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Research on Garments Cutting system of Production Capacity Prediction

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Abstract: As an important link of the garment production, enhancing the forecasts of the production capacity on cutting aspects has a great significance on reasonable arrangements for production planning and can improve the efficiency of garment production. In this study, the main links of cutting aspect are analyzed, such as pattern layout drawing, spreading and cutting cloth into certain shape, marking, testing, sorting and bundling and so on. A field survey is carried out to get the cutting time of knitted garment. Ten groups of total time on the cutting aspects of knitted garment are investigated in different enterprises. Through correlation analysis of the data, the major factors which influence the knitted garment cutting mostly are got. And then the formula of the major factors can be established by regression analysis. So the formula of the knitted garment total cutting time can be deduced. This study can make clothing company forecast the knitted garment cutting time and arrange the reasonable production planning to reduce the unnecessary loss of the company and increase the production efficiency.

Key words: Cutting capacit, influence factor, time calculations

INTRODUCTION

In the value chain of global clothing, the clothing value chain includes material handling, product design, textile production, ready-to wear manufacture and marketing. According to statistics, the appropriation of profits in clothing value chain is as follows: design of 40%, marketing of 50% and production of 10% (Ghiassi and Spera, 2003; Zhang *et al.*, 2012). In developed country, all garment enterprises turn to the high end of clothing value chain to realize the upgrade of clothing industry (He, 2008).

In clothing industry, China is low side of clothing value chain and the world market occupancy rate is only 17%, mainly in trade process (Yu, 2008). So research on predication of apparel production capacity is important for clothing enterprises to arrange the production planning, increase the production efficiency and save production cost, so it has practical significance in clothing industry (Ho, 2012; Ding, 2003).

With the development of technology, modern knitwear have overcome many disadvantages and the advantages have been expanded and used to receive the recognition of most consumers because of unique style routes (Ho and Peng, 2012; Zhang, 2010). The knitwear has been dressed more and more, so they play a important role in underwear, T-shirts and sweaters.

In this study, the main links of cutting aspect are analyzed, such as pattern layout drawing, spreading and

cutting cloth into certain shape, marking, testing, sorting and bundling and so on. A field survey is carried out to get the cutting time of knitted garment. Ten groups of total time on the cutting aspects of knitted garment are investigated in different enterprises. Through correlation analysis of the data, the major factors which influence the knitted garment cutting mostly are got. And then the formula of the major factors can be established by regression analysis. So the formula of the knitted garment total cutting time can be deduced. This study can make clothing company forecast the knitted garment cutting time and arrange the reasonable production planning to reduce the unnecessary loss of the company and increase the production efficiency

MAIN PROCESSES OF CUTTING

The production capacity of clothing cutting depends on the type of clothes, the time of spreading, cutting, marking, testing, sorting and bundling and so on. The specific index of production capacity of clothing cutting is the total production time of cutting, that is, the total time needed to finish a bed of cutting task.

According to the variety of cutting fabric, the process and specialization of cutting in clothing enterprises are different, but the main processes are basically similar, which can be divided into the following contents.

- Pattern layout drawing
- Spreading
- Cutting
- Marking and testing
- Sorting and bundling

Through the processing of the cutting process and pass the cut-parts quality check, then it can delivered to sewing workshop to do sewing process.

GARMENT CUTTING PRODUCTION CAPACITY MEASUREMENT

Garment cutting production capacity measurement is defined according to the research and analysis on the company’s production status, finding out each factor which influences the cutting production capacity and its influence degree. The production time is recorded by measuring all aspects of a cutting task on the spot. The total production time is calculated at the end.

Methods for the measurement are as follows:

- The factors are investigated, which are the number of operation works, processing equipment, cutting workshop personnel, processing equipment, the length of spreading, width of fabric, plies of the spreading material, spreading method, modes of setting cutting pieces
- Operation time of each link is recorded by using a stopwatch, including preparing time, spreading time, breaking time, drawing sample time, cutting time, marking and testing time and sorting and bundling time

The average result is got by 10 times of test. Spreading one layer at a time, the time of spreading, breaking and marking is recorded respectively during the concrete measurement.

- The whole production time is accumulative by all parts of the cutting task with documented data.

