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Research Article

The Application of the Art Design Method in the Appearance Improved of Pumping Unit

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Abstract: The appearance of the pumping unit was improved by the industrial design methods in the paper, so it belongs to the combination of the petroleum machinery and industrial design field The appearance of the pumping unit was improved by the bionic design of art design methods, with the analysis of dynamics and mechanics the practicality and safety of the improved pumping unit were verified, The original pumping unit model and the improved model of pumping unit were established by the software Solidworks, and imported into the mechanical analysis software Ansys, and the stress and deformation of the beam, the donkey head and support of the original type pumping unit and the improved Lu type pumping unit were analyzed, and the final rendering was produced by 3dmax. According to the analysis result, the stress and displacement of the improved pumping beam and support were slightly larger than the original pumping unit, but from the point of actual values, the improved pumping beam and support could satisfy the intensity and the rigidity the requirements, within the scope of the normal safe use, and can be used in production. the perfect combination between mechanical and art was achieved, the feasibility of using the art design method in the petroleum petroleum mechanical product design process was verified. The results showed that the art design method is used in the design of the petroleum petroleum mechanical product appearance is completely feasible. The environment was beautified, the man-machine relationship was improved by the products with good appearance and the viewers were pleasant, the demand of spiritual culture was met, what was more important was that the level of modern social material culture could be improved, the perfect combination of science and technology and cultural art was realized. The art design method is used in the design of the petroleum mechanical product appearance is completely feasible. The environment was beautified, the man-machine relationship was improved by the products with good appearance and the viewers were pleasant, the demand of spiritual culture was met, what was more important was that the level of modern social material culture could be improved, the perfect combination of science and technology and cultural art was realized.
Keywords: The art design method; Pumping unit; Petroleum mechanical product.

INTRODUCTION

The art design method is an important design in industrial design, it refers to using the means of art, in accordance with the laws of aesthetics, to modeling the industrial product, to design high quality and beautiful, comfortable and convenient, affordable products, to make the products with a beautiful feature of artistic expression under the premise of guarantee function. With the development of domestic industrial design, art design has become an important part in modern industrial product design and it plays a very important role in improving the product's material and spiritual function. In recent years, a large number of domestic enterprises attach importance to the art of product modelling design, has obtained the remarkable economic benefits, opening a new situation for the development of new product design.

THE FUNCTION OF THE ART DESIGN METHOD

The art design method has a strong economic function. The main material function of industrial products is based on the function of technical performance. For example, a car with an ugly shape and inconvenient operation, unreasonable space design, although it has a basic technical performance, but it can't satisfy the requirement of the safe and comfortable ride and aesthetic requirements of appearance, it is likely to lose its economic value because of neglected. Industrial design not only have the effect of economic value increased, at the same time, all kinds of industrial products with pleasant appearance shape, color, surface act the role of the surface texture and comfortable, not only to reflect the function of its material better, but also to beautify people's life and production environment. Industrial product design as a kind of objective form, is involved in the spiritual life of people, enrich the people material and

spiritual requirements, and make people living, working, studying in the elegant and comfortable environment with pleasing eyes, is not only beneficial to health of body and mind, improve the production efficiency, but also makes people feel beauty, educate people about beauty subtly, cultivate people's thought and sentiment, promote the social construction of spiritual civilization, and this is a reflection of its mental function.

The application of the method of artistic modelling design method in the petroleum mechanical product design

For a long time, the performance and price are an important aspect of success for petroleum mechanical products, but in the era of the development of science, culture and art, people's need petroleum mechanical products not only solve the problem of "have" and "no", and but also the demand of the product on form design, color and texture coordinate, and beauty with the environment is higher and higher. And a product that can meet people on aesthetic psychological appearance also should cause the attention of people. So today the design of petroleum mechanical products is not only to ensure that products are useful on the geometry, and its appearance also should continuously be designed with the elements of artistic in the modelling method, to make structure creative and appearance beautiful, in line with the modern aesthetic, to meet the spiritual demand of people on the product. This would not only improve the artistic value of petroleum mechanical products, at the same time also can make the long cold man-machine relations improved, reduce the distance between the man and machine, enable people to work and live in the elegant environment. More importantly, compared with similar products under the premise of the same function, petroleum mechanical products with a new art form will be in the market competition, to secure a position..

The application example of the artistic improvement design on the petroleum mechanical product

The pumping unit was a large mechanical recovery equipment widely used in oil field, its function was strong, its structure was complex and dangerous, users who faced it felt fear, and with no artistic value. At present, the pumping unit used in oil field was mainly decided by the technology and structure, its shape and color was single, flat, and poor coordination with the environment. In this paper, the bionic design of the art methods was used to improve the its appearance based on the conventional 3 type pumping unit, on the premise of guaranteeing function.

