



Suzuki Motor Corporation Technology Strategy Briefing

July 17, 2024

Representative Director
and President,
Suzuki Motor Corporation

Toshihiro Suzuki

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NHK “Night of the Makaizo Society”

Participated as Team "S-zuki"

“S-zuki’s” machine was
“Sho-Sho-Kei-Tan-Bi (Smaller,
Fewer, Lighter, Shorter, Beauty)”



Suzuki’s philosophy of conduct



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The other day, we appeared on NHK’s program “Night of the Makaizo Society” and competed in an electric massager 25m drag race and a birthday candle-blowing with alligator water-guns.

“Night of the Makaizo Society” is a technology development/entertainment program in which children’s toys and household appliances are transformed into vicious monsters for competitions within one and a half month.

Suzuki's machine, developed through heated discussions by members who volunteered regardless of department or age, was a beautiful machine that embodied Suzuki’s philosophy of conduct of "Sho-Sho-Kei-Tan-Bi (Smaller, Fewer, Lighter, Shorter, Beauty)." While other teams used two or six massage devices, Suzuki's machine was simple, using just one massage device, making it smaller, with fewer parts, lighter, shorter, and infused with technology where performance and durability were required. Although the machine did not finish the second run, it rushed to its teammates to share the victory with Team Suzuki.

In the candle-blowing challenge, we re-recognized the importance of principles and the difficulty of responding to disturbances. It was an inspiring challenge where participating teams united beyond company boundaries.

Suzuki's Philosophy of Conduct



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This demonstrates Suzuki's philosophy of conduct.

The philosophy of conduct toward realizing the mission statement are:
Genba, Genbutsu, Genjitsu (Actual Place, Actual Thing, Actual Situation)
Sho-Sho-Kei-Tan-Bi (Smaller, Fewer, Lighter, Shorter, Beauty)
YARAMAIKA (Entrepreneurial Spirit)

It also plays an important role in achieving the technology strategy.

Minimization of Energy by Sho-Sho-Kei-Tan-Bi

Minimization of Energy

by “Sho-Sho-Kei-Tan-Bi (Smaller, Fewer, Lighter, Shorter, Beauty)”



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Various industries are advancing technological development and discussions towards achieving carbon neutrality by 2050.

Carbon neutrality means balancing the total amount of greenhouse gas emissions to net zero.

In other words, it can be achieved by absorbing or removing the same amount of CO₂ that is emitted.

The less CO₂ emitted, the less needs to be offset.

Based on the philosophy Sho-Sho-Kei-Tan-Bi, Suzuki will minimize the energy used and reduce CO₂ emissions to the utmost limit.

This is our technological philosophy.

From manufacturing to recycling, we aim for "technology that minimizes resource and environmental risks," providing the joy of mobility to people around the world while striving to achieve a carbon-neutral world.

Suzuki's Philosophy of Conduct

輕 (輕)

Etymology

If you decompose the kanji character for "light (輕)" it becomes "車" and "𨔵". "車" is a kanji that expresses a carriage drawn by a horse. Now, this letter means a car, but in the past it meant a car pulled by a horse. On the other hand, "𨔵" expresses "straight" as the warp thread is stretched on the craft table. From these backgrounds, it became to have a meaning of "a vehicle that can run straight and smooth", and this is said to have come to mean "light-weight".

(Reference)

<https://www.sankei-shokai.jp/kanji-to-nakayoku/20220327060000.html>



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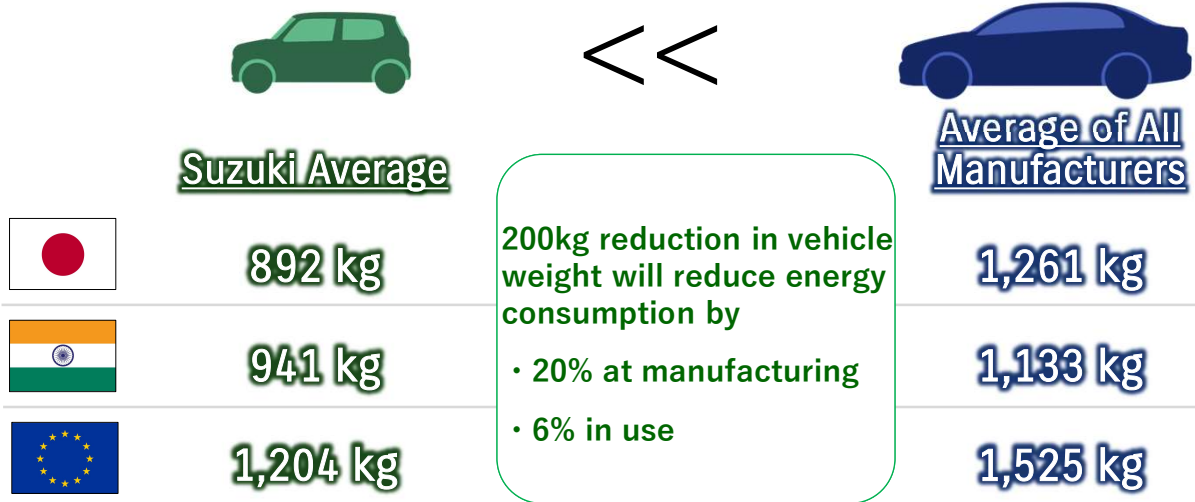
One aspect of "Sho-Sho-Kei-Tan-Bi", "lightness", has a profound meaning.

The kanji "輕" (light) originated from the combination of the pictogram for "car" and the pictogram for "a straight, strong vertical thread" (meaning "straight and strong"), symbolizing a "car charging straight into the enemy lines," which later came to mean "light."

In the first place, the kanji character for "light" is said to have come from the kanji for "a vehicle that can run straight and smooth" that is able to turn and move quickly, and this is said to have come to mean light-weight.

