DENSO

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Passenger Vehicle Air Conditioning System Using an Ejector

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

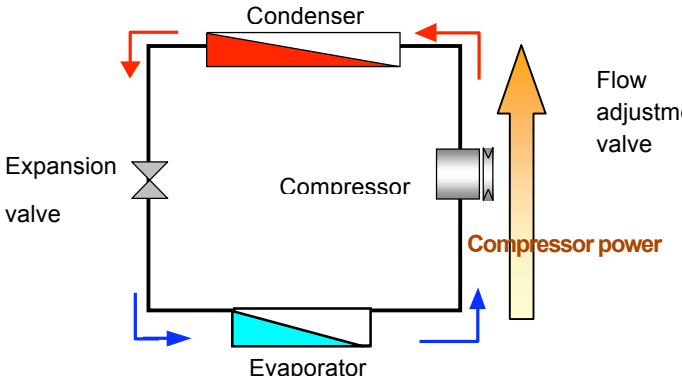
Everyone knows driving with the air conditioning on can impact fuel economy – which is why improving fuel economy goes beyond focusing on engine efficiency. DENSO has developed the world's first vehicle air conditioning system that uses ejector technology. The ejector, which is a small refrigerant injector, helps reduce the compressor's power consumption by up to about 25 percent, compared to conventional vehicle air conditioning (A/C) systems, which helps improve fuel economy while running the A/C.

Here's how it works – the compressor uses much of the energy consumed by a vehicle's A/C system to compress refrigerant. In conventional A/C systems, an expansion valve is used to reduce the pressure of the refrigerant before passing it through the evaporator to cool the air. Instead of an expansion valve, DENSO uses an ejector. 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 A/C's overall power consumption, which translates into fuel savings.

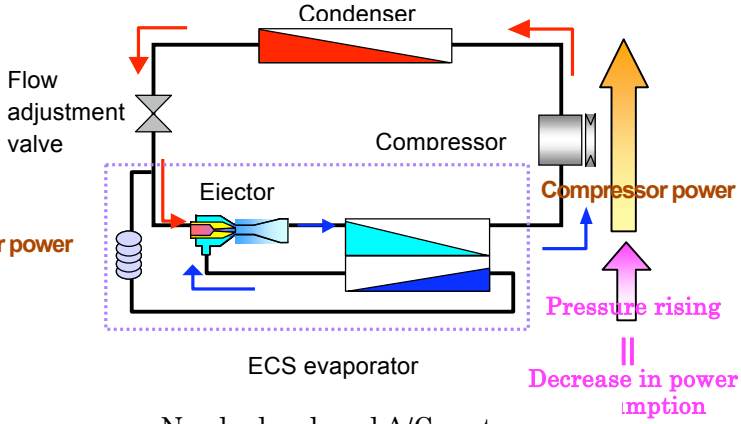
DENSO previously applied ejector technology to truck refrigeration units and household CO_2 heat-pump water heaters. The conventional ejector was not small enough to be installed in vehicle A/C systems. DENSO overcame this challenge with its new system by integrating the ejector into the evaporator tank, where refrigerant flows. This design eliminated the need for the ejector to have a thicker structure to withstand external pressure and it also eliminated the pipe connection parts needed to connect the ejector with the evaporator, which helped 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.

Comparison of refrigeration cycle

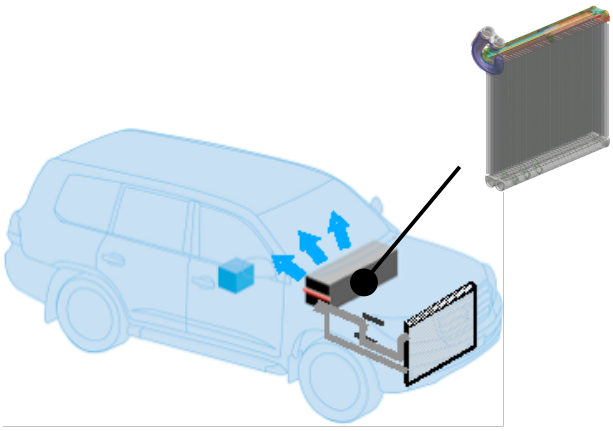


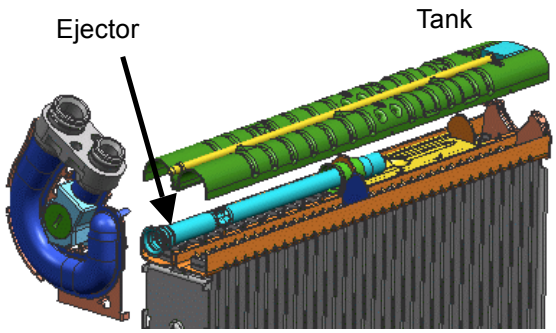
Conventional A/C system



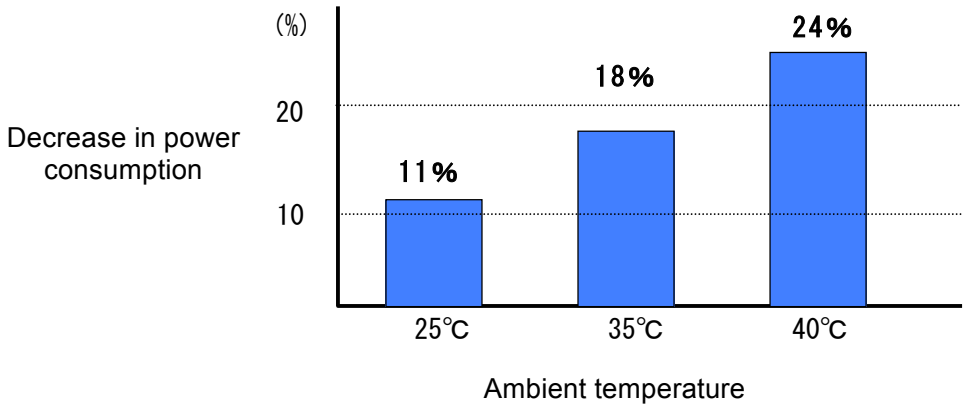
Newly developed A/C system

Installation image of ECS evaporator





Reduction effect in power consumption of compressor



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