CALCULATION OF PRODUCTION CAPACITY FOR GARMENT CUTTING

Garment cutting production capacity is the total time for all aspects by completing a b cutting task. It also can be got by analyzing statistical data and then establishing the corresponding formulas for calculation.

Multivariate statistical analysis is chosen because that a result of cutting production ability is determined by many factors, calculation model is established to calculate. The following example of the knitted apparel is used to explain.

Extraction of the element influenced total cutting time: Cutting process data of 10 sets of representative clothing are surveyed, which are measured by different knitted fabrics and different styles at the enterprise production departments.

The correlation analysis is carried out by measuring the 10 groups of knitted apparel cutting operation time and laying time, breaking time, designated sample time, cutting time, operation preparing time, marking inspection time and rolling time. The results are shown in Table 1. It can be seen that knitted garment cutting operation total time correlation is influenced most by laying time, followed by rolling time, designated sample time, cutting time and marking inspection time. Cutting operation total time is less influenced by operation preparing time and breaking time and their influence can be neglected.

Calculation of production time of each link: Total time of cutting operation is influenced most by the spreading time. The calculation method is introduced through the spreading time as an example.

Spreading time is determined by the factors such as the length, the width, the number of layers. Ten groups of knitted clothing shop material time got from survey are shown in Table 2. The results of correlation analysis are shown in Table 3.

It can be seen from the table that the spreading time is influenced most by the spreading plies. Linear

Table 1: Results of the correlation analysis

		Time							
		Total	Spreading	Breaking	Marking	Cutting	Preparation	Marking and testing	Bundling
Total cutting time	Pearson correlation	1	0.705*	-0.039	0.482	0.362	-0.279	0.396	0.512
	Significant (bilateral)		0.023	0.914	0.159	0.304	0.436	0.257	0.130
	Sample number	10	10	10	10	10	10	10	10

Table 2: Spreading time by measuring

Groups	1	2	3	4	5	6	7	8	9	10
Spreading time (min)	140.8	97.5	76	120	64	45.9	116.7	156	200	43.5

Table 3: The results of correlation analysis

		Spreading time	Spreading length	Spreading width	Spreading layers
Spreading time	Pearson correlation	1	0.236	-0.034	0.931**
	Significant (bilateral)		0.511	0.926	0.000
	Sample number	10	10	10	10

Table 4: Regression analysis

Non standardized coefficients						
Model	B	Standard error	Trial version	Standardized coefficients	t	Sig.
1	Constant	23.467	13.044		1.799	0.110
	Spreading layers	0.832	0.115	0.931	7.200	0.000

Table 5: Total cutting time

Groups	1	2	3	4	5	6	7	8	9	10
Total operation time (min)	246	315	262	230	252	257	310	295	382	157

regression analysis is chosen. The results are showed in Table 4.

The calculation formula can be got for the time of knitted clothing spreading material from the table:

$$\text{Spreading time } x1 = 23.467 + 0.832C \quad (1)$$

where, C is spreading layers

Similarly, D is chosen to be a set of row number, E for the number of marking dress piece. The calculation formulas can be got for knitted apparel rolling time, delimit kind, marking time and cutting time.

$$\text{Bundling time } x2 = -3.132 + 0.394E \quad (2)$$

$$\text{Marking time } x3 = 190.615 - 0.778b + 4.530D \quad (3)$$

$$\text{Notching and bundling time } x4 = 0.12 + 0.063D \quad (4)$$

$$\text{Cutting time } x5 = 24.502 + 0.389E \quad (5)$$

Calculation of total cutting operation time: Knitwear cutting operation total time formula is created based on the above several factors, which influenced the total cutting time more. First, the total operation time can be get by adding time of each link in knitting wear cutting working time. Total cutting time is showed in Table 5.

Linear regression analysis is chosen to determine the relationship about the total cutting time of knitted garments , spreading time, rolling time, designated sampling time, marking time and cutting time. The results are showed in Table 6.