The term "light" refers not only to weight but also to being nimble and agile, allowing both the mind and actions to be light and effortless.

Minimization of Energy by Sho-Sho-Kei-Tan-Bi



Comparison of passenger vehicle weight average for all manufacturers and Suzuki (weighted average by sales)



Japan : Average of the median vehicle weight of all gasoline passenger vehicles (standard, small, and minivEHICLE) listed in the Ministry of Land, Infrastructure, Transport and Tourism's "Fuel Efficiency List, March 2024"
 Europe : Calculated based on the approved value of CO₂ regulations in 2022
 India : Calculated based on the FY2021 figures announced by the Government of India in 2023

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We at Suzuki have been creating vehicles that are just the right size for transportation, that are light-weight and fuel efficient, and that are safe, and with sufficient equipment.

In other words, we have been creating safe and small vehicles that require minimal energy.

We compared the average vehicle weight of all manufacturers in Japan, India and Europe, with the average vehicle weight of Suzuki vehicles.

Looking at these 3 regions, Suzuki makes 200 to 300 kilograms lighter vehicles than the average weight of all manufacturers in each region.

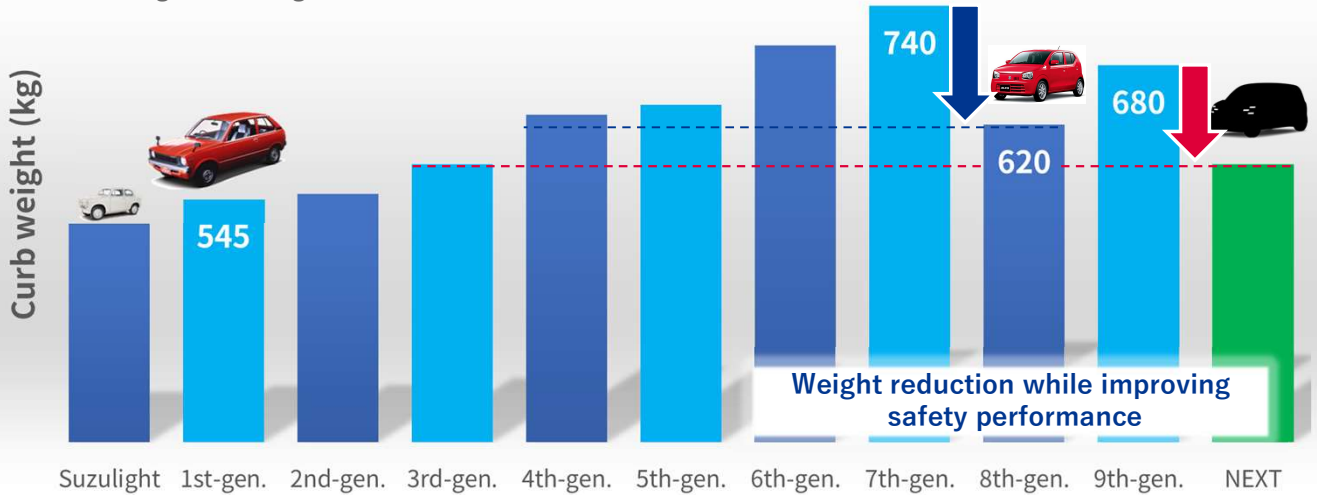
If the vehicle weighs 200 kilograms less, it requires fewer materials, about 20% less energy for production, and 6% less energy for driving.

Compact and light-weight cars greatly contribute to the minimization of energy consumption.

Minimization of Energy by Sho-Sho-Kei-Tan-Bi

*The curb weight is the representative of grade of each model.

Curb weight of Suzulight and Alto



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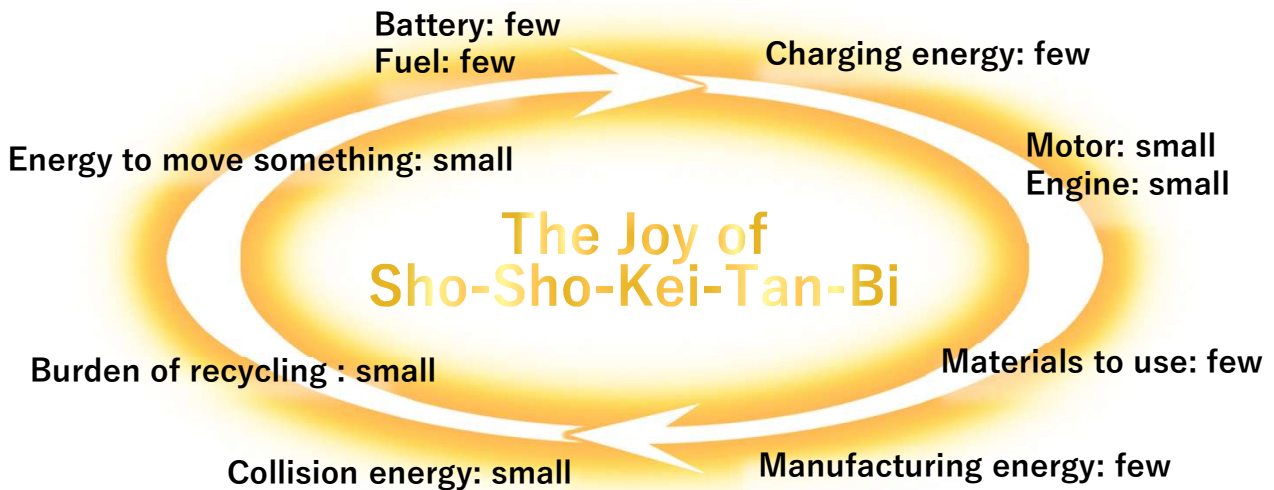
Suzuki has a long history of making cars that are friendly to customers and the environment, and our mission is weight reduction and this challenge has been taken over.

