

Styling Design of 2022 Dax 125

Yuichi YOKOYAMA¹Takamasa SUMASU²Worawit CHAWALITNIMITKUL³

ABSTRACT

Upon an initiative from Honda's Thai Office, the Dax 125 has been developed as an addition to the "Redesigned Classic Models" such as C125, Monkey 125, and CT125. Since the combination of its small-diameter wheels and horizontally extended frame body resembled the long-bodied, small-sized dog, dachshund, the original DAX was named as DAX Honda in Japan. When designing the style of this model, the T-shaped pressed steel frame having a long beam extending from the steering head pipe to the seat was deemed as the key element to emphasize its uniqueness. We imagined various types of use such as "going out for a ride like taking a lighthearted walk wearing sneakers" and "enjoying a ride with family members on weekends." With that in mind, we chose "family & leisure sneakers" as the key words for the development of the product. In this project, rather than producing a clay model, we have used VR, which allows virtual viewing of the model from 3D CAD data, to acquire an image picture of the entire vehicle from an early period of styling design. Although it was a challenge to maintain the original product image in the new product having a larger engine displacement and higher performance, with the efforts of project members in Thailand and Japan focused on the common goal, the beautiful new model featuring the gentle and modern taste has been realized.

1. Introduction

Recently in Japanese motorcycle market, sales are growing in the small model segment having an engine under 125 cc.

Among such models, the "Redesigned Classic Models" such as Honda's C125, Monkey 125, and CT125 are especially popular among experienced users and so-called return users who choose to ride again after a long absence from the saddle (Fig. 1).

Meanwhile in Thailand where this new model is to be sold, the motorcycle market is growing more toward the hobby use by affluent users from the traditional use of

motorcycles for daily transportation. The customization of '60-'70 Super Cub is starting to become popular among such hobby users whose information via SNS provides impacts to worldwide audience. Honda's "Redesigned Classic Models" have been increasing their presence as an instrument to demonstrate their personality (Fig. 2).

In the said circumstances, upon the proposal from the office of Honda R&D in Thailand, the design concept model of Dax 125 was produced. The Dax 125 is planned as a product to add to the redesigned classical model line up using the original DAX, which was sold from 1969 until 2003, as a design motif.



Fig. 1 "Redesigned Classic Models" of Honda

¹ Design Center

² Honda Motor Co., Ltd.

³ Honda R&D Southeast Asia Co., Ltd.

2. History of DAX

The original DAX was a global model initially launched in 1969 and first sold in America as the ST50/70, then in Japan and Europe. Since the combination of the small-diameter wheels and horizontally extended frame body resembled the long-bodied, small-sized dog, dachshund, the original DAX was named as DAX Honda in Japan.

A general motorcycle design in the days the original DAX was planned was such that had mechanical parts such as the fuel tank, the seat, and the engine, and they were individually emphasized as a design feature. With the mechanical parts hidden and contained in the pressed steel frame, the original DAX realized a motorcycle that was user-friendlier and enjoyable for a wide variety of customers. The less mechanical and easily approachable styling design was well received by various types of customers and its production was continued until 2003 (Fig. 3).



Fig. 2 Snapshot of motorcycle dealer in Thailand



Fig. 3 History of DAX

3. Dax 125 Design Concept Model

3.1. Proposal from Thai Office

The design concept model was first proposed from the office of Honda R&D in Thailand.

What triggered the proposal was the prototype model having a 125 cc engine and a pressed steel frame that a Japanese R&D engineer, who was a DAX enthusiast, was trying to develop in advance. Although DAX models were previously not sold in Thailand, they were well known by the motorcycle manias called “enthusiasts” as well as the trend-setters. They perceived a high value in the one and only character attained from the T-shaped pressed steel frame of the original DAX.

