

Style and Design of FCX CLARITY

Masaru HASEGAWA* Yozo TAKAGI*
Kazuhiko SATO* Keiichi ARAKI*

ABSTRACT

The FCX CLARITY, a new fuel cell vehicle (FCV), has a package layout and design that make full use of one of the FCV's great advantages, that of a freedom of package layout with distributed powerplant components. On top of being a zero emissions eco-friendlier vehicle, the FCX CLARITY was developed with the goal of creating a next-generation sedan offering new value and appeal, joy of driving, and pride of ownership. The eye-catching design was meant to give a glimpse of the future in a way that makes it instantly recognizable as different from that of an internal combustion engine vehicle. This includes the exterior design that achieves new proportions with short nose and long cabin with its configuration of dynamic surfaces. The resulting new form is completely unlike that of any conventional sedan. The interior was designed ahead of its time, optimizing its wide open cabin space to create spacious and comfortable personal space, and a cockpit which gives a new sense of fun with futuristic features.

1. Introduction

In 2002, Honda introduced the 2003 model year FCX, the first fuel cell vehicle (below, FCV) certified by the US EPA, and thereby demonstrated the strong basic performance of this vehicle. Since then, Honda has performed research and development with the goal of further enhancing the performance of this new technology and thus promoting it⁽¹⁾.

The FCV has an FC stack which generates electricity, as well as an electric drive motor, instead of the traditional internal combustion engine. Because these components can be distributed, it gives the automobile the potential for a radically changed package layout and design. However, the FCX through the 2005 model had a number of limitations that were due to, a large powerplant as well

as a chassis borrowed from the Honda EV Plus⁽¹⁾. Because of these limitations, nothing about the exterior identified the FCX as an automobile created with leading edge technology.

For the new FCV, the FCX CLARITY, Honda developed a new powerplant that includes a newly developed, smaller and higher-output FC stack, and a platform specifically for the FCV which enabled a new package layout and design taking full advantage of the freedom afforded to this package. The goal of this development was to convey to a larger audience the potential of the new fuel cell technology.

This paper reports on the development of the design of the FCX CLARITY (below, CLARITY) (Fig. 1).

2. Design Goals

The design concept was to design an automobile that would be instantly recognizable as offering new value and attractiveness impossible to achieve with an internal combustion engine vehicle. Honda's goal was to create a futuristic, eye-catching design that would steal the heart of the viewer at first glance, provide a glimpse into the future the very instant the door was opened, and inspire a new generation of drivers with dreams about the automobile society and the global environment (Fig. 2).



Fig. 1 2008 model year FCX CLARITY

* Automobile R&D Center



Fig. 2 Design concept

Additionally, the designers felt that the unique features of this FCV, namely its strong environmental performance (with zero emissions), interior spaciousness enabled by the new package, and the high-torque yet quiet ride afforded by its electric motor, made this package layout appropriate to a premium car of the future, and so Honda has considered the CLARITY to be a “premium sedan for the next generation.” Other design goals were to achieve a level of presence, class, and comfort appropriate to such a vehicle.

3. Package Layout

In order to achieve a package layout optimizing FCV’s biggest advantage — the potential for a distributed power plant — all the powerplant components were made more

efficient and compact, and a platform was developed exclusively for the FCV that promotes their efficient layout (Fig. 3).

Up to now, large FC stacks have been located, for example, under the floor of a high-standing vehicle. The new FC stack was given an innovative new structure that made it efficient and compact^{(2), (3)} enough to be placed in the center tunnel. As a result, the sedan package has a low floor, low center of gravity and low overall height that would have been impossible in a conventional FCV (Fig. 4).

Additionally, thanks to a more compact front-wheel-drive motor⁽²⁾, it was possible to design a short nose and achieve a long cabin that increases interior space for all occupants while limiting overall length. The result is the generous cabin space of a large-class body in a medium-class body.