The improvement design scheme of the pumping unit

Design scheme was based on the 3 type pumping unit, the donkey head, beam and support were mainly designed. In the process of sketching map, the bionic object was the deer in nature, because the deer in China had the same pronunciation with the word ”Lu”, it meant propitious and promotion. The concept of the appearance design for pumping unit was from the animal, the deer (figure 1), because the connection structure between the donkey head and beam of the pumping unit was similar with the morphology of deer and deer head, antlers were eliminated, the donkey head was designed and looked like the deer head, the beam was instead of deer, the haunch were abstracted, and designed with the pumping unit support, figure 2 was finally scheme of the Lu type pumping unit. The appearance of the improved Lu type pumping that was designed with bionic design method was novel and beautiful, the overall shape is a symbol of hope and yearning for achievements and future. Senior officials and high government pay had always been the pursuit of people all around the world, hoping that the improved pumping unit could motivate people who worked, lived around it, and saw it to work hard and achieve their ideal, ambition, and get a promotion.

Fig. 1 Deer in nature

Fig. 2 The sketch of the Lu type pumping unit

The movement and dynamics analysis of the improved design of pumping unit

In the process of improving design, based on the 3 type pumping unit, linkage size remained the same, under the same typical operating conditions, the crank torque curves of original 3 type pumping unit and the improved Lu type pumping unit were drawn, as shown in figure 3 and figure 4.

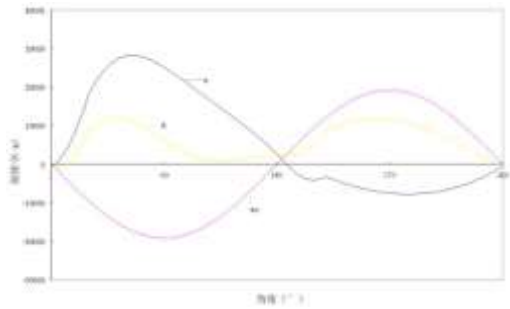

Fig. 3 The torque curve of the original pumping unit

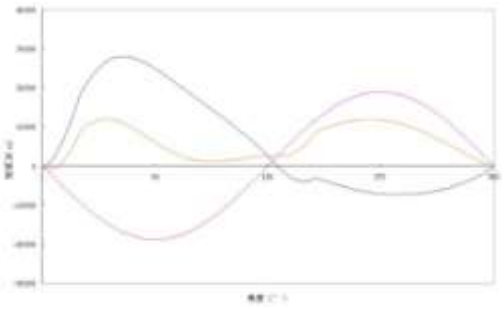

Fig. 4 The torque curve of Lu type pumping unit

From the torque curve, the maximum output torque of the output shaft of the gearbox of the original 3 type pumping unit was 12031.08, the RMS torque was 7316.51. The maximum output torque of the output shaft of the gear box of Lu type pumping unit was 11943.34, 0.7% lower than the original 3 type beam pumping unit, the RMS torque was 7311.34, 0.068% lower than the original 3 type pumping unit, so the adverse change was not caused by the improvement design of pumping unit, instead the work performance of the pumping unit was improved.

The finite element analysis

The original pumping unit model and the improved model of pumping unit were established by the software Solidworks, and imported into the mechanical analysis software Ansys, and the stress and deformation of the beam, the donkey head and support of the original type pumping unit and the improved Lu type pumping unit were analyzed, the results were shown in figure 5 ~ 8.

