

# The Decisive Research of Materials and Processes in Product Design

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**Abstract:** With the development of The Times, product design is no longer limited to simple functional considerations, but gradually evolved into a comprehensive discipline integrating art, technology and humanities. Material and process as one of the three core elements of product design, its importance is beyond doubt. Materials and processes are the material and technical conditions of product design, and their development plays a decisive role in the change of products. This paper aims to deeply explore the importance of materials and processes in product design, as well as the creation concept of "beauty of materials and workmanship" in product design, and explore its application value in contemporary product design through the study of pragmatic aesthetics combining traditional creation concepts and the innovation of materials, processes and design aesthetics in modern product design. It is hoped that these studies can provide useful inspiration and reference for the development and innovation of product design field.

**Keywords:** Material innovation, exquisite workmanship, technical beauty, practical beauty.

## 1. Introduction

As an old Chinese saying goes, "Heaven is times, the earth is pneuma, the material is beautiful, and the work is skillful. If you combine these four things, then you can be good." This paragraph can be used as the basis for product design evaluation criteria, good design to be timely, to have the characteristics of The Times and regional characteristics, to reasonably choose the use of materials, fully explore and use the characteristics of materials, to have superb technology. As an important principle of design evaluation criteria, materials and processes are the material and technical conditions of product design, which play a vital role in shaping product shape, improving user experience and product aesthetics. The function and form of the product constitute the three major elements of product design, and the realization of the function and shape of the product is based on the material and process. Therefore, the ancient Chinese gradually formed the creation concept of "beautiful materials and skillful workmanship" in the course of a large number of practices. "Material beauty and workmanship", as the name suggests, is that the material should be suitable and the process should be exquisite. Pay attention to is to give full play to the properties and characteristics of different materials, the use of superb skills, exquisite design and aesthetic concepts, so that the properties of materials and products perfect integration, so that it becomes an excellent product. In ancient times, people's choice of materials was almost natural, and there was no mature design concept now, but the ancients still tried to pursue the combination of craft and beauty, based on "dexterity" to make the works more practical and aesthetic. "Material beauty and ingenuity" is not only a simple choice of appropriate materials and techniques by the creator, but also a display of the creator's artistic views and values in the process, and in the context of the collision and integration of contemporary multiple artistic concepts, giving it stronger vitality.

## 2. The Performance and Function of Materials and Processes in Product Design

Materials determine the form and function of products to a certain extent, and the development of materials and processes plays a decisive role in the transformation of products. For example, the design evolution of a chair has experienced the development and application of natural materials, processed materials, synthetic materials, composite materials and smart materials. In this process, craftsmen and modern designers make full use of the performance characteristics and processing technology of different materials to design ideas, and develop products with different styles (Figure 1).



**Figure 1.** Chairs of different materials and processes

The chair design in the above picture includes both ancient Chinese chairs and Western modernist chairs, both reflecting traditional craft designs and new materials and technologies.

These chairs are different in shape, but they all reflect the beauty of the combination of materials and technology in different historical periods. In ancient China, traditional culture pursues modesty, so solid wood chairs also show a dignified posture. Craftsmen use superb woodworking technology to give the chair a soul. With the emergence of modernism, designers made full use of the technical characteristics after the industrial revolution, using the combination of metal bending process and leather soft bag, reflecting the technological innovation under the background of The Times. Gradually, people make use of the widespread use of plywood bending process, reflecting another progress in material technology, but also expressing some environmental protection concepts, and the red chair we see uses the plasticity of chemical plastics to make a changeable form, which provides more possibilities for our modern aesthetic and mass production.

### **2.1. The representation of materials and processes in design**

In product design, the choice of materials directly affects the appearance, texture and performance of the product. Different materials have different physical, chemical and mechanical properties, so it is crucial for the designer of the product to choose the right material. The characteristics of the material determine the manufacturing process and processing method of the product, but also provide designers with inspiration and limitations for creation. Designers need to fully understand the properties and characteristics of materials in order to better play the advantages of materials and achieve the design goals of products. Closely related to the material is the process technology. Process technology is the key step of transforming materials into final products, which includes the processing, molding, assembly and other processes of materials. Different process technologies have different requirements for materials, some materials are suitable for a particular process, and for another process is not suitable. Therefore, in the process of product design, designers need to take into account the matching between materials and processes, and choose the appropriate process technology to realize the design concept.

Design is the integration of materials and processes to achieve the final presentation of the appearance, structure and function of the product. Designers need to consider the characteristics of materials, process limitations and market needs, creative design and program planning. Design is not only the pursuit of aesthetics, but also the comprehensive embodiment of functionality, practicality and user experience. Therefore, designers need to take into account the impact of materials and processes on product design in the design process, find the best balance point, and achieve the perfect combination of product design and manufacturing.

