

Study of the Design for the Efficient Use of Pump-Type Cosmetics Containers

Jung Hee Yi¹ and Moon-Hee Choi²

¹Ansan City, Gyeonggi Sangrok Hanyang Daehangno 55, Cultural Content, Hanyang University, Korea, Adjunct Professor, junghee4974@lycos.co.kr

²Marketing Team Manager of Boryeongmud RIS, Chungwoon University, Korea
moon3713@hanmail.net

Abstract

Pump-type containers are easy to use and also hygienic because the contents do not contact with the air. In this regard, pump-type containers are widely used from detergent to cosmetics. However, sometimes users have to throw the lotions away even if there is still remaining lotion in containers. Thus there is a need to take the measures against the pump-type containers that cause a waste. An experiment- measuring the remaining content of the 2 types of cosmetics-shampoo and body lotion- in containers after pumping the containers until nothing comes out of the containers- was conducted and the inner structure of containers was compared to identify the structural causes for the problems. The purpose of this study is to seek the effective design for pump-type cosmetics containers. A waste of cosmetics prompts customer complaint and also brings about environmental problems. The results of this study are estimated to make contribution to providing effective ideas to container makers, management of cosmetics brand companies and consumers.

Keywords: Pump-Type Container, Effective Application, Saving type Container Design

1. Introduction

Since long time ago, cosmetics containers have been playing a more important role than a role of containing products. Due to the diversification of consumer needs and the change in dose types, the importance of cosmetics containers was highlighted and consumers see the cosmetics containers as more than just plastic material. Korea has the leading plastic molding technique, which is internationally accepted. Pump-type containers are easy to use and also hygienic because the contents do not contact with the air. Thus pump-type containers are widely used from detergent to cosmetics. However, most users had the experience of having to throw away lotions even if there was still remaining lotion in containers. It is a waste even if it was a small amount. Pump-type containers incurs consumers' economic loss and environmental pollution. Thus this study is intended to seek the alternatives for the effective use of pump-type cosmetics containers.

1.1. The Concept and Configuration of Pump-type Cosmetics Containers

A wide range of cosmetics container are in use. Among them, pump-type cosmetics containers are the most widely used. Pump-type cosmetics containers using a pressure to deliver the content to users are used for a wide ranged of goods. A pump-type cosmetics container in general has a pumping unit in the upper part of the body and the content is discharged when the pumping unit is pressed. This type of cosmetics container is composed

of 1) body that contains the content, 2) discharging part that is coupled with the body or the upper part of the body and 3) protective cap that protects the pumping unit from being pressed by mistake. Pump-type cosmetics containers are easy to use, yet its purpose is to block the air from the outside. However the remaining content on the nozzle part after pumping is exposed to the air and hardens. Thus it is inevitable for users to squeeze the end part.

1.2. Status of Pump Type Cosmetic Containers

Dishwashing detergent container that makes bubbles immediately after pumping has been developed for the first time in Korea. Aekyung Sunsaem Bubble detergent container produces the optimal bubbles by controlling the contact ratio between the undiluted solution and the air through its unique mesh structure. The undiluted solution is mixed with the air, not with water, and the bubbles without moisture are produced. 6-7 gr liquid detergent is needed for washing dishes. But only 2.4 gr of this detergent is needed for washing dishes. This detergent is very cost effective and environmentally friendly because it brings about less sewage pollution and less water waste. In particular, the minimal design is made by a world-famous designer Karim Rashid.



Figure 1. Aekyung, Sunsaem Bubble

Atopalm Intensive Care Panthenol Lotion minimizes the deterioration of MLE ingredient and ceramides while being preserved. Furthermore it uses the principle-a piston pushes up the content-which enables users to use the product to the end and is made by expensive, yet hygiene vacuum pump containers.



Figure 2. Atopalm Intensive Care Panthenol Lotion

L'Oreal's Man Expert Series use neck-less style pump-type containers unlike ordinary pump-type containers. The semi-transparent plunger(the second from the left) inside the grey container moves up little by little whenever users use lotion. There is a small hole underneath the grey container to prevent the interference due to the atmospheric pressure when the plunger moves up. The advantage of this container is users can use the product to the end-more cost-effective than ordinary tube or pump-type container. This product is patented.



Figure 3. L'Oreal's Man Expert Series

Due to the state-of-the-art science combined in container design, the container has a direct effect on the competitiveness of products. A trend that a container differentiates the product- a container designs how to use the products- is emerging. Thus a scientific design is instrumental to cosmetics containers.

