
**Contact: Sadayoshi Yokoyama,
Goro Kanemasu**
DENSO CORPORATION
Phone: 81-566-25-5594
Fax: 81-566-25-4509
sadayoshi_yokoyama@denso.co.jp
goro_kanemasu@denso.co.jp

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Passenger Vehicle Air Conditioning System Using an Ejector

— Contributes to significant reduction of compressor's power consumption —

DENSO Corporation has developed the world's first vehicle air conditioning system that uses ejector technology. The ejector, which is a small refrigerant injector, helps reduce the compressor's power consumption by up to about 25 percent, compared to conventional vehicle air conditioning systems, and thus contributes to fuel savings.

Much of the energy consumed by a vehicle's air conditioning system is used by the compressor to compress the refrigerant. In conventional air conditioning systems, an expansion valve is used to reduce the pressure of the refrigerant before passing it through the evaporator to cool the air.

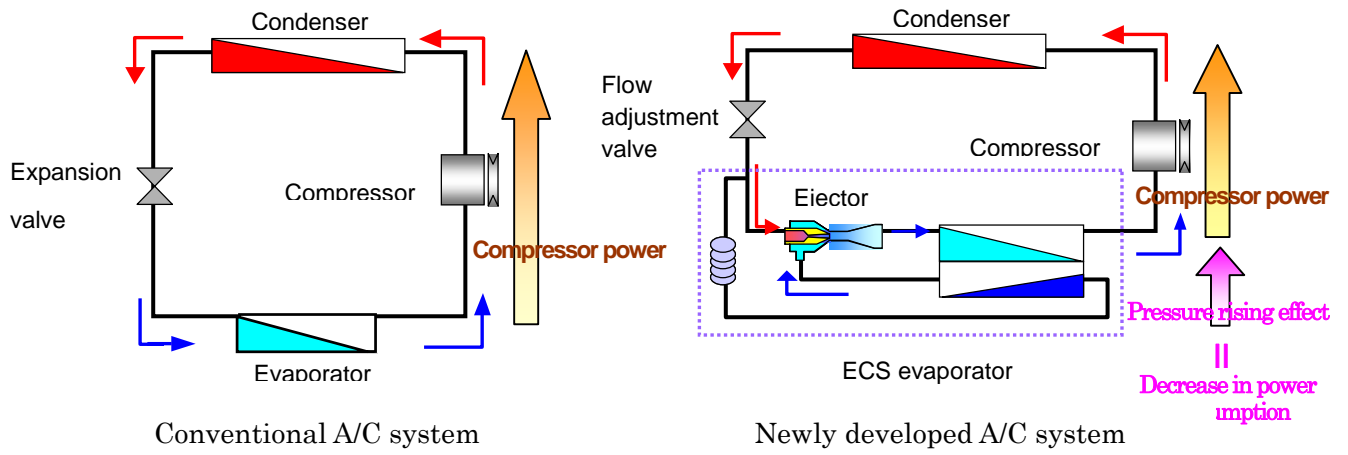
This system uses an ejector instead of an expansion valve. The ejector recovers expansion energy, which was previously lost in the expansion valve, and converts it into pressure energy. This, reduces the compressor's workload and helps reduce the air conditioner's overall power consumption.

DENSO previously applied ejector technology to truck refrigeration units and household CO₂ heat-pump water heaters. The conventional ejector was not small enough to be installed in vehicle air conditioning systems. DENSO overcame this challenge with its new air conditioning system by integrating the ejector into the evaporator tank, where refrigerant flows. This design eliminates the need for the ejector to have a thicker structure to withstand external pressure and also eliminates pipe connection parts needed to connect the ejector with the evaporator, which helps reduce the size of the ejector. The ejector cycle system evaporator (ECS evaporator), which is equivalent to the size of a conventional evaporator, can also be applied to conventional air conditioning systems.

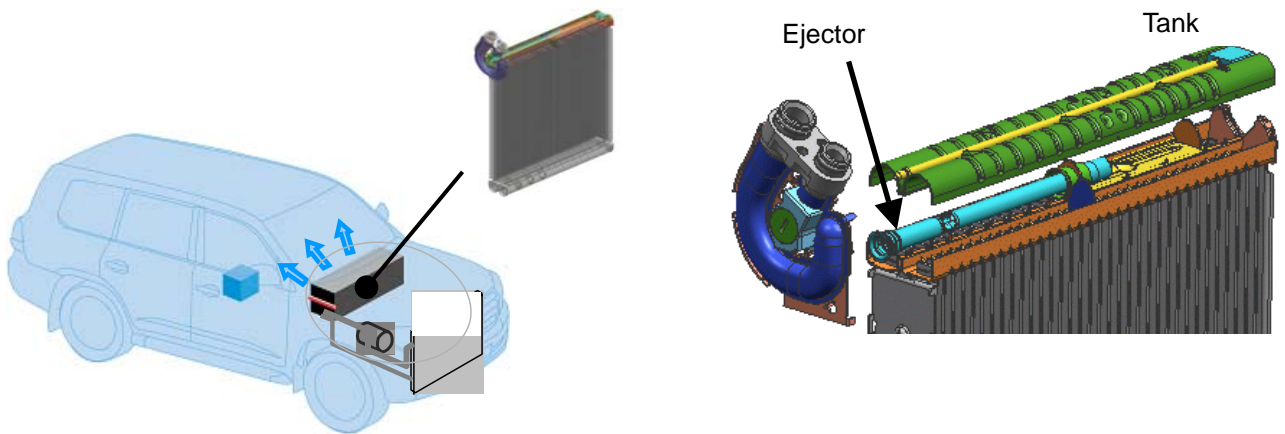
The system is installed on the Prius, introduced by Toyota in May 2009.

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Comparison of refrigeration cycle



Installation image of ECS evaporator



Reduction effect in power consumption of compressor

