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"Direct Pattern on Loom"-An Innovative Method of Garment Construction

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Abstract

The impact of the fast fashion phenomenon is seen both in apparel and textile manufactures since the manufacturing time of apparels is considered as the most potential factor in reducing the overall time of the fashion cycle. In addition to the need for reduction in lead time, there is an increase in levels of quality expectations, resulting in higher cost of manufacture. Hence, in the present scenario, for high fashion garments, there is a need for technology which can minimize lead time and fabric losses, in addition to the production of garments as per the requirement of the customers in a short span of time. A DPOL (Direct Pattern on Loom) method for weaving fabric in the shape of garment panels (pieces) finished at the edges that could considerably reduce fabric loss and lead time is developed by using the electronic jacquard weaving machine.

The main aim of the project is to study the feasibility of the production of Direct pattern on Loom especially on jacquard and to check the lead time required with conventional and this modern method.

Keywords: Direct Pattern on Loom (DPOL); Lead time; Fashion; Fashion cycle

Introduction

The classic definition of fashion states that "fashion indicates style or styles most popular at a given time, and constitutes four basic components of style, change, acceptance and tastes" These four components of fashion have drastically changed their dimensions in the last few years. Years back fashion changes used to evolve gradually, giving time to the consumers to get accustomed to the new look [1]. However, in the recent scenario fast fashion concepts are the most current fashion retail phenomenal. Fast fashion clothing seizes trends with no dilution. To cope up with modern fashion trends most fashion retailers are now changing styles and designs of clothing very quickly and offering more variation in designs and styles. This has reduced the trends of manufacturing similar styles in higher volume and expanding trend of smaller volumes and large numbers of varying styles are on the rise.

The direct impact of these fashion market trends is being absorbed by the apparel manufacturing and the textile industry as a whole. In this fast fashion phenomenon apparel and textile manufacturers are under most pressurized situation at manufacturing time of the apparels is considered as a most potent factor in reducing the overall time of the fashion cycle, and plays a major role in acceleration of fashion goods. This is perhaps the major reason the lead times of textile and apparel manufacturers have reduced to 45 days in 2010 from 90-110 days in 1996. However, the volume of production has also reduced. This reduction in volume of the orders with large variations in styles has resulted in enhanced expenses from the core manufacturing point of view. In addition to the textile manufacturing sector has also borne the impact as fabric constitutes the basic raw material for the apparel manufacturers.

The fabric cost contributes about 40 to 50% of the cost of a garment. Another important issue is the growing international quality trends with these fashion apparels. With these increasing levels of quality expectations, the cost of quality is also getting very high. With greater design features and rising standard of high end fashion apparels, apparel manufacturer's time. The technology is named as the DPOL (Direct pattern on the loom) technology, which works on the concept of weaving the garment patterns directly on a jacquard Loom. This technology will help the high fashion garment industries to solve the problem faced by them in the recent scenario. Cost reduction, labour reduction, reduction in the number of stages in the manufacturing process and wastage reduction are some of the features of the newly introduced DPOL technique [2].

Concept of DPOL

The DPOL (Direct Pattern on Loom) method consists of weaving the garment patterns directly on jacquard loom, instead of weaving the fabric and then cutting it in the form of garment panels as is followed in the conventional method of garment manufacturing. After the panels are woven on loom, they are cut manually and stitched in the same manner as done in the conventional process. Here the conventional processes like drafting, pattern making, marker planning, grading are eliminated as all the patterns are placed on the entire width of the fabric depending on the reed of the weaving machine in the form of marker. This information is then converted into a machine recognizable code with the help of software and is fed into a computerized jacquard machine for carrying out the weaving process. The woven patterns are directly cut and the stitching process is carried out. Required embellishments which are possible during the weaving process are given during the designing in the software and other embellishments are given during sewing [3].

