

RENESIS hydrogen rotary engine

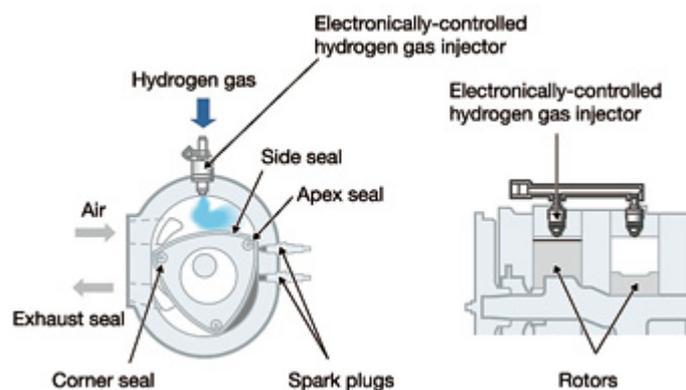
A cleaner kind of Zoom-Zoom performance realized by exclusive Mazda technologies

Mazda is pursuing development of the RENESIS hydrogen rotary engine with a view to realizing cars in which the Mazda Zoom-Zoom spirit can be enjoyed in a way that is gentler on the earth. With this engine, Mazda has applied the benefits of its unique rotary-engine expertise to realize clean operation together with the pleasurable performance that motorists expect of Mazda cars. A dual-fuel system enables the RENESIS hydrogen rotary engine to run on gasoline when necessary (a convenient capability for long journeys and for journeys in areas that lack hydrogen supply facilities). The engine is as drivable and reliable when running on hydrogen as it is when running on gasoline. And since hydrogen capability necessitates only minor engine and body differences relative to a car with a gasoline-only rotary engine, it can be adopted without significant additional cost.



Technologies used in the RENESIS hydrogen rotary engine

The RENESIS hydrogen rotary engine is supplied with hydrogen gas by an electronically controlled direct-injection system. With each of the engine's two rotor housings, air is drawn through a side port and hydrogen is injected directly into the induction chamber by electronically controlled gas injectors on the top of the rotor housing. The benefits of the rotary engine in hydrogen-combustion mode are maximized by the following technologies:



- Backfire suppression

Unlike a reciprocating engine, a rotary engine has separate low-temperature induction chambers and high-temperature combustion chambers. With the RENESIS hydrogen rotary engine, therefore, there is no risk of ignition in the part of operating cycle in which hydrogen is injected. In other words, the RENESIS hydrogen rotary engine realizes superior combustion without ever backfiring.

- Direct injection + exhaust-gas recirculation (EGR)

Since the RENESIS hydrogen rotary engine has separate induction and combustion chambers, this ensures a safe temperature for provision of the gas injectors with rubber seals (the rubber

seals are susceptible to the higher temperatures encountered in a conventional reciprocating engine) and thus permits the gas injectors to be mounted on the rotor housings beside the induction chambers for direct-injection. In accordance with driving conditions, the direct-injection arrangement is optimally combined with a system that injects fuel into the intake manifold. An EGR system complements the fuel-supply arrangement to further enhance the engine's combination of high power and low exhaust emissions.

- Excellent mixing of hydrogen and air

A rotary engine has stronger flows of air-fuel mixture and a longer operating cycle than a reciprocating engine, so it realizes concomitantly thorough mixing of hydrogen and air. The result is a homogeneous mixture, which is crucial for hydrogen combustion.

RX-8 Hydrogen RE

The world's first hydrogen-fueled rotary engine vehicle

Mazda developed the world's first hydrogen-fueled rotary engine vehicle, the RX-8 Hydrogen RE, and began commercial leasing in February 2006. While fuel cells generate electricity to power the motor which drives the vehicle, the rotary engine mounted in the RX-8 Hydrogen RE uses hydrogen as a fuel for combustion. This is the company's "Ultimate Eco-Car", developed faithfully in accordance with Mazda's mission to build Zoom-Zoom fun-to-drive cars. It delivers all the torque, acceleration and exhaust tail note of a regular internal combustion engine yet with reduced oil consumption, zero CO₂ emissions and virtually no NOx generation, it is truly an environmentally friendly car.



