

Concept and Styling Design of the NM4

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ABSTRACT

One of the issues in motorcycle business is that young people's interest in motorcycles is declining year by year. Accordingly, there has been a need to consider a new model targeting such young generations. To respond this need, Honda has started to create a motorcycle design category that has exceptional features and does not belong to any of the conventional motorcycle categories to explore new motorcycle market. The basic features of the design structure was decided as "Low & Long," and the descriptions of "Massive front styling" and "Cockpit position" were coined as two keywords. Actual methods to materialize these design concepts in a real motorcycle were investigated by having serious involvement in structural design work as well to take practical vehicle requirements into account.

Following this process, the model of the NM4 was brought into mass-production and it was confirmed, through the numbers appeared in the responses on Twitter, that our objective to get a wider recognition among customers not currently using motorcycles was achieved.

1. Introduction

Looking back the historical background, the market of large motorcycles in developed countries expanded since 1990's. Due to the Bankruptcy of Lehman Brothers in 2008, the market in those countries started to decline and that brought about a fierce competition among automotive brands within a limited pie of the market with a size of less than a million units (Fig. 1).

In such markets, users are increasingly concerned with the individual life style with a focus on the personality rather than absolute performances of a vehicle. Consequently it led to a diversity of requirements for large motorcycles. In the meantime, young people's interest in the motorcycle decreased. As a result, the average age of

riders increased year by year. Accordingly, the market situation got increasingly difficult, in which the number of potential users who kept their interest and, eventually, enjoy large motorcycles inevitably decreased to a large degree.

Hence, the development of the NM4 was initiated to investigate a new model targeting young generation that has little interest in motorcycles.

2. Development Concept

As the model was developed for getting a new cluster of customers, it was understood important to be recognized by the people who have no interest in motorcycles. In our process of creating styling designs, a priority was set to make the vehicle immediately recognized at the first look of people who have only a slight interest in motorcycles, rather than getting consent from existing motorcycle users. It was also regarded as important to present a concept of the exterior design that was exceptional and not categorized in any existing motorcycles. In addition, it was defined as an indispensable requirement to make the best use of the unique technologies of Honda. As another important requirement, lowering the height of a hurdle for an inexperienced customer who was potentially becoming a motorcycle rider was also defined.

In the pursuit of lowering the hurdle for beginners, not only an easy riding for inexperienced customers but also a creation of a different value, which conventional

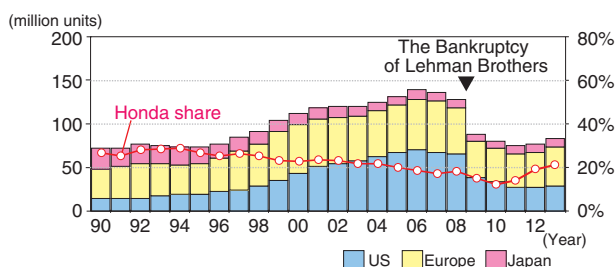


Fig. 1 Sales of large motorcycles in Japan, Europe and US (not including ATVs and off-road motorcycles) (from Honda in-house survey)

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motorcycles did not have, were envisaged. For achieving those objectives, the development was given a less priority in absolute performances, such as speed or power, as well as not seeking a high riding technique to a rider.

The basic idea was to increase motorcycle fans in the future by having more avenues to enter the world of motorcycles that was created through expressions of a new conceptual view and through the lowered hurdle for beginners to access.

3. Styling

3.1. Defining Basic Features of Structure

As a first step, a thorough consideration was conducted to find what kinds of transportations or vehicles were giving an impression of attractiveness to ordinary people and our directions of the structural design was defined.

Examples were collected from transportations and vehicles widely recognized, from the past to the present, by people in 20s or 30s. They were not limited to existing transportations but included the ones that appeared in the movies or animated cartoons. Moreover, our collection was expanded to include apparel and other products that are attractive enough in recent years. Through the results, it was found that futuristic styling, low and long form, fat tires and low height seating were universally recognized as attracting features. Consequently, these factors were defined as important points to vigorously design the basic proportion (Fig. 2).

