

Industrial waste heat recovery solutions

Operational efficiency and
future sustainability



An associate company of
Spirax-Sarco Engineering plc

econotherm
WASTE HEAT RECYCLING TECHNOLOGY



Waste heat recovery

ECONOTHERM® provides solutions to complex waste heat recovery applications for industrial users wishing to reduce operating costs and carbon emissions.

ECONOTHERM® heat pipe exchangers offer many distinct advantages over more common technologies.

We can recover 'irrecoverable' waste heat that other heat exchangers cannot:

- We can deal with a wide temperature range, from -50 to 1000C
- We can recover waste heat from aggressive environments such as highly acidic or very dirty particulate matter exhausts.
- We can extract up to 25% more waste heat energy than conventional heat exchangers.

Our technology is renowned for being extremely robust and able to operate in diverse and challenging heat recovery environments:

- The combination of a unique low cost manufacturing process and patented exchanger designs ensure a long, trouble free service.
- We offer very high levels of redundancy - our units are almost failsafe and will run 24x7x365.
- A heat pipe heat exchanger virtually guarantees complete separation of the fluids involved in the heat exchange.

The return on investment (ROI) payback period is 3 to 24 months, depending on application parameters.

www.streblenergy.com

Why Econotherm?

ECONOTHERM® UK Ltd design and manufacture heat pipes and heat exchangers for use in diverse areas of industrial waste heat recovery. We particularly focus on difficult to recover heat, for example very hot and, or very dirty exhausts.

Since 2007 we have delivered our custom built solutions – ranging in size from a few kilowatts to several megawatts – to blue chip clients in many industrial sectors around the globe.

Our growth plans have recently been aided by a £1m investment from Spirax Sarco, of which we are now an associate company. We have received Green technology awards from Shell Oil and UK Carbon Trust and our leading edge development of new heat pipe technology continues to put us at the forefront of the waste heat recovery business.

ECONOTHERM® and our installation partners are able to offer full turnkey solutions and supply products from our standard range. We can also customise to a set of bespoke requirements. All heat recovery products are made using our patented manufacturing process at state of the art production facilities in Wales, United Kingdom.