Since the Suzulight and the first-generation Alto were launched, the curb weight has increased to meet the needs of the times.

When we developed the eighth-generation Alto, we worked on a company-wide project for weight reduction, and we achieved to make it lighter than the fourth-generation Alto while improving safety performance.

At this technology strategy, we will re-accelerate our weight reduction initiatives, and aim for a significant weight reduction similar to that of third-generation.

Minimization of Energy by Sho-Sho-Kei-Tan-Bi



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In summary, philosophy of “Sho-Sho-Kei-Tan-Bi” requires less energy to move something.

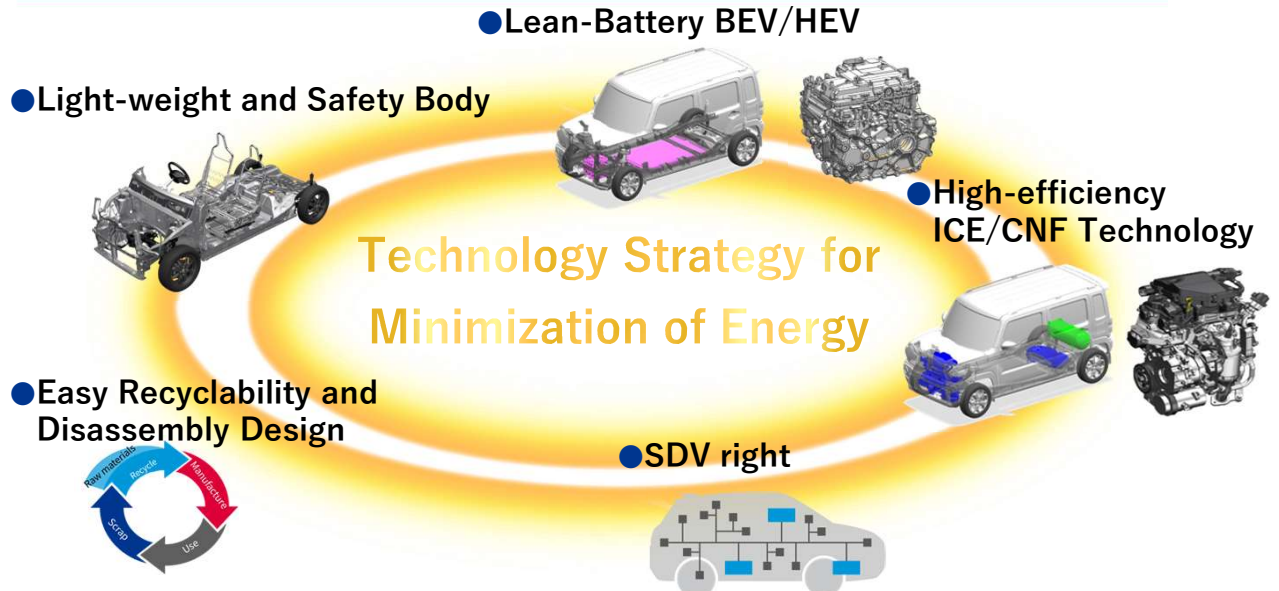
That means “Sho-Sho-Kei-Tan-Bi” minimizes battery and fuel.

Small battery requires fewer energy to charge.

Furthermore, it minimizes motor and engine displacement, and the materials to use. Small products require less manufacturing energy, and light products have less collision energy, small burden for recycling, fewer costs and risk for raw materials. Plus, light cars have small damage for the roads as well as buried water and gas pipes, which require less energy for infrastructure construction.

Light-weight creates an angelic cycle that leads to various good things.

Technology Strategy 2024 for Minimization of Energy



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We will work to achieve minimal energy with Sho-Sho-Kei-Tan-Bi.

The technical strategies to achieve this goal are as follows:

- “Light-weight and safety body” that supports the whole as the basis of everything,
- “Lean-Battery EV and HEV” with optimal materials in optimal place for the customer’s demand,
- “Combination of high-efficiency ICE with CNF”,
- “SDV right” that creates value with affordable system,
- “Easy recyclability and disassembly design” for the circular economy.

These are the five strategies of our technological development.

Motorcycle and Marine

Team
SUZUKI
— CN CHALLENGE —



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Although we focus on automobile technology today, the strategies are common to all of Suzuki's products.

Regarding motorcycles, we are working on the CN Challenge using carbon-neutral fuel at the Suzuka 8 Hours Endurance Race that will be held from this weekend.

Marine is also working on carbon-neutral and environment-friendly technologies such as micro-plastic collecting device in the sea.

Suzuki's Philosophy of Conduct



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Based on our philosophy of conduct, Suzuki will tackle toward realizing its mission statement and achieving minimization of energy optimal for each country and region.

Through this, we will provide people around the world with the joy of transporting freely.

Please look forward to Suzuki's technology strategy and product development.





Suzuki Technology Strategy 2024

July 17, 2024

Director and Senior Managing Officer
Chief Technology Officer
Suzuki Motor Corporation

Katsuhiro Kato

Minimization of Energy by Sho-Sho-Kei-Tan-Bi

Minimization of Energy

by “Sho-Sho-Kei-Tan-Bi (Smaller,
Fewer, Lighter, Shorter, Beauty)”

