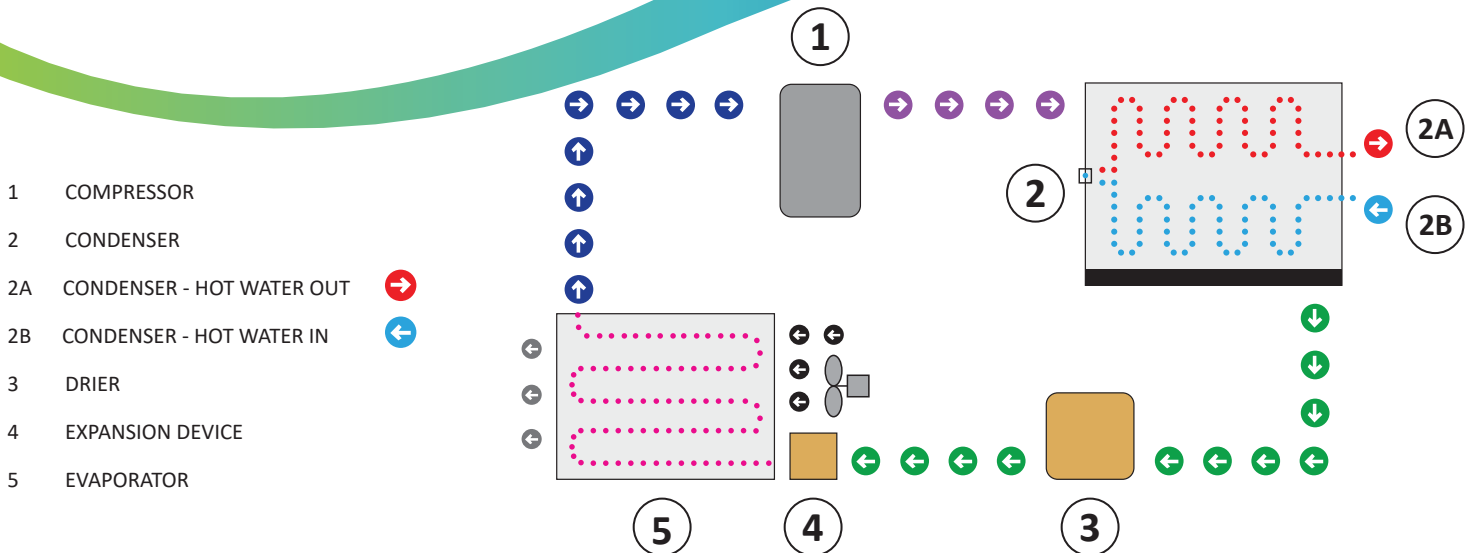
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Water Cooled Condensers



What are Water Cooled Condensers?

A Water-Cooled Condenser is a heat exchanger that removes heat from refrigerant vapour and transfers it to the water running through it. Having the refrigerant vapour condensed on the outside of a tube achieves this. In doing so, the vapour condenses and gives up heat to the water running inside the tube.

The benefit of a Water-Cooled Condenser are as follows:

- + Where space is restricted for air cooled plant, a Water Condenser is a good solution
- + Thermal energy recovery to put into other heating processes
- + More robust, reducing the need to replace as often as Air-Cooled Condensers
- + Quiet operation compared to Air-Cooled Condensers
- + Energy efficient
- + Can be housed indoors
- + Higher heat transfer rate