Conventional Process vs. DPOL-method of garment construction

In the Figure 1 both the conventional and DPOL methods are compared with respect to the areas of the product development in which the designer works. In the conventional process the designer begins with the selection and sourcing of the fabric of the required

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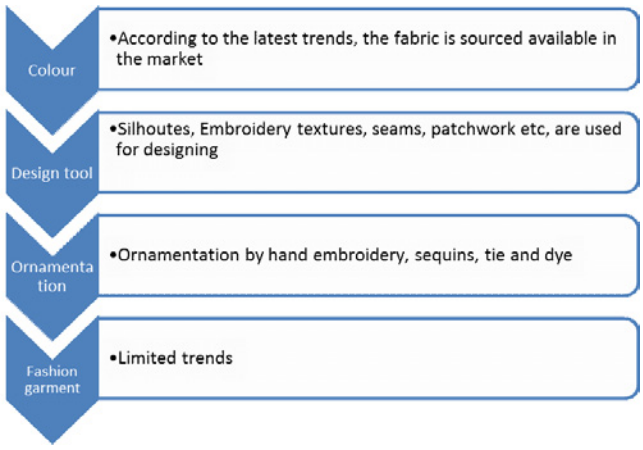

Figure 1: Process Flow for Conventional vs Modern Concept of DPOL Method.

weave and colour. Then the designer applies various design tools such as silhouettes, embroidery, texture, seams, patchwork, etc. then the ornamentation of the garments is being done. The resultant fashion garment is thus produced.

The garments produced using DPOL, on the other hand, depicts perfect blend of textile technology, garment engineering and fashion designing. The fabric is specially designed and manufactured for its particular end use. The garments are unique and are difficult to copy as their fabric is specially woven by the designer using particular yarns as desired, and fabric is not available in the market [4]. Surface ornamentation was imparted at the time of fabric manufacture, it's neither printed nor embroidered and adds to the richness to the design. The design is imparted to the garment components at the right places at the time of their manufacture in DPOL process, so as to get aesthetically appealing products once the components are assembled to make a complete garment. The designer can make creative designs and explore his creativity in all the three stages colour, design tools and ornamentation at a time during preparing the patterns in the software in the DPOL process, which is not possible in the conventional process [5-7].

Materials and Methods

The project was undertaken to develop the various pattern on the electronic jacquard loom with the Bonas Software. DPOL technology involves the use of electronic jacquard machines. With jacquard machines it is possible to control each end and thus we can manufacture patterns on the loom with selvedge around its ends. Also we can give various patterning effects. We can change the weave as required and also alter the pick density. The Jacquard software also helps in automatic making and digitizing of the patterns and makes it easier to weave

Methods

• Process flow for designing with DPOL on Jacquard with the help of Bonas software

• Pattern designing

• Pattern digitizing

• Jacquard design preparation with theBonas Jacquard software

• Pattern weaving with different panels

• Cutting of pattern from loom

• Stitching

• Finishing

• Testing

Textile Weaves Used: Satin weave, sateen weave, twill weave, plain weave, Preliminary basic block drafting-EPI-68 & PPI-44

Pattern Preparation on Jacquard loom: Measurements used by adding seam allowancewas as follows:

1. Full length=31.71"

2. Chest round=27.91"

3. Neck depth=5.41"

4. Neck width=4.255"

5. Scye depth=7.93"

6. Shoulder width=4.75"

Also there will be shrinkage in the fabric as we are making garment directly after weaving without doing fabric processing so here shrinkage allowance should also be added.

Final measurements:

1. Full length=34"

2. Chest round=28.2"

3. Neck depth=5.8"

4. Neck width=4.3"

5. Scye depth=8"

6. Shoulder=4.8"

The horizontal measurements are multiplied by Ends per inch (EPI) to get the Horizontal dimensions of thedesign and the vertical measurements are multiplied by the Picks per inch (PPI) to get the vertical dimensions.

Thus,

The width of the pattern=68*28. 2=2392+selvedge (34ends)

The length of the pattern=44*34=1496+(selvedge 20 ends)

The actual process of making the design of the software: Before we begin with the actual pattern designing process we have to keep some ends for the true selvedge and false selvedge.

• 24 ends are kept empty.