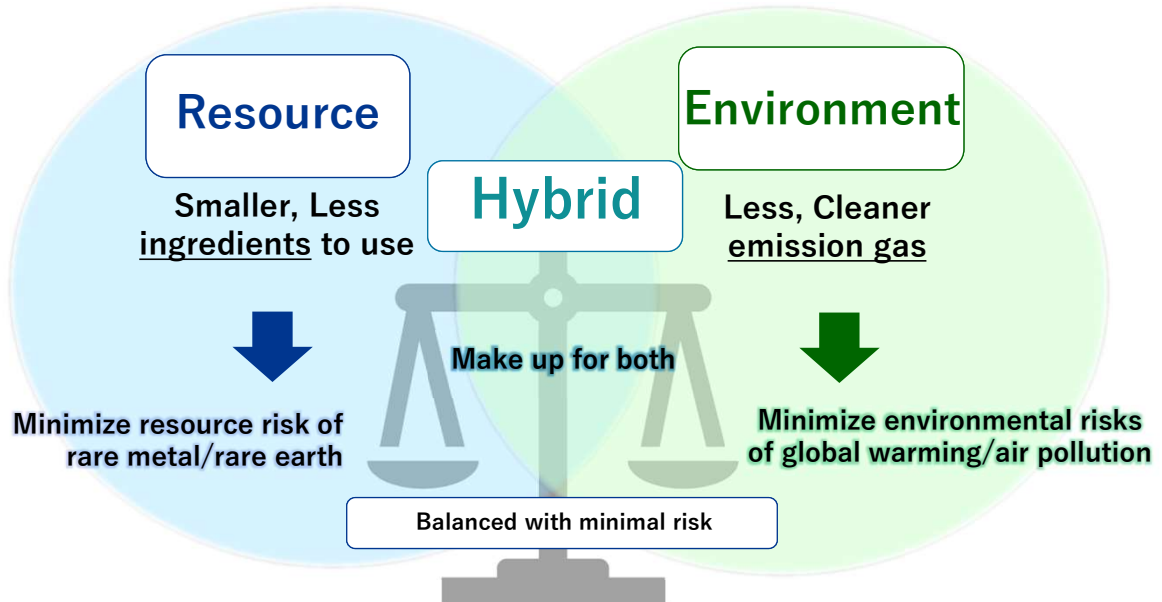


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- Suzuki's Technology Strategy 2024 looks ahead 10 years.
- It aims to realize energy-minimizing technology from product materials to recycling.
- The goal is to contribute to the formation of a sustainable society.

Minimization of Energy: the Origins



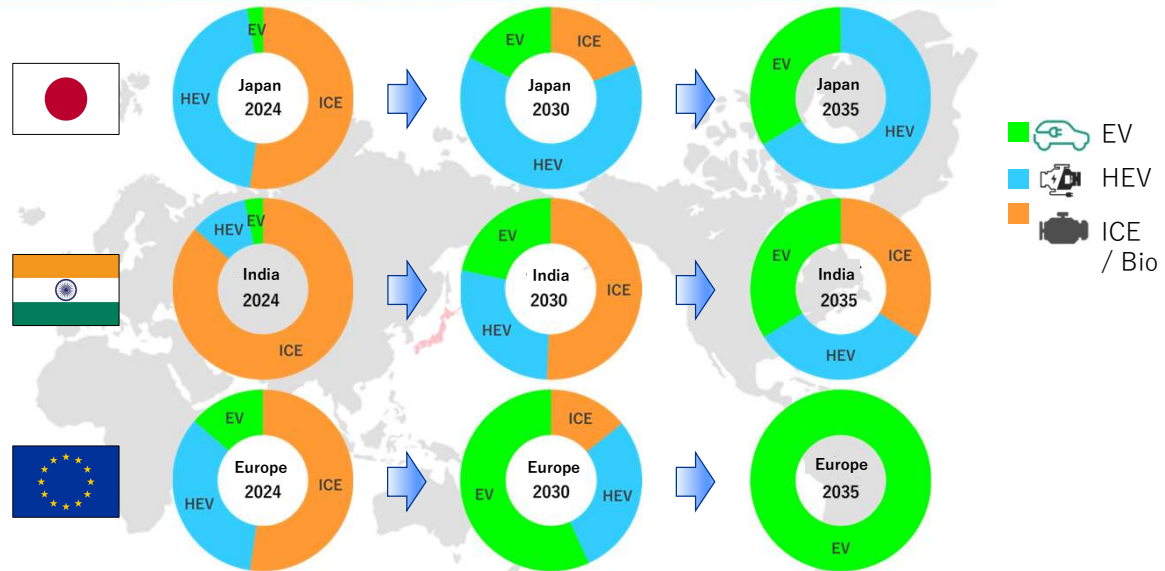
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Minimization of Energy: the origins

- The risks associated in the endeavors of us companies are environmental risks and resource risks.
- Minimizing environmental impact, and using limited resources wisely; by combining these efforts, we aim to minimize risks.
- Smaller cars require fewer and lighter materials. If the car is lighter, the required power source can be smaller.
For EVs, this means fewer and lighter batteries, smaller motors, and reduced use of rare earths and rare metals.
- For internal combustion engines, smaller displacement reduces both environmental and resource risks.
- Lighter cars have less impact on roads, reducing road maintenance burdens and the recycling burden of the vehicle itself, thereby improving overall energy security for society.
- This is the origin of why we set the technology strategy for minimization of energy.

Automobile EV Sales Ratio Forecast (All Manufacturers)



*Regarding the electrification ratio of the sales ratio forecast
Based on S & P Global Mobility data
Analyzed, processed and prepared by Suzuki Motor Corporation in light
of legal trends