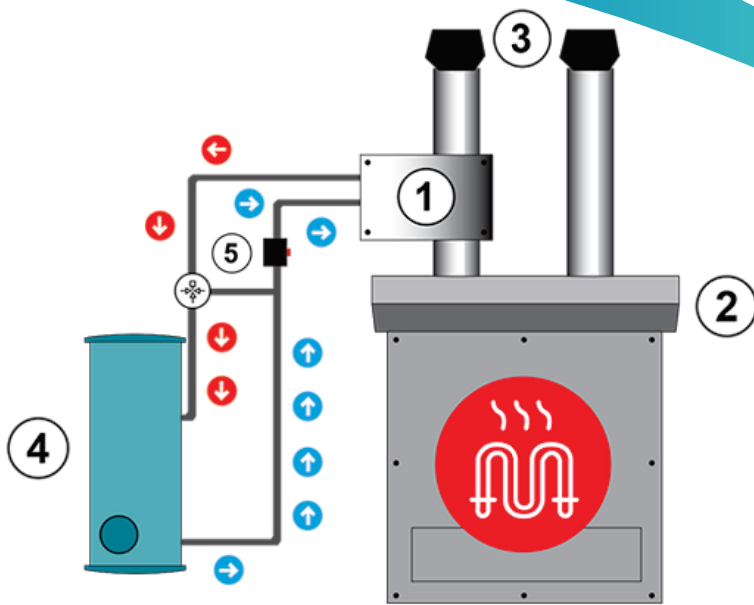
The range of uses for this heat will depend on the application and temperatures of the system, however typically could be used for:

- + Steam system make-up water pre-heat
- + Wash down water pre-heating
- + Space heating
- + Domestic hot water i.e. toilets, kitchens, laboratories, showers etc
- + Boiler return water pre-heat
- + Process heating
- + Drying

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Flue Gas Heat Recovery



- 1 ENERGY RECOVERY UNIT
- 2 HEAT GENERATING PROCESS (BOILER, ENGINE, OVEN, DRIER ETC)
- 3 CHIMNEY FAN WHICH ENSURES AN OPTIMAL DRAUGHT AND PERFECT PRODUCTION RESULTS
- 4 BUFFER TANK TO STORE HOT WATER FOR FUTURE USE
- 5 CIRCULATION PUMP

What is Flue Gas Heat Recovery?

Flue Gas Heat Recovery Systems are designed to recover unused energy from flue gases or process air and transfer this thermal energy to a water system which can then be exported to a point of use. In a market with ever increasing energy prices there is a focus on effective use of resources and restrictive CO₂ gas emission requirements. It therefore makes sense to exploit the considerable amounts of energy found in flue gas, steam or other process heat exhaust and extraction systems.

The benefits of Flue Gas Heat Recovery are as follows:

- + Typically, 12-16% reduction in fuel usage and an equivalent reduction in CO₂ emissions
- + Attractive return on investment periods
- + Constant pressure monitoring and compensation to ensure no detriment to processes
- + No condensation risks due to intelligent control system
- + Compact unit for ease of installation
- + Retrofittable

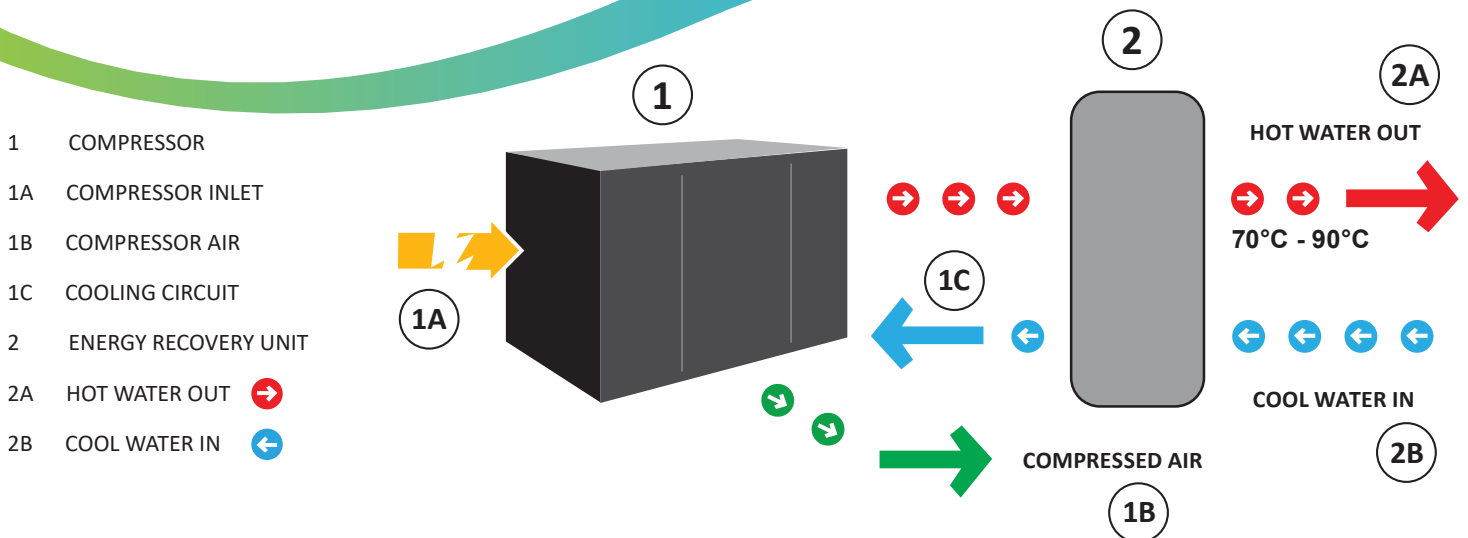
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Compressor Heat Recovery



