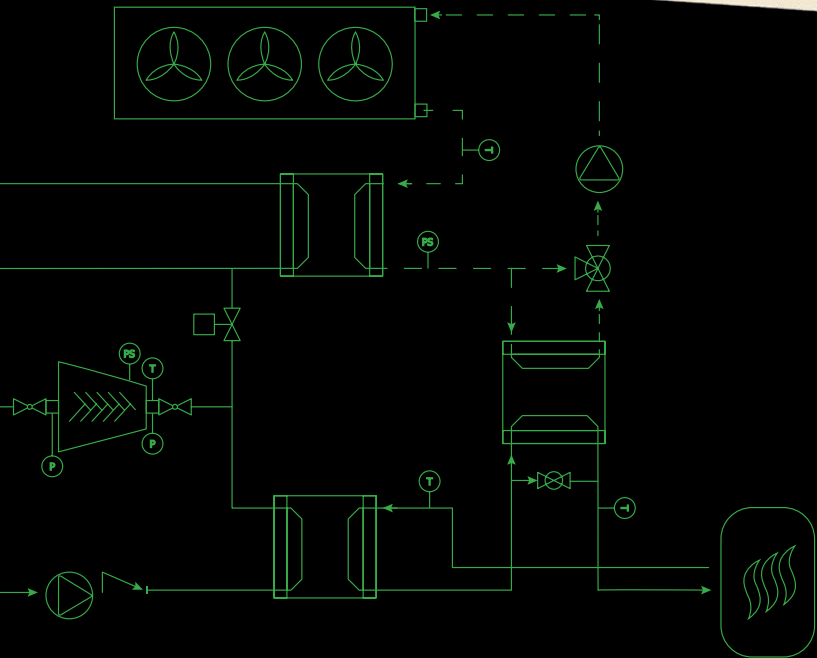


ACTIVE COOLER AC800

ACHIEVE NET-ZERO COOLING WHILE GENERATING CLEAN POWER

COOLS UP TO 800 KWTH // GENERATES UP TO 75 KWE



COOLING TO POWER.

THE FUTURE OF ENERGY EFFICIENCY.

PRODUCT OVERVIEW

Power generation and industrial processes generate considerable heat loads. This heat is a waste of energy and requires cooling systems to reject it - further wasting energy and contributing to global emissions. The ElectraTherm Active Cooler serves as a net-zero cooling to power solution, meeting the cooling system's requirements while generating clean electricity as a secondary function when the cooling load is not at peak demand. Since the system operates on heat in the form of a liquid, there are no additional emissions or fuel consumption.

The Organic Rankine Cycle (ORC) process converts sources of low temperature heat greater than 70°C - such as engine jacket water and geothermal fluids - into clean, usable power. The ORC process also reduces the cooling load significantly, 70-100%. This allows the cooling to power system to prioritize the production of electricity asides for periods of high ambient temperature and peak cooling demand. During peak loads, the ORC expander is bypassed and the system prioritizes cooling, fulfilling cooling requirements regardless of power generation. This is the only time, other than initial startup, that the Active Cooler will consume power that is not its own.



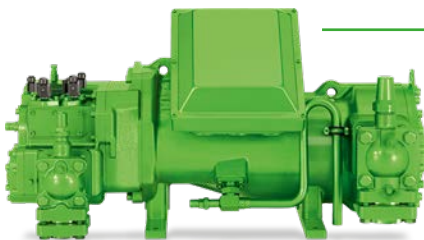
AC800

GENERATE UP TO 75 KWE

COOLS UP TO 800 KWTH

- // Heat loads larger than 800 kWth may require a custom design.
- // Heat sources above 150°C require an additional heat exchanger.

- // Weight: 6,500 kg
- // Dimensions: 2.3m * 10.1m * 2.0m (W*L*H)



All ElectraTherm ORC systems are powered by BITZER's semi hermetic, twin screw expander. This allows ElectraTherm's ORC process to utilize much more variable heat sources than leading turbine technologies thanks to greater transient operation that allows for "wet" dual-phase flow and greater turndown ratios allowing for continuous power generation when dealing with inconsistent thermal input.



CUSTOM SOLUTIONS ENGINEERED JUST FOR YOU

We at ElectraTherm know that every project is specific, therefore every project requires a specific solution. Our team of engineers and technicians are at your full disposal to identify the best solution that fits your needs. We individually analyze your site conditions and the environment to determine which ORC product is right for you.

