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Research Article

Study on Delight-oriented Design of Food Machinery

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Abstract: The purpose of this study is to explore delight-oriented design methods of food machinery, thereby working out the food machinery that has the taste of delight-oriented design, in order to make people feel comfortable and joyful in the process of using and then bring the modern life of growing tensions more fun. It specifically researches the interesting appearance, humanized operation and emotional experience. The study elaborates that the interesting appearance achieves the interesting modeling design of food machinery mainly through the shape, color and material elements; the humanized operation mainly involves the function and structure elements; the emotional experience could be built mainly through three ways, respectively through the design of imitating culture to arouse the cultural experience of users, through the systematic design to build the atmosphere and situation of experience and through the serialization and family design to meet the experience of new type consumer. And then the analysis for the humanized design of food machinery is made, based on which the conclusion has been reached.

Keywords: Delight-oriented design, food machinery, humanized design

INTRODUCTION

The development of the food machinery industry in China began in the 1970s, formed in the 80s. In the late 80s and early 90s it entered the stage of rapid development, initially forming an independent industrial system of complete category and supporting variety. Since the 80s, the average growth rate per annum of output value is about 24%. At present in our country the scientific research and teaching institutions specialized in food machinery are more than 500 and the food machinery enterprises are more than 1900, with an annual output value 13.5 billion Yuan (Chen, 2005).

Take a wide view of the development process of food machinery, it is not difficult to discover that those designed more excellently food machineries have already got away from icy cold, boring mechanical face and also got away from the characteristic of disobeying human's nature, but become full of affinity, match appreciation of the beauty and the interest of modern people and occupy more outstanding position in the competition (Jiang, 2011). Food machinery is a very important equipment in contemporary food industry. Therefore, at the premise of satisfying the function, carrying on a research, development and design to it, continuously raising its outside quality and satisfying the demand of the market competition, have became an impending problem for the industry of food machinery to deal with (Zhan, 1999).

In our country, the food machinery is given a high value as well and after the effort of several decades, our food machinery gradually approaches advanced level in the world in the aspect of function design, but in the aspect of modeling design, it still doesn't cause enough value of the insider. In the modeling design, the food machinery exists many problems, such as dull color, improper collocation; huge body, crude lines, inconvenient operation; inappropriate show device to observe etc., (Jiang and Cheng, 2010), which makes some food machineries originally have the same market competition ability as the foreign products, but because of neglecting modeling design, resulting in low outside quality, it makes the whole quality greatly discount (Jiang, 2013a).

With the improvement of living standards, food machinery has gradually tended to be intelligent, networked and greening, of which the modeling inclines to be pluralism and the emotional factors become the important factor that influences consumers to buy products. Delight-oriented design of food machinery is to make food machine emotional and make person pleasant, giving consumers relaxed, happy and humor emotional experiences, being helpful to realize the individuation and differentiation design strategy of food machinery and producing higher added value in the competition of product homogeneity (Fang *et al*., 2013).

In recent years, in China, the food machinery industry although has obtained certain achievements, relative to the development and requirement of food industry the development of food machinery is still inadequate (Jiang, 2013b). Currently the self-sufficiency in food machinery equipment in our country only reaches needed 60~70%, every year still importing a number of food and packing machinery. Large food

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factory in particular, Sino-foreign joint venture, is still using the whole production line imported from abroad.

The purpose of this study is to explore delight-oriented design methods of food machinery, thereby working out the food machinery that has the taste of delight-oriented design, in order to make people feel comfortable and joyful in the process of using and then bring the modern life of growing tensions more fun. Donald Norman, a professor of computer and psychology in Northwestern University, said that it is important for product to have good functions; it is also important for product to let people learn and use easily; it is more important for product to make person feel cheerful.

At the same time, through the delight-oriented design of food machinery, it also will necessarily improve the market competitiveness, improving the self-sufficiency rate of food machinery in China.

MATERIALS AND METHODS

The delight-oriented design of food machinery is by means of the design of food machinery, to make some aspect of food machinery, including the shape, function, texture, touch and the background and related story of food machinery, attract consumers and show a certain fun, such as elegance and connotation, innocence and romance, humor and funny, or simplicity and nature, to create a happy joyful aesthetic experience. It is not a kind of style, nor a kind of fashion and but a kind of language tool what is adopted when designers express their design thoughts and communicate with users. Its connotation and humor often are easily accepted by people (Liu, 2008).