What is Compressor Heat Recovery?

Over 90% of the electrical input to a compressor is lost as heat. By recovering this waste heat energy from air or water-cooled compressors you can reduce your energy bills significantly and thus reduce CO2 emissions. The thermal energy recovered can be recovered to an air or water system and utilised in many different ways. Many companies gain significant financial benefits from installing waste heat recovery equipment, especially if the site has long operating hours.

The benefit of Compressor Heat Recovery are as follows:

- + Attractive return on investment periods (typically less than 2 years)
- + Retrofittable
- + High levels of recoverable energy
- + Large temperature ranges for multiple uses

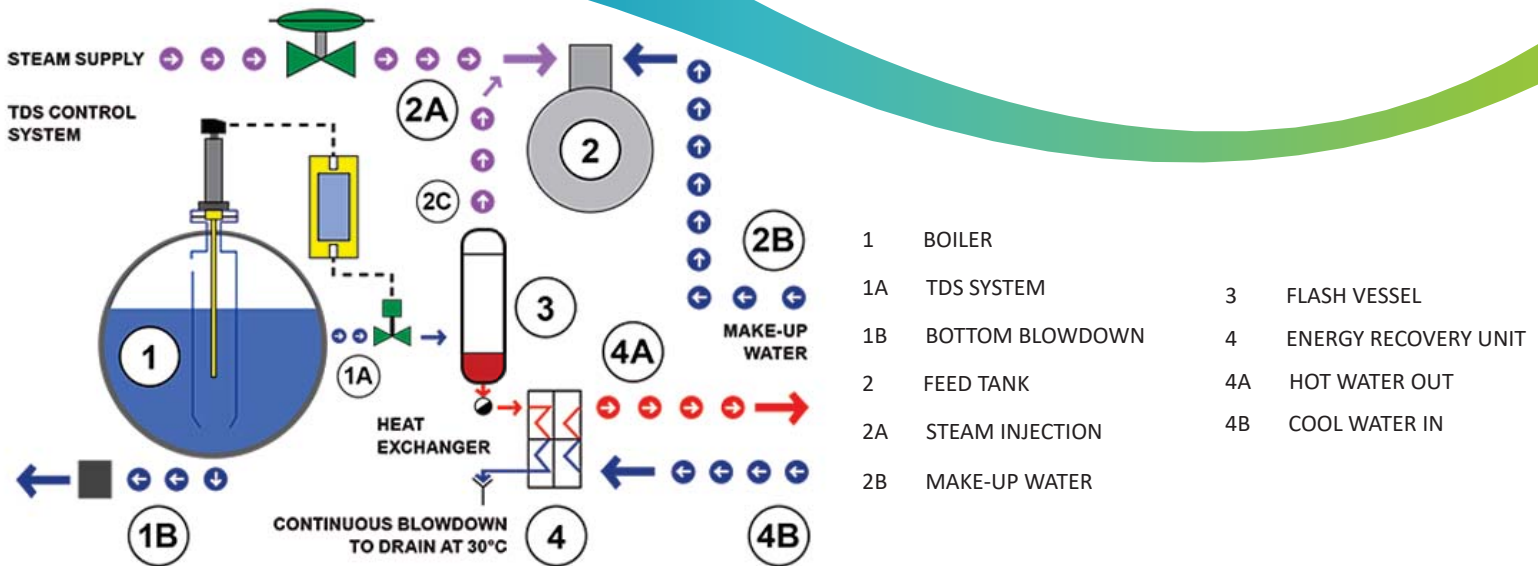
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Steam Plant Heat Recovery



