Easing Contraction for Three-dimensional Construction of Sleeve

Dept. of Fashion Design, Pukyoung National University
Instructor MYUNG-HEE LEE

Contents

Ⅰ. Introduction

Dressmaking which is defined as the process of changing two-dimensional cloth into three-dimensional clothes needs a lot of joining parts. Particularly, sleeve needs a more curved surface than other joining parts owing to shape of the top of arms.

Easing is used to control the fullness along the seam-line to create the fullness curved shape of the sleeves, and it plays an important role in increasing three-dimensional construction power.

Unfortunately, sufficient data regarding effective easing conditions to increase three-dimensional construction power of sleeve are not available. Therefore, the author tried to investigate the effective easing conditions to increase three-dimensional construction power of sleeve by cap height.

Easing contraction made by different angles on the sleeve cap curve line in previous work[1)] were examined and the effective easing conditions according to the variation of angles were determined.

This study contains the following objectives :

Firstly, to obtain the easing contraction ratio in sleeve according to the above easing conditions.

Secondly, to investigate the three-dimensional construction power of sleeve by the factors of easing contraction.

Thirdly, to determine for each sleeve the effective easing conditions on the basis of the calculative easing contraction ratio in the sleeve patterns by cap heights.

Ⅱ. Experiments and methods

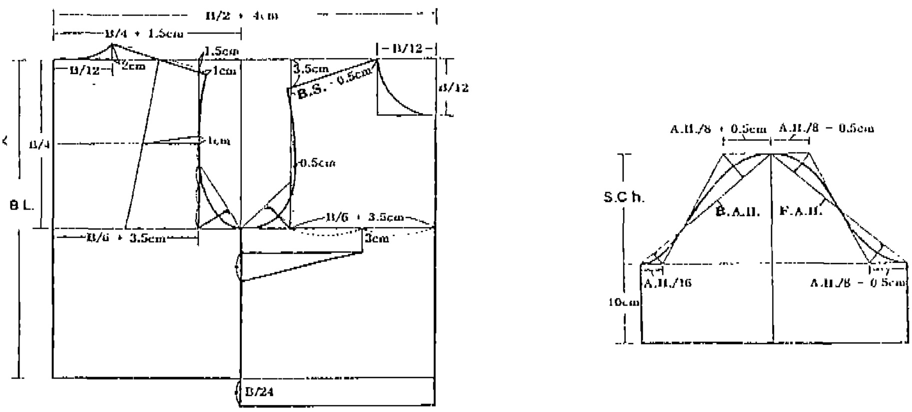
1. Pattern making and angle selection

1.1 Pattern making

The basic patterns for bodice and sleeve used in the experiments is shown in Fig. 1. Those were made on the basis of the data of '92 National Anthropometric Survey which had been developed in One-Ja IM method[2)] for making woman's basic pattern. The cap heights usually used for blouse pattern making are selected from commonly consulted reference[2~6)].

1.2 Sleeve classification by angle selection

The sleeve pattern is divided into two parts : the upper part and lower part from the notch for



B : Bust－85.1cm, B.L. : Back Length－39.3cm, B.S. : Back Shoulder, A.h. : Armhole height－17.9cm
A.H. : Armhole－42.2cm, B.A.H. : Back Armhole－20.8cm, F.A.H. : Front Armhole－21.4cm,
S.C.h. : Sleeve Cap height－A.h.×5/6, A.H./3, A.H./4+4cm, A.H./4+3cm, A.H./4+2cm, A.H./4+1cm, A.H./4

Fig. 1. Pattern making of bodice and sleeve

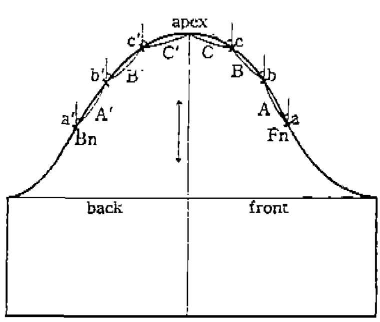


Fig. 2. The measuring positions of the sleeve

measuring angles at the top of sleeve cap curve line which needs easing contraction.

For angle selection between vertical line and sleeve cap curve line, angles a′, b′, c′, c, b, a were measured as shown in Fig.2, and those according to cap height are in Table 1.

As shown in Table 1, we can see the degrees of sleeve curvature changes according to cap heights : approximately sleeve A, B－20°~90°~20°, sleeve C, D, E－30°~90°~30°, sleeve F－45°~90°~30°, and sleeve G－45°~90°~45° on sleeve cap curve line.