• 25-29 end for the main selvedge

•30-63 end for the false selvedge

• 64-2455 end for the main body pattern design

• 2456-2489 end for the false selvedge

• 2490-2496 end for the main selvedge

This is the actual distribution of ends as per the requirement of pattern and the selvedge for the edges of the pattern. Here the main importance of the selvedge is for the minimization of fraying of the raw edges of the pattern. So that the pattern edges do not get frayed, as frayed edges cause problems during sewing and also hamper the appearance of the garment. Fraying also may lead to changes in the

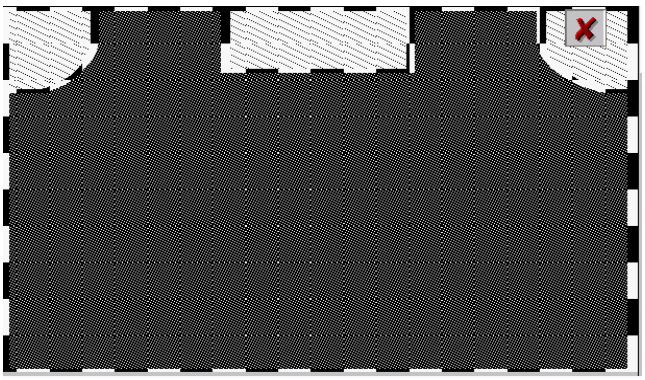

Figure 2: Overview of the pattern of BONAS Jacquard Software.

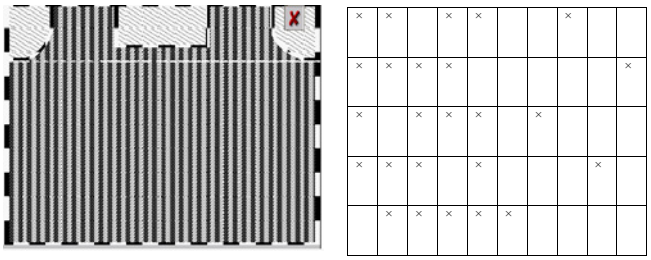

Figure 3: Basic Bodice Pattern with 5 End Sateen and Satin for Stripes

pattern dimensions, which may lead to grievous problems. The main pattern consists of 5 end sateen which is copied all across the pattern care is taken at the armhole so that it fits accurately 7 end satin weave then fills in the other areas.

The Basic Bodice Pattern Including Seam and shrinkage allowances will look as follows: (Figure 2).

The actual transfer of software designs onto the Bonas jacquard machine and final weaving: After preparing the designs onto the Bonas software, the design is then transferred onto the BONAS ELECTRONIC JACQUARD MACHINE for the weaving purposes. The design can be transferred through any hardware device like floppy or hard disk, or pen drives. After transferring the design on to the control panel the machine settings have to be done and then the actual weaving is carried out.

Stitching: Finally the 2D fabric is converted into the 3D garment by using various types of stitching machines. The use of specific machine again depends on the user and the requirement of the final garment design.

Variations with stripe and check: For the making of the stripe and check effect, the main basic bodice block is prepared and then with the help of Bonassoftwares the weaves are inserted into the design to create the stripe and check the effect. There are the different weaves are used to create the stripe and check effects .such as for the stripe effect here the two different weaves are used that is the warp and weft faced sateen (i.e. Satin and sateen). And for the check effect these both the weaves are used but in reverse manner.

The Basic Bodice Pattern Including Seam and shrinkage allowances with stripe effect will look as follows in Figure 3.

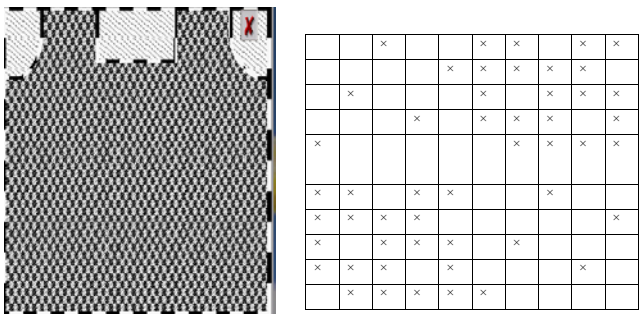

Figure 4: Checks Pattern on Jacquard Loom with 5 end Sateen and Satin.

