

# Application of Virtual Reality Technology in Optimized Design of Pharmaceutical Packaging

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**Abstract:** With the development of modern science and technology, virtual reality technology is also increasingly refined and has begun to be applied in many industries and fields. In the process of optimization design of pharmaceutical packaging, starting from the construction and realization process of virtual reality technology in pharmaceutical packaging, the research on multi-platform parameter research, stereo molding, interactive design, virtual packaging release, etc., which is carried out mainly by Vitools interactive platform and combined with 3DMax three-dimensional software. It greatly improves the accuracy and effectiveness of optimized design.

**Keywords:** Virtual Reality; Pharmaceutical Packaging; Optimal Design; Applied Research

## 1 Introduction

Virtual reality technology through the computer simulation of the real environment, can be formed through the formation of virtual scenes and virtual objects between the formation of people, the real environment, and the virtual environment. This technology has received widespread attention and importance as soon as it appeared, and now it has become a creative tool for many technicians and designers and is used in the fields of art creation, product development, digital production, etc. The application of virtual reality technology in the optimization design of pharmaceutical packaging is a new technology and design of new fusion, which verifies the success of the optimization design scheme in the virtual space, and provides a convenient way of adjusting the optimization of the design scheme so that the design quality of the pharmaceutical packaging can be improve the design quality of pharmaceutical packaging.

## 2 Optimized design and development of pharmaceutical packaging

Explore the design and development of pharmaceutical packaging optimization, the first step is to study the content of pharmaceutical packaging optimization, as well as the design process and development management of pharmaceutical packaging analysis and research, a better understanding of the steps and processes of pharmaceutical packaging design, for the subsequent combination with virtual reality technology to do a good job as an important foundation.

## 2.1 General Design Process for Pharmaceutical Packaging Development

Different pharmaceutical companies have different requirements for design, which makes the details of the design process different, but the general process is similar, see Table 1, The general design process of pharmaceutical packaging development can be roughly divided into packaging analysis - design concepts proposed - - design stage - production samples - production - sales of six major stages. -Design stage - production samples - production - sales of six major stages. Simply put, it is the "proposed - analysis - solution" of an operational process(as shown in the table below).

It can be learned that the optimization process of pharmaceutical packaging design is more cumbersome systematic engineering, and at present, to achieve the desired results of the ideal science, the design process adopts a more orderly way of parallel engineering design management.

**Table1.** Design flow

point	element	
Packaging analysis phase	Analysis of the original packaging (appearance, functionality, added value, etc.)	Demand for reasons for consumer purchases or reasons for non-purchases
Design concept phase	New technological directions, market demands and consumer needs	Market research, data collection, determination of design direction, specification of design requirements
Production Preparation Stage	test experiment	Prototyping, functional testing
production stage		Mold processing
sales phase		Packaging display, promotional advertising

## 2.2 Pharmaceutical Packaging Design Development Management

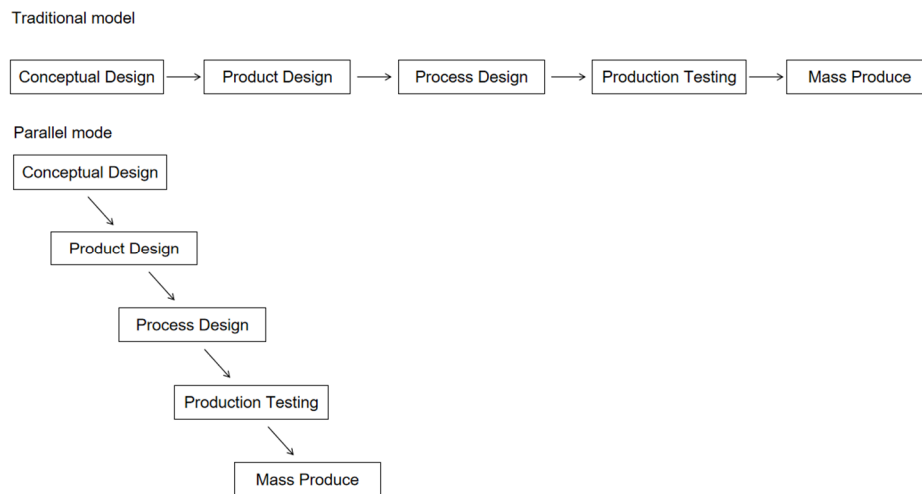
In pharmaceutical packaging design and development management, parallel engineering is a very fast management method, The most important feature is to optimize the sequence of the design and development process can be evolved in parallel.

In traditional serial engineering, the model is that the more detailed the division of labor, the higher the efficiency of the work, so the serial method is the whole process is subdivided into several steps, with each department and individual doing only a part of the content, and is relatively independent of each other, after the completion of the work of the results of the results of the transfer to the next department, the formation of product concepts are not necessarily complete and uniform. This not only results in a long development cycle but also higher costs. Parallel engineering, on the other hand, is to be oriented to the entire process or object, emphasizing that designers should not only consider the design, but also think about the design of the process, manufacturability, producibility, maintainability, etc., and consider the cooperation between other parts when designing a certain part. So that Each design stage can evaluate the object, find problems, and then quickly adjust and propose improvement methods

to ensure the quality and consistency of the design. Through comparison, it is obvious that the use of parallel design can greatly shorten the design cycle, reduce costs, and make good communication between designers and engineering, sales, and design of drugs to ensure that more in line with market demand.