Spirax-Sarco Engineering plc



Food industry gas to water crossflow heat exchanger



Gas to gas pharmaceutical - Ireland



Heat exchanger being built



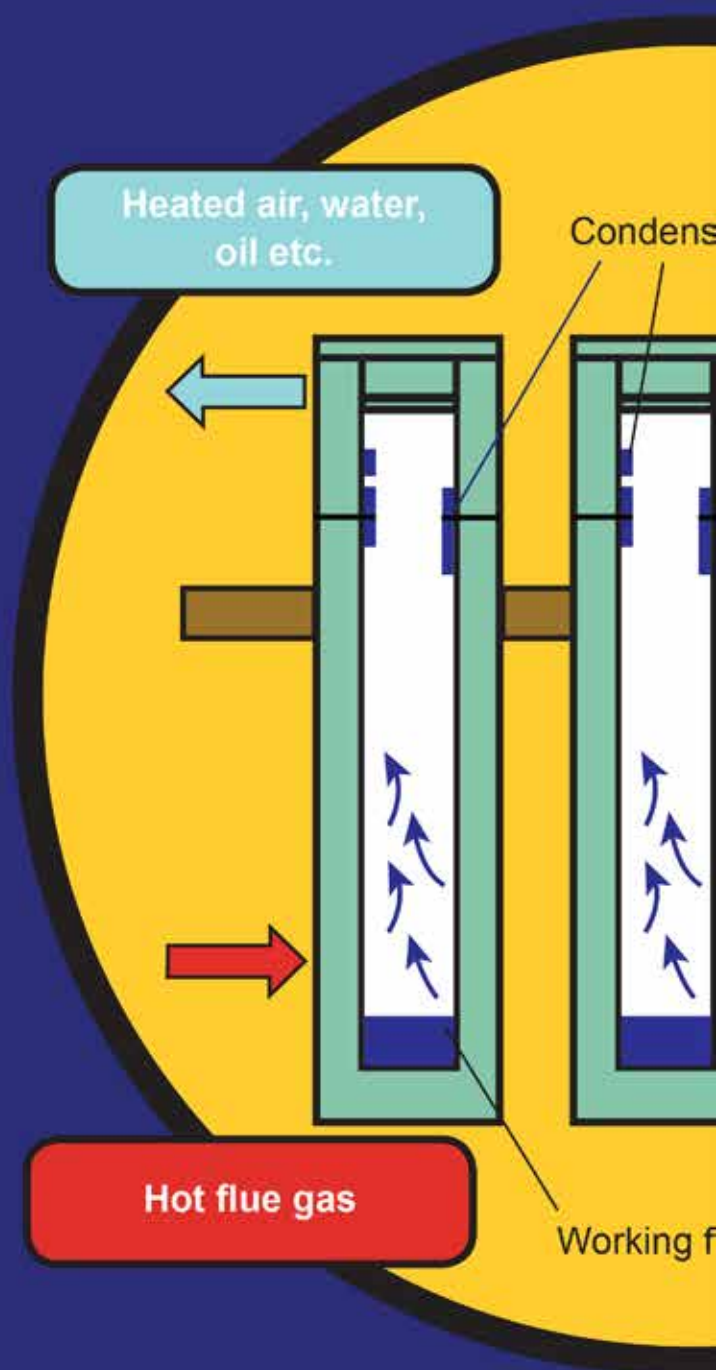
Solar panel cooler heat pipe

Heat pipes

how they work

ECONOTHERM® heat pipes offer a very efficient and cost effective means of recovering waste heat from exhaust heat streams. The heat pipes at the core of our exchangers are able to operate at exhaust temperatures up to 1000°C which offers a wide range of recovery possibilities. The recovery mediums can be to gas (air), water or oil or other fluids as required by the application. At the core of Econotherm® heat exchangers lie our patented superconductor heat pipes. Econotherm® heat pipes are as much as 1000 times more conductive than copper.

Conventional heat recovery technology generally consists of a complex multi-tubular structure of thin metal. This is vulnerable to single tube failure, erosion and corrosion. They are also difficult to clean and suffer from thermal stress cracking. Econotherm® heat pipes do not rely on a thin metal surface for heat transfer; they are built out of more robust materials offering increased resistance to erosion. They are also very easy to clean as the pipes are smooth and do not attract particulate matter or dust.