The delight-oriented design methods of food machinery have diversification and each kind of method all has its own emphasis and characteristic.

Interesting appearance: The interesting appearance achieves the interesting modeling design of food machinery mainly through the shape, color and material elements.

Shape bionics: German famous designer Luigi Colani once said: "the basis of design should be from the truth that the life in the nature takes on and what I do is nothing but to imitate the variety of reality which the nature reveals to us." It tells us that the nature contains the nature's mystery of endless precious deposits of design.

Through abstractly simulating the external shape of life body to obtain the appearance characteristics of fun, affinity and humor, such as the cartoon characters of exaggeration, personification, the lovely animals and plants modeling and others; or through choosing the artificiality shape that has the similarity as a mock object to carry through fuzzy design, it could achieve the goal of weakening the functional definition of food machinery.

Fig. 1: Sliced noodles robot

Fig. 2: Soybean milk machine

Depending on the realistic degree of reappearing things, characteristics and features it could be divided into the concrete shape, abstract shape and image shape three kinds.

Concrete shape bionics: Concrete shape is that penetrating the eyes construction with the physiological nature reaction to feel the existent shape after cordially mapping the shape of outside world into the retina excitor. The bionics design of concrete shape has a good sense of taste, appetency and naturalness and people are willing to accept. If food machinery moderately adopts natural shape, it would bring intimacy and taste for the food industry workers (Fu, 2002), as shown in Fig. 1.

Abstract shape bionics: Abstract shape is from natural objects prototype, through generalization and abstraction, from the whole, reflecting the unique substantive characteristics of object. The simplicity of form and the generality of characteristic just accords with the requirement of modern industrial products for the simplicity of appearance shape, geometry and product semantics. Therefore, it is widely used in modern product design. It would make food machinery appearance be more concise and beautiful for food machinery designers to moderately use abstract bionics, as shown in Fig. 2.

Image shape bionics: Image shape bionics design is the advanced stage of bionics design. It is the key to find the specific relation between prototype and object, for the relevant natural objects attributes, using the manner of metaphor and symbol to reflect the characteristics of product. Image shape bionics is the inspiration of designer for nature and put this kind of inspiration through product to elucidate, thus reaching the realm of objects and me blending. It is the key to find out the internal relations between natural objects and products through the analogy with product and natural objects. If this trade-off relationship is proper, it would make the design be unity of form and spirit, preferably reflecting

Fig. 3: Automatic inflatable packaging machine

the peculiarity of product. The shape bionics is often used in modern automotive modeling design, such as SEC coupe of Mercedes Benz, Twingo of Renault and perfectly round Mazda 121, all looking like some kind of animal. Viper of Dodge likes a snake of preparing to give you critical strike and Ferrari 275 GTB looks like a cod fish. Food machinery equipment could also refer to some concept of automobile design, making its appearance show a certain style (Qiu, 2005).

Open design of color: The color is the first vision impression that an object gives person. At the moment of looking, the present thing before person is the effect of color match, that is to say, on the visual effect, the color precedes the shape and is even more attractive than the shape. The color has very strong magic power in modeling art. The different color can produce different mental state and physiology function to person and with the dissimilarity of the person's age, sex, career, race and environment, it has difference. Color not only is indispensable in the art, but also has some bizarre effects, for example the feelings and symbol function that color gives person.

In the design of food machinery, the color not only has the aesthetic and decorative nature, but also has symbolic significance of symbol. In the delight-oriented design of food machinery, the color is more important. Carolyn Bloomer, a visual arts psychologist in USA, thought that colors evoke all kinds of emotions, express feelings and even affect our normal physiological feelings (Liu, 2008).

In addition, from the classic cases about food machinery design, we can see such a characteristic, that is they make food machinery which originally has no fun in people's mind become vivid through the bold use of color. Through combining color and concrete shape, it is made to have the strong emotional color and performance characteristics, so that it will produce a strong spiritual impact, therefore, the color becomes an important factor to express fun. In use of color, good designers can blend the personal emotions, preferences and ideas of designer and consumer in it, which plays the emotional design incisively and vividly. They also make use of the combinations of different materials to increase the natural wild interest or warm affections, which makes person produce strong emotional resonance (Jiang, 2007). For example, some large-scale food machinery equipments in food factory could try to not use the aluminum alloy that flashes cold light, but use some other materials and add a few warm colors, so as not to make the workers feel unconcerned, but friendly, which could reduce the depressing feeling of workers and increase the interest in work, as shown in Fig. 3.