Table 1. The angle between the vertical line and the sleeve cap curve line

sleeve patterns by cap height	Back				Front		
	a′	b′	c′	apex	c	b	a
A (A.h.×5/6)	24°	33°	49°	90°	46°	28°	21°
B (A.H./4+4cm)	25°	35°	51°	90°	48°	30°	23°
C (A.H./3)	30°	40°	58°	90°	53°	34°	25.5°
D (A.H./4+3cm)	32°	42°	60°	90°	56°	36°	27°
E (A.H./4+2cm)	35°	44°	62°	90°	59°	41°	32°
F (A.H./4+1cm)	42°	47°	63°	90°	61°	45°	36.5°
G (A.H./4)	45°	55°	70°	90°	63°	50°	40°

We classify sleeve patterns to the three types according to angle shape from the above results as shown table 1 : sleeve A type－20°～90°～20°, sleeve D type－30°～90°～30°, and sleeve G type－45°～90°～45°.

Figure 3 shows sleeve patterns A, D, G which are selected according to sleeve classification by angle selection.

Table 2 indicates the calculative easing contraction ratio in the sleeve patterns(A, D, G).

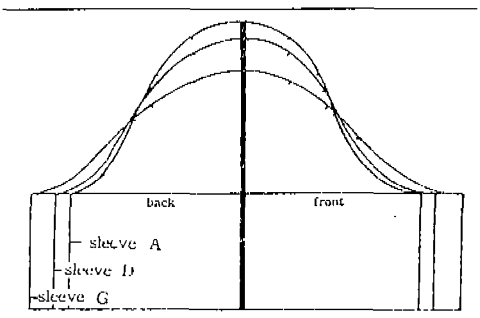


Fig. 3. The pattern models of sleeve A, D, G

Table 2. The calculative easing contraction ratio at sleeve patterns

Sleeve pattern	Calculative easing contraction ratio
A (A.h.×5/6)	9.6%
D(A.H./4+3cm)	7.3%
G (A.H./4)	4.5%

2. Easing contraction process

Easing contracion is one of the sewing methods for the three-dimensional construction, and a modification of the structure of cloth. Fig. 4 shows the model of the interior structure of cloth modified by easing contraction.

The one row of ease stitching used to ease is performed by shirring foot of sewing machine. This technique has an advantage of making easing fast and even by modifying the stitch density under the easing condition.

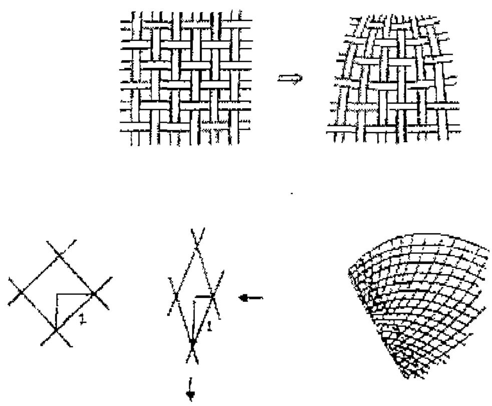


Fig. 4. The model of the structure of cloth modified by easing contraction[7,8]

3. Conditions of experiment

3.1 Fabrics and thread

We can see the properties of fabrics used in these experiments in Table 3 : fabric F1 was cotton, fabrics F2 and F3 were 65% polyester and 35% cotton. The properties such as weave, density, thickness, etc. of the submitted fabrics were examined which are influencing factors on easing contraction.

We can see decreasing tendencies of bending properties in relation to the angle of bias.

Spun polyester 60's/2 was used as sewing thread in these experiments.

Table 3. Properties of fabrics

Properties		Fabric		
		F1	F2	F3
Material		Cotton 100%	Cotton/ polyester 35/65	Cotton/ polyester 35/65
Weave		Plain	Plain	Plain
Thickness(mm)		0.150	0.126	0.127
Weight (g/m2)		129.54	109.79	103.43
Yarn number (Ne's)	Wp	45.4	50.5	46.5
	Wf	45.9	48.1	47.6
Density	Ends/cm	57.1	54.3	44.9
	Picks/cm	29.5	28.3	29.5
Diameter (mm)	Wp	0.135	0.128	0.133
	Wf	0.134	0.131	0.132
Ratio of gap (%)	Wp	22.9	30.5	40.3
	Wf	60.5	62.9	61.1
Flexible rigidity (45°cantilever)	Wp(0°)	40.08	32.38	34.85
	45°bias	36.50	28.25	29.35
	Wf(90°)	30.58	24.98	29.23

3.2 Easing conditions

Table 4. Easing conditions

Sewing machine	DB2-B736 (brother)
Speed	3450 r.p.m.
Stitch, seam	L 12, 6.01.01/301
Stitch density	38 stitch/3cm (N1.0: 0.8mm)
	26 stitch/3cm (N1.5: 1.1mm)
	19 stitch/3cm (N2.0: 1.5mm)
	14 stitch/3cm (N2.5: 2.0mm)
Needle	DB×1 #11
Thread	sp 60's/2
Thread tension(bobbin/upper:g·f)	40 / 120
Pressure foot	shirring foot

Table 4 indicates sewing conditions used in this experiment which we carried out controlling stitch density by the dial of stitch numbers.