3.2. Studies of the Concept Model

We considered that the key element to impress the uniqueness of the original DAX was the T-shaped pressed steel frame having a long beam extending from the steering head pipe to the seat. That in mind, we chose “horizontal rigid line” as the styling theme of Dax 125 (Fig. 4). These words are aimed to emphasize the T-shaped pressed steel frame symbolic in the original DAX. In the process of idea sketch, various images such as the one close to the original DAX to another having a high-tech image were drawn (Fig. 5). Among the various idea sketches, the key sketch



Fig. 4 Styling concept



Fig. 5 Idea sketches

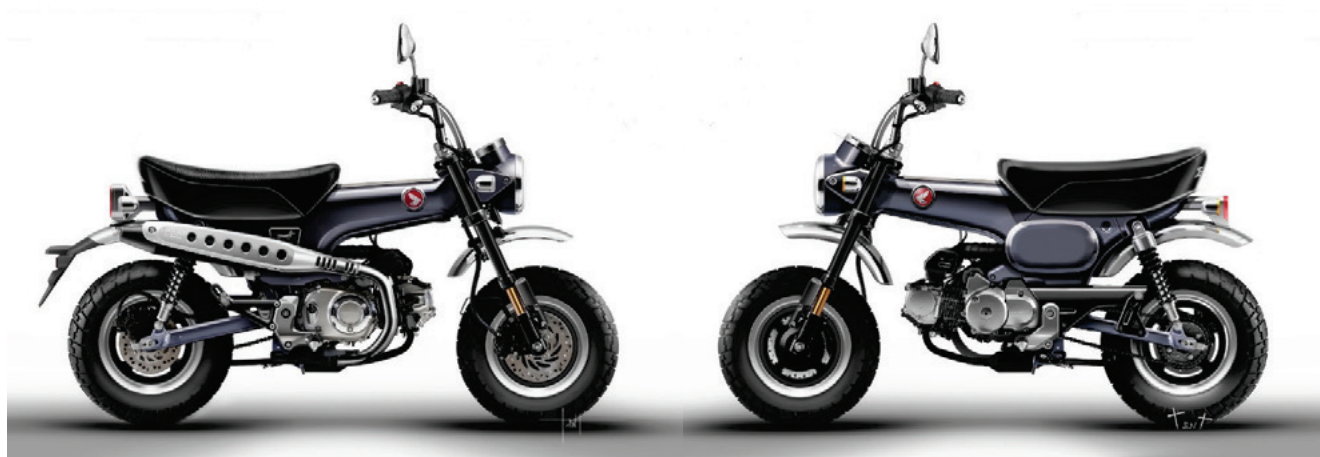


Fig. 6 Key sketches

was chosen because the original DAX image and the high-tech image were well blended in it (Fig. 6). The styling image model was produced by the office of Honda R&D in Thailand (Fig. 7).

3.3. Impressions of the Concept Model in Japan

Produced by Thai Office, the concept model was introduced to the product development team in Japan. As a motorcycle with a pressed steel frame has not been developed recently, some of the evaluation members were skeptical about the outcomes based only on the simulation. Although there were a number of hurdles to clear before bringing to a reality, the concept model had a charm that outbalanced the negatives, impressed the division upper managements, resulting in the finalization of mass-production model development. It was also decided to develop the new model in Japan because it involved a development of a pressed steel frame.



Fig. 7 Concept model produced by office of Honda R&D in Thailand

4. Development of Mass-production Model in Japan

In the redesigning of this model, the key point is how to restore the image of the iconic T-shaped pressed steel frame, which is an item that draws attention and creates user-friendly atmosphere by containing mechanical parts in it. It is an important item for realization of the one-and-only cute styling design.

4.1. Model Concept

In an attempt to realize a global model appropriate in countries in addition to Thailand and Japan, we reviewed the model concept.

We imagined various types of use including the one for a family fun on weekends while being suitable for a casual use like going out for a walk in sneakers, just like the original DAX. Thus, we have established the key words “family & leisure sneakers” (Fig. 8).