To carry well on the color design of food machinery the follow aspects should be considered.

Value the choice of tone: The choice of main tone of food machinery is a problem of very importance, the different tone will form different art effect. In matching color of food machinery, having main tone can seem to be to unify. The color is more little, the main body characteristic is more strong, the decorate characteristic is more good and the external form relation of food machinery is more unify. Contrary, the color matches more much, causing the color more disorderly, so that it is difficult to adjust generally, the main body characteristic is unclear and the harmonious effect is broken.

The choice of tone still needs to notice whether unique beauty. It needs to hold tight people's mental request for the color of food machinery, transform the tone of food machinery to make it produce an unusual attraction, in the meantime, increase the category of tone to satisfy people's fondness for different colors (Jiang, 2014).

Moreover, the base, the body and other big pieces of food machinery are suitable to use a low pure degree color as the main body color and use clear, elegant and clean color to unify overall situation to make the main tone definite. Using little area of high purity color to embellish to make the whole seem to be abundant, change and organic. The whole color generally uses monochrome or two sets of colors, not more than three sets of colors (Fu, 2002).

Match the national characteristic of color: National characteristics of color seems to have formed a kind of international norms, namely, when choosing color, it should avoid using the colors forbidden by countries of sale or consumers. For example, in China, people advocate red and red represents auspiciousness, optimistic and happy (Zhang, 2010). But in some countries, such as Benin, red is regarded as a negative color; In the desert region of Middle East, the nations regard green as an auspicious color, while in France, people avoid using dark green; In Egypt, people often think of the blue as a demon, while in Iraq, Turkey, blue is regarded as the color of mourning and in Syria people like blue. In terms of nation, the Mongolian love yellow, but the Miao and the Uygur avoid using yellow. Therefore, the color design of food machinery could not be separated from the objective reality and the geographical and environmental requirements. It should study the regional difference of color, fully respecting the features of love and taboo for color in different

Fig. 4: Noodle maker

Fig. 5: Cotton candy machine

Fig. 6: Orange extractor

Fig. 7: Hand dumpling machine

regions and different nationalities. It should use the color loved by people and avoid the color forbidden by people, so that the color design of modern food machinery conforms to the people's aesthetic taste, thereby loved by people and expanding market.

Match the new age request of appreciation beauty: With the progress of the age, the improvement of people's living standard and the increase of cultural art accomplishment, the appreciating beauty standards also change. In a certain period or a certain region or world scope, some colors are popular of people and are extensively popular, becoming the "popular color". The "popular color" has a strong age characteristic, as a result, in a period, it become the color which is used extensively. The color design of food machinery also should sufficiently consider using the "popular color" to accord with the age request, as shown in Fig. 4.

Creative use of color: Bold use of bright colors, break through the traditional color design of food machinery. Bright-colored color collocation lets food machinery look more friendly and fills originality and interest, as shown in Fig. 5 and 6.

Ingenious collocation of material: In addition to shape and color, material is also an indispensable element that expresses visual fun language of products, but unlike the first two, the fun language of product material comes from the people's tactile experiences to a great extent. This kind of mingling between vision and touch lets people produce rich emotional experiences in the process of using product. While traditional materials such as wood and cloth always remind of warmth and comfort, modern materials such as metal and glass will make person produce the feeling of romance and elegance, which might be called emotional associations of materials. Putting this kind of material in use of food machinery tends to make food machinery more or less take along emotional tendencies.

Indeed, design and materials are inseparable. In the design of food machinery, it is very important to know the feeling physical property of material. If we can reasonably use and arrange the feeling physical property of material, it will bring new features to the modeling of food machinery. In food machinery design, modern designers often adopt or add natural materials that can embody the warm, security and comfort feeling, such as wood, bamboo, etc. As shown in Fig. 7, the hand dumpling machine, designed to help people make dumplings, not only saves manpower, but also reduces the working procedure, of which the wood texture of crank handle not only fits the design concept of green environmental protection, but also weakens the industrial and indifferent sense of modern food machinery design. Through the adjustment and change of materials to increase the natural wild interest or warm affections, it makes person produce strong emotional resonance (Liu, 2008).