In the styling design of the outer surfaces, implementation of synthetically characterized neat form was selected. Accordingly, the expressions of the outer forms that appear in the shapes of smartphones or electric appliances with the latest designs were implemented instead of using forms with expressions conventionally applied to motorcycle designs such as “vigorousness” or “speediness.”

The engine equipped with Dual Clutch Transmission (DCT) was decided to adopt, in terms of application of a unique technology of Honda, contributing to lower the hurdle to beginners as well. It was aimed to realize an easy riding, simple operations and the feeling inherently characterized by a motorcycle. Basic components exhibiting key features of a motorcycle, such as a bar type handle, a muffler of cylindrical shape and other parts around the

wheels and the braking system, were made visible. Through those implementations, the impression as a motorcycle was made emphatically noticeable and a room for customizing for personalization was maintained. The space allocation of utility compartments was also examined considering conveniences in practical use. The possible need for having even more utility spaces was investigated as well.

3.2. Styling Directions and Design Elements

As mentioned above, the styling design of the NM4 was aimed at the creation of a fundamental concept view that was exceptional and was not categorized in any motorcycle.

Among various options of our design directions to take, the design that gives us a futuristic atmosphere was set as our design orientation while considering attractive features to the younger generations who had been brought up surrounded by digital culture of movies, animations and games as their familiarized items.

3.2.1. Massive front styling

This styling keyword involves in overall silhouette of the vehicle. The structures composed of boldly shaped surfaces and the front fairing extruded to lateral directions, together with rearview mirrors built in it, were installed in the front area. These design components enhanced the massive appearance in the vehicle front area. On the contrary, rear area was streamlined into a low and small form. With those compositions, representations of boldness and dignity were achieved to create a unique silhouette.

The rear cowl design with descending line to the rear is contributing to make the vehicle design represent the complete antipode against conventional designs with the rear cowl with ascending line that frequently appears in sporty models in which the absolute performances are of great importance. That descending design is also for a representation of the concept that has a different sense of value from that of sporty models.

3.2.2. Cockpit position

The riding position was designed to realize a relaxed riding for even a rider without enough experiences. For that purpose, the height of the seat was designed low and a backrest to lean against and footrests to stretch out his or her legs on them were equipped. Moreover, the instrument panel, which is usually placed in the position to be looked down, was located in front of the rider. In those designs, it was aimed at to have a rider feel as if he or she were sitting in a cockpit, which was totally different from the feelings of any existing motorcycles. Those measures were designed to create an unexperienced feeling in dynamic tastes of riding as well as providing visual appeals in conjunction with a strongly claimed personality.

The design expressing a new identity was created while it could get a wider acceptance by people to some extent, just like in the cases of consumer products appearing in our daily lives. Therefore, it was designed with expressions

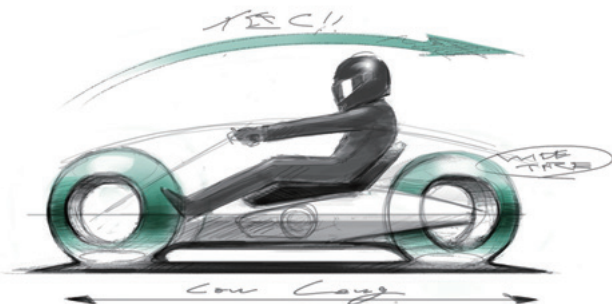


Fig. 2 Conceptual proportions of exterior design

of uniqueness yet without applying excessive complexity by implementing simplified outer surfaces and character-defining lines. That was because it was intended to make it stay showing the realistic functionalities as a vehicle in the real world avoiding it looked like an object in some virtually created world, while reflecting the sense of younger generations.

Keeping these ideas in mind, idea sketches were roughly drawn followed by implementation of them into actual vehicle configurations and equipment. On the other hand, the process of feeding-back the technical ideas and comments to the sketches yielded from engineers was repeatedly conducted to make it a realistic design (Fig. 3, Fig. 4).