3.3 Samples

We performed this experiment modifying the samples and conditions : three types of fabrics (F1, F2, F3), three types of sleeve by cap heights(A-A.h.×5/6, D-A.H./4+3cm, G-A.H./4) and four kinds of stitch density(N1.0, N1.5, N2.0, N2.5).

Sleeve samples were cut with the allowance 1cm on sleeve cap curve line.

4. Observations

4.1 Easing contraction ratio

Easing contraction were measured by 1mm calibrated roller ruler on the sleeve cap curve line.

The ratio of easing contraction was calculated by the following formula.

Easing Contraction Ratio (%) =

$$\frac{l-l_0}{l}\times 100$$

l : length before easing

l_0 : length after easing

4.2 Three-dimensional construction power of sleeve

We observed the shape of the top and center line of the sleeve in the photos of the plain figure and profile of the sleeve in order to investigate the three-dimensional construction power of sleeve by cap height.

Ⅲ. Results and discussions

1. Easing contraction ratio in sleeve

The easing contraction ratio made by sleeves (A, D, G) under the above easing conditions were shown in Table 5.

The lower the stitch density, the higher the easing contraction.

We could find the ratio of easing contraction getting lower in samples F1-sleeve A, D.

The easing contraction ratio made by different angles on the sleeve cap curve line in previous work[1] under the above easing conditions were that : approximately, sample F1 was 4.5% at 0°, 90° and 7~9% at the other angles(20°, 30°, 45°, 60°, 70°), sample F2 was 11% at 0°, 70°, 90°, 13~14% at 20°, 60° and 17% at 45°, 30°, and sample F3 was 7~8% at 0°, 90° and 12~14% at the other angles(20°, 30°, 45°, 60°, 70°).

When we observed the ratio of easing contraction according to the type of easing seam line (curve line, straight line), we could find that in sleeve samples of different cap heights to be higher than that in samples of different angles

Table 5. Easing contraction ratio in sleeve

Fabric	Stitch density	Sleeve by cap heights		
		A(A.h.×5/6)	D(A.H./4+3㎝)	G(A.H./4)
F1	N1.0	2.6%	2.4%	2.8%
	N1.5	3.1%	3.3%	5.8%
	N2.0	6.2%	6.0%	8.7%
	N2.5	14.2%	12.3%	13.1%
F2	N1.0	6.0%	7.7%	6.5%
	N1.5	10.6%	10.7%	12.4%
	N2.0	11.5%	14.4%	16.7%
F3	N1.0	5.3%	5.5%	6.8%
	N1.5	9.6%	9.3%	10.9%
	N2.0	14.2%	12.8%	14.4%

N1.0:38stitch/3cm(0.8mm) N1.5:26stitch/3cm(1.1mm)
N2.0:19stitch/3cm(1.5mm) N2.5:14stitch/3cm(2.0mm)

2. Three-dimensional construction power of sleeve by the factors of easing contraction

2.1 Stitch density

We could find that there were a little difference in easing contractions on the parts of sleeve cap curve line. However, almostly the lower was stitch density, the higher gets easing contraction in all parts of sleeve cap curve line.

Figure 5 is the photo of the sample fabric by changing stitch density. It shows that the lower the stitch density, the higher the three-dimensional structure.

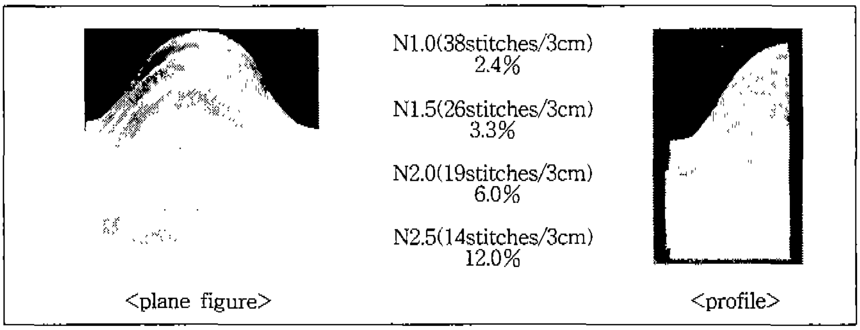


Fig. 5. The easing effect by stitch density on sleeve D-F1

As in left side of the photo of Fig. 5, we can see the top of the sleeve cap getting concaved as stitch density increases, and the right side of the photo of Fig. 5, we can see the center line of sleeve getting curved as stitch density increases.