Humanized operation: The humanized operation mainly involves the function and structure elements. Here the humanization consists of the following three meanings.

The facilitation of food machinery function: By means of function bionics or structure bionics to realize the reasonability and understandability of food machinery man-machine interface, on the basis of convenient and simple practicability to build operation pleasure (Norman, 2005).

Fig. 8: Smoobo blender

The gamification of food machinery operation: By means of the ingenious structure design or technology application, it could realize the entertainment operation of usage mode. As shown in Fig. 8, the blender, of which the modeling is unique and the color is gorgeous, produces the rebound power by thrown, which prompts cell and rotating blades to operate and complete the mixing operation. Using such an interesting blender lets person fondle admiringly.

The personification of food machinery role: Designers through the intelligent technology and the application of bionic design, shape food machineries into users' friends and family, which lets the spirit joviality of users come from the mutual benefit and intimacy between people and things and not the one-way use of people to things (Fang *et al*., 2013).

Emotional experience: Emotion is mainly from the interaction and experience produced in the process of users using food machinery, having the characteristics of vagueness, dynamics and integrity, which could be built by the following ways.

Through the design of imitating culture to arouse the cultural experience of users: The design of imitating culture refers to putting the various cultural characteristics or cultural symbols into product design, making person produce association, which is the design method to produce a relationship between products and culture. Designers can extract the typical symbol elements from the traditional food culture to apply in aesthetic shape elements of food machinery design, touching user affective commitment to local culture and national culture.

Through the systematic design to build the atmosphere and situation of experience: Aim at the fuzziness of service environment and integrity of function of food machinery to conduct systematical experience design of atmosphere, realizing the barrier-free interaction between environmental elements and human elements.

Through the serialization and family design to meet the experience of new type consumer: Through the unity of the aesthetic shape elements and technical elements to show the brand advantage, providing consumers with more fashionable consumption experience and life experience (Fang *et al*., 2013).

To sum up, the delight-oriented design strategies of food machinery have diversification and each kind of strategy all has its own emphasis and characteristic. And the using design methods and concept are also different, as shown in Table 1.

RESULTS AND DISCUSSION

The humanized design is highly advocated in today's society. Only designers diligently pay close attention to people and humanity, it can touch people with the design that is full of humanitarian spirit. Delight-oriented design is an important standard that embodies the humanized design. As a chirping kettle, if changing the whistle into a harmonic whistle, it does not make person panicky for sharp whistle when the water is boiling and of course it also maximally reduces the noise harm to people. The scissors that are assembled in contrast to the conventional direction bring convenience for people used to use the left hand. The focal point of these designs lies in making more people in the society feel the warmth of the world, the love of humanity and the harmony of people and things. The rapid development of high-technology is gradually changing all aspects of human production and life. While showing the great conquest strength and incomparable intelligence and wisdom of human, it also brings person new troubles and worries and that is loneliness of human feelings, alienation and emotional imbalance. So in high-tech society, people inevitably pursue the balance

Table 1: Delight-oriented design analysis of food machinery

Design strategies	Emphasis	Characteristic	Design methods and concept
Interesting appearance	Shape	Affinity and loveliness	Shape bionics, imitating object
		Jocosity and humor	Cartoonlization design
		Lifelikeness and fun	Loveliness design
Humanized operation	Function	Conciseness	Function bionics
	Structure	Generality	Structure bionics
		Entertainment	Humanized design
			Usability design
			Intellectualized design
Emotional experience	Culture	Interaction	Imitating culture design
	Atmosphere	Fuzziness	Systematic design
	Environment	Dynamics	Serialization design
	Emotion	Integrity	Family design
	Memory	Intellectuality	

of high-tech and high emotion and the technology is more advance, the desire of balance is more intense (Jiang, 2007).

The profession of food machinery is similar to other professions, requesting people fully consider various factors including physiological and mental factors in development design of food machinery, making the operation simple, labor-saving and accurate and making the work environment comfortable and safe and making work efficiency and work quality of the man-machine system attain superior (Ding, 2005).