Our products

Heat exchangers



Gas to Air



Gas to Liquid



Steam Generator



Steam Condenser



Flat Panel

Heat pipes



Standard



Finned



Hybrid

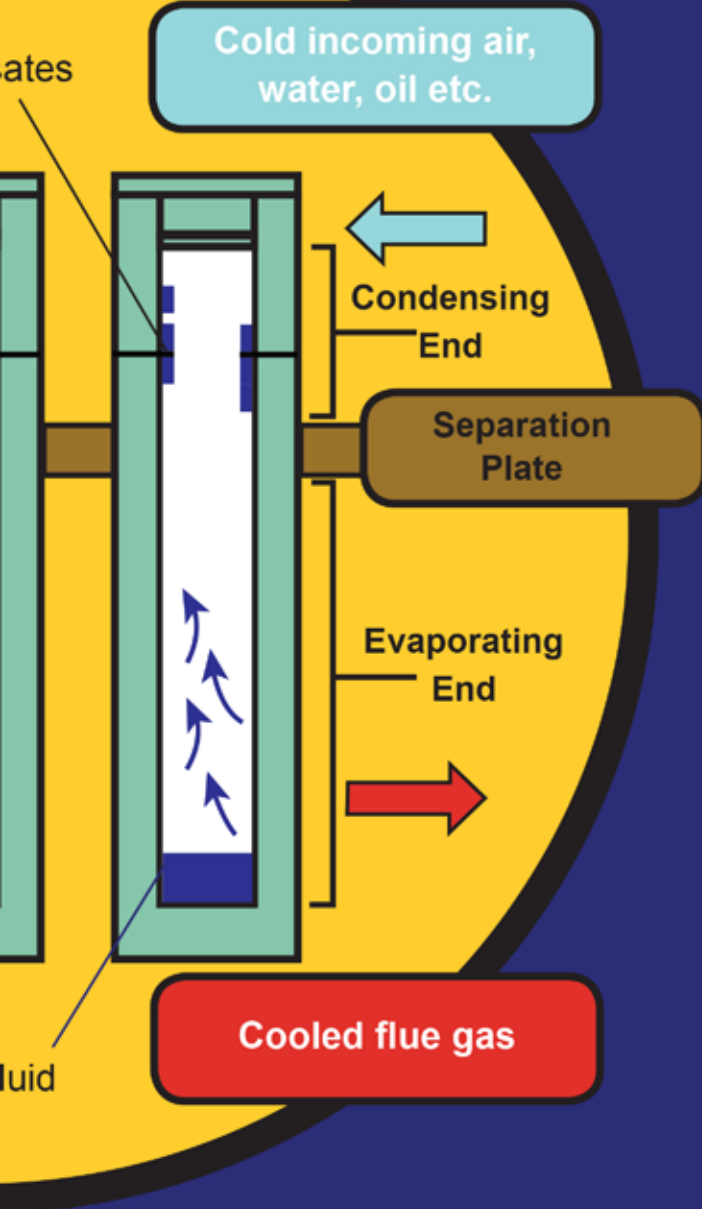


S-Shape



Loop

The advantages



Multiple Redundancy / Increased Reliability

Each pipe operates independently, so the heat exchanger is largely unaffected by a small number of pipe failures - it will continue to function until next maintenance. Zero cross contamination through independent pipe operation.

Low Fouling

Use of smooth pipes allows exchangers to be used in high particulate or oily applications. Easy to clean and maintain with a variety of cleaning solutions available.

Isothermal Operation

Eliminates cold corners and condensation, and hence corrosion. Allows greater energy recovery.

Increased Life Expectancy

Heat pipes are made from more robust materials offering increased resistance to erosion. Integral design minimises adverse effects of metal expansion; heat pipes are free to expand and contract independently of the casing.

Increased Flexibility

Robust construction allows deployment in "difficult" heat recovery environments. Heat pipes can be added or removed to ensure optimum heat recovery. Available in a wide range of custom sizes or bespoke designs.

Reduced Operational Cost

Reduced pressure drop across exhaust, hence lower parasitic load. Boiler/furnace efficiency increase of 3-5%. Collection of condensate in the exhaust gases can be arranged.

Low Pressure Drop

Less capital and running cost on fans and greater energy recovery.

Highly Scalable

Modular designs for large units allow assembly on site with future expansion capability.

Reactivity

Very fast reaction time, different control options and suitable for sensitive apparatus.

Capacity Limits

	Design Temperature	Design Pressure
Exhaust Inlet	1000C	0.1 barg
Oil Outlet	350C	30 bar
Water Outlet	350C	30 bar
Air Outlet	320C	0.1 barg
Seals	550C	32 bar

Sectors and applications

Econotherm® work across many sectors of business and can provide heat recovery systems for a diverse range of heat sources.

The diagram shows examples of the many applications we can provide. Our design team is available to discuss your particular requirements and tailor a system to suit you.