Unsure of the thermal energy available or where to start? Our analysts will assist you from initial interest to final implementation, and beyond. ElectraTherm will be standing by throughout the product life cycle to ensure smooth and seamless operation.

FLEXIBLE OPERATION

FAST START

FAST START

After installation and configuration, the system is set by default to go from "off" to full load in 60 seconds. Depending on site conditions this time can be turned down to as little as 15 seconds. This is the only point the system will consume power that is not its own.

FULL LOAD

FULL LOAD

At full output our cooling to power systems boost efficiency as much as 5% by generating clean electricity and offsetting the cooling load. This amounts to an extremely low levelized cost of electricity, making the system a great sustainable asset for any size operation. Our units are modular, scalable, and mobile so you can use them however, whenever, and wherever you need to.

VARYING LOAD

VARYING LOAD

The ability to automatically load-follow allows you to leave the machine unattended, confident that it will continue operation as long as there is hot water. This opens up opportunities across industries that may have heat but an inconsistent flow.

LOW LOAD

When the cooling demand is high, the Active Cooler will automatically turndown power production to fulfill cooling requirements. The system will then resume optimal power production once the conditions are met.

LOW LOAD

Another benefit of using a twin screw expander is the ability to produce electricity from low-temperature sources previously seen as uneconomical for power generation. While a heat source may not provide enough thermal energy for maximum output, any heat upcycled into clean electricity is energy not wasted.

FAST STOP

FAST STOP

When site conditions become too volatile or the hot water source is suddenly cut off, the unit will perform an emergency stop. Unlike other ORC solutions on the market that breakdown and become bricked when fluctuations occur repeatedly, ElectraTherm's solutions are built to withstand abrupt changes in conditions.

In these instances, the ORC expander will be bypassed and the Active Cooler will provide only cooling to ensure continued safe operation.

OPPORTUNITIES ACROSS INDUSTRIES

The ElectraTherm Active Cooler is an ideal fit for businesses that implement commercial cooling to expel excess heat greater than 70°C. Common industries with enough thermal energy for ORC power generation that would benefit from net-zero cooling include manufacturing, air / gas compression, biogas production, and those with the need to generate power such as landfills, hospitals, well pads and other micro-grids. The Active Cooler is optimized for net-zero cooling, however, could still provide for an equally efficient power generator for applications with enough available thermal energy.



For remote operations - such as oil and gas extraction / compression - the ability to serve as a net-zero cooling system and micro-grid providing a baseload power supply allows operators to implement processes that maximize efficiency, previously not possible without an on-site electrical source. Designed with flexibility in mind and with larger systems in development, the Active Cooler is easily integrated into existing systems and scalable to multiple megawatt heat loads.

HEAT

The amount of heat available is the largest factor in determining if a heat source is viable for ORC heat recovery. While heat sources as low as 70°C can be used, heat sources above 100°C are considered ideal. Other variables that play a role in determining output are the flow rate and hot/cold water temperature differential.

RUN HOURS

The more time an application is operational, the more heat there is available to convert into electricity. There are 8760 hours in a year and suitable applications will experience 80% up-time, however applications with 90% up-time offer the best economics.

COST OF POWER

Installing an ElectraTherm ORC cooling to power system comes with several benefits, from a reduced carbon footprint to increased efficiency. However the most tangible benefit realized is the value of electricity produced / offset. Ideal projects have electrical costs greater than \$0.10/kWh.

GOOD FOR BUSINESS...

SIMPLE



The simple and flexible nature of our ORC solutions enables them to be adjusted to fit the needs of any application. A robust, modular, and scalable design allows the system to be easily integrated into existing processes while also allowing for future adjustments. Able to successfully operate at partial loads with varying conditions means that the system will produce electricity even when your processes are not at full capacity, providing a dependable power supply.

RELIABLE



Every ElectraTherm product goes through a rigorous testing process at our world-class R&D test facility to ensure absolute reliability. Our technicians and dedicated global partners offer full support for any issues you may encounter throughout the product lifecycle.

PROFITABLE



Our systems use existing heat as fuel, keeping operating costs minimal. ElectraTherm converts this heat into clean electricity, ready immediately. By generating power and reducing the cooling load, ElectraTherm increases total energy efficiency up to 10%. Our offerings may also qualify for local sustainability incentives as well as enabling micro-grid functionality in remote regions.