The food machinery is a high-tech product, of which the structure is very complicated and usually has a lot of buttons and control plank. People usually think that mastering its operation is very difficult and needing very high technique level and thereby influencing its usage. In consideration of the man-machine factors in design, the humanize control panel should be adopted, which can draw near the distance of person and machine, if considering the design of operation panel from the point of view of person's cognition, it is easy for operator to learn, understand and do a reaction. As a machinery of processing food, in addition to having a high technique, it should infuse deep sensitive cognition into the product. Do not forget giving more concerns and more popular and convenient operation method to operator in design, which makes the product hommization and gives operator with affinity. For example, in the noisy environment, the distinguishing ability of eye to the warm color descends, but the distinguishing ability to the cold color (particularly green) raises on the contrary, which should cause a value in the design of indicating and control device of food machinery. Only hard study in the cognition design of a man-machine interface, endowing thoughtfulness and affection in design process, can raise the friendliness of the product interface and the market competition ability of the product.

The workbench and the operation panel of food machinery are to be provided for person to operate, so their size, position and high should all accord with the size of "average person". For example, the size, position and shape of hand handle in the door of Japanese product all consider the man-machine factors and the diameter much took to be suitable for the size (4~5 cm) that the Asian hand holds and the position of hand handle is in the center partial to the next position in the door, which is as far as possible to make the wrist keep natural state and keep the hand and the small arm in a line. The operation panel is a main interface for man-machine interaction, where person conducts the careful operation of information-based control type, so its position, tilt angle, upper show, the size and position of control device all should make the person observe and operate in a comfortable, accurate and efficient working condition, as shown in Fig. 9 and 10.

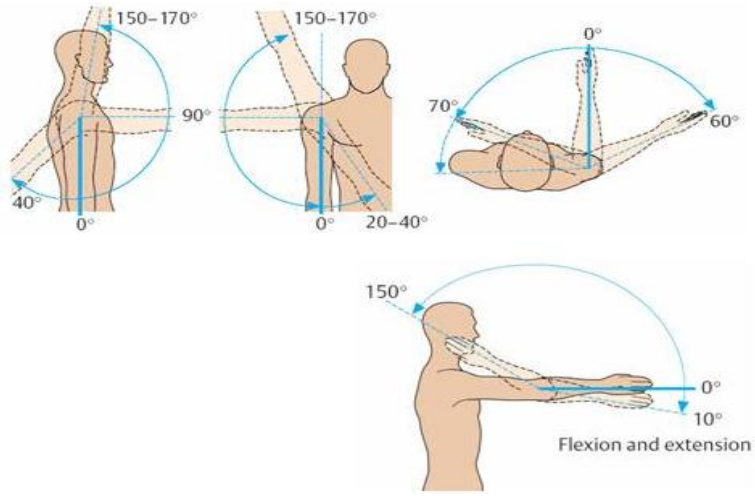

Fig. 9: Range of activity of human arm and hand

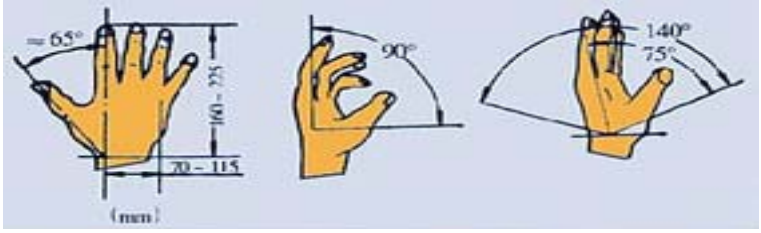

Fig. 10: Structure and range of activity of hand

CONCLUSION

Now delight-oriented design of food machinery mainly manifests in the supplement to the psychology of modern people. They have made some sort of ornament and supplement with interesting shape, structure or applied characteristics in the busy and tense modern life and using their understanding design language and vivid lovely shape mediates modern people hit by the fast rhythm.

At the same time, with the rapid development of science and technology, many new types of food machinery have been produced, which are expressed in the most concise and amiable design language with interesting design, which greatly relieves the tension and fear what have been produced when people face with high-tech and new functional food machinery. On the usage and instructions recognition system using interesting design makes people easily operate the varied functions of food machinery.

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