Automobile Technology Presentation

April 16, 2014
Suzuki Motor Corporation

※ Models in this presentation are for the Japanese domestic market, unless otherwise mentioned.
Product Development Policy

- Top-Class Environmental Performance
- Affordable Price
- Car with Pleasure and Reliability
SUZUKI GREEN Technology

- Wagon R
- Spacia
- Alto Eco
- Swift
- Solio
- Hustler

- September 2012
- March 2013
- July
- November
- January 2014
Change in Fuel Consumption

※ Measured in JC08 test cycle (verified by Japan’s Ministry of Land, Infrastructure, Transport and Tourism). The fuel consumption rates are values obtained under a specific testing conditions. The rates vary according to the actual use conditions (weather, traffic, etc.) and driving situations (sudden starting, use of air conditioner, etc.). As of the end of March 2014. Rates before JC08 test cycle was applied are results of in-house calculation.
Equipment Rate (From Jan. to Mar. 2014)

Mini (passenger)

Accumulated Sales of 520,000 Units

As of the end of March 2014. Based on Suzuki research on registered units data of Japan Light Motor Vehicle and Motorcycle Association and Japan Automobile Dealers Association from January to March 2014.
Auto Gear Shift
India

Booking Situation of the Celerio

Booking of the Celerio (MT+AGS)

Approx. 35,000 units (From Feb. 6 to Mar. 31, 2014)

Rate of units equipped with AGS

47%

Auto Gear Shift

As of the end of March 2014. Based on Maruti Suzuki research on accumulated booking units.
Future Efforts on Environmental Technologies

Environmental Technologies

- Improvement of Body
- Increase of Powertrain Efficiency
- Energy Management

- Lightweight Platform
  - Reduction of Running Resistance
  - Reduction of Air Resistance

- High-Efficiency of Engine

- Efforts into Transmission
  - Engine Auto Stop Start System Technology
  - Deceleration Energy Regeneration (ENE-CHARGE)

- Deceleration Energy Regeneration + Its Utilization (Hybrids)
Integration of Platforms

Situation at Maruti Suzuki India

Alto Series
WagonR
Zen Estilo
Swift
Swift Dzire
Ertiga

Mini Passenger Platform

B-Segment Platform

FY 2013 Sales Units

431,000 units
430,000 units

Based on Maruti Suzuki research as of the end of March 2014.
Efforts into Electrification

- Engine Auto Stop Start System
- Energy Regeneration (ENE-CHARGE)
- Mild HEV
- Strong HEV
- PHEV
- FC
- EV

Thorough Increase of Engine Thermal Efficiency, Advancement to Next-Generation

Present
Basic Concept of Platform

1. Integration of Platform
   Integrate into 3 types of Mini, A- and B-segments

2. Modularization
   Modularize functional components, and increase development efficiency

3. Weight Reduction
   Reduce whole vehicle weight by up to 15%
Integrate development of new platforms into three types: Mini (K), A- and B-segments.
2. Modularization

Strategy for modularization of functional components

Suspension: 4 Types
Air-Conditioning System: 2 Types
Front Seat Frame: 3 Types

Commoditize beyond segments
3. Weight Reduction

- Renovate the main structure and component layout
- Improve required performance (crash performance, rigidity and NVH)
- Reduce whole vehicle weight by up to 15%
3. Weight Reduction

Concrete method for weight reduction (1)
Disperse force with smooth shape

1. Abolition of reinforcement by the smooth shape
2. Reduction of sheet thickness by the smooth shape
3. Weight Reduction

Concrete method for weight reduction (2)
Serial cross-section

Ensure body rigidity using less members by joining basic cross-section
Next-Generation Lightweight Platform

3. Weight Reduction

Body rigidity

Current Platform

Next-Gen. Lightweight Platform

Bending Rigidity
Improved by 30%

Torsional Rigidity
Improved by 30%
Development of Powertrain

Basic Concept of Engine

1. Gasoline Engine
   - Challenge to 40% thermal efficiency
   - Concentrate and consolidate engine development to Mini and under 1400cc engines

