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Mazda Global Tech Forum 2017

Outline of Tech Information

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Note

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Introduction

In August 2017, Mazda Motor Corporation announced “Sustainable Zoom-Zoom 2030,” a new long-term vision for technology development that looks ahead to the year 2030. In light of the rapid changes taking place in the automotive industry, the new vision takes a longer-term perspective and sets out how Mazda will use driving pleasure, the fundamental appeal of the automobile, to help solve issues facing people, the earth and society.

The following is an overview of "Sustainable Zoom-Zoom 2030" and the next-generation SKYACTIV-X engine and next-generation vehicle platform that together represent the first step toward realization of this vision.

1. Sustainable Zoom-Zoom 2030

Mazda believes its mission is to bring about a beautiful earth and to enrich people’s lives as well as society. The company will continue to seek ways to inspire people through the value found in cars.

Earth

Through conservation initiatives, create a sustainable future in which people and cars coexist with a bountiful, beautiful earth

Mazda’s approach

- Expand measures for carbon dioxide reduction from a “well-to-wheel” perspective, considering emissions over the vehicle’s entire life cycle
- Aim to reduce corporate average “well-to-wheel” carbon dioxide emissions to 50 percent of 2010 levels by 2030, with a view to achieving a 90-percent cut by 2050
- Achieve this with a policy prioritizing efficiency improvements and measures for cleaner emissions that apply in the real world
- In line with this policy, continue efforts to perfect the internal combustion engine, which will help power the majority of cars worldwide for many years to come and can therefore make the greatest contribution to reducing carbon dioxide emissions, and combine the results with effective electrification technologies
- From 2019, start introducing electric vehicles and other electric drive technologies in regions that use a high ratio of clean energy for power generation or restrict certain vehicles to reduce air pollution

Society

Through cars and a society that provide safety and peace of mind, create a system that enriches people’s lives by offering unrestricted mobility to people every where

Mazda’s approach

- Develop more advanced safety technologies under the Mazda Proactive Safety philosophy, working toward the goal of eliminating traffic accidents
- Further enhance safety fundamentals, such as correct driving position, pedal layout and good visibility, and standardize them across all models



- Promote further standardization of i-ACTIVSENSE advanced safety features, which help drivers recognize and assess potential hazards; in addition to Japan, where they are already becoming standard, gradually make these technologies standard in other markets starting in 2018
- Begin testing of autonomous driving technologies currently being developed in line with Mazda's human-centered Mazda Co-Pilot Concept¹ in 2020, aiming to make the system standard on all models by 2025
- Using connectivity technologies, create a new business model that enables car owners to support the needs of people in depopulated areas and those who have difficulty getting around

People

Enhance customers' mental well-being with the satisfaction that comes from protecting the earth and contributing to society with a car that offers true driving pleasure

Mazda's approach

- Pursue an enhanced *Jinba-ittai* driving feel that will unlock people's potential and revitalize them mentally and physically
- Based on the philosophy of "breathing life into the car," further develop KODO design to raise vehicle design to the level of art that enriches the emotional lives of all who see it

2. SKYACTIV-X Next-Generation Engine

SKYACTIV-X is a new proprietary internal combustion engine from Mazda that combines the high-revving character of a gasoline engine with the efficiency, torque and response of a diesel. Offering an uncompromised combination of environmental performance, power and acceleration performance, SKYACTIV-X fully enables the *Jinba-ittai* driving experience Mazda aims to offer customers.

Technological innovations

- SKYACTIV-X is the world's first commercial gasoline engine to use compression ignition,² in which the fuel-air mixture ignites spontaneously when compressed by the piston
- A proprietary combustion method called Spark Controlled Compression Ignition overcomes two issues that had impeded commercialization of compression ignition gasoline engines: maximizing the zone in which compression ignition is possible and achieving a seamless transition between compression ignition and spark ignition.

Features

- This new proprietary combustion engine combines the advantages of gasoline and diesel engines to achieve outstanding environmental performance, power and acceleration performance.
- Compression ignition and a supercharger fitted to improve fuel economy together deliver unprecedented engine response and increase torque 10–30 percent*³ over the current SKYACTIV-G gasoline engine.
- Compression ignition makes possible a super lean burn*⁴ that improves engine efficiency up to 20–30 percent*³ over the current SKYACTIV-G, and from 35–45 percent*³ over Mazda's 2008 gasoline engine of the same displacement. SKYACTIV-X even equals or exceeds the latest SKYACTIV-D diesel engine in fuel efficiency.



- With high efficiency across a wide range of rpms and engine loads, the engine allows much more latitude in the selection of gear ratios, providing both superior fuel economy and driving performance.

Moving forward Mazda hopes to help create a future in which people, the earth and society can coexist with cars, to enrich people's lives through a car ownership experience that celebrates driving, and to become a brand with which customers feel a strong emotional connection.

3. Next-Generation Platform

Mazda's next-generation platform was developed with an enhanced focus on the human-centered concept, and the functioning of the tires, suspension, body and seats was reviewed from the viewpoint of comprehensive vehicle optimization. The new platform offers more comfortable and less tiring driving and enables drivers to respond quickly to environmental changes by optimizing the human body's natural ability to balance itself. With the body easily able to balance itself in response to driving inputs, development efforts focused on achieving perfect response and the ultimate *Jinba-ittai* driving feel.

Features

Seats

- Redesigned seats keep the pelvis upright to maintain the spine's natural S-curve.
- Seat mounts and other parts are more rigid for smooth and quick transmission of inputs from the vehicle body to the driver's pelvis. At the same time, the internal structure of the seat is more rigid for direct transfer of loads from the sprung mass to the human body.

Body

- To transmit inputs without delay, four-wheel diagonal rigidity is enhanced with frames connected not only vertically and laterally but also fore and aft, creating multi-directional ring structures.

Chassis

- Redesigning the functional distribution to suspension, tires, arms and dampers optimized the structure, enabling each part to work interactively along the temporal axis to smoothly control energy transfer to the sprung mass.

NVH

- High-strain energy areas are damped with damping nodes, damping bonds and other efficient damping structures depending on the nature of area.
- Based on how people perceive sound, the "quality of quietness" is improved by controlling not only loudness but how noise changes over time or when coming from different directions.

- 1 Mazda's human-centered self-driving technology development concept. People enjoy driving while being revitalized mentally and physically. Meanwhile the car is driving "virtually" with a firm grasp of the movements of the driver and



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the car. In unexpected situations, such as a sudden loss of consciousness, the car will override the driver, automatically contact emergency services and drive safely to the most appropriate location.

- 2 As of August 2017. According to in-house investigations.
- 3 Engine is still under development and figures are subject to change.
- 4 A condition in which the ratio of gasoline to air is reduced to a level that would not ignite in a spark-ignition engine.