1.3. The status of cosmetics industry and of cosmetics containers

According to 2012 Korea's Cosmetics Industry Analysis Report published by the Korea Health Industry Development Institute, the size of Korea's cosmetics industry in 2011 was \$6.3bil (the world no.11), accounting for 2.6% of the global market. The size of Korea's cosmetics market in 2011 was KRW trillion 589.8 billion, 4.5% increase from KRW trillion 308.4 million in 2010.

Table 1. The Size of Cosmetics Market in Korea (KRW in mil , %)

Classification	2008	2009	2010	2011
Market size	5,104,562	5,534,191	6,308,416	6,589,797
(\$ in million)	4,630	4,336	5,456	5,947

The size of Korea's cosmetics industry was KRW6 trillion 385.6billion in 2011, 6.2% growth from 2010, and accounted for 0.52% of Korea's GDP.

Since the mid-to-late 80s, the materials for cosmetics containers began to diversify. Plastics are widely used to make cosmetics containers (from foundations to a wide range of cosmetics including color, hair and body cosmetics) because of its cost-effectiveness and superior formability. It is because consumers prefer easy-to-use pump-type containers, which leads to an increase of plastic containers than glass containers which are difficult to carry and use.

In particular, plastic material received a lot of attention as the material that can be applied to pump-type containers and when the air-less pump was developed to prevent the content from coming into contact with the air. Air-less pumps developed to prevent the deterioration of the content due to the contact with the air were imported from abroad before the 90s. Samhwa Plastics Co.,Ltd developed the Korea's first sir-less pumps. In recent years the Korean products with the upgraded meal balls are exported abroad.



Figure 4. Airless Pump

2. Research Subjects and Methods

A research has been conducted, targeting 6 types of shampoo and 6 types of body lotions from 2011-12 top cosmetics brands (based on annual sales).

Table 2. Research Subjects

Product Line	Product Types					
Shampoo	A1	A2	A3	A4	A5	A6
Body lotion	B1	B2	B3	B4	B5	B6

As for the research method, first, a questionnaire survey regarding the problems in using pump-type cosmetics containers was conducted, targeting 105 adult men and women in their 20-60s. Second, an experiment-measuring the remaining content in the container after pumping until no content comes out of a container- was conducted. The content was removed from the container in a way of normal use by ordinary users and then the remaining content in the container was measured by product type. The amount of the remaining content was

measured by product type. Third, the characteristics of the structural cosmetics container designs were comparatively analyzed to identify the structural measures taken by the containers.

3. Empirical Research and Result Analysis

3.1. Research Results

First, the problems in using pump-type cosmetics containers are shown as follows.

Table 3. Problems in using Pump-type Cosmetics Containers

Problems in using pump-type cosmetics containers Can't use until the end	Total	Ratio
Difficult to check the contents because the container is opaque	14	13.3%
Can't use until the end	48	45.7%
Turn the contain upside down to use the cosmetics until the end	17	16.1
Cosmetics does not come out well	12	11.4%
Expensive	5	4.7%
Others	9	8.5%
	105	100%

60% of respondents replied they had to turn the container upside down or could not use the content to the end. As for other opinions, some respondents replied they had to turn the container upside down but they could not stand the containers upright because of the narrow upper side. The solution remaining around the pump hole dried up, so they had to pump the containers several times. Second, the remaining content was compared with the actual volume when no more content came out of the container.

3.2. Empirical Research and Result Analysis

The first is the result of consumer perception survey conducted to understand the purchase patterns of IT accessories consumers. Fig.5 shows the reasons of using IT accessories.

Table 4. Problems in Using Pump-type Cosmetics Containers

Shampoo	A1	A2	A3	A4	A5	A6
Volume	800ml	800ml	800ml	800ml	800ml	820ml
Remaining content	35.29ml	57.57ml	56.70ml	49.44ml	50.84ml	84.34ml
Remaining content	4.41%	7.19%	7.08%	6.18%	6.36%	10.29%
Body lotion	B1	B2	B3	B4	B5	B6
Volume	354ml	400ml	450ml	400ml	450ml	591ml
Remaining content	60.91ml	67.62ml	69.30ml	61.10ml	91.86ml	94.10ml
Remaining content	17.20%	16.91%	15.40%	15.28%	20.41%	15.92%

The results showed the remaining content accounted for 4.41% min. - 10.29% max. of the actual volume. In product A6, a largest amount of content remained (10.29%, remaining content: 84.34ml, actual volume: 820ml). The remaining content of 6 body lotions was from 20.41% min. to 20.41% of the actual volume. The largest remaining content was 91.86ml in B5 (20.41%, actual volume: 450ml).

Third, by judging the results of Study 2 are mainly due to the structure of containers, the inner structure design of containers were compared with each other and analyzed.

The inner structure of a basic pump-type container is shown below.

