Issues of assessing the quality characteristics of transport-technological machines as objects of industrial design

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Abstract. The article considers the concept of “beauty” and defines design as the basic qualitative characteristic of a transport and technological machine. The generalized definitions of terms are given: concept, industrial design, product. On the example of BELAZ dump trucks, an analysis of the formed composition, according to its basic characteristics, is presented. The conclusion is given on the fundamental components that form a harmonious visual image.

1. Introduction

A modern transport and technological machine is not just a high-tech, complexly organized object, but also an artistically-technically composed composition that has a harmonious visual image. In the formation of any constructive system, expressed in a three-dimensional spatial structure, such qualities as are important: “expediency and perfection from the point of view of functioning; it is necessary to lay in it the characteristics of future usability - the ergonomic principle; economic issues and requirements related to the formal decision and to aesthetics in general should be taken into account”[1, P. 30-31]. Traditionally important in the development of special-purpose vehicles is the desire to improve quality characteristics, which are primarily associated with serial improvements in the functional and operational characteristics of the product. And this is inextricably linked with the logical organization of the design and artistic image, which is built according to the laws of "beauty." Beauty - the aesthetics of a technological machine - is associated with structural units and their interaction in the system, and its organization in the external manifestation.

Today, the automotive industry is actively developing. If we analyze the proposed concepts of various companies, we can identify priority areas and determine the prospects for the industry. In general, we can talk about the development trend in automotive design towards the creation of autonomously functioning systems [2]. Also, interest in the development of objects with individual indicators does not fall. And of course, one of the basic qualitative characteristics of the machine today is the formed visual appearance - its design.

2. Evaluation of quality made product design

By what criteria can you define and evaluate a quality-made product design - a concept or an industrial design of a transport-technological machine and, in fact, the product itself. First, you need to understand the terminology - what is a concept and what distinguishes it from an industrial design? Of course, there is no clear boundary between these concepts. But try to designate it. Briefly formulating definitions of
concepts, a concept is a single demonstration instance of an innovative product or its project [3]. And an industrial design is a constructive and artistic-aesthetic decision, reflected in the appearance of the product, the determining property of which is the ability to be reproduced in an industrial way [4]. And a product, according to GOST 2.101-2016, is an item or a set of items to be manufactured at an enterprise - that is, it is any product manufactured according to design documentation. Thus, a concept is a starting point for an industrial design if it can not only be implemented in production, but is also economically feasible and a production technology can be developed for it [3]. And an industrial design is a prototype, which in turn can become a serial product. As for the evaluation criteria of the formed artistic and aesthetic expressiveness, they depend entirely on the object. Therefore, we will understand this issue and analyze the transport and technological special-purpose vehicle and dwell on the main characteristics that allow you to form an image.

Consider the powerful BELAZ 7560 mining truck (Figure 1). Here, the impressiveness of the technical form - as a strong beginning, is opposed to the lung. Monolithic mass in contrast with the structural fence. If everything was shown to be heavy, then a vivid image would not have formed. All the tectonics of the machine are based on comparisons - the console of the visor of the body protecting the “light” frame of the driver’s cab, the smooth surfaces of the cab are opposed to the ribbing of the body. The main tool here is scale. Despite its dimensions, the machine is co-scaled to humans - the division of the monolithic mass is subordinate to the design, but their study is comparable to human anthropometry. The object contains small articulations: elements of a light cabin, elegant radiator grilles, stairs and handrails. The contrast also enhances the nuanced sound of the elaboration of certain forms for general laconicism. These are thin profiles of frontal design, small and complex, and the plastic of individual nodes and elements is ornamentally built. The dynamics of the form are expressed in the orientation - the visor, the metric repetition of the ribs of the body, their horizontal movement is outlined, in the outlined line of the cab and the general silhouette of the car. There are some disadvantages - the line framing the bottom of the cab is “broken” - not revealed and torn, the diagonal of the stairs is too active and “cuts” the shape (Figure 1, a). These disadvantages are eliminated in another modification (Figure 1, b), but the coloristic solution is not very organic. The mass of white is equal to yellow and the side of the car would have looked even more dynamic if we replaced the background color from white to yellow, since the contrast power of blue on yellow is stronger than blue on white. In general, the Belarusian “BelAZ has a recognizable, pronounced corporate identity. BelAZ is not just a trademark, it is a brand, a Soviet legacy. Corporate identity manifests itself in color and form - it is subordinate to the square. In the coloristic solution, two opposite colors work in contrast: warm yellow and cold blue; white is neutral, but full of life.

For comparison, consider the 2014 design concepts for BelAZ (Figure 2). We give a brief description and evaluate the formation of images. The concept of Babiy Dinis does not meet the established corporate identity, although the author himself claims that he took the classic “square” BelAZ as the basis [6]. What is the inconsistency? Its object is not tectonic, there is no struggle of contrasts, a game of contrasts. Color division does not obey the general system. The whole object is perceived as monolithic - black and yellow, the colors taken are close to equality in visual mass. As a result, contrast is not born. The form of an unmanned dump truck is not perceived as dynamic, due to the general structure and color scheme, it is static. Nuance comparisons are also not very advantageous, corrugation is monotonous, and does not give a game with smooth shape surfaces. Accordingly, we can conclude that the author’s application for compliance with the corporate identity has not been implemented. And the image is resolved superficially. Thus, it is impossible to talk about a well-made design proposal. The proposal of Alexander Babich, although decided in the company colors, is very controversial. Since the form does not meet the functional purpose. The object is more like an aircraft than a mining truck.
Figure 1. BelAZ dump trucks of the 7560 series [5]

a) a photo of the BelAZ 75603 dump truck; b) 3D-model of the BelAZ dump truck

BELAZ
Denis Babiya Concept

BELAZ COSMO
Alexander Babich Concept

Figure 2. Design concepts of BelAZ dump trucks [6].

Considering the general description of the formation of a visual image, we can conclude that the compositional means that form the tectonic structure are decisive. And a harmonious selection of components, gives the right solution in appearance. A tectonically organized three-dimensional spatial
structure should have a reflection of functional significance. The form should be informative, it should not "deceive" or be misleading, but should clearly indicate the purpose of the object. And most importantly, the tectonically organized form of the machine is always associated with the frame and the distribution of forces and loads in it. The shape of many objects today is a kind of decoration that is not connected with the structural frame. Also, in modern design concepts, one can trace the desire for some hypertrophy of key and iconic elements. For example, an increase in the brand name in Mercedes tractors, or voluminous wings of Volvo trucks, or massive "nostrils" in BMW tractors. But a generalized approach gives a generalized view. For a competently built and deep analytical study, it is necessary to determine the correct paths in the formation of compositionally structural laws and their implementation in design. Firstly, it is necessary to trace the overall structure of the composition. Secondly, establish the principles underlying it. Thirdly, to analyze the internal relations in the components of the system and determine their role and significance. Fourth, to see and understand the issues of achieving balance - balance in the structure. Fifth, analyze the value of compositional tools taken as a basis, which give a general visual representation of the object. Such an algorithm for the methodical assessment of the shape formation of a transport-technological special-purpose machine has been developed and described in the training manual "Fundamentals of Technical Design" [1, C 133-139].

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