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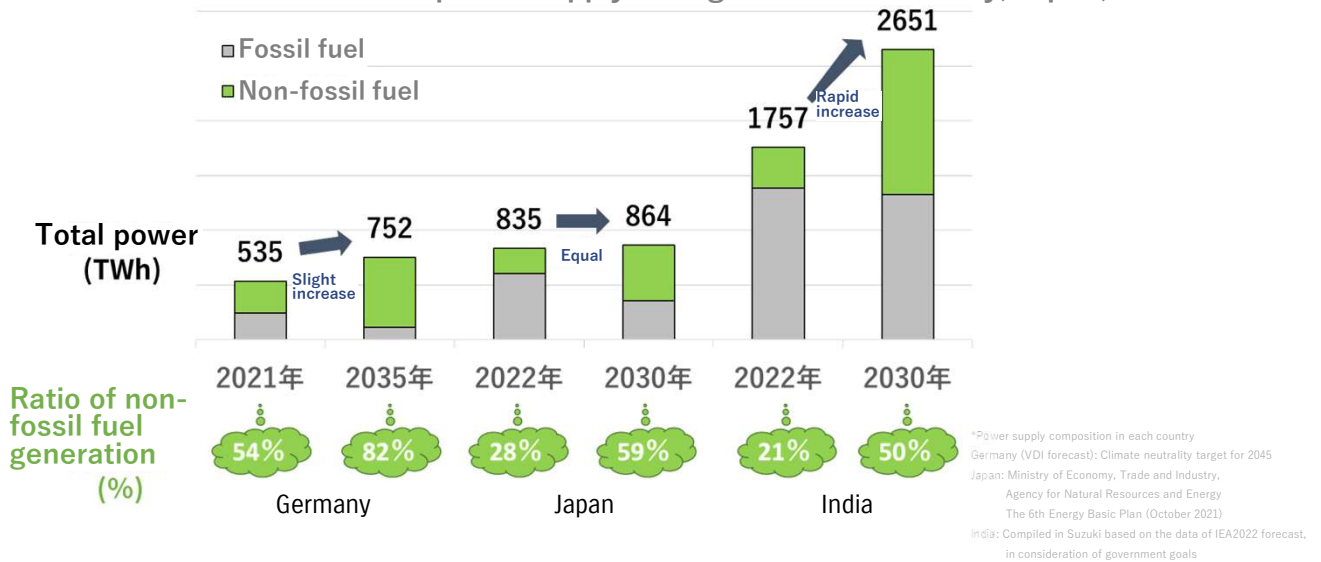
Forecast for the sales ratio of automobile EV by all manufacturers in Japan, India, and Europe over the next ten years

- For Japan, following the national policy aiming for new car sales of 100% electrified vehicles, including hybrids, by 2035, sales ratio is expected to be 70% HEV and 30% EV.
- India, actively introducing biofuels such as ethanol and CBG, is expected to be 1/3 each for ICE with CNF, HEV, and EV.
- In Europe, the overwhelming adoption of EVs is predicted.
- The forecast varies by region due to differences in power conditions and infrastructure.

One of the reasons for the differences come from the variation in power generation mix by region, which will be shown next.

Global Power Supply Configuration (Major Sales Regions)

Results and forecasts of power supply configuration in Germany, Japan, and India



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Power generation mix of 2022 results and 2030 forecasts, with Germany representing Europe, Japan and India

- While these are just forecasts and not guaranteed outcomes, the key point to note is that by 2030, the share of non-fossil fuel power generation is expected to be about 80% in Europe, but lower in Japan and India.

*Germany's power generation mix shows 2021 result and 2035 forecast

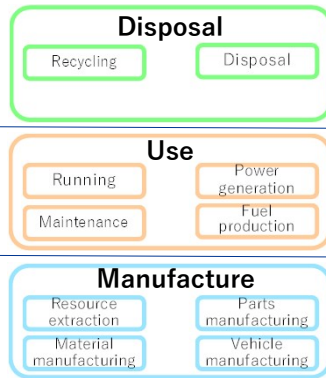
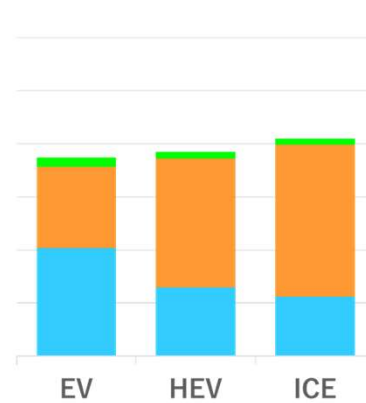
Minimization of Energy

Conceptual Diagram of Energy Consumption in the Life Cycle (Comparison of BEV/HEV/ICE)

Non-fossil fuel electric energy 25%



Non-fossil fuel electric energy 75%



*Conditions under consideration: 110,000 km, other settings are unique to Suzuki
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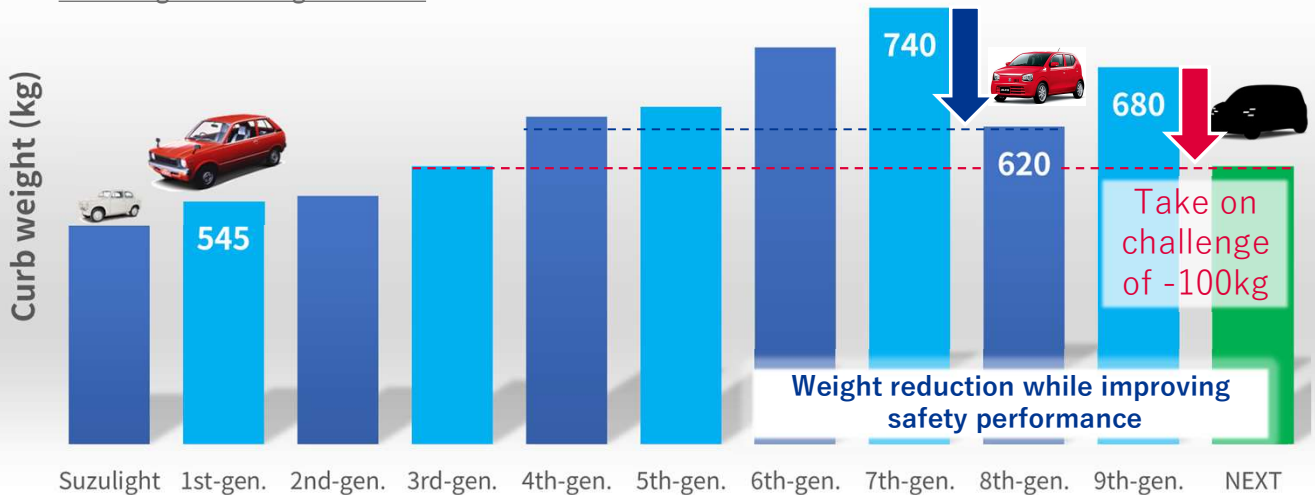
Lifetime secondary energy requirements for EVs, hybrid vehicles, and internal combustion engine (ICE) vehicles with the adoption of non-fossil fuel electric energy (estimated calculation by Suzuki)