2.2 Bending property of fabric

In this study, easing contractions were observed for the three sample according to the bending properties of fabrics as follows : F2>F3>F1. The degree of curvature was F2>F3>F1 in order for sample fabrics F1, F2, F3 as shown in Fig. 6.

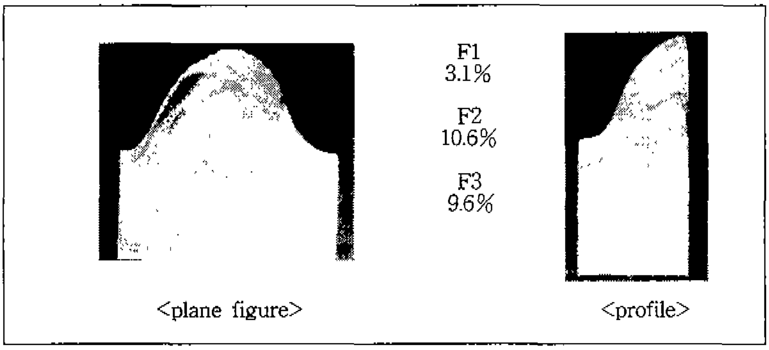


Fig. 6. The easing effect by fabric on sleeve A-N1.5(14stitches/3cm)
F1-cotton 100%, F2 · F3-polyester65/cotton35%

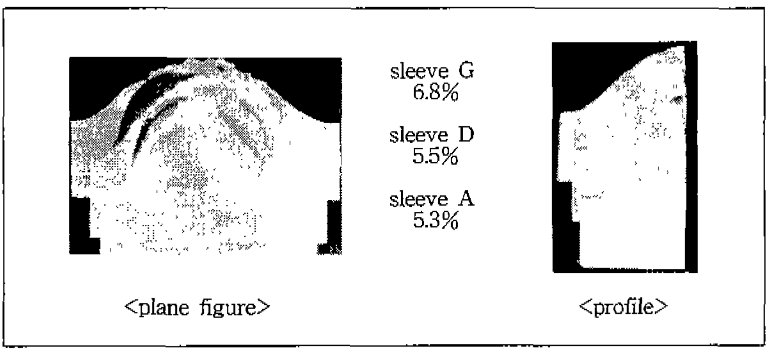


Fig. 7. The easing effect by sleeve on F3-N1.0(38stitches/3cm)

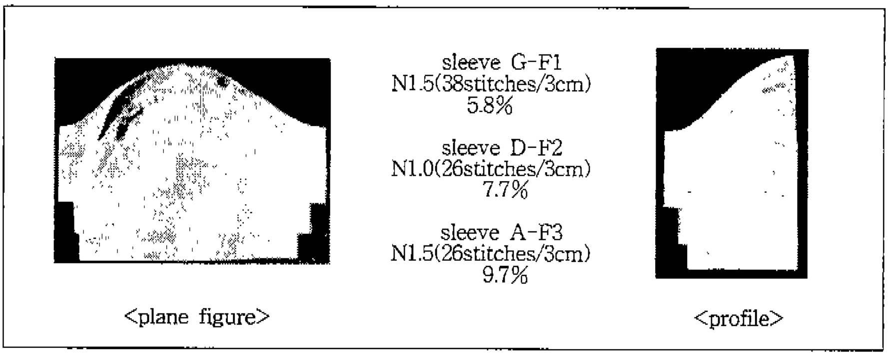


Fig. 8. The appearance of the top of the sleeve under the proper easing condition ; F1-cotton 100%, F2 · F3-polyester65/cotton35

2-3 Sleeve by cap height

Fig. 7 is the photo of sample fabric changing cap height, in which the center line of sleeve A is more curved than that of other sleeves D, G although it is lower easing contraction.

We could find the ratio of easing contraction getting higher as the cap height decrease, otherwise the three-dimensional construction power of sleeve getting higher as the cap height increase.