Through Figure 1, it can be found that the use of parallel design can greatly shorten the design cycle, reduce costs, and enable good communication between designers, engineering, and sales, the design of drugs to ensure that more in line with market demand.<sup>[1]</sup>

At present, under the development of science and technology and the market, the field of pharmaceutical packaging development in the continuous introduction of new technologies such as computers, networks, information, etc., in which virtual reality technology to update the design means is an important aspect.



**Figure1.** Parallel vs. Serial Design Comparison Chart

### **3 Feasibility of Introducing Virtual Reality Technology for Pharmaceutical Packaging**

#### **3.1 The concept of virtual reality technology**

"Virtual Reality" is derived from the English "Virtual Reality", referred to as VR technology. Virtual reality technology is a comprehensive technology integrating computer technology, sensing technology, human psychology and physiology, and other cutting-edge technologies and theories, which is through the use of computer simulation systems to simulate the integration of visual, auditory, tactile, and other virtual environments, the user needs to use the necessary equipment in a natural way to interact with the objects in the virtual world, to provide users with multi-information, three-dimensional dynamic, interactive simulation experience, thus generating immersive and realistic feelings and experiences. Simulation experience, to produce immersive real feelings and experiences.

### **3.2 Application Advantages**

Virtual reality technology is a kind of science and technology that simulates the simulation world through the computational simulation system, which has been gradually applied in various fields, and also includes the design of pharmaceutical packaging, mainly has the following application advantages:

1. Visualization design. Virtual reality technology can present the designer's conception in a three-dimensional way to help designers see the effect of the design scheme more intuitively, and can be optimized and adjusted through the virtual environment of the pharmaceutical packaging, check the packaging effect at any time, without spending a lot of time and cost for sample production. The advantages of visualization design can not only save time and cost but also improve the efficiency and accuracy of the design.
2. Interactive design. Virtual reality technology can interact with the user using touch devices, designers can interact in the simulation environment, and optimize and adjust the packaging through posture and movement, This interactive design improves the efficiency and creativity of designers, but also improves user participation and increases the sense of experience.
3. Reduce waste. Traditional pharmaceutical packaging design requires a large number of samples, which not only leads to an increase in costs will also has a certain impact on the environment, and virtual reality technology through the digital design method, greatly reducing the traditional way of wasting resources.
4. Optimize the production process. After the completion of the pharmaceutical packaging design, virtual reality technology can transfer the design files directly to the production equipment, you can directly carry out the production, the direct output method can reduce the human factor errors in the production process, improve production efficiency and quality.

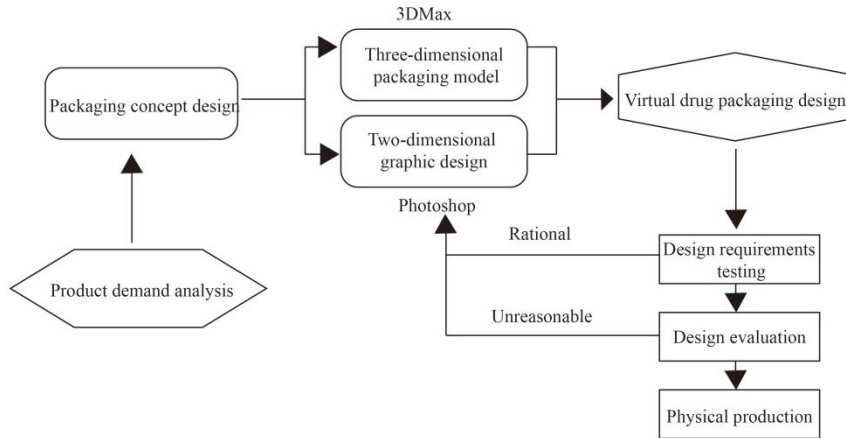
## **4 The construction and implementation process of virtual reality technology in pharmaceutical packaging optimization**

The optimized design of pharmaceutical packaging is expressed in the structure and external design, The structure needs to be shown through the process of opening, but the external design is three-dimensional and needs to be observed from all angles to truly show the appearance effect of patterns, textures, materials, and other appearance effects, and it needs to be coherent in all aspects of the design in three-dimensional space. The organic combination of virtual reality technology and pharmaceutical packaging optimization design implements the designer's conception into the specific three-dimensional virtual technology, which not only makes the packaging appearance effect more comprehensive, but also penetrates into its structure, sense of experience, and feeling of use.<sup>[2]</sup>