What is Steam Plant Heat Recovery?

Steam systems offer multiple opportunities for energy recovery, the most common being flash energy recovery and TDS blowdown energy recovery. Routinely and in some cases constant TDS sampling operations on steam systems allow for energy recovery from flash steam and also the condensate to drain. The energy can be recovered via a heat exchanger and/or flash vessel depending on the application. Other flash steam recovery (from blowdown vessel, condensate receivers, etc) can further improve system efficiencies by recovering the energy and potentially returning condensed steam to the condensate system to reduce water make-up and chemical treatment. Steam de-superheaters also offer energy recovery opportunities.

The benefits of Steam Plant Heat Recovery are as follows:

- + Recovery of otherwise lost energy
- + Simple system and installation
- + Retrofittable
- + Improved boiler efficiency
- + Reduced running costs
- + Attractive return on investment periods

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Food Manufacturer: Heat Recovery Case Study



This case study demonstrates how previously Denco Fluid Systems have completed the design and manufacture of an Energy Recovery module coupled to a Variable Speed Drive Air Cooled Compressor via a heat exchanger on the oil lubrication circuit. The oil lubrication circuit operates at circa. 85°C and can produce hot water and up to 80% of the compressors total capacity.

This particular operation utilises the hot water produced to heat up the inlet to the onsite mains water header tanks through a heat exchanger thus transforming the header tanks into hot wells. This hot well was then able to continually supply the plant with hot water for wash downs amongst other applications reducing the sites gas consumption.

The installation of this equipment saved the user circa £20K per annum with an equipment payback of only 9 months.



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Flexibles Manufacturer: Heat Recovery Case Study



Denco Fluid Systems have completed a number of energy recovery projects by reclaiming waste heat from air compressors to reutilise in heat sinks found in all industries. This particular energy recover system consisted of energy recovery from a variable speed driven water cooled compressor via a heat exchanger on the compressor cooling circuit. The compressor cooling circuit operates at circa. 85°C and can produce hot water and up to 80% of the compressors total capacity.

This particular operation utilises the hot water produced on a separate closed circuit water system to increase air temperature in a process heating duct. By removing a suction of the ductwork a hot water coil was fitted into the ductwork which allowed the transfer of heat from the compressor cooling circuit through the water circuit and into the supply air. This process reduced the use of gas burners for heating the air.

The installation of this equipment saved the user circa £10K per annum with an equipment payback of only 2 years.



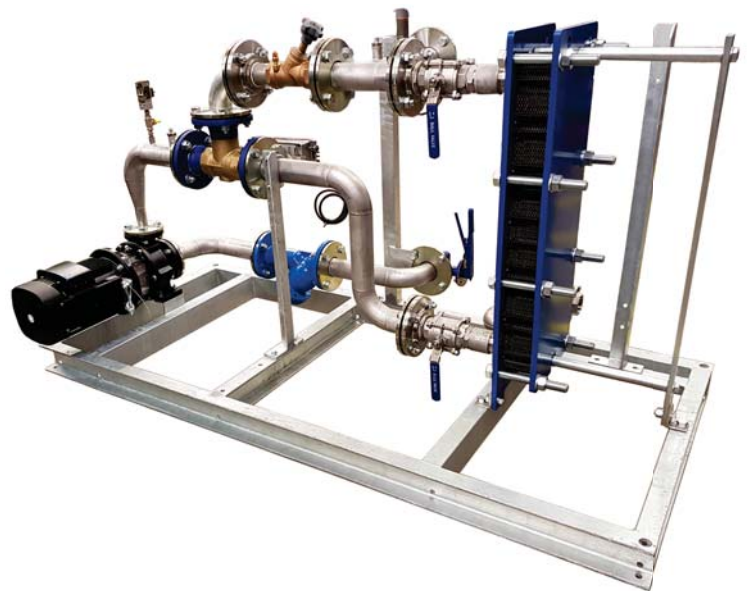
Car Parts Manufacturer: Heat Recovery Case Study