3. Effective easing conditions for each sleeve

With the change of stitch density and fabrics, effective easing conditions for each sleeve are as follows :

Sleeve A (A.h. × 5/6) — N2.0 with F1, N1.5 with F2, F3

Sleeve D (A.H./4 + 3 cm)) — N2.0 with F1, N1.0 with F2, F3

Sleeve G (A.H./4) — N1.5 with F1, N1.0 with F2, F3

Most proper easing contraction among the above easing conditions are as shown in Fig. 8, which is equal to the one calculated from sleeve patterns in this study.

Ⅳ. Conclusion

This study was carried out to investigate the easing condition to effectively change two-dimensional cloth into three-dimensional clothes in sleeve.

The results obtained as follows :

1) The lower the stitch density, the higher the easing contraction.
2) For the three-dimensional construction power of sleeve by cap heights
   ① As the cap height increased, emphasizing the curvature of the sleeve became more effective, by making easing contraction more on the cap curve line of the sleeves.
   ② The higher the cap height and power of three-dimensional construction, the greater the bending tendency of lateral outline in a cross sectional view.
3) Effective easing conditions which increased three-dimensional construction power were as follows :

① Sleeve A (A.h. × 5/6) — N2.0 with F1, N1.5 with F2, F3

② Sleeve D (A.H./4 + 3 cm)) — N2.0 with F1, N1.0 with F2, F3

③ Sleeve G (A.H./4) — N1.5 with F1, N1.0 with F2, F3

〈reference〉

1. Myung-hee Lee · Suk-chul Choi, A Study on Easing Contraction made by different angles -About angles on the sleeve cap curve line-, Journal of the Korean Society of Clothing and Textiles, Vol. 22, No.1, (1998), p.41-48.
2. 林元子, 衣服構成學-設計 및 縫製-, 敎文社(Seoul), (1995), p.8~19.
3. 鄭雲子, 衣服構成學, 螢雪出版社(Seoul), (1993).
4. 朴惠淑 · 李明姬, 西洋衣服構成, 修學社(Seoul), (1992) p. 35
5. The Encyclopedia of Fashion Detail 1, Rasara publishing Company, (1996) p. 239~243.
6. 이형숙, 서양의복구성-패턴제작편-, 교학연구사(서울), (1992), p.35~38.
7. 木岡悅子, 自立と選擇の被服舊姓學, ミネルブァ書房:東京, 1993, p. 167.
8. 香取智惠子 外2人, 立体成形に必要な布地の性質の數値的表現の提案-袖山いせこみへの適用- 家政學雜誌, Vol. 21, No. 2, 1970, p. 117~118.
9. 鳴海多惠子, いせこみの科學, 衣生活, 通巻297號, 1991, p. 48~53.
10. 南日朋子 · 村松京子, "いせ"に ついて(第 1報)-いせの方法による影響, 家政學雜誌, Vol. 13, No. 2, 1962, p. 24~80.
11. 道家とき 外 3人, "いせこみ"に關する一考察, 織維學會誌, Vol. 39, No. 4, 1983, p. T-167~T-172.
12. 石毛フミ子, 袖山のいせこみ分量について, 家政學雜誌, Vol. 6, No. 4, 1955, p. 156~160.
13. Myung-hee Lee · Jeong-sun Park, A Study on Sewing Method for Clothing Construction -The Easing Contraction by Shirring Foot-, Journal of the Korean Society of Clothing and Textiles, Vol. 20, No.6, (1996), p.1107- 1115.

〈논문 요약〉

소매입체구성을 위한 오그림

오그림은 평면상의 천을 구조적으로 줄여서 입체화시키는 봉제기법으로서, 평면상의 소매산둘레를 입체적으로 곡면화하는 데 유용한 기법이다.

본 연구는 소매의 입체화 과정에서 소매 상부의 곡면 구성을 위한 연구로써, 셔링노루발을 이용하여 오그림 조건별 소매산 높이에 따른 오그림에 의한 입체구성력을 비교하고 각 소매에서의 효용 오그림 조건을 살펴본 결과는 다음과 같다.

1) 오그림 땀수가 작을수록 오그림률은 높게 나타났다.

2) 오그림에 의한 소매의 입체구성력은

① 소매산이 높을수록 소매산둘레를 입체적으로 곡면화하는 데 효율적이었다.

② 소매산 높이가 높아지고 입체구성력이 높아질수록, 단면상의 측면 외곽선의 굴곡이 높게 나타났다.

3) 소매산 높이에 따른 효용 오그림 조건은 다음과 같다.

① Sleeve A (A.h. × 5/6) — N2.0 with F1, N1.5 with F2, F3

② Sleeve D (A.H./4 + 3 cm)) — N2.0 with F1, N1.0 with F2, F3

③ Sleeve G (A.H./4) — N1.5 with F1, N1.0 with F2, F3