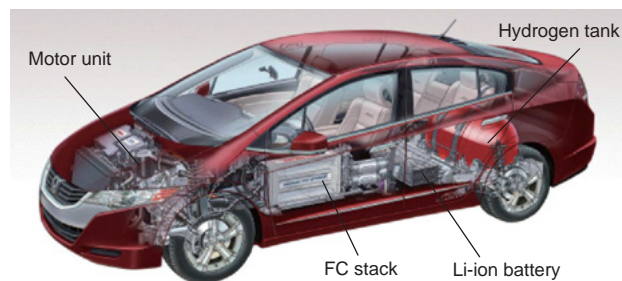


Fig. 3 Main powerplant components

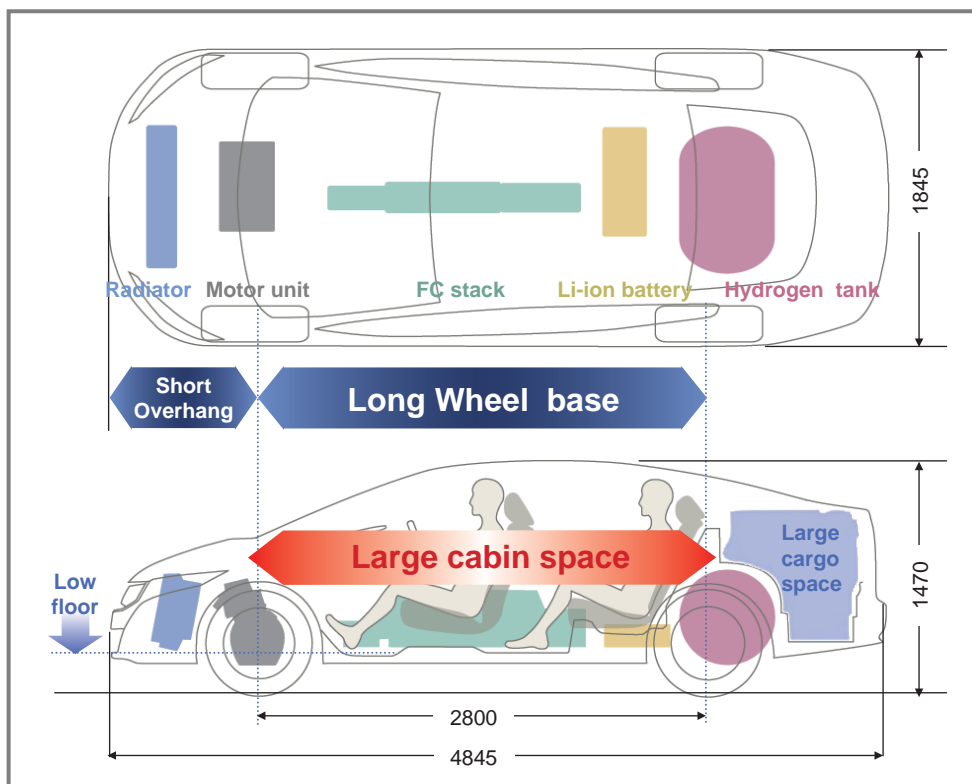


Fig. 4 Package layout

Furthermore, by reducing the size of the hydrogen tank and the auxiliary power source⁽⁴⁾, by making their layout more efficient, and by providing a high-deck trunk, the design enabled enough trunk space to fit four golf bags or one folded-up wheelchair.

This FCV package layout is achieved because there is no longer an internal combustion engine. This provides not only more cabin space but also a high degree of design flexibility. It is also possible as a result to achieve an “eye-catching design” with new proportions (namely, a short nose and long cabin) and a newly designed interior space.

4. Exterior Design

The concept of the exterior design was the “Dynamic Full Cabin Sedan,” characterized by new, long cabin proportions and the bold, tapering cabin afforded by the innovative platform. The concept also features wider fenders and a lower center of gravity, which together invoke a dynamic cruising form (Fig. 5). The package aims to create a vehicle instantly recognizable as the CLARITY from whatever angle it is viewed (Fig. 6).

The front expresses a strong graphic (Fig. 7) from the bumper to the headlights, stressing strong presence and width, while the front pillars, which jut out far to the front, evoke the dynamic, progressive image of the CLARITY.

From the side, the expansive shoulder section, made possible by greatly tapering the mono-form cabin in front and back, symbolizes the hood and trunk of a new type of sedan. The door mirror takes up the plated molding coming from the side glass, making the mirror appear to be of a single piece with the body. The exterior door handle is designed to accentuate the workmanship of the individual components. The handle’s sharpness and length are used to draw out the elegance and length of the cabin (Fig. 8).