4.2. Main Target Market

Although the proposal came from the Thai Office, in addition to the limited market of hobby users in Thailand we set Japan as the main target where use of the product as a daily commuter is presumable. In the Japanese market, the



Fig. 8 Key words

redesigned classical models, i.e., C125, Monkey 125, and CT125 are popular among experienced users and so-called return users. We considered that the new model should have features to increase user options of product selection while avoiding rivalry with these three models. That in mind, we have chosen the long seat that allows carrying of a passenger in the standard trim and the four-speed transmission equipped with an automatic centrifugal clutch that does not require clutch operations. These features make the new model stand out from the existing ones (Fig. 9).

4.3. Styling Design

The conditions that should be strictly adhered to were established to maintain the styling image of the concept model and the original DAX which served as a design motif. In the said process, an icon was produced to clarify the design requirements (Fig. 10). With the icon produced, the balance and the key points of the unique styling became clearer than before. Accordingly, the T-shaped pressed steel frame, the high-mounted muffler, and the round lighting instruments (headlamp, taillamp, turn indicators) were set forth as the requirements.

Among those, the T-shaped pressed steel frame was considered as the most important style identity to emphasize the long horizontal beam that corresponds to the long body of the dog.

4.4. Studies of Styling Design by 3D CAD

In the conventional styling design of motorcycles, it was a common practice to evaluate the style using a 3D clay model after finalizing the 2D sketch. In this project, however, we elected to evaluate the design using the 3D CAD data rather than producing a clay model. Speaking specifically of the frame, the design was directly conducted on the 3D CAD without any reliance on the commonly-practiced reviewing of the design using 2D sketches.

When the pressed frame itself plays a key role of the styling design as in this model, its external shape itself directly affects the strength. In the development of a motorcycle using a pipe frame, the strength and/or the

stiffness can be adjusted by modifying the pipe diameter, gusset plate thickness and/or size. In this new model having a pressed steel frame, however, such a method cannot be taken. That in mind, we frequently exchanged the 3D CAD data between the styling design team and the function design team to achieve the attractive appearance while satisfying the functional requirements. The styling design by this method enables applications of outcomes from the analyses on the manufacturability, stiffness, strength, and crashworthiness that change on daily basis in the development process and affect with each other, as well as allowing adequate sharing of information with the functional design team. As adjustments and analyses on a surface height that should be increased or reduced had to be repeated several tens of times at an increment as small as 1 mm, this method was quite efficient.

4.5. T-shaped Pressed Steel Frame Design

The following styling design criteria were set forth to achieve the design target.

