Based on the People Because of the Large Snowplows Design

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Abstract. Based on the current development status of large snowplows in the market, by studying human factors engineering design as an entry point. Defects and problems that exist in the present large snowplows as a starting point, and thus to design a large snowplow. It is not only capable of multifunctional conversion, but also added more humanized design concepts, to make it better and more convenient to be used and meet the needs of different environments.

Introduction

Large snowplows, as an integral part of daily life, it more reflects the importance of humanized design. Although it meets people's part's requirements of production and life, but in some specific conditions there are still many deficiencies. This article is to depart from the functional design of large snowplows and further improvement of large snowplows, to make it more adapted to different environment of use requirements, and strive to achieve unity of shape and function, in order to better reflect the value of modern large snowplows.

Determine the Design of the Entry Points

At present, the structure and function of large snowplows on the market is relatively single, which still cannot fully meet the requirements of different working environments. [1] In this article, the modified snowplow is different from other common large snowplows, because it has a human appearance and more perfect function of organic combination. In addition, a large snowplow must possess not only the technology also the function of science aesthetics, for a rapid development of society, technology is not only important, humanized design also become particularly important, therefore, the function and humanized design as a breakthrough point, thus to meet the needs of our products.

The Main Problems of the Human Factors Engineering of the Existing Products

Human factors engineering is a new and rapidly developing interdisciplinary, involving a variety of disciplines, such as: physiology, psychology, anatomy, management, engineering, system science, science, safety science, environmental science, etc, application field is very broad. [2] Through the analysis of using process of existing large snowplows and researches to the users, summed up the following questions, and solve these problems as an important target to design the large-scale, multifunction snowplows.

Firstly, aiming at several problems which exists in large snowplows on the market, such as the singleness of the way of clearing snow and the function, a snow cleaning which is not thorough, snow weather and night lighting, body design range, charring onion-depth investigation and analysis, more reasonable arrangements on the appearance of large snowplows, more man-machine solutions in the details, making the snowplows more suitable for different environments.

Secondly, keeping keep good coordination between the part and the whole of the snowplows, and make large snowplows more complete.
Design Points Large Snowplows

The Conception of Integral Appearance

Snowplows in people's daily life is indispensable, especially on winter, and in the north. Although its overall shape after decades of development has been finalized, but relatively bulky, looks not very smart, so in the shape of a change in the tire has also been changed. The snowplow overall shape is referenced to the style of the existing large bulldozer, crawler design, the entire cab can be 360 degree rotation. It can do not turn around and drive before and after. The biggest difference is that it has two shovels which can transform the working angle, so that it can shovel the snow two times during one driving time. The driver's cab top with yellow warning lights, you can alert the other people [3]. As is shown in Figure 1.

![Figure 1. The appearance of snowplows figure.](image)

The Concept of the Snowplow's Snow Shovel

Now, on the market most of the snowplows have only one shovel and the shovel work in only one direction. Its work effect and work efficiency is not very satisfactory. Considering the above factors, we need to design a snowplow that can shovel snow in front and behind, also can improve the work efficiency, also can work in more than one angle. The previous one-piece snow shovel is divided into three parts, in the middle of the big, on both sides of the small, to connect with shaft, with hydraulic pressure as power, to design a snowplow that can be moved up and down or moved right and left, both sides can also fan rotation, so it can meet different needs. Behind the snowplow to add a snow shovel, reached the purpose of increasing efficiency, as is shown in Figure 2.

![Figure 2. The snow shovel.](image)

The Concept of the Snowplow's Crawler

Now we see most of the snowplows landing site on the rubber tire, which touches the ground of the area where is small and the tyre wear is also very big, and this will cause the service life of the snowplows to shorten or will need frequent replacement tires. It will also west a lot of manpower and material resources and have a bad impact on the social environment. However crawler design, increasing the snowplows and ground contact area, reducing pressure. Its friction and power are greater. Metal texture of the crawler's service life is greatly prolonged, while also extending the
snowplow service life, saving resources. [4] When the pavement snow completely frozen, the snowplow body weight with crawler can play a role in a crushed ice, making the shovel snow more convenient. As is shown in Figure 3.