### **2.2. The influence of various material configurations on product design**

In modern product design, the configuration of various materials is often used to achieve richer product forms and better performance. The configuration of diverse materials can give full play to the characteristics of various materials and bring more possibilities and inspiration to the design of products. For example, metal materials are often used for structural support and shell packaging of products, plastic materials are often used for exterior parts and internal isolation parts of products, and rubber materials are often used

for seals and shock absorbers of products. Through the rational allocation of these materials, the functional partitioning and performance optimization of the product can be achieved, and the overall quality and competitiveness of the product can be improved. In addition, the configuration of various materials can also achieve the beauty of the form and harmony of the product. To achieve formal beauty and harmonious beauty, designers need to consider the choice of materials, the use of technology and the design of creativity, to find the best design scheme and implementation. In this process, as a designer, we first need to fully understand and be familiar with the characteristics and application range of various materials, and choose materials suitable for product design. For example, you can consider the texture, color, transparency, strength and other characteristics of the material, as well as its compatibility and complementarity with other materials. Secondly, it is also necessary to make reasonable use of process technology to transform the design concept into the actual product form and structure. Different process technologies have different requirements for the shape and structure of the product, and designers need to choose the appropriate process technology to achieve the design objectives according to the design requirements of the product and the needs of the market. Finally, designers need to exert their creativity and imagination, through innovative design concepts and formal expression, to achieve the beauty of the form and harmony of the product.

## **3. The Importance of The Creation Concept of "Beauty of Material" and "Skill of Work" to Product Design**

Materials and processes are the basic elements and basis of creative activities, in the material material is extremely rich, the rapid improvement of technical conditions at present, designers have more space for the choice of materials and processes, while the modern design environment is increasingly complex, people are more knowledgeable, which also puts forward higher requirements for designers' aesthetic and design skills. Excellent product design should consider not only the appearance and texture of the product, but also the function and performance of the product. Good aesthetic value can enhance the brand image and market competitiveness of products, stimulate consumers' desire to buy; The excellent utilitarian value can meet the use needs and experience of consumers, and enhance the user satisfaction and loyalty of the product. In product design, aesthetic value and utility value do not exist in isolation, but complement each other and promote each other. Good product design should not only have excellent aesthetic effect, but also have practical function. Through the unification of aesthetic value and utility value, the comprehensive benefit of products and the promotion of market competitiveness can be realized. But in some cases, the aesthetic value and utility value of the product may have certain contradictions and conflicts. For example, there may be a choice between the appearance design and the functional layout of the product, and trade-offs between the two need to be made. In this case, designers need to find the best design scheme and implementation according to the positioning and market demand of the product, considering the aesthetic value and utility value.

### 3.1. The importance of process technology in product design

Technical beauty refers to the aesthetic expression of the technological level and manufacturing technology embodied in the process of product manufacturing. Exquisite technology can not only improve the appearance of the product texture and process grade, but also enhance the use of the product function and market competitiveness. First of all, the product process is the guarantee of product quality; Secondly, advanced process technology can improve the performance of products. Modern consumers have increasingly high requirements for product quality, and they hope that the products they buy not only have good appearance and texture, but more importantly, excellent performance and reliable quality. Excellent technology can ensure the manufacturing accuracy and quality stability of the product, and improve the service life and reliability of the product. And through the use of advanced manufacturing technology and process means to achieve functional zoning and performance optimization of products, improve the overall performance and competitiveness of products. In the design of industrial products, the new process technology can not only make the size and structure of the material become more exquisite, bionic intelligent, but also greatly improve the development efficiency of the material, making the traditional material processing process simpler, so as to meet the production of intelligent crafts. In the fierce market competition environment, the process technology of the product can improve the cost performance of the product for the enterprise, establish a good brand image and market reputation, attract more consumers and customers, and improve the sales and market share of the product.

### 3.2. Case Analysis



Figure 2. Wood tools design

Contemporary design has great innovations in materials and processes, but too many stainless steel, plastic, chemical materials, the use of products become cold, not family, while many new materials and new technologies have also brought huge environmental pollution and waste of resources. This triggered the designers to think (Figure 2), is a series of bamboo designers designed a series of daily necessities, aesthetic, simple and practical environmental protection. Bamboo is a fast-growing plant, its growth cycle is particularly short, and bamboo has high hardness, easy deformation, easy processing, sufficient materials, low cost, natural environmental protection and other characteristics, is the general public can consume the product. At the same time, products made of natural materials will have natural wear and tear after a long time of use, which is the connection between

people and products, so the longer the product is used and the deeper the user's emotion, the more valuable it is. On the contrary, man-made materials do not have this characteristic, and people will quickly discard it because of the obsolescence of its style and the wear and tear of its material, resulting in secondary waste. Therefore, the concept of sustainable design needs to be treated in a dialectical way. It not only includes the saving and secondary utilization of resources, but also the harmony of creation is a key point, which is the hidden wisdom of creation in the traditional Chinese creation culture.