SUSTAINABLE



Over 50% of energy used in power generation and industrial processes is lost as heat - making this heat an enormous source of renewable energy. Increasing energy efficiency by upcycling this waste heat into emission-free electricity is the single easiest way to mitigate emissions and achieve sustainability goals.

CASE STUDY

- // 800 kW engine + AC800
- // 8000 hours of operation annually
- // Power Output (Net): 35 kW
- // Radiator Offset: 8 kW
- // Total Annual Output: 344 MWh

COST SAVINGS

\$34,400 per year at \$0.10/kWh
\$51,600 per year at \$0.15/kWh

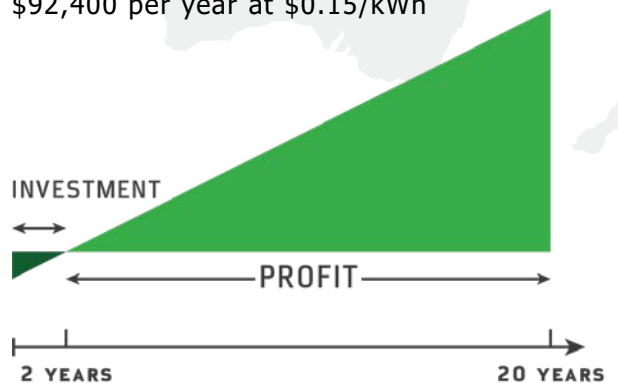


CASE STUDY

- // 1.6 MW engine + AC800
- // 8000 hours of operation annually
- // Power Output (Net): 67 kW
- // Radiator Offset: 10 kW
- // Annual Power Output: 616 MWh

COST SAVINGS

\$61,600 per year at \$0.10/kWh
\$92,400 per year at \$0.15/kWh



...AND THE PLANET

Corporate environmental responsibility, or a company's duties to minimize their carbon footprint and to abstain from damaging natural environments, has become increasingly more important in today's modern age. While it will take decades to achieve the sustainability goals set by nations around the globe - there are steps to be taken today that over time will make a large impact. The simplest of these steps is converting heat into electricity through an ORC. This increases fuel efficiency, thus reducing fossil fuel consumption and emissions. It also reduces reliance on the grid, which often uses non-renewable forms of energy. Additionally, the ORC process offsets the cooling load 70-100% - leading to significant energy savings. Boosting energy efficiency with ElectraTherm is practical, profitable, and improves your bottom line as well as the environment.

WHAT ONLY 5 ACTIVE COOLERS COULD DO FOR YOU...*



CLEAN ELECTRICITY PRODUCED

By recycling waste heat into usable power, you generate 3,285 MWh of emission-free electricity annually, enough to power 280 U.S. homes year-round.



CO₂ ELIMINATED

By using a waste heat recovery system to achieve net-zero cooling as well as to generate power, you effectively offset the equivalent of 2,330 metric tons of carbon dioxide annually.



CARS NOT DRIVEN

Your annual pollution offset is equivalent to taking 500 cars off the road, or reducing gasoline consumption by 435,000 gallons.



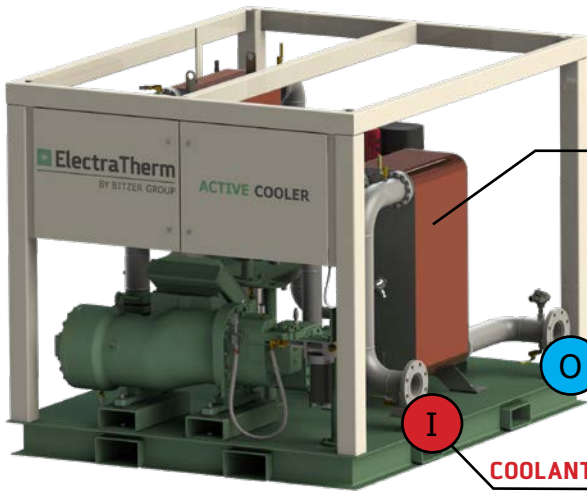
CARBON ABSORBED BY TREES

Your annual pollution offset is equivalent to the carbon sequestered by a 2,850-acre forest, or 100,000 mature trees.

SOURCE: EPA GREENHOUSE GAS EQUIVALENCIES

*CALCULATIONS BASED ON (5) ACTIVE COOLERS GENERATING 65 KW NET AND OFFSETTING 10 KW EACH.