A further energy recovery process enabled Denco Fluid Systems to capture the waste heat generated from 2 compressors from 2 different manufactures and connect the 2 systems together combining the heat recovered and therefore resulting in a useable duty for the identified heat transfer.

The heat recovered from the compressors was fed to a hot water coil that was immersed in a wash down tank that was essential for the customer's process. The amount of energy saved allowed the customer to remove the gas burners that were being used at full capacity all year round to heat the bath, and replace them with Denco Fluid Systems's hot water coils resulting in the significant cost savings.

The installation of this equipment saved the user circa £20K per annum with an equipment payback of only 9 months.



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Natural Gas Compression: Heat Recovery Case Study



This particular energy recovery system consisted of energy recovery from a variable speed driven water cooled compressor via a heat exchanger on the compressor cooling circuit. The compressor cooling circuit operates at circa. 85°C and can produce hot water and up to 80% of the compressors total capacity.

By reclaiming the waste heat from a gas compressor Denco Fluid Systems used this energy to heat the water supply used in offices for showers, taps and radiators etc. in order to reduce energy consumption of boilers or replace them entirely.

This particular operation utilises the hot water produced on a separate closed circuit water system to provide a heat interface unit with hot water which used an integral heat exchanger and pump to replace the customer's boilers. This process reduced the sites use of gas boilers for heating.

The installation of this equipment saved the user circa £20K per annum with an equipment payback of only 9 months.



Future Heat Recovery Projects



Flue gas heat recovery systems vary depending on the applications, available static, temperature in flue and flue medium etc. Variables determine the type of heat recovery equipment used and therefore the application the heat can then be used for. Denco Fluid Systems utilise a variety of heat recovery systems utilising different equipment to recover the waste energy and have the ability to tailor each system to use the most effective equipment for the application.

Denco Fluid Systems are capable of selecting the equipment needed for the energy recovery systems and identifying the heat sinks on site in order to calculate the potential energy savings and paybacks by reducing the consumption of fuels or electricity.

Examples of systems where wasted heat from exhaust fumes has been considered includes asphalt plants where large burners generate extreme heat yet require warm air at the air intake for the system. By introducing a hot water coil to the exhaust stack and recirculating hot water to an additional coil on the cold air intake the air can be transfer making the process more efficient.

Further projects have considered the use of incinerators and furnaces fitted with purpose built energy recovery modules suitable for heat recovery processes to be sold with the OEM to allow for future development and unique selling points in a competitive market.

Denco Fluid Systems have the capabilities to design, supply and install heat recovery modules to a multitude of applications and in a large number of industries.

For further information on future projects or to contact Denco Fluid Systems to review the potential applications for heat recovery systems, call us on (+44) 01432 365000 or email us: info@dencofluidsystems.com

- Hydronic Modules
- Dry Air & Adiabatic Coolers
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- Control Systems with BMS Integration
- Installation Services
 - Siting Equipment
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 - Electrical Installation
 - Commissioning
- Air & Water Cooled Chillers
- Glycol Antifreeze
- Temperature Control Units
- Evaporative Cooling Towers
- Spray Troughs
- Emergency Cooling Systems
- Service, Maintenance & Support
 - Total Plant Hire
 - Chiller Hire
 - System Reviews
 - Plant Reviews
 - After Sales Report

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