

We realized energy saving of 15 ~ 30%, by retrofitting the spiral coil unit (trade name: “Miracle coil”) to the front stage of the expansion valve of the existing freezing, refrigerating and air conditioning machines. We sold about 800 units in a short period of time.

This time, we have succeeded in developing a next generation air conditioning system that realizes substantial energy saving by incorporating new spiral coil units into the air conditioner for both cooling and heating.

We are ready to sell this technology (technology licensing for specific models and parts supply).

1. Features of this system

- 1) No conventional expansion valve
- 2) Two stage coil with small diameter and medium diameter for heating works as an expansion valve and an evaporator (vaporizer)
- 3) Two stage coil of medium and small diameter for cooling works as a condenser and an expansion valve

2. Application

- 1) air conditioner for EV
- 2) air conditioner for home-use
- 3) business-use freezer, refrigerator, air conditioner

3. Sales conditions

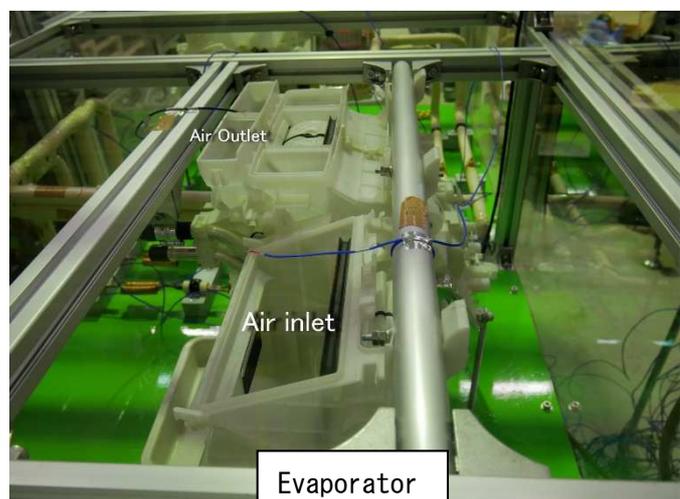
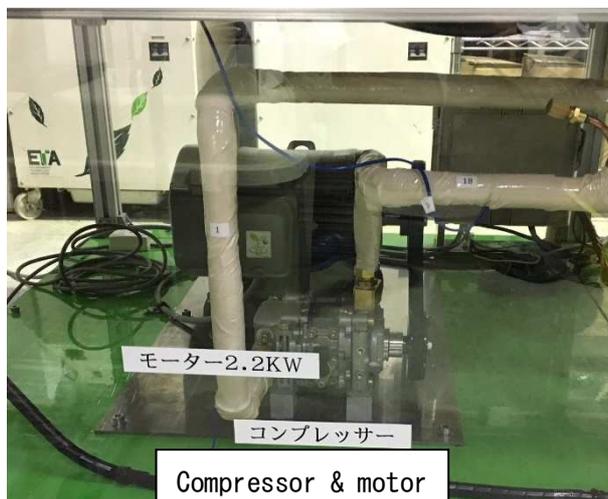
ETE Ltd. will develop the system for specific models according to customers' application, and supply parts.

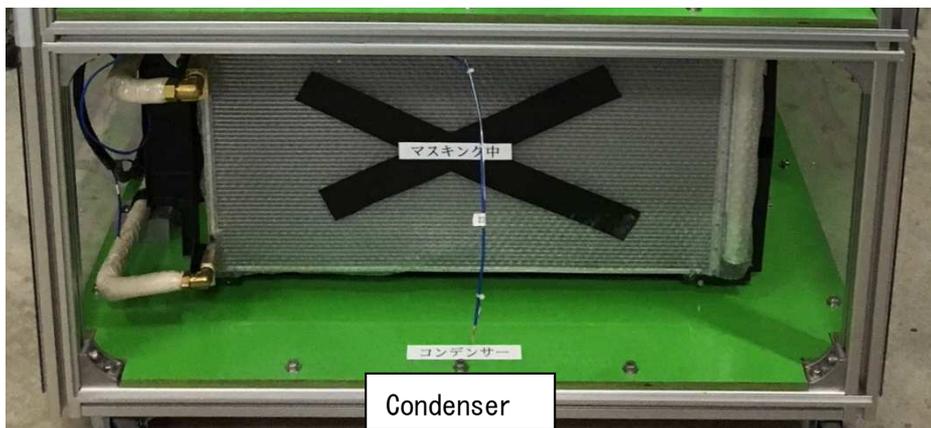
ETE Ltd. and the customer negotiate and determine the target performance, based on the energy saving target and the performance of conventional products.

4. Example of equipment specifications

- 1) Power (2.2kW motor)
- 2) Compressor (scroll type)
- 3) Refrigerant (R134a)
- 4) The evaporator *of Toyota - Aqua and the condenser **of Toyota - Vitz

Note1) *& These function names are for cooling. In the case of heating, the roles are reversed.**





Note2) In order to suppress the function of heat exchange, the surface of the condenser is masked.

5. Data during heating

Compressor inlet		Compressor outlet		Airflow of evaporator		Compressor		Ambient
Pressure	Temp.	Pressure	Temp.	Inlet.	Outlet	Rotation	Power	Temp.
0.22MPa	12.5°C	1.0MPa	101.8°C	27.4°C	42.0°C	950rpm	1.45kW	10.6°C

Note3) Pressure unit is gage pressure.

At the compressor outlet pressure 1.0 MPa, the refrigerant gas temperature reached 101.8 °C. As a result, the blowout air temperature was 42.0°C and the achieved temperature difference from the air suction port was 14.6°C. Motor power was 1.45kW (Power factor 0.738) .

【Power reduction rate obtained from theoretical calculations】

In order to bring the compressed R134a gas temperature to 101.8 °C with an adiabatic efficiency of 0.7 from the point of 0.32 MPa abs 12.5°C, it is necessary to compress to 2.37 MPa abs.

The test result was 1.1 MPa abs that is lower about 1.3 MPa than the calculated value.

The ratio of the pressure difference is $(1.1 - 0.32) / (2.37 - 0.32) = 0.38$.

This indicates that the power of the compressor will be reduced to less than half of the normal heat pump.



(@ ETE Ltd. Fukaya Labo Feb. 9 2018)

■Please contact us for any questions.

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