In modern product design, the practical significance of "material beauty and dexterity" is very important. Xu Hengalcohol et al in "Practical technology aesthetics" when talking about "product regularity" pointed out: "All products are based on objective laws, the selection of certain materials, in accordance with a certain structural form, through a certain process." The ancient sages have long summarized the principles of "integration" and "proper" use of various materials. Zhang Daoyi pointed out that the four conditions of "time of heaven, air of earth, beauty of materials and dexterity" are mutually compatible and indispensable. Especially in the age of handicraft, the material is taken from nature, and its fine and exquisite technology is the key to the manufacture of fine utensils.

In the modern mass production of industrial products today, due to the emergence of synthetic materials, materials are not directly derived from nature. However, the regularity of "conforming to material nature and making art by materials" is still worthy of respect and inheritance. In modern design, the "material and material requirements are beautiful, and the processing requirements are exquisite" still has practical significance. The correct choice and use of materials is directly related to whether the beauty of design can be reflected. At the same time, the engineering technology in art design also lies in how to choose and use good materials. Therefore, the "harmonious beauty" of the product is based on the familiarity and treatment of the material, that is, whether it can fully grasp, use and play the properties and characteristics of the material.

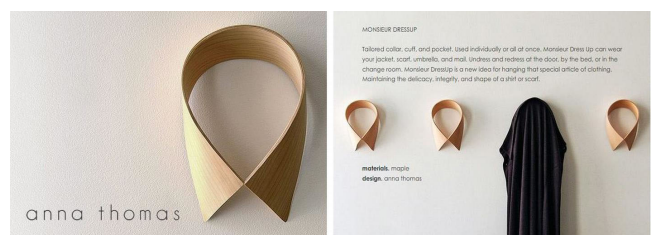


Figure 3. Wooden hanger design

Although the picture shows a simple coat hanger design (Figure 3), it makes people feel very friendly, which comes from two aspects, one is the selection of wood hot pressing process, the natural properties of wood make people comfortable and gentle, hot pressing process mature and stable, low price. Second, the modeling design is simple and rounded. Through the modeling, people can recognize its function at a glance, and the rounded modeling will not let the clothes hang for a long time. Therefore, the anthropology presented in this design is not only in the functional size and shape of the hanger and the fit of the clothes, but also in the psychological comfort, which reflects the people-oriented design concept in the design.

For product designers, they not only need to understand the chemical properties of materials, but also need to fully grasp

the physical properties of materials. The material related forming process and processing characteristics should be more familiar, only in this way, the designer can change the shape of all kinds of reasonable and ingenious, show creative play. In "Design Aesthetics", Mr. Li Chaode pointed out that "materials are called the first element of design beauty" : "In particular, designers are required to be good at playing the characteristics of materials under different conditions of use, and give materials beautiful attributes." Material is the basis of product structure and molding. Without the right material, there will be no corresponding process. The process technology is the intermediary of the ideal realization of materials and people, and there is no process modeling without process technology. Process technology takes the processing and transformation of materials as the object, and completes a specific purpose through certain production tools. It is not only a means, but also a process, is the unified product of means, process and purpose. Materials and technology are tangible and intangible carriers of product modeling, which play a certain role in design, play a certain role, and even bring a certain impact. This effect can be positive or negative, positive or negative. They shape the overall appearance of the product and build the social effect of the product. Therefore, design is the material, technology, these inanimate matter into the soul, so that it becomes a living product. Products should conform to human ideals, not destroy nature.

#### 4. Conclusion

The aesthetic concept of material beauty and craftsmanship is deeply rooted in the creation activities of traditional artisans. With the advent of the post-industrial era, the innovation of materials and processes has presented broader possibilities. As the continuation of a region and a nation, traditional culture cannot be discarded. The integration of traditional culture and industrialized society has become a major feature of product design. The combination of traditional technology and modern design has injected cultural connotation and atmosphere of The Times into the product. Modern design needs to fully consider the interrelationship between different materials to ensure that the different elements contained in the product can be interrelated and work together, so as to achieve the harmonious beauty of product design. Product design should not only respect the laws of nature, but also be good at observing and learning from the form and structure of nature, and integrate this observation and understanding into product design and production, deeply understand the actual needs of people, master the characteristics of various materials and processing techniques, and then create beautiful and practical products. With the continuous development of science and technology and the continuous progress of society, the creative concept of "beauty and workmanship" has become more and more important in the context of modern design and material innovation. Future research can further explore how to use traditional cultural resources and innovate product design concepts to meet the growing individual needs of consumers; At the same time, we continue to study the promotion of new materials and new processes for product design, explore more cutting-edge and innovative design methods, and create products that meet the practical needs of modern people.

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