3.3. Issues in Realization of Styling and Solutions

Issues of creating a styling with a new identity, while realizing a lower hurdle for beginners, are described below with the solutions.

3.3.1. Creating Low & Long form satisfying caster angle requirements

For creating Low & Long form, it is desirable to locate the front tire as forward as possible to constitute a stylish and bold proportion of the vehicle. For such front



Fig. 3 Design sketch of side view



Fig. 4 Design sketch of front view

tire arrangement, it was necessary to increase the caster angle extensively. With a large caster angle, the natural maneuverability is generally hard to be obtained. It was one of the inevitable requirements for the NM4 to have a natural maneuverability because the vehicle is targeting beginners in riding motorcycles. The issue to be tackled was to create a well-balanced design of Low & Long form while maintaining a natural maneuverability.

To solve this issue, the positions of the front tire and the head pipe were determined to have a minimum allowed caster angle within the range that does not affect the balance of the design. Finally, the issue was settled by setting the optimized trail distance yielded through a fork angle of 37 degrees, composed of a leaned caster angle of 33 degrees and a slant angle 4 degrees. In addition, the front fairing was designed to cover up the front fork. This visually enhanced the merged appearance of the front tire and the body, and the silhouette of lower and longer posture was expressed.

3.3.2. Realization of low seat height

Regarding the seat height, it was aimed to make rider's feet touch the ground with ease without sacrificing the unique proportion. Accordingly, it was set at 650 mm. This height is the lowest among the large motorcycles of Honda. However, how it could be materialized in the actual body parts arrangement became an issue.

Firstly, through reviewing the conventional installation positions, the electrical components, which are installed collectively under the seat in many cases, were moved to other locations as far as possible. In addition, the frame pipes under the seat were laid out at lower positions with a smaller distance between them. To examine whether or not the seat height, which was set ultimately the lowest position, didn't affect the natural riding posture, a simplified mock-up model was prepared (Fig. 5). Based on this examination, slight adjustments were made to the shapes of the seat and the fuel tank. Through the above mentioned trials and changes, the target seat height was successfully established maintaining a sufficient seat cushion thickness to grantee a comfortable riding.



Fig. 5 Simplified mock-up model

3.3.3. Clearance between rear cowl and rear tire

Another issue to be tackled was the clearance between the rear tire and the rear cowl that was positioned at the lowest possible height. The lowest height and the small-sized design of the rear cowl was an inevitable requirement to realize the Low & Long proportion and Massive front styling at the same time. However, the issue was that using a fat rear tire with a sufficient suspension stroke naturally requires a large clearance around the tire. The low and compact rear cowl confronts to that requirement.

The balance between the design and the functionality was pursued through elaborations of repetitive sketches and arrangements. Pro-Link suspension, the damper system of Honda Multi-Action System (H.M.A.S) and swing arm made through fine die-casting of hollow aluminum structure, which offers light weight and high degree of freedom in its design, were incorporated into the rear suspension system. By implementing those measures, a compact rear cowl design was established to enhance the impression of fatness of the rear tire while maintaining a comfortable riding and a good driving stability with a minimum required suspension stroke.

3.3.4. Allocation of utility space

A sufficient space for the utility compartment was inevitably required when the conveniences of a variety of users were considered. Utilizing the space made available by Massive front styling, the utility compartments were arranged in the front fairing. Thus, an additional convenience was offered together with a new perception of the bold front design and improved protection from the wind.

3.3.5. Layout of built-in mirrors

The built-in mirrors play an important role as one of the crucial factors that highlight the new styling. In the meantime, the locations of the mirrors that provide an adequate viewing capability were hard to be determined only by considering through sketches or views on a computer screen.