Sector	Heat Source	Application
Automotive	Furnace	Air Heating
Metals		Combustion Pre-heat
Construction	Kiln	Drying
Bricks		Building heating
Asphalt	Boiler	Water
Glass		
Ceramics	Oven	ORC Power generation
Food	Generator Set	Thermal Oil
Mining		
Oil & Gas	Once Through Steam Generator	ORC Power generation
Exploration		Thermal Oxidiser
Processing	Process	
Generation	Incinerator	
Pharmaceutical		
Printing/Paper		
Waste to energy		

Cleaning and maintenance

Waste heat recovery environments are frequently hot and dirty. Fully functioning, clean pipes are essential for optimum performance. **Econotherm®** heat exchangers are designed to minimise cleaning and maintenance requirements. Heat pipes are readily accessible for manual cleaning using compressed air or high pressure water/steam. Alternatively, for very dirty or sticky exhausts, **Econotherm®** automated system options can remove particulate matter using sonic horns (pulse blasters or sound waves), moving plate scraping mechanisms or a vibrating method which literally shakes dust off the pipes.

Our heat pipe exchangers require very little maintenance. We recommend routine inspections be made by the client every few weeks after initial installation and then annually thereafter.

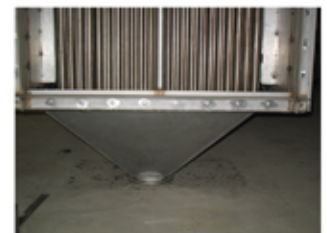
Additional assistance including advice, replacement parts and installation are all available through **Econotherm®** and our distributors.



Maintenance Panels



Sonic Horn - Inside unit



Aerodynamic trap

Case studies

Gas to Oil - Qinetiq, UK

Gas to oil heat exchangers were installed to heat thermal oil from a variety of exhaust gas sources. The hot thermal oil is then input into an Organic Rankin Cycle engine to generate electricity for building heating. The Econotherm waste heat recovery unit was chosen due to high resistance to fouling and ease of cleaning.



Exhaust Temp In/Out	1000 C/ 250 C
Thermal Oil Temp In/Out	135 C/280
Exhaust/Oil Mass Flow	4150/ 9200 (Kg/hr)
Energy Recovered	940 KW
Recovered Energy Value	£150K p/a
Heat Exchanger Cost	£25K
Payback Period	3 Months
Price per KW recovered	£23

Gas to air - Automotive, Aluminium Furnace, USA

Econotherm® GA 360 smooth pipe heat exchanger • 500 kW combustion air pre-heater • High particulate matter exhaust from furnace • Low fouling, easy cleaning and maintenance, high reliability • Unit positioned outside main factory premises • Customer advised it was not possible by consultants (acid etc).

Exhaust Temp In/Out	400 C/ 266 C
Air Temp In/Out	30 C/ 293 C
Exhaust/Air Mass Flow	12,000/ 6,374 (Kg/h)
Energy Recovered	528 KW
Recovered Energy	\$155K p/a
Project Cost	\$150K
Payback Period	16 Months
\$/KW recovered	\$123 (£76)



Multi-stage, in series steam/water, natural gas - Spirax Sarco, Italy

1 stage of 198C/12 Bar steam generation, left hand side • 2 stages of water heating delivered by 2 standard modules, visible on right of unit • Pipes screwed in from underneath on standard modules can be removed individually • Hinged access doors for easy cleaning, sealing nuts will be replaced by latches on future units



Exhaust Temp In/Out	420 C/ 160 C
Water Temp In/Out	160C/ 198C (12 bar)
Exhaust/Water Mass Flow	11,484/ 900 (Kg/h)
Energy Recovered	520 KW
Recovered Energy Value	£19K p/a
Heat Exchanger Cost	€19K
Payback Period	12 Months
Price per KW recovered	£36

Many opportunities for real cost savings are being missed in industry today due to the perception that certain types of waste heat cannot be recovered.

Econotherm® can help you recover this wasted heat and put it to good use, saving you money and helping the environment at the same time.

Our aim is to **recover** **the irrecoverable**

Econotherm® operates to ISO 9001 quality standards. We manufacture pressure vessels to the European PED standard and can produce to ASME U stamp quality if required by clients.

Econotherm® products can be procured through the Spirax Sarco global network. Alternatively **Econotherm®** has dedicated distributors in the following countries:

Australia
Canada
Czech Republic
Denmark
Greece
Hungary
Ireland
Malaysia
Poland
Russia
UK
US



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