The back of the vehicle is characterized by rear fenders that blend strongly into the tapering of the cabin and by the contoured rear panel. These features give CLARITY a strong individuality unseen in sedans up to now. The



Fig. 6 Final renderings



Fig. 7 Front view



Fig. 8 Cabin, door mirror, and exterior handle



Fig. 5 Dynamic full cabin sedan image



Fig. 9 Rear view

rear combination lamps, integrated into the extra window that traverses the area, accentuate a thoroughly wide-looking stance (Fig. 9).

5. Interior Design

The concept of the interior design is a “Futuristic Cocoon,” which evokes a sense of the future the moment the door is opened, and a comfortable area that uses the ample cabin space to envelop each passenger (Fig. 10).

As Figs. 11 and 12 show, the area around the cockpit gives a constant sense of driving a car of the future. The innovative three-dimensional FC meter and newly developed compact electric shifter, among other

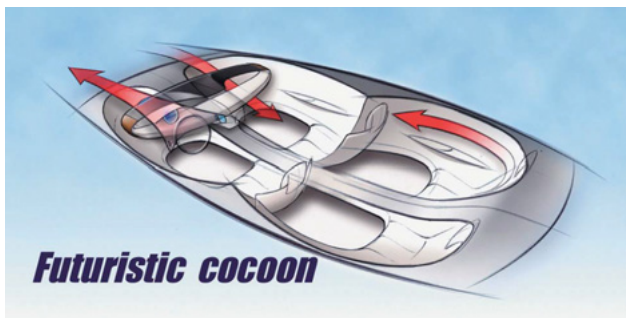


Fig. 10 Futuristic cocoon

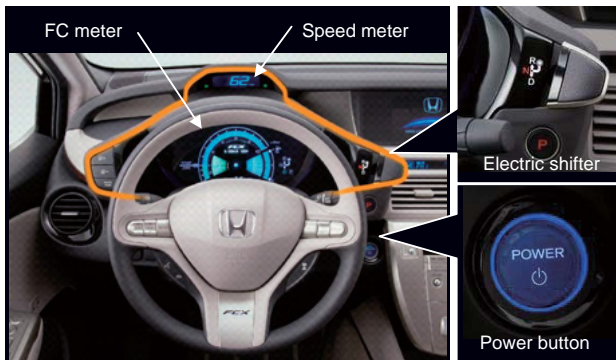


Fig. 11 Futuristic design around meter-visor

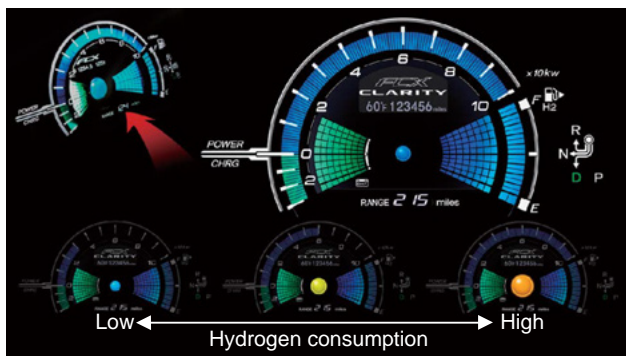


Fig. 12 FC performance meter

unprecedented points of interest, are built around the meter visor. The new H₂ ball-meter located in the center of the FC meter is both functional and entertaining as it encourages the driver to monitor hydrogen consumption with sensory clues - the color and size of the ball.

In order to highlight the refreshing and open nature of the forward space made possible by eliminating the internal combustion engine in front, the CLARITY has a “floating layered instrument panel” whose components appear to float in layers, suggesting open space where air might pass between the panels (Fig. 13).

In addition, the four seats are each independent spaces which enable four passengers to sit in comfort. The door linings have a dynamic, round form that looks as if they were boldly scooped out with a spoon in the center to enfold each passenger. This provides a wider and more enveloping feel creating a personal space in which each passenger can be comfortable (Fig. 14).



Fig. 13 Floating layered instrument panel



Fig. 14 Dynamic round form

6. Color Design

6.1. Exterior

The exterior color was chosen to be both elegant and high-class for a next-generation premium sedan, but also to be brilliant and evoke a progressive feel. The objective was to project all the composure and dignity of a premium sedan while also expressing shadows on the contoured

surfaces such as the fenders and C-pillars. The color chosen with an image of the star garnet gemstone has a strong contrast of deep black and bright red highlights. A newly developed high-contrast paint was used to express a progressive feel (Fig. 15). Furthermore, with the intention of giving the CLARITY an iconic presence, star garnet metallic was selected as the only color.