INTERFACE AND PARAMETERS

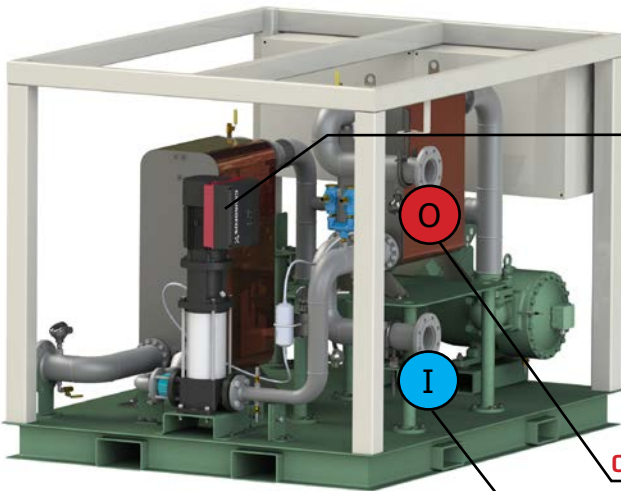


HEAT EXCHANGERS

Energy efficient heat exchangers provide optimal heat transfer efficiency and pressure resistance. Advanced design technologies and extensive verification guarantees the highest performance and longest possible service life. Asymmetric channels provide optimal efficiency in the most compact design.

COOLANT OUTLET TO SOURCE

COOLANT INLET FROM SOURCE



WORKING FLUID PUMP

An efficient and durable multistage centrifugal pump is ideal for varying flows and pressures, adapting to any situation to optimize energy output. The integrated drive reduces system wears and requires minimal maintenance.

COOLANT OUTLET TO RADIATOR

COOLANT INLET FROM RADIATOR

For a more detailed system interface and parameters, please reach out to us and we will be happy to assist you with all the materials you need to make an informed decision.

SPECIFICATIONS

Thermal Input (Heat Rejected)*	> 380 kWth
Hot Water Inlet (Temperature)**	70-150°C
Hot Water Inlet (Flow Rate)	3-15 l/s
Power Output (Gross / Net)	Up to 75 kW / Up to 65 kW
Weight (skid option)	4,800 kg
Dimensions (skid option)	2.4m * 9.5m * 1.75m (W*L*H)

*Loads larger than 800 kWth may require a custom design or secondary unit.

**Higher temperature heat sources require an additional heat exchanger.

HIGHLIGHTS

- Provides up to 100% full-load cooling abilities while generating clean power.
- Offsets parasitic cooling load while generating up to 75 kWe.
- Reduce or eliminate engine derate due to insufficient cooling.
- Closed-loop system with simple water and grid connections.
- Heat is our fuel - zero emissions or fossil fuel requirements.
- Reduced capital cost and provides additional revenue for years to come.
- Provides a baseload power supply in remote areas.

PILOT INSTALLATION #2 - GAS COMPRESSION



At a natural gas compression site in Oklahoma an Active Cooler is humming away providing net-zero cooling while generating clean electricity - serving as a radiator alternative with a payback. For remote projects like this the Active Cooler is capable of serving as a micro-grid, allowing operators to generate and store power for a variety of uses. In many remote applications the value of having access to power is just as - if not more - beneficial than the fiscal value associated with the electricity. You have to cool the engine anyways, the Active Cooler allows you to profit from it.

BENEFITS OF THE ACTIVE COOLER

- ✓ Achieve net-zero cooling while generating emission-free power.
- ✓ Eliminate the parasitic cooling load, reducing energy costs and increasing efficiency.
- ✓ The Active Cooler saves you money year after year.

ISSUES WITH RADIATORS

- ✗ Insufficient cooling leads to reduced performance and engine derate.
- ✗ Faulty radiators can lead to costly repairs and downtime.
- ✗ Radiators consume power, costing you money year after year.



Bitzer

GOOD FOR BUSINESS.
GOOD FOR THE PLANET.

WHO WE ARE

ElectraTherm is a global leader in low temperature heat recovery using Organic Rankine Cycle technology. ElectraTherm has shipped over 100 ORC units to over 14 countries, achieving over 2,000,000 hours of operation. Being supported by BITZER, the world's largest independent manufacturer of compressors comprised of over 3,500 employees, allows the ElectraTherm team to continue developing waste heat recovery technology that is good for business and the planet.

ElectraTherm By BITZER Group

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