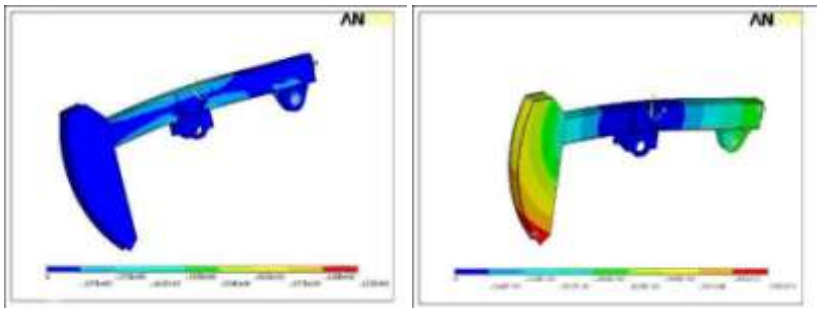

Fig. 5 The stress and deformation figures of the original pumping unit

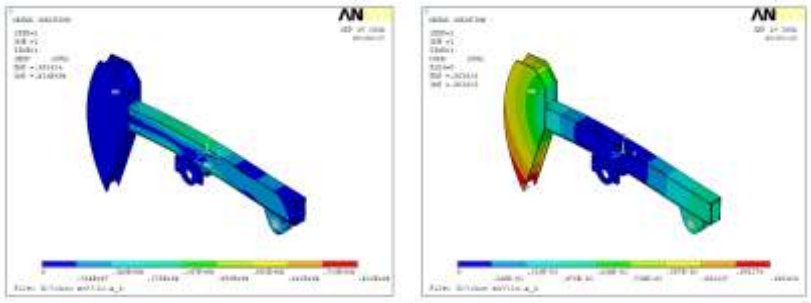

Fig. 6 The stress and deformation figures of the Lu type pumping unit

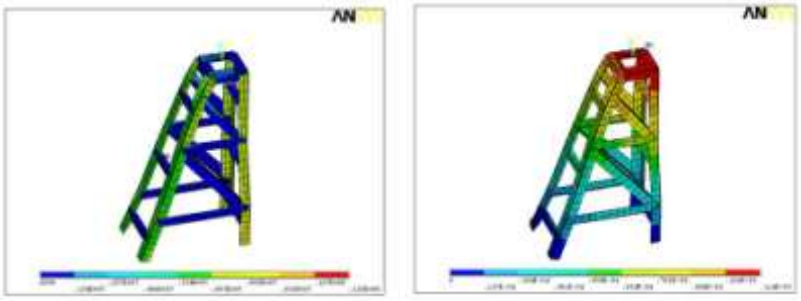

Fig. 7 The stress and deformation figures of the support of the original pumping unit

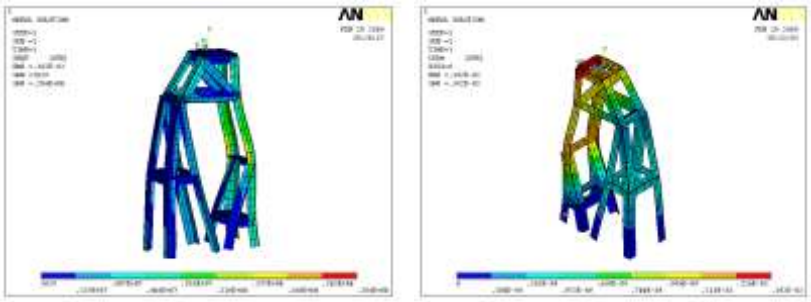

Fig. 8 The stress and deformation figures of the support of the Lu type pumping unit

From the figure5 and figure6, the maximum stress of the original beam was 68.3 MPa, the maximum stress of the Lu type beam was 83.6 MPa, the maximum displacement of the original beam was 1.476 mm, the maximum displacement of the Lu type beam was 1.436 mm. From the figure 7 and figure 8, the maximum stress on the original pumping unit support was 12 MPa, the maximum stress of the Lu type pumping unit support was 20.6 MPa, the maximum displacement of the original pumping unit support is 0.114 mm, the maximum displacement of the Lu type pumping unit support was0. 142 mm. According to the analysis result, the stress and displacement of the improved pumping beam and support were slightly larger than the original pumping unit, but from the point of actual values, the improved pumping beam and support could satisfy the intensity and the rigidity the requirements, within the scope of the normal safe use, and can be used in production.

Effect showed

The Solidworks model was built into and rendered in 3dmax, through adjusting parameters repeatedly, eventually the effect of the Lu type pumping unit was produced, as shown in figure 9 and 10. Two kinds of main body color were used on the coloring, in yellow and green. Yellow was the color of the deer itself, yellow made the bionics more colorful, at the same time yellow was honourable symbol of the ancient Chinese dynasties, was the color of the Chinese nation. Green was the color of grass, the base of the green is the abstraction of the grass in the nature, combined with the constant working state of the pumping unit in motion, the overall display effect was looked like a deer running on the grass, beautifully, lively and full of vitality, at the same time it can beautify the environment and make people feel happy to see it.

Fig. 9 the first effect of the Lu type pumping unit

Fig. 10 the second effect of the Lu type pumping unit

CONCLUSION

As people demand for products is more and more perfect, the product of the artistic design was the inevitable development trend of the future product design, especially the petroleum mechanical products, due to its functional, appearance of indifference, affinity is poor, it urgently needs to be integrated into the art design method to carry on the appearance, in order to promote the value of art and culture under the condition of the practical function of the product. In this paper, based on the conventional 3 type pumping unit, the bionic design of the art design method was used for improving design, finally the novel appearance, beautiful Lu type pumping unit was got ,and through movement and dynamics, finite element analysis the practicability of Lu type pumping unit was proved, and the final rendering was completed. The results showed that the art design method is used in the design of the petroleum mechanical product appearance is completely feasible. The environment was beautified, the man-machine relationship was improved by the products with good appearance and the viewers were pleasant, the demand of spiritual culture was met, what was more important was that the level of modern social material culture could be improved, the perfect combination of science and technology and cultural art was realized.

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