(1) Dense packaging of parts in the frame for a slim

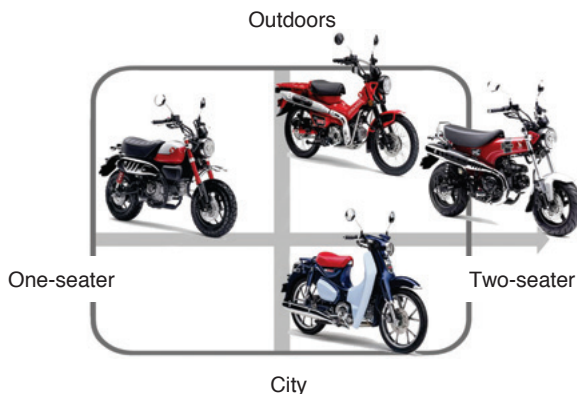


Fig. 9 Positioning map of various models

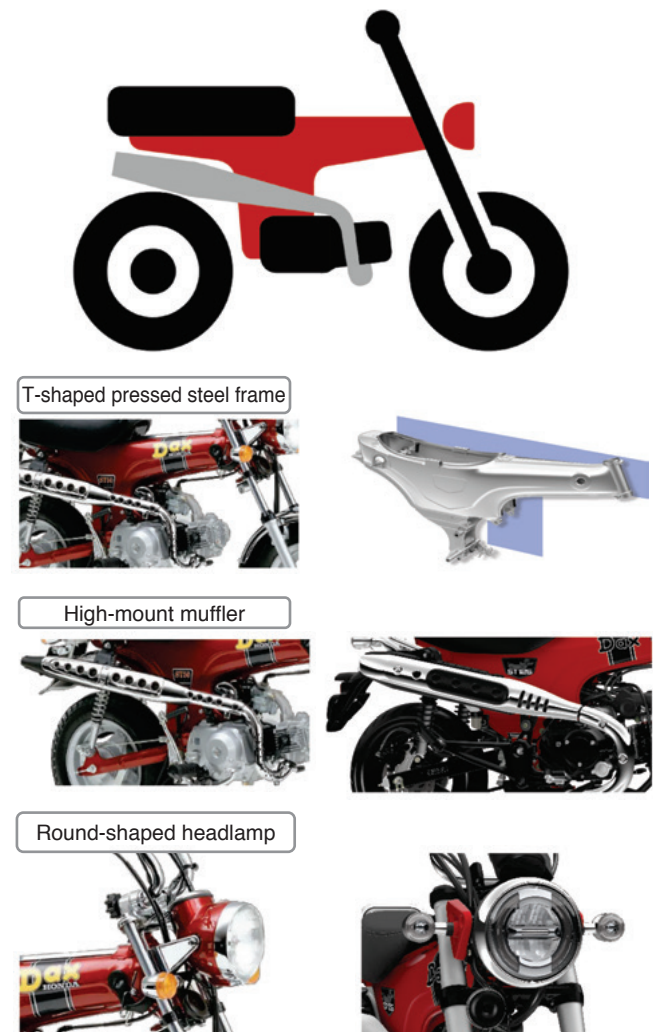


Fig. 10 Icon indicating balance of styling

appearance while maintaining an appropriate clearance
 (2) Gentle-looking surface attainable only from the pressed steel product

(1) Dense packaging of parts in the frame for a slim appearance while maintaining an appropriate clearance

A feature of the original DAX frame is such that the long and slim T-shape is clearly recognizable. In this new model, a larger number of parts than in the original DAX have to be contained in the frame due to an increase of engine displacement and ancillary devices necessary in a modern motorcycle. When compared to the original DAX having an engine displacement between 50 cc and 70 cc, the new model has to contain additional parts such as the ABS modulator, the canister, and the 3-axis IMU to detect body inclination while dealing with the increase of fuel tank capacity, air box volume, and battery size.

In the conventional method, various function development teams perform a parts layout of their own in advance. In such a method, an extra allowance has to be given to the clearance, causing an increase of the frame width, which does not allow restoration of the slim and long body of the original DAX character.

An increase of seat width resulting from an increase of the frame width hinders rider's easy reach of feet to the ground. Similarly, the high-mounted muffler, which is a key item of styling design, sticks out more toward the outside, requiring the passenger to extend his or her right leg to outside. A slim frame is important for the Dax 125 because

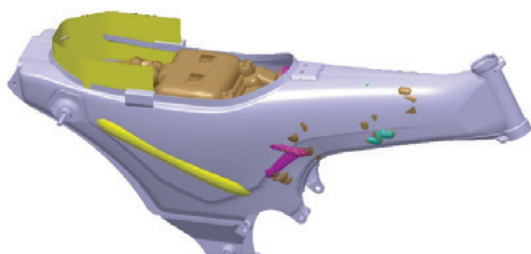


Fig. 11 Functional parts sticking out in early frame data

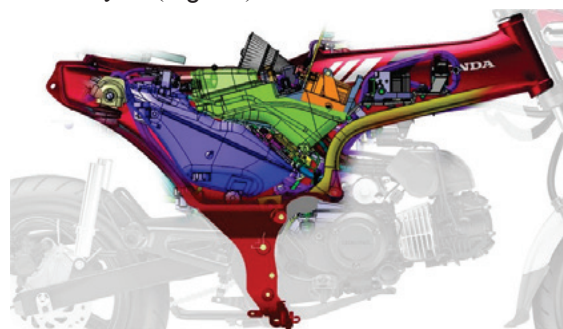


Fig. 12 Air box, fuel tank, and battery densely packaged in the pressed steel frame



Fig. 13 Pressed steel frame having an optimum volume

one of the goals is passenger comfort.

