

Da Vinci Co., Ltd.

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<http://www.davinci-mode.co.jp/>

Only-One

**Spec/performance
Number-One**

Large market share

Low temperature wasted heat makes it possible to generate electricity
~Breakthrough of once-difficult technology~

Low Temperature Wasted Heat Recovery System

Outline of technology

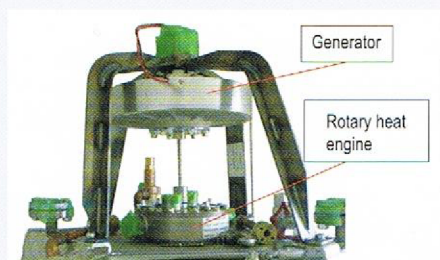
This rotary heat engine is driven by efficiently evaporating and condensing a working fluid designed for wasted heat temperatures of 80 ~ 200°C. Electricity is generated by the combination of the engine and a generator. This system is the result of our extensive know-how in thermal structural design.

Rotary heat engine capable of recovering low temperature wasted heat

Our rotary heat engine is an external combustion engine (see below) with Rankine Cycle (basic cycle of dynamic power generation with steam) that runs on the principle of evaporating and condensing liquids. This engine is composed of a rotor, generator, evaporator, condenser and working fluid. Using wasted heat from the outside, the working fluid in the evaporator is evaporated into gas, which is then fed to the rotor. The incoming gas turns the rotor. Once losing its energy, the gas is converted back into liquid by the condenser and fed to the evaporator again. As the rotor is connected to a generator, its rotation is converted into electric energy. If large quantities of high pressure steam are available as with a boiler, the steam outlet can be coupled directly to the rotary heat engine to directly turn the rotor. This rotary heat engine applies proprietary technology for recovering low temperature wasted heat of 80 ~ 200°C.

Efficient energy conversion by selectively using working fluids

By selectively using water, ethanol, ammonia and other working fluids according to the wasted heat temperature, sufficient temperature difference can be ensured near to the boiling point of the working fluid. This margin enables low temperature wasted heat to be efficiently recuperated as an energy source for electrical or mechanical power. Power can potentially be utilized for the wasted heat of factories or the differential pressure of cogeneration systems and boilers.



Rotary heat engine

Seebeck elements allowing the use of wasted heat without power supplies

In relation to wasted heat recovery heat engines, Da Vinci can supply integrated low-temperature wasted heat recovery systems (built with magnetic heat pump technology that uses a magnetic fluid and its magnetism to transfer heat highly efficiently), as well as on our own technologies, including thermal energy conversion power generation technology with Seebeck effect, and thermal design (thermal structure design) technology. One of the promising applications of our low temperature wasted heat recovery technology is a Seebeck element-based thermal energy conversion power generation system capable of meeting startup power requirements (for the control systems) of rotary heat engines, which in turn allow for the use of wasted heat from incinerators without power supplies.

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●Background

All around the world, laws, regulations and funding schemes are advancing with regard to the reuse of wasted heat. Moreover, hopes are growing in non-combustive energy generation systems as alternatives to petroleum. And, unlike solar heat, wind power and other natural energies, wasted heat can be supplied at a stable constant rate. Given the circumstances, the reuse of wasted heat is an indispensable technology for fighting climate change.

●Novelty, originality

The rotary heat engine was developed to convert wasted heat of 150°C or less, which has been long considered difficult to use, into electrical and mechanical energy, after it was discovered that the Ammonia Rankine Cycle was more efficient near the boiling point under pressure than the Carnot Cycle for gaseous media. Moreover, the Rankine Cycle allows equipment to be smaller and less expensive. These two points make the rotary heat engine unique.

●Comparison with competitors

Wasted heat recovery is also used with steam turbines and Stirling engines. While these technologies are applicable to recovering high temperature wasted heat, they are unsuited for recovering wasted heat of low temperature. Ours is the only technology that can recover wasted heat in the 80-200°C temperature range. Moreover, our technology uses heat-receiving materials (liquid and gas) that have heat transfer rates different from those of materials used in the Stirling engine. As a result, we can produce a smaller rotary heat engine.

■ Outline and basic information about company

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Number of employees: 19
Capital: 60.15 million yen
Founded: April 1989
Representative: Kenji Higashi, President

■ Outline of business

Da Vinci Co., Ltd. is an environmental equipment manufacturer that specializes in the heat business and especially thermoelectric conversion and thermal structural design for heat radiation, accumulation and transfer.