2. Diesel Engine
   Development of in-house engines mainly for the Indian market
1. Gasoline Engine
Achieve 40% average thermal efficiency by early 2020

- For Mini (660cc), continue improvements of Alto’s 35km/L fuel efficiency technology
- For compact car, further brush up fuel efficiency technology of the DUALJET engine

- Increase of thermal efficiency by increasing compression ratio
  Fuel atomization technology - atomized spray, increase of direct atomization rate, DUAJET atomization
  In-cylinder flow technology – increase of tumble, control of disarray
  Ignition technology – strengthening of ignition energy

- Reduction of loss - Cooled EGR, Low-friction
Development of Powertrain

1. Gasoline Engine
Concentrate and consolidate engine development to Mini and under 1400cc engines

- For Mini engines, integrate into R06A and continue its improvements

- For compact car engines, lineup naturally-aspirated, and direct-injection turbocharged engines by commoditizing the base engine
2. Diesel Engine

Development of in-house engines mainly for the Indian market

- Development of in-house two-cylinder engine
  Scheduled to be equipped on small cars for emerging market
2. Diesel Engine

**Engine Specification**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Arrangement and number of cylinders</td>
<td>In-line two-cylinder</td>
</tr>
<tr>
<td>Type of valve operation</td>
<td>DOHC</td>
</tr>
<tr>
<td>Number of valves</td>
<td>8</td>
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<tr>
<td>Displacement</td>
<td>793 cc</td>
</tr>
<tr>
<td>Bore x Stroke</td>
<td>77 x 85mm</td>
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</tbody>
</table>
Newly-developed Automated Manual Transmission (AMT) which equips an electro-hydraulic actuator that automatically operates clutch and gearshift, on the new five-speed manual transmission.
Development of Powertrain

Structure of Auto Gear Shift

Integrates the controller with the electro-hydraulic actuator unit.
Realizes reduction of wire harness and weight.

Controller

Electro-hydraulic actuator unit

New five-speed manual transmission
Development of Powertrain

Features of Auto Gear Shift

① Enables easy driving without clutch pedal and gearshift operation
  Automatically operates clutch and gearshift with the electro-hydraulic actuator

② Contributes to low fuel consumption with high transmission efficiency
  Because basic structure of AGS is manual transmission, thanks to its high transmission efficiency of gears, it achieves fuel efficiency equivalent to that of manual transmission
Features of Auto Gear Shift

③ Realizes smoothness like never before in the conventional AMT by contriving the controls
   By optimally controlling the speed and timing of clutch, gearshift, and accelerator operation, it realizes smooth shifting of gears

④ Easy driving thanks to creep function
   Enables easy driving for parking and during traffic congestion by setting creep function
Hybrid System

New system being developed by Suzuki

【Idea】

ISG Technology

ene-CHARGE

Deceleration energy regeneration technology adopting lithium-ion battery

- High-efficiency, high-output regeneration
- Silent restart of engine thanks to belt drive
- Motor assist function

New system developed from ENE-CHARGE (lead-acid + LiB + ISG)
New system being developed by Suzuki

【Composition】

Motor Assist

ISG
Integrated Starter Generator

Electric components
(meter, audio, etc.)

Lithium-ion battery pack
- Battery cell
- System controller
- Power changeover switch

Electric components
(lights, etc.)

Lead-acid battery
By increasing the amount of regeneration during deceleration, it has increased its usable electricity. By doing so, it has realized motor assist during acceleration.
Utilize increased regeneration energy for motor assist

Hybrid System

【Effect: Comparison of regeneration capacity】

Increase regeneration energy during deceleration with the higher output and efficiency of alternator (=ISG)

New System (ene-CHARGE +ISG)

+ 30%