The RX-8 Hydrogen RE's latest technological advances

- Automatic transmission and increased driving range

In readiness for a market launch, Mazda recently provided the RX-8 Hydrogen RE with an automatic transmission that permits easy driving. We also enlarged the fuel tanks and adopted fuel-economy-enhancing technologies that, notwithstanding the automatic transmission, realize a hydrogen-mode driving range of 100km (as measured on Japan's 10-15-mode cycle).

- On-the-fly fuel selection

A switch in the cabin allows the driver to switch between gasoline mode and hydrogen mode without stopping the car (a useful capability for long journeys and for journeys in areas where there is no hydrogen-supply infrastructure). The selection switch is located at the bottom-right of the instrument panel (in front of the driver). During operation in hydrogen mode, the switch, which is blue and rotor-shaped, is illuminated. If the car runs out of hydrogen during hydrogen-mode operation, it automatically switches to gasoline mode.

- Hydrogen indicator in three-dial meter cluster

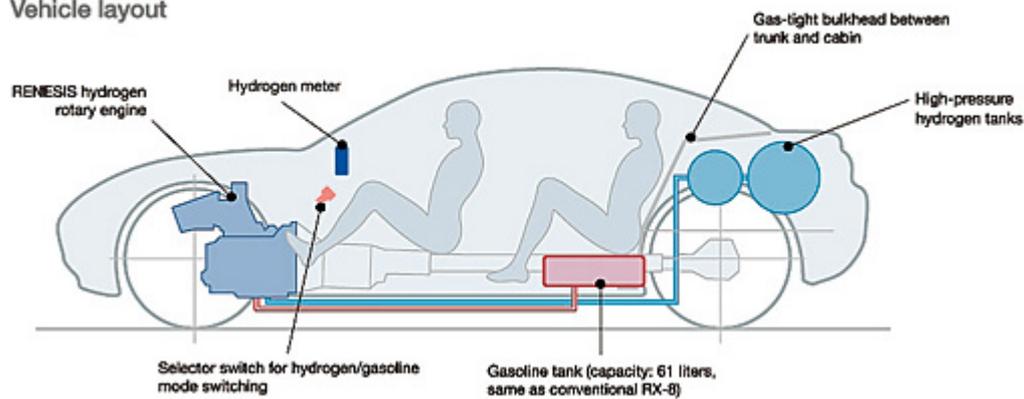
In the previous version of the RX-8 Hydrogen RE, a remaining-hydrogen meter, a fuel-mode indicator and warning lights were located in the center of the instrument panel. In the current version, these items are incorporated into the meter cluster in front of the driver for better visibility. The meters are bathed in blue light during hydrogen-mode operation.



Safety

The RX-8 Hydrogen RE is equipped with sensors located in each part of vehicle to detect leakage of hydrogen gas and prevent accidents. In case of gas leakage, warning light lights up by these sensors and they close the safety valve installed in the hydrogen tank. As well, the mode is immediately changed to the gasoline mode.

Vehicle layout



RX-8 Hydrogen RE major specifications

Model	Mazda RX-8 Hydrogen RE	
Body and chassis	Overall length	4,435mm
	Overall width	1,770mm
	Overall height	1,340mm
	Wheelbase	2,700mm
	Seating capacity	4 persons
	Tires (front and rear)	225/55R16
Engine	Type	RENESIS hydrogen rotary engine with dual-fuel system
	Fuels	Hydrogen and gasoline
	Maximum output	Hydrogen mode: 80kW (109PS) Gasoline mode: 154kW (210PS)
	Maximum torque	Hydrogen mode: 140Nm (14.3kgm) Gasoline mode: 222Nm (22.6kgm)
Transmission	4AT	
Driving range (10-15 mode)	Hydrogen mode: 100km Gasoline mode: 549km	