![Figure 3. The snowplows' crawler.](image)

**The Concept of the Snowplow's Driver's Cab**

The multifunctional large snowplows, except for the function, the use of the existing popular simple design style, making the whole design looked simple and elegant. When used as a large snowplows, the design of this type of bird's nest increases a sense of warmth and child's comfort. In addition, when converted into seats, it allows users to enjoy the new feeling comfortable that half open seat brought. It will also bring a surrounded by private and comfort feeling. Now snowplow is a truck or lorry as a model, the cab is fixed and immobile. [5] Only through the rearview mirror to see the back situation of the car. This is inconvenient for the driver to operate. So we can try to replace the cab with a metal frame and tempered glass. Only in this way can expand the vision of the driver's driving, improve safety and comfort. The cab can rotate 360 degrees. It's convenient to drive around and don't need trouble the U-turn. It's also more suitable for the driver driving a snowplow operations.

**The Concept of the Snowplow's Warning Lights and Rearview Mirror**

As a public service machinery, the snowplow’s warning light is essential. It can remind others in the work, pay attention to safety and slow down. Then the mirror can let the driver has a preliminary understanding of the body behind the road conditions and snow clearing effect. Yellow and flashing lights’ warning ability is stronger, improving safety; the rearview mirror instead of the original plane mirror. Convex mirror can make rear vision more open and improve the safety.

**Human Factor Analysis**

**Dimensions**

A product of the most simple, if designers do not have dedicated to the design, it will also bring inconvenience to consumers. Ergonomics is a subject of researching the relationship between people and products and the interaction between the machine and the environment and making the products and environment in harmony with others [6]. In the design of large snowplow, some of which the size of the parts need to considering the actual situation of drivers in driving snowplows, the snowplows and the driver's overall analysis and comparison, considering the overall coordination, appearance and stability. Snowplow’s size: the total length of snowplows 4900mm, width: 2800mm , the length of the body of the car: 3200, the height of the whole car: 2500mm , the height of the bucket: 800mm, as is shown in Figure 4, Figure 5.
Material Analysis

Large snowplows requirement for body material is higher than other products, through the analysis of the different metal material contrast, ultimately selected material is a kind of call PDCPD poly 2-ring pentadiene heat resistant unsaturated polyester resin as snowplows body cover, it is a new kind of resin material, low density, not easy to fracture. Using A kind of laminated glass as snowplows windshield, toughened glass is used as around, can damping hot, better protection for the driver.

Color Analysis

Large snowplow is a severe social machinery vehicles. It services to the society and people and provides safe and convenience. So generally chooses yellow as the color of the vehicle, to bring people a strong visual impact. On the road, a small yellow warning card can remind people that driving the car should be pay attention to matters in order to avoid traffic accidents. From the snowplow’s colors we can also get some enlightenments: body does not necessarily be yellow, it can be made of grey or silver. But around the driver’s cab, we can use other colors, such as yellow, blue. In the warning to the people, at the same time also can form a global and local contrast, making people feel comfortable.

Conclusion

Through the investigation and study of large snowplows, we improved design of large snowplows. Under the premise of the snowplow’s snow removal function remains the same, doing some researches and discussions on problems that exist in the vehicle body or driving, and then improves it, make it more perfect and be able to meet the needs of society. With the development of the times, people pay more attentions to the traffic. The large snowplow’s market will become more and more important. But due to snowplow’s quality and quantity, it still can’t meet the needs of society. I believe that the improvement in the design of snowplow will expand the market benefits. Therefore, under the guidance of the "people-oriented" design concept, humanized design is not only the needs of social development but also the future design trends.
References

[1] Zhao Decheng. Product design - from concept design to the implementation of the form, 2010.