The formula of knitted garment cutting operation total time can be got from the table:

$$y = 90.237 + 0.849X1 + 3.581X2 + 0.624X3 - 166.425X4 + 0.980X5 \quad (6)$$

Where:

X1: Spreading time

X2: Bundling time

X3: Marking time

X4: Notching and inspection time

X5: Cutting time

PREDICTION SYSTEM OF CUTTING CAPACITY

Purpose and thinking of prediction system: With the popularization of computer technology, computer technology is increasingly being applied to the garment enterprises. Twenty years since the reform and development, China has eight consecutive years to be the NO.1 in the garment production and export. Related industries, such as the clothing auxiliary equipment and technological progress, will eventually be reflected clothing industry. The clothing industry will use the characteristics of computer, such as efficient, rapid and flexible, to help the clothing enterprise predict the productive capacity and turn labor intensive into technology industry.

In order to make the enterprise predict each batch of knitted apparel in cutting project needs time more quickly, to arrange production plan, not affect the delivery time, to avoid unnecessary losses, this prediction system is specially developed.

The developing thinking is shown in Fig. 1.

Verification of prediction system: If an order of knitwear is received in clothing enterprises and the breadth of fabric is 160 centimeters, according to the arrangement the spreading length is 220 centimeters, the number of plies is 120, 4 parts are laid on each layer, there are 32 cut-parts on layout picture. These data are input into the program to get the related time of cutting operations.

Open the program and enter into the main interface, shown in Fig. 2.

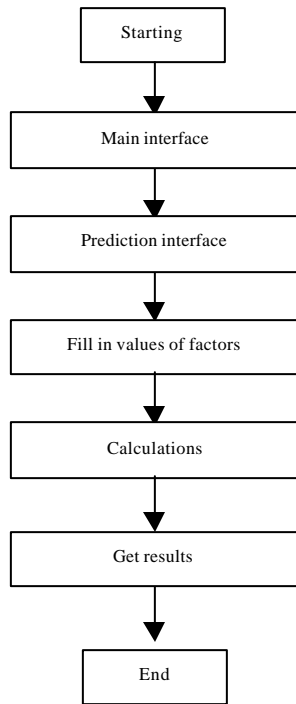


Fig. 1: Developing thinking of prediction system

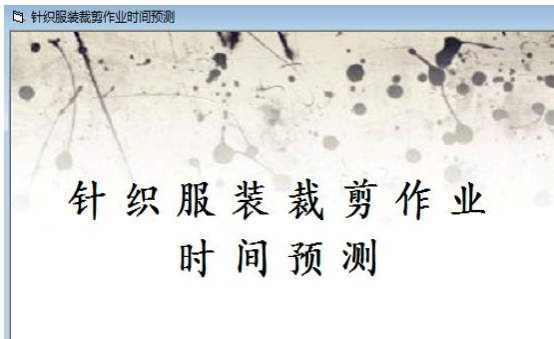


Fig. 2: Main interface of prediction system



Fig. 3: Interface of data input



Fig. 4: Running results of prediction system

Click on the main interface and the interface of data input will be shown as Fig. 3.

After data input, click running to get the results, shown in Fig. 4.

According to Fig. 4, the system forecasts that the total time of cutting the knitted clothes is 231 min and the practical cutting time is 249 min. So the predicted results is 18 min less than the practical time and it can be considered that this system is feasible to predict the cutting time of knitwear to provide definite reference value for clothing enterprises.

CONCLUSION

Garment cutting project is the first step of putting clothing into production and it has a great influence on the garment sewing and processing process. Therefore, prediction must be improved about the garment cutting process production capacity and in order to control the garment cutting time, the quality of the garment cutting can be in control at the end.

Knitted garment cutting operation time is mainly composed of spreading time, rolling time, designated sampling time, marking time, cutting time. The result is drawn in this article through measuring the knitted garment cutting each link time in clothing companies. SPSS system is used to relevant analysis according to their respective influence factors. With the results of linear regression analysis using SPSS, a series of formulas are got. According to the formula, using the VB programming, a forecast system is made. After verification, the prediction system can be used to predict the clothing enterprises' knitted garment cutting operation time and thereby the production schedule. The products could be delivered on time to reduce the unnecessary loss.

The research on prediction of knitting garment cutting time is only preliminary. Further studies are still needed with analyzing a lot of data and doing deeper experiments.

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