- The graph includes resource extraction, energy required for parts and vehicle manufacturing, energy required for vehicle use, and disposal/recycling.
- The vehicles shown here are in the Swift class.
- The left side represents a 25% non-fossil fuel electric energy adoption rate, while the right side represents a 75% adoption rate.
- When the adoption rate reaches 75%, EVs become the best choice in terms of energy.
- In periods or regions where the adoption rate is lower, hybrids are the best choice.
- We believe that a multi-pathway approach to technology, including EVs, hybrids, and ICEs using carbon-neutral fuels, is necessary depending on the timing and region.

1. Light-weight and Safety Body: Light-weight Platform (HEARTECT)

*The curb weight is the representative of grade of each model.

Curb weight of Suzulight and Alto



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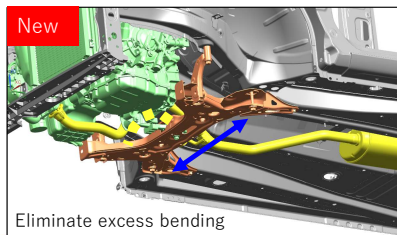
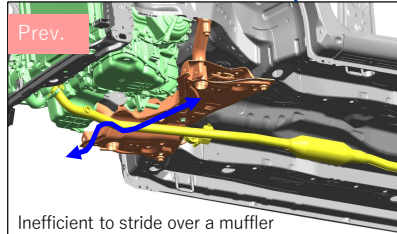
Suzuki's technology strategy in five areas

- 1) Light-weight and safety bodies: the light-weight platform "HEARTECT."
The first-generation Alto weighed 545kg, and its weight increased up to the seventh generation due to regulatory changes and other demands of the times.
- With the eighth-generation Alto, the entire company united in a weight reduction effort, improving safety performance while reducing the weight by 120kg, bringing it back to the level of the Alto from four generations ago.
- This achievement was made exactly 10 years ago.

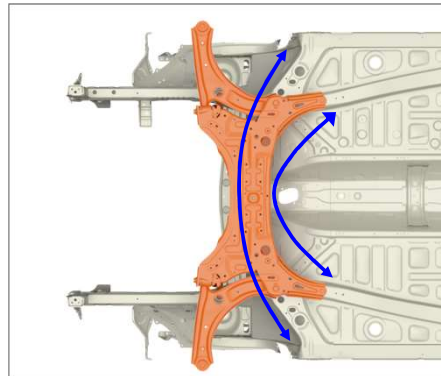
1. Light-weight and Safety Body: Light-weight Platform (HEARTECT)

>> Company-wide unity and concession (Entrepreneurial spirit “YARAMAIKA”)

Review of relationship between muffler and suspension frame → ● Efficient load transmission



● Suspension frame as part of vehicle body skeleton member



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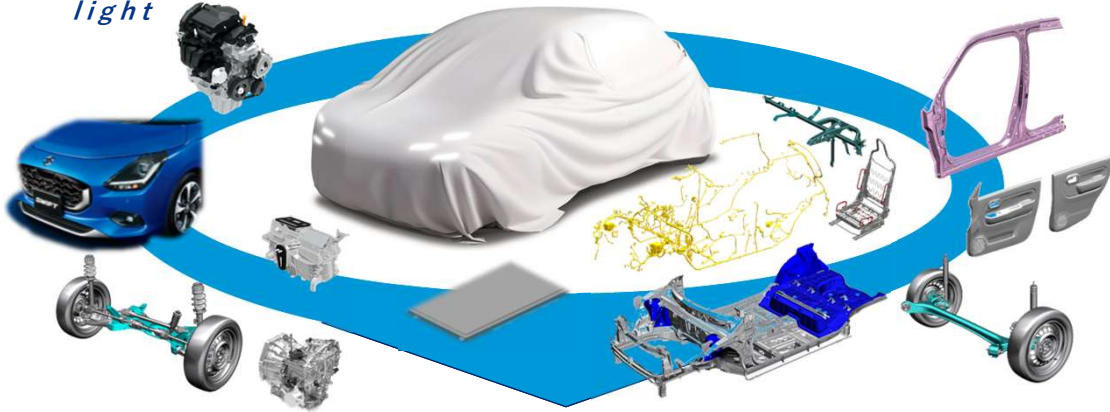
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- Previously, the muffler ran down the center of the underside of the vehicle, with other components designed to avoid the hot muffler.
- By getting rid of preconceived notions and re-evaluating from scratch, we straightened the suspension frame and bent the muffler instead.
- This theoretical analysis showed that this would increase rigidity, reduce weight, and improve driving performance.