That in mind, the styling design team prepared 3D CAD data of the target frame configuration at the start of this project and provided the data to the frame body design team. The data formed a basis of component layout for various function development teams.

Among the functional part to be contained in the frame, bulky items are the air box and the fuel tank. The fuel tank having a 3.8 L capacity for convenience in daily use sticks out from the 3D CAD data of the frame provided by the styling design team (Fig. 11).

A lack of space also occurred in various other parts. To deal with these issues, the major components were located and relocated like a puzzle, and the layout was modified over and over. Along with an extensive change of layout, the styling design team also reviewed the style to come up with an optimum design satisfactory from the standpoints of function, law compliance, and style.

After several layout modifications and reviewing of the style, the layout is finalized in such a manner that the air box, the fuel tank, and the battery are densely packaged in the frame, and the electrical parts such as the ECU are stored in the side covers (Fig. 12).

The sharing of layout criteria within the teams in the early period of development contributed to the prompt addressing of issues, ultimately allowing realization of the pressed steel frame having an optimum volume as a 125 cc class motorcycle (Fig. 13).

- (2) Gentle-looking surface attainable only from the pressed steel product

In addition to the T-shape in the side view, we pursued a timeless and unique appearance only attainable from the pressed steel material in an attempt to make the product lovable and amiable for a long time for the users. Even now when models having cosmetic parts made of plastic are in the mainstream, there still are quite a few users who are attracted by the solidness and the structural charm of steel material.

Although the Dax 125 is an industrial product for mass production, we conducted studies to make the surface appear like a craft object. Here, the term “surface appearance” is used to refer to the tension and change of surface often used in the art-related industry which deals with three-dimensional objects.

In a craft object having a gentle appearance, the craftsman elaborates to create a user-friendly shape (Fig. 14). In the Dax 125, we have pursued such a surface appearance that the user can admire for a long time, and that is smooth and comfortable to touch while maintaining the requirements as a motor vehicle such as stiffness and strength (Fig. 15).

The press work of steel sheet is such a manufacturing method in that the flat steel sheet is placed between the upper and lower dies and pressed to the designated shape. As the necessary stiffness, strength, etc. are sometimes unachievable if the steel sheet is excessively stretched locally, a concave-folded portion has to be large in size. Another feature is that the entire surface needs to be bulged sufficiently to maintain necessary stiffness and strength.

Taking into account the said characteristics of the



Fig. 14 Craft object having gentleness



Fig. 15 Surface appearance that is smooth and comfortable to touch

pressed steel sheet, the frame is configured with an accent in the imaginal line running in the fore-and-aft direction, thus emphasizing the T-shape and expressing entire vehicle body's stretchiness (Fig. 16). Moreover, the modern and tight, yet gentle style has been realized by incorporating small, mechanical protrusions in the gently-curved and organic cross section.

In an attempt to grasp the final volume of entire vehicle, the shape was virtually reviewed from the 3D CAD data from the early period of styling design (Fig. 17). The shape was analyzed and modified repeatedly as many as to approximately several tens of times. Yet, it is not easy to produce a surface appearance that is smooth and comfortable to touch if the shape is reviewed only in the screen, even using the very fine images from the 3D CAD. Hence, we frequently cut out a wax model and reviewed the actual contour by touching and feeling with our hands (Fig. 18).



Fig. 16 Expression of entire vehicle body's stretchiness

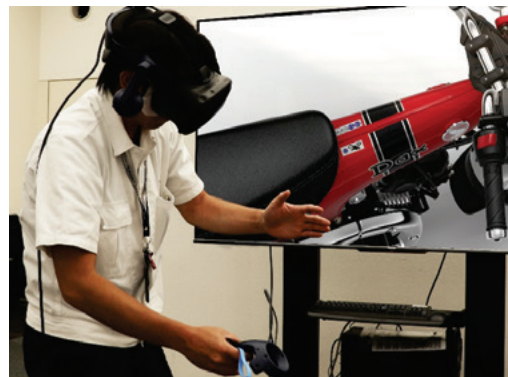


Fig. 17 Virtual evaluation using VR



Fig. 18 Wax model to touch and feel the shape

Thus completed is the T-shaped pressed steel frame featuring the dense packaging of parts in the frame while maintaining an optimum clearance as well as achieving the gentle appearance.