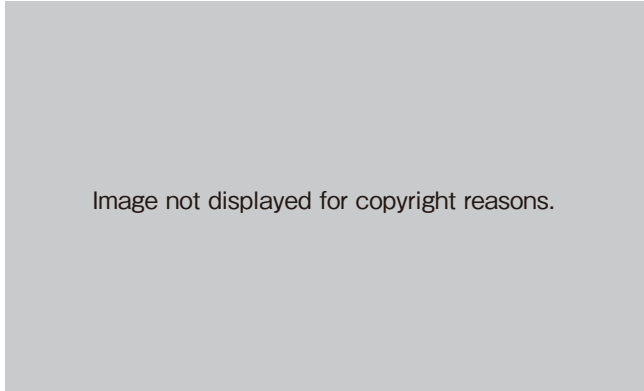


Fig. 15 Star garnet image

6.2. Interior

The theme of the interior is “Future Craft,” with a futuristic look as well as a warmth that envelops the passenger in comfort. The colors and materials were coordinated to project these ideals (Fig. 16).

The seats, armrests, console trays, and other components which come in direct contact with the skin are made with Honda Biofabric⁽⁵⁾, a new plant-based material that is eco-friendlier and has a high-quality feel to the touch. A pale-pink color scheme gives an air of warmth. The instrument panel, door lining, and the like are made with a combination of traditional materials like wood-grain panels, and new materials such as silver accents and clear acrylic. By coordinating new materials different from anything found in conventional high-end cars, the CLARITY projects a next-generation premium image.



Fig. 16 Interior material coordination

7. Emblem Design

The emblem design also features the CLARITY’s clean and premium nature.

The letters in “FCX” use a design that symbolizes the environmental performance and progressiveness of an FCV with clear material that evokes a clean image from which the sharp, plated lettering floats (Fig. 17).

In addition, the logo of the new name “CLARITY” stretches out longer than the lettering of “FCX.” With a separate-type lettering and satin-plated finish, this component too projects a premium feel and is designed to establish name recognition.



Fig. 17 Emblem design

8. Conclusion

The FCX CLARITY was designed specially as an FCV taking full advantage of the characteristics of a new technology - the fuel cell - to replace internal combustion engines. Thus, it is the first FCV to create new value and attractiveness in addition to the strong environmental performance of zero emissions.

Going far beyond the idea of the eco-friendlier car, the CLARITY is the first FCV to achieve not only the universal attractions of a car, which include the pleasure of driving and joy of ownership. It was also built as a “next-generation premium sedan” that surpasses the existing idea of a high-end automobile.

For the design, a package was used that made full use of the potential of the exclusive platform, providing new sedan proportions (a short nose and the mono-form of the long cabin, both completely different from conventional sedans) and a cabin space that combines an exciting futuristic feel with enveloping comfort. Thus, the CLARITY provides new direction for future car package layout and designs.

It is Honda’s hope that the FCX CLARITY will showcase the possibilities of the new technology of fuel cells to more and more people and inspire a new generation with dreams about the future of the global environment and the automobile society.

References

- (1) Kawasaki, S., Ogura, M., Ono, T., Kami, Y.: Development of the Honda FCX Fuel Cell Vehicle, Honda R&D Technical Review, Vol. 15, No. 1, p. 1-6
- (2) Matsunaga, M., Fukushima, T., Ojima, K., Kimura, K., Ogawa, T.: Fuel Cell Powertrain for FCX Clarity, Honda R&D Technical Review, April, 2009, p. 7-15
- (3) Saito, N., Kikuchi, H., Nakao, Y.: New Fuel Cell Stack for FCX Clarity, Honda R&D Technical Review, April, 2009, p. 16-23
- (4) Yamamoto, K., Anekawa, A.: Development of Lithium Ion Battery System for Fuel Cell Vehicle, Honda R&D Technical Review, April, 2009, p. 43-48
- (5) Nishide, H., Yoshikawa, K., Nakagawa, K., Esaki, H.: Heated and Cooled Seat for FCX Clarity, Honda R&D Technical Review, April, 2009, p. 30-34

■ Author ■



Masaru HASEGAWA



Yozo TAKAGI



Kazuhiko SATO



Keiichi ARAKI