1. Light-weight and Safety Body: Further Challenge to Light-weight

S51T
light

Vehicle weight reduction contributing to
minimization of energy during use and manufacturing



Team Suzuki's project to extend concessions to the entire car

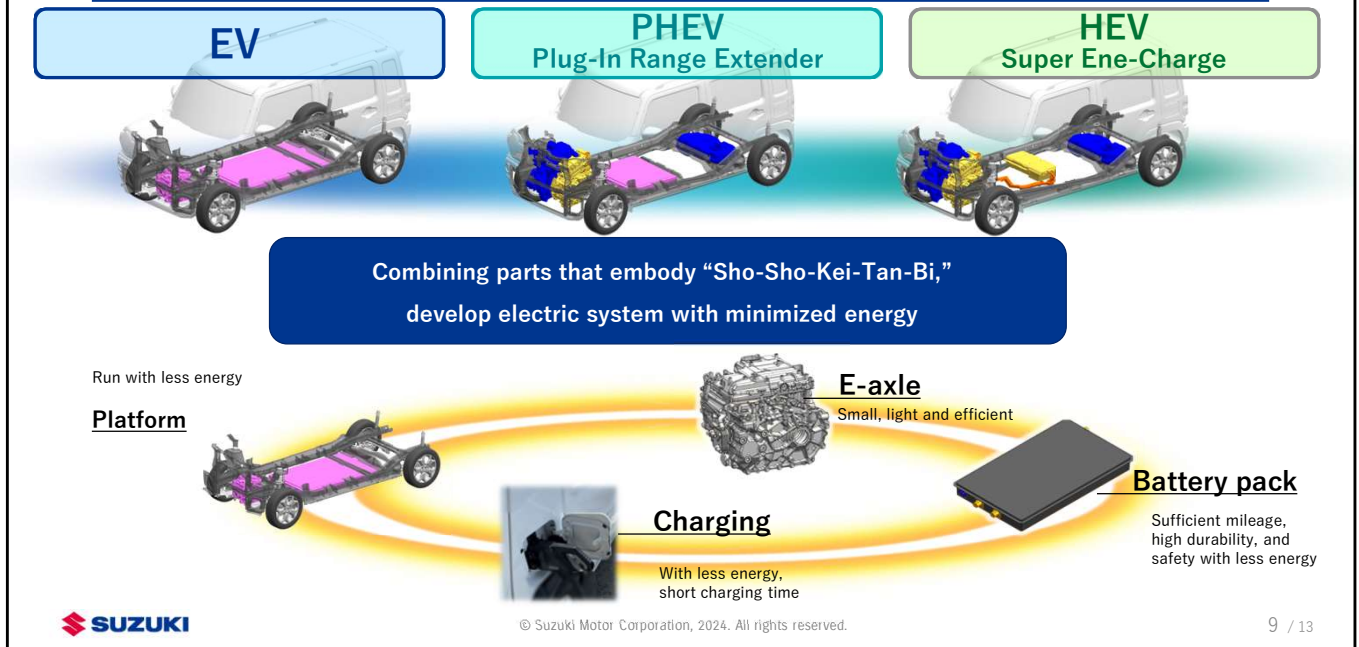


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- We will challenge for further weight reduction of 100kg for 10 years ahead.
- We will further evolve the safe and light-weight "HEARTECT" platform, which contributes to resource conservation and environmental protection, and work on minimizing energy consumption through weight reduction technology.

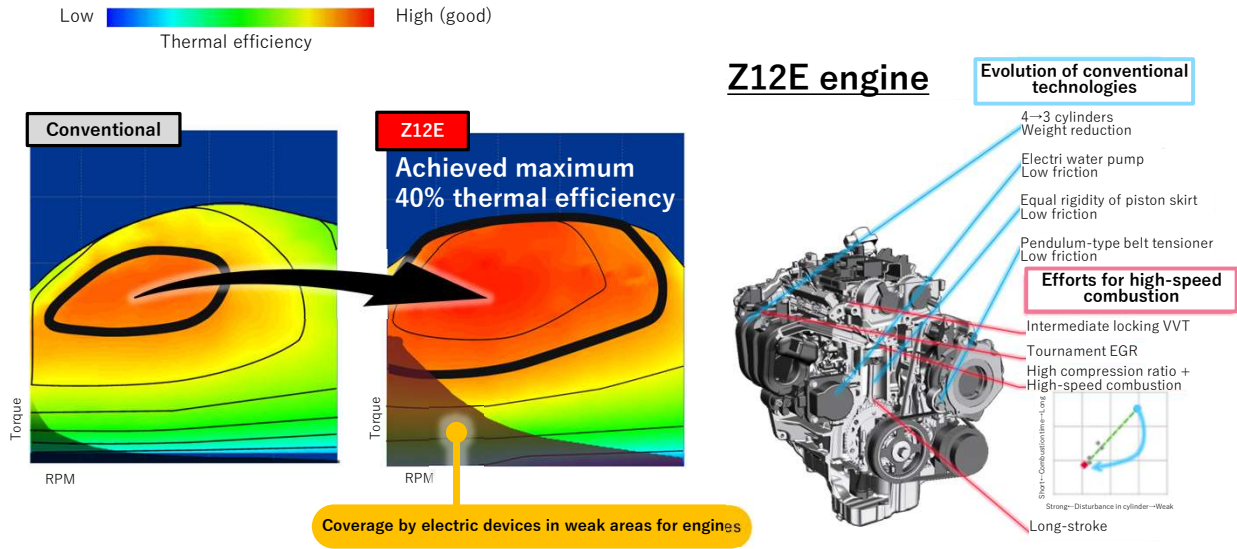
2. Lean-Battery BEV/HEV



2) Technology for BEV and HEV

- As non-fossil energy becomes more widespread, BEV will be the ideal solution in terms of energy.
- We will bring BEV to the market from next year and promote energy minimization in electrification as well.
- We will continue to develop light-weight platforms, small, light-weight, and highly efficient E-axes, small battery packs that ensure a suitable driving range, and electric technologies that are durable, safe, and short charging times.
- We develop lean-battery electric technologies with the aim of "using the minimum and necessary batteries without excess."
- Until non-fossil energy becomes fully widespread, HEV is the best solution.
- The 12V mild hybrid for mini car has an engine output of 36kW with NA + 2kW motor.
- This output will be insufficient in the future, we will develop a lean-battery, Super Ene-Charge with 48V while enhancing motor output.
- Only 10kW motor can make up to about 30% of output.
- The 48V is particularly well-suited for Suzuki's small and light-weight cars.
- Suzuki aims to deliver the most energy-efficient electric vehicles suited to the country, region, and customer usage, without excessive battery capacity, by developing energy-minimized electric vehicles.