Through the repeated trials on a computer simulation, the mirror positions were roughly arranged. Following that, the validation of visibility was conducted using the simplified mock up model in the final step and the optimized arrangement was fixed. This mirror arrangement also contributed the enhanced comfort of a rider because this arrangement was determined considering a wind protection to the hands grabbing the handlebar as well (Fig. 5).

4. Prototype Model

Based on the styling sketches refined through the process aforementioned, a prototype model, which was compatible to an actual driving, was made. Regarding utility space, an additional version of the vehicle model

that has extra utility compartments on the sides of the rear cowl was also lined up. The rear utility compartments were designed intentionally as undetectable type parts to keep the consolidated body form although detachable ones are commonly used. This utility space configuration made this model differentiated enough compared to the standard version. Figure 6 shows the final prototype model.

It was also verified through the test riding of the prototype model whether our objectives, i.e. an easy maneuverability and a new ride feeling, were created beyond the new appearances. It was confirmed through the test riding that a natural and unexperienced riding taste further than our expectations was created by the combination of the Cockpit position of leaning against the backrest and the engine equipped with DCT. Moreover, lateral inline arrangement of the built-in mirrors and the instrument panel in front of the rider creates a visual effect that gives enhanced feeling of leaned vehicle body angle to the rider when running through curves. These impressions proved to us that an unprecedented feeling of riding enjoyment was fully established.



Fig. 6 Prototype model

5. Transition to Production Model Development

Following the evaluations on basic drivability of the prototype model, the development process moved to the next step of the actual production model development. The production model development was completed through the process of making some changes on specifications and finalizing the detailed modifications to realize further enhancement of the expression of the unprecedented unique feature of the product while achieving easy access and riding of the vehicle (Fig. 7).

The features added in the revised specification are described below.

5.1. Gauge with Switching Colors

An ambient air temperature gauge, a fuel gauge and a clock were also installed on the instrument panel. In

addition to regularly equipped functions, the side gauges present an illumination effect on their perimeters by changing the brightness like heartbeats. It is not merely a visually designed effect but a demonstration that makes the user feel more engaged to the motorcycle.

A gauge unit with automated color change function was adopted that shows the driving modes of DCT by changing the colors of the background lighting and the perimeter illuminations (Fig. 8). The colors of the background



Fig. 7 Mass production model of the NM4-01



Fig. 8 Instrument panel

lighting and the perimeter illuminations can also be set to fixed colors chosen from 25 color options to fit the user's preference (Fig. 9).

5.2. Erectable Pillion with Adjustments

The pillion was designed to be erected to become a backrest and was structured to have an adjustment mechanism for shifting in longitudinally four steps and in three angular steps. That made the best fitting riding positions available for a variety of users to provide them with an enhanced comfort of riding (Fig. 10).

5.3. Model Name Indication with Debossed Shaping

A simplified expression was applied by employing a

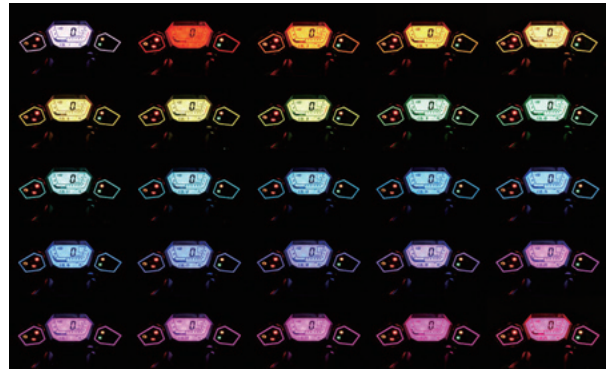


Fig. 9 25 meter color variations



Fig. 10 Upright positionable pillion (4 angular positions including 3 upright positions with longitudinal adjuster)

debossed shaping for the model name indication to associate it with a flavor of recent sophisticated products of smart phones or electric appliances (Fig. 11).

5.4. Utility Compartments

Utility compartments were provided in the right and left sides of the front fairing. In the left side container, a securing lock and an outlet of 12 volts electric power were additionally installed to enhance its utility (Fig. 12).