### **4.1 Packaging optimization design process based on virtual reality technology**

The packaging optimization design process based on virtual reality technology is shown in Figure 2, according to the positioning of drug packaging and demand for the overall optimization of the design ideas, on this basis, the design of the three-dimensional structure and graphic design, which are produced using three-dimensional software and graphic

software, respectively, and then enter the most important part of the three-dimensional model mapping and rendering, and imported into the Virtools software to complete the virtual drug packaging design. The design of the packaging, and then simulate and analyze its physical properties, modify and adjust to meet the requirements, program evaluation, the virtual drug packaging combined with the virtual environment, investigate the feedback of the user community, until it meets the expected goals, and then carry out the physical production.<sup>[3]</sup>

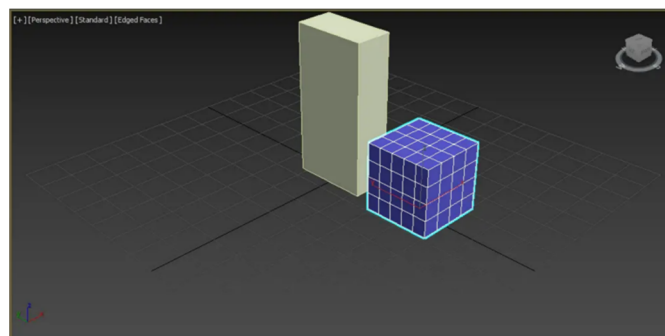


**Figure2.** Flowchart

#### 4.2 Creation of 3D model

Three-dimensional software in the field of packaging includes CAD, Maya, 3DMax, etc. However, taking into account the compatibility and other factors, 3DMax is chosen as the software for creating three-dimensional models.<sup>[4]</sup>

3DMax is the most widely used three-dimensional software, which is powerful, easier to operate, more compatible with other software, and stable in interactivity and speed. The geometric model created by 3DMax is imported into Virtools, a virtual reality technology software, for editing and other interactive actions, as shown in Figure 3.



**Figure3.** 3DMax modeling

### 4.3 Interactive display of physical properties

During transportation and use of packaging, there are always collisions, crushing and deformation, etc. The interaction function in Virtools virtual system can simulate these real situations very well, making the user experience more realistic.<sup>[5]</sup>

The 3D model is imported into Virtools software for interaction testing. To simulate the physical interactions involved in pharmaceutical packaging: collision, gravity, friction, deformation, etc. Virtools comes with hundreds of behavioral modules that allow the user to change the basic parameters of the 3D model, such as size, color, and position, by dragging and dropping the built-in modules from these libraries. Meanwhile, using the combination of modules in Virtools Physics Pack, the interaction of physical attributes such as friction, gravity, and elasticity can be generated, as shown in Figure 4. For example, collision detection is done by encircling box detection method along coordinate axes, directional encircling box detection method, encircling sphere detection method, and so on. Deformation detection is to change the coordinates of the triangular vertices of the virtual drug packaging, which makes the grid of the original space change and produces the deformation effect. Adding the interactive display of physical attributes can enhance the intuitive experience of drug packaging in different use environments and transportation.

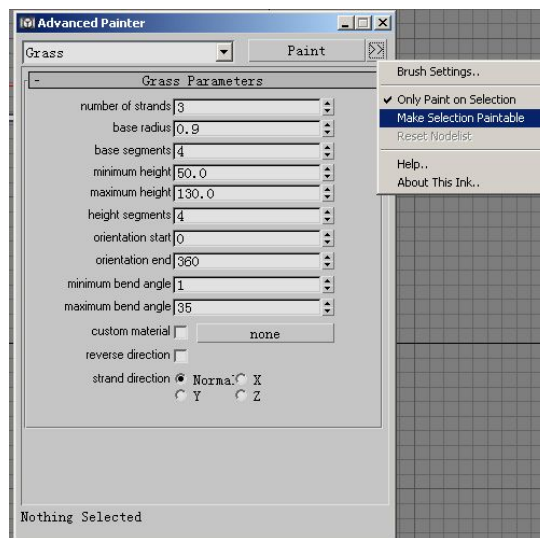


Figure4. Implementing Interactive Behavior

### 4.4 Virtual Packaging Product Launch

The web server in the Virtools virtual system is able to integrate the contents of the database, and the contents completed locally can automatically connect to the web server, which can be accessed to download the files and also operate the database to realize interaction. Finally, the optimized design can be published as a web page format and uploaded to the server to allow users to give feedback and achieve the detection of packaging optimization, so that the packaging is more in line with the user's expectations.

Establishing a distributed virtual platform through Virtools' behavioral function module allows multiple people to interact and share information in the same virtual environment over the network. The Server behavior function module is used to realize the connection between the client and Virtools Server; the Download behavior function module of Virtools is used to realize downloading; and the Database behavior function module of Virtools is used to realize the operation of the database. In order to realize multi-user real-time communication and resource sharing in the virtual environment.<sup>[6]</sup>

## 5 Conclusions

Virtual reality technology is also in the process of continuous improvement, and there is more and more corresponding software that can be used in daily life. Various industries also take virtual reality technology as an important design way for production and development, and drug manufacturers can also apply virtual reality technology to optimize the design of drug packaging, which can be used to meet the aging problem and quality and safety problems existing in the society, promote drug sales, and make the drug packaging in the ever-changing market demand to meet the needs of different consumers, to make the drug packaging more Humanization, to meet the needs of the public.

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