3. High-efficiency ICE/CNF Technology



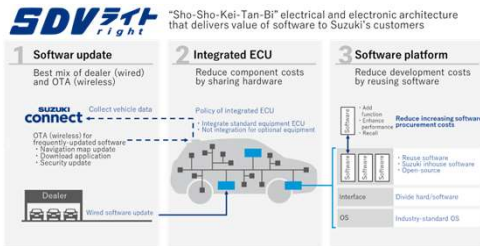
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3) Powertrain technology.

- In 2023, we announced a high-efficiency engine (Z12E engine) that focuses on combustion, the core of internal combustion engines, and launched it with the new Swift.
- This engine achieved a maximum thermal efficiency of 40%, a long-held goal of our engineers.
- In the future, we will expand this high-efficiency engine technology and pursue efficient combustion of CNF fuels such as biogas and bioethanol.
- We aim to achieve high efficiency by fast combustion and clean exhaust emissions.
- At the same time, we will develop engines that fit well with the "Super Ene-Charge" electrification technology.

4. SDV right



Suzuki adopts an update strategy that considers the user's perspective.

Reuse software.

Utilize existing software.

Suzuki aims to offer affordable prices with "just right" and "this is fine, this is what I want" features.



For example, safety equipment.

Traffic conditions vary from country to country.

We will provide customers with safety equipment optimum for each region of the world.



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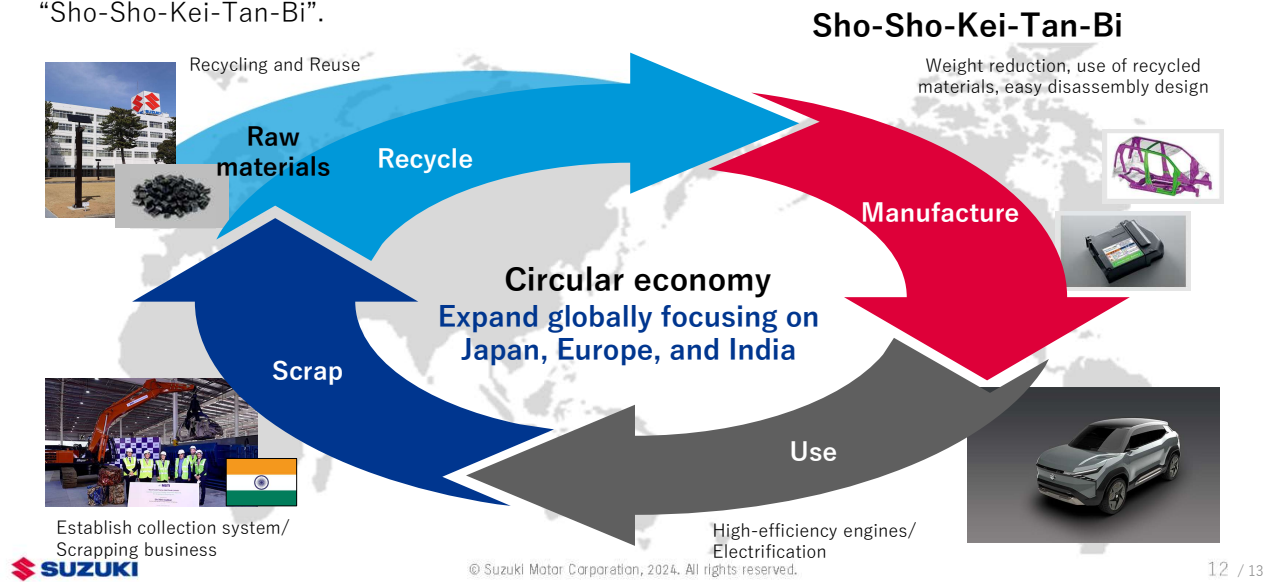
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4) Software, in other mean, control.

- Nowadays, the word of SDV (Software Defined Vehicle) become general phrase, and it means electric architecture that make value for the vehicle.
- Some electric devices have too much function to use.
- Suzuki is developing "SDV right," an affordable system that embodies energy minimization through "Sho-Sho-Kei-Tan-Bi," to create value for cars and offer it to customers.
- Software updates will be a best mix of wired and wireless (OTA), ensuring they are not excessive but user-friendly, making customers feel it the "just right" SDV (SDV right) and "this is fine, this is what I want."
- For advanced driver assistance systems (ADAS), it is crucial to develop systems that are well-suited in the road and driving conditions of each country to reliably support safe driving.
- In India, a key market for Suzuki, the unique traffic conditions and congestion, as shown in the photos, make it difficult to simply apply Japanese solutions.
- Leveraging Suzuki's 40 years of experience in India, we plan to develop and offer ADAS that performs well even in the congested streets of Indian cities.
- We aim for "just right" solutions.

5. Easy Recyclability and Disassembly Design

We will achieve to minimize energy consumption and circular economy with the philosophy of “Sho-Sho-Kei-Tan-Bi”.



5) Final area

- While refining technologies to minimize energy consumption, we are also working on circular economy that consider the entire lifecycle.
- We will further expand our current initiatives for reuse of batteries including structure of collection systems, recycling of resin, easy disassembly design, promoting the use of recycled materials, and utilizing for streetlights.
- In India, we are working on collection system and have started dismantling and re-materialization.
- We will promote the activities toward realizing a circular economy.

Suzuki's Philosophy of Conduct



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Conclusion

- Based on our mission statement and philosophy of conduct, we will structure the five strategies of technologies.
- We will realize "minimization of required energy" more effectively, more inexpensively, and faster by devising technologies without sparing the small accumulation of technologies.
- This is the true essence of Suzuki's technology and a technology strategy unique to Suzuki.
- We are trying to achieve our goals with everyone's participation and overall optimization.