4.6. Welding

In the Dax 125 in that the pressed steel frame serves as a cosmetic part as it is, the appearance of welding beads plays an important role.

The beam, which stretches from the steering head pipe to the seat and is visible when the rider looks down from a seated position, is very critical from the standpoint of cosmetic finish. As the said part is composed of three pressed steel sheets, i.e., the right and left and bottom plates, welded together, the welding beads are visible from all angles.

In the Dax 125, therefore, a number of cosmetic reference samples of welding beads were produced to maintain the cosmetic quality of welding beads (Fig. 19).

To enhance cosmetic appearance of welding beads, the parameters such as the welding speed, the type and the amount of shield gas, the jig, and the torch angle were reviewed and specific conditions were established. Furthermore, the addition of finishing processes such as the spatter removal with the wire buff constantly helps ensure quality appearance of welding beads (Fig. 20).

In an attempt to help ensure necessary stiffness and strength in the steering head pipe area taking into account aesthetics, the data was analyzed in advance, thus realizing the simple yet beautiful finish (Fig. 21).

4.7. Styling Design of High-mounted Muffler

The high-mounted muffler is one of the necessities of DAX and is a critical item to produce such atmosphere in that the user feels it's good for casual rides and he/she may be able to go anywhere. The high-mounted muffler is often employed to increase ground clearance for off-road riding, and makes it easy to create light and agile, "go anywhere" image. The following criteria were set forth when designing the high-mounted muffler.

- (1) Exhaust pipe cover as beautiful as a brass instrument (Fig. 22)
- (2) Slim-looking muffler tucked along the frame

- (1) Exhaust pipe cover as beautiful as a brass instrument

As an exhaust pipe of mass-production motorcycle is machine-bent, its shape often looks mechanical because it is composed of straight lines and a bend having a constant radius. In this new model, we chose to realize an appearance like a brass instrument by creating an elegant and smooth line by hiding the exhaust pipe with the exhaust pipe cover made of chrome-plated pressed steel sheet while maintaining a sufficient space from the hot exhaust pipe.

With the pipe cover designed to match with the muffler cover, the high-mounted muffler having integrity and

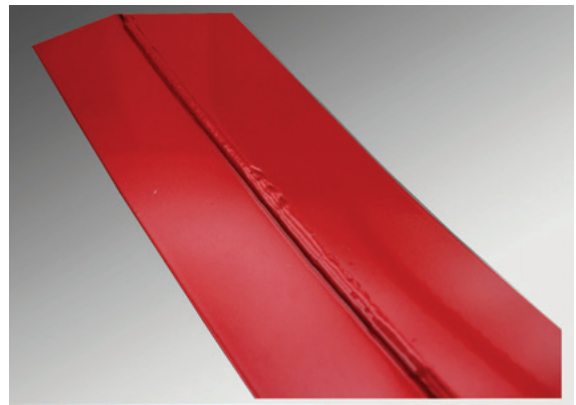


Fig. 19 Sample of welding bead appearance

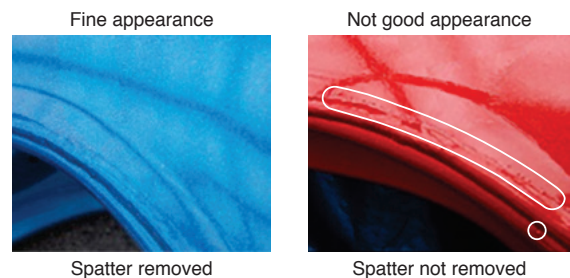


Fig. 20 Verification of spatter removal



Fig. 21 Simple yet beautiful steering head pipe area without gusset



Fig. 22 Elegant bending of brass instrument

beauty from the chrome-plating has been realized (Fig. 23). This design is aimed at being admired for a long time just like the pressed steel frame.