Furthermore, another vehicle version, which was provided with additional utility spaces in the sides of the rear cowl, was also lined up. Those utility containers were intentionally designed as undetachable parts, while they are usually detachable, to fully maintain the consistency with the mono-solidity design. By doing so, the design of this version was made express a totally different identity from the original version (Fig. 13).



Fig. 11 Embossed emblem of the model name



Fig. 12 Front utility space (Left side) (Shown in the photograph is the model for Japanese market)



Fig. 13 The NM4-02

6. Responses after Product Release

The NM4 was released at The 8th Osaka Motor Show in 2014. The survey result (in-company investigation by Honda) showed the number of responding tweets on Twitter reached 1858 and the accumulated number within 10 days on and after the release date rose to 4061 tweets. It can be evaluated that it attracted a lot of interest even though no previous information had been provided in advance (Fig. 14). Among the generations of responders, the degree of interest was high in the late 20s for males and the late 30s for female (Fig. 15).

Moreover, it was noticed that a considerable number of re-tweets were from the people outside of the motorcycle businesses or from discrete individuals. This illustrated that the developed model was noticed as a topic among the people who had not involve in the communications on conventional motorcycle relating topics so far.

Regarding exterior design, opinions were distinctively separated into two groups of likes and dislikes. However, the results indicated that not a few people showed their favors on it.

These results could not be directly translated as the positive indicators towards good sales but they proved that the initially aimed objective of broadening recognitions

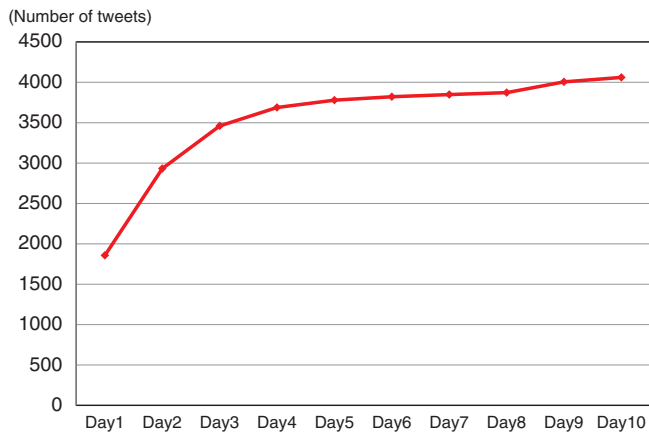


Fig. 14 Cumulative number of tweets after the announcements from public relations (from Honda in-house survey)

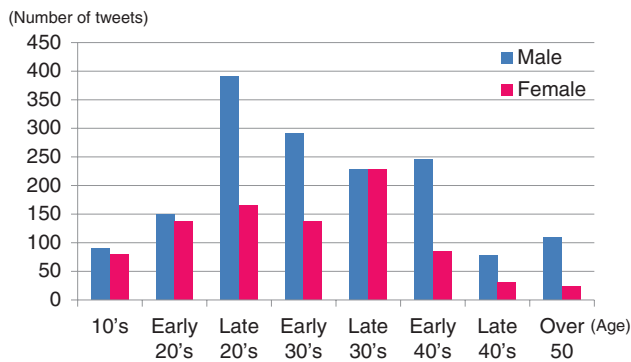


Fig. 15 Tweets number of in another age/gender (from Honda in-house survey)

among the people who did not use to be the users was successfully achieved.

7. Conclusion

The NM4 created a styling design, which could be recognized even at the first look, and a fundamental concept view, which was exceptional and did not categorized in any conventional motorcycles, by applying the factors of futuristic styling, Low & Long form, fat tires and low height seating, together with lowered hurdle for beginners' use. The expression of a novelty was successfully realized by applying Massive front styling that offers a unique silhouette and Cockpit position that offers new experiences of dynamic riding as well as its visual appearance.

We hope the development of the NM4 is contributing to make the first step towards the ultimate goal of exploring new customers in the market.

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