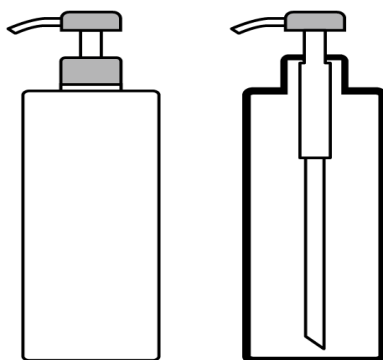



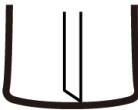




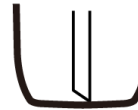





Figure 5. Inner Structure of pump-type Cosmetics Container

The pump hose structure and the variation in the space between the bottom and the end of the hose were analyzed.

Table 5. Pump-type Cosmetics Containers

Product Line	Product Name	A1	A2	A3
Shampoo	Inner structure of container			
		Space 0cm	Space 0.4cm	Space 0.2cm
	Product Name	A4	A5	A6
	Inner structure of container			
Body lotion		Space 0cm	Space 0cm	Space 0.7cm
	Product Name	B4	B5	B6
	Inner structure of container			
		Space 0.5cm	Space 0.5cm	Space 0cm
	Product Name	B4	B5	B6
	Inner structure of container			
		Space 0.3cm	Space 0.8cm	Space 0.3cm

Most of products have the structure in which there is a space between the end of pumping hose and the bottom of the container. Thus, there should be residual content. The space between the end of pumping hose and the bottom of the container was about 0.8cm. Even if the end of pumping hose touches the bottom, it is still difficult to use the content to the end. If the pump hose is cut flat, the content does not move up easily. So, it is cut in V or in a circle. When only a small amount of content remains and there is even a small amount of the air in the tube, the content comes in with the air. Thus the pump does not work properly and the content is discharged intermittently or even spurts. If the bottom is wide, there will be more residual content. Even if the tube is lengthened, there are some parts that do not make contact with the tube and the flowability is poor. So it is difficult to use the content to the end. Because of that reason, some users open the lid to use the content to the end, yet it is not easy because the lid itself is very narrow.

4. Conclusion

Pump-type containers are easy to use and hygiene because they do not make contact with the air. Thus pump-type containers are widely used from detergent to cosmetics. However, sometimes users have to throw away lotions even if there is still remaining lotion in containers. The residual contents from 4.41% min to 20.29% max of the actual volume is wasted. Furthermore the entrance is so narrow that the content does not come out even though users beat the containers and the containers have the structures that makes it difficult to cut the containers to use the residual contents, which leads to economic loss and environmental pollution. If makers have to stick to the present pump-type containers, they have to seek the measures so users can use the content to the end. Transparent containers and the containers with long pump tube that touches the bottom of containers will be the solutions to the problems. Based on the results of the research as above, the design for cosmetics containers were suggested as follows.

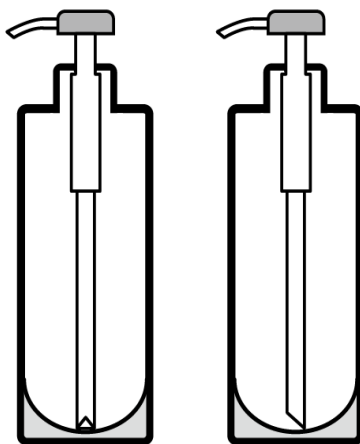


Figure 6. Suggestion of Pump-type Cosmetics Container

The bottom surface of the containers is designed to slope so the contents can gather in the center of the containers. The end of the pump tube was positioned on the lowest part of the container bottom. There is a need to lengthen the pump tube, make U-shaped or V-shaped container bottom and design so users can open the lid with ease. Thus it incurs the additional cost for the makers. From the perspective of companies, there is a need to change the

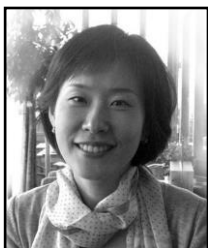
structure of containers through investment in facilities. Even if additional investment in facilities is required, the products have the advantages over the competing products, which will in turn lead to the market dominance. Thus it is worthwhile for companies to consider this seriously for the consumer's benefit.

A waste of cosmetics brings about the consumers' complaints and environmental pollution. The results of this research is estimated to make contribution to the design of pump-type cosmetics container and the prevention of environmental pollution.

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Authors



Yi, Jung Hee

Hanyang University, Adjunct Professor, Korea
Hanyang University, Dept. Visual Communication Ph.D
The Director of KAIS
The Director of Brand Design Association of Korea



Choi, Moon-Hee

Marketing Team Manager of Boryeong Mud RIS, Chungwoon
University, Korea
Hanyang University, Dept. Visual Communication Ph.D
The Director of KAIS
The Director of Korea Academia-Industrial Cooperation Society