(2) Slim-looking muffler tucked along the frame

To keep the high-mounted muffler from sticking out sideways, the frame side of muffler outer shell is recessed to allow a space for the rear shock. Thus, the design having an integrity with the frame body has been realized. The use of black plastic protector on the muffler cover is a consideration to make the muffler look slim (Fig. 24).

4.8. Coloring

With respect to the coloring, two color options have been chosen. They are the heritage red that reminds of the original DAX of the old days with a target at return users, and the blue gray, which is a modern earth-color

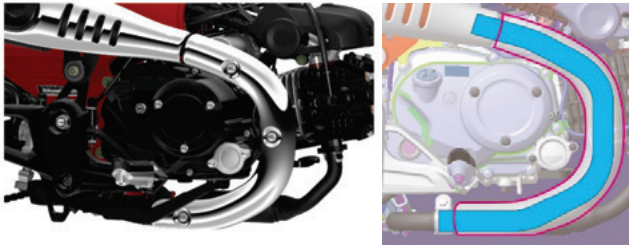


Fig. 23 Exhaust pipe cover as beautiful as a brass instrument

that young users having no knowledge of the original DAX also favor.

When the colors of past DAX models are compared, red and blue are seen frequently as the standard color of DAX (Fig. 25). Especially the red is employed in the first-generation DAX as well as in the revival version sold in 1996 in Japan. The red is also the corporate color of Honda. Accordingly, the red is selected. Among various kinds of red, the Pearl Nebula Red having a luxury image is selected.

In the meantime, young users tend to favor a quiet body color that makes the rider play the main role rather than the motorcycle. That in mind, we chose the less-colorful, Pearl Cadet Grey as a color targeted at young users.

The two colors are aimed at a wide variety of users from



Fig. 24 Slim-looking muffler tucked along the frame



Fig. 25 Colors of past DAX models

the experienced ones who know the original DAX up to the young ones (Fig. 26).

The vertical stripes on the pressed steel frame resembling a collar of dachshund are the standard graphic of the original DAX. The design having a luxury image that also satisfies adults has been achieved by the use of simple colors while maintaining the original image.

The original dachshund mark has been redesigned to make it modern while keeping the playful mind of the old days. Along with the increase of power from the engine displacement of 125 cc, the new mark is designed to a café-racer style to emphasize an uplifting image by the oval tires, the wind-swept ear, and the wearing of goggles. At the same time, the bold lines are used to highlight the character and to enhance recognizability (Fig. 27).



Fig. 26 Colors of new model: Pearl Nebula Red (left) and Pearl Cadet Grey (right)

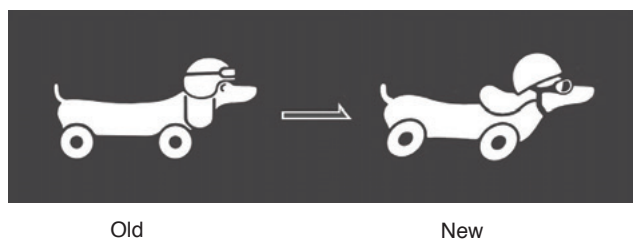


Fig. 27 Redesigned modern dachshund mark

5. Conclusion

The development of new Dax 125 is a redesigning of the historical motorcycle with a challenge in how to maintain the original image in the new model having a larger displacement engine and higher performance. Although the hurdle was much higher than we thought to package the devices in the simple and compact design to meet the latest law regulations, the goal has been achieved by employing the new styling design method using 3D CAD.

Although the roles were shared like the concept model produced in Thailand and the advance technical studies of frame and the mass-production product development conducted in Japan, each party had a strong fondness of the

Dax 125, resulting in the focusing of all their efforts into the common goal of product development. As a result, we have achieved a beautiful new model having a modern image in addition to the identity of the original DAX.

We would like to continue development toward a further evolution while monitoring how the users in the worldwide market receive the new model.

■ Author ■



Yuichi YOKOYAMA



Takamasa SUMASU



Worawit CHAWALITNIMITKUL