Sr. No.	Hot air Weft (%)	Hot water Weft (%)	Hot air warp (%)	Hot water Warp (%)
1	1	1.2	7	7
2	1	1	7	7
3	1	1	6.5	6.5
4	1	1	6.5	6.5

Table 1: Hot air and hot water shrinkage of the weaved pattern.

The Twill weave was used for selvedge whereas for the body of the pattern sateen and satin weave was used. The Basic Bodice Pattern Including Seam and shrinkage allowances with checks effect will look as follows in Figure 4.

Results and Discussion

The main aim of the project is to check the feasibility of the DPOL process on the Bonas jacquard loom. All the testing was carried out at the fabric stage because of direct panel production on jacquard loom. The shrinkage, abrasion and drape have to be checked for the accurate percentage of saving into the fabric as the raw material. Whereas various physical tests were carried out to prove the applicability of the DPOL patterns with respect to the conventional patterns. The test results are as follows.

Shrinkage test

The shrinkage is very important factor as during the chemical processing of the fabrics, there are chances of size alteration. As in the case of DPOL pattern preparation method the size may alter on the jacquard that's why the shrinkage testing was carried out and these percentages was taken into consideration during the measurements put into the pattern.

The shrinkage for the hot air and hot water shows that for the weft yarn there is less shrinkage whereas in warp it is quite more so by taking into consideration the same percentage had been added for the production of pattern on jacquard loom (Table 1).

Abrasion Testing

The result shows the abrasion resistance of the cotton polyester sample and polyester sample.

The result shows there was an average loss of 1.2% in weight whereas thickness loss was 4%. All the tests were carried out for the standard 400 cycles. It can be seen from the above Table 2 that the average loss in the thickness and weight of the garment will be more or less same to that above mentioned. And hence it can be mostly preferred for garment pattern preparations.

Sr. No.	Initial wt. (Grams)	Final wt. (Grams)	Initial thickness (mm)	Final thickness (mm)
1	0.214	0.212	0.59	0.55
2	0.211	0.209	0.58	0.54
3	0.201	0.196	0.54	0.53
4	0.203	0.202	0.52	0.52
Avg.	0.20725	0.20475	0.5575	0.535

Table 2: Abrasion resistance of the cotton sample weaved on jacquard.

Sr. No	Initial wt. (Grams)	Final wt. (Grams)	Initial thickness (mm)	Final thickness (mm)
1	0.214	0.206	0.59	0.53
2	0.211	0.207	0.58	0.51
3	0.201	0.189	0.54	0.52
4	0.203	0.198	0.52	0.51
Avg.	0.20725	0.2	0.5575	0.5175

Table 3: Abrasion resistance of the cotton sample weaved on jacquard.

Sr no.	Wrap strength kg(f)	Warp elongation inCms	Weft strength kg(f)	Weft elongation in cms
1	200	7.5	20	6
2	185	7.4	20	7
3	187	7.3	23	8
4	189	7.5	24	5.5
5	190	7.3	20	7
Avg.	190.2	7.4	21.4	6.7

Table 4: Tensile strength of the cotton polyester sample.

Sr. No.	Wrap strength kg(f)	Wrap elongation in cms	Weft strength kg (f)	Weft elongation in cms.
1	192	8	85	6
2	190	8	115	9
3	205	8.5	65	5
4	190	6	55	5.5
5	185	5	65	5
Avg.	192.4	7.1	77	6.1

Table 5: Tensile strength of the cotton polyester sample.

The average loss in weight was 3.5% whereas the average loss in thickness was 7.1%. The effect of cotton and polyester is prominently seen as in the loss of weight and thickness in the pattern (Table 3).

Tensile strength testing

The stripe strength was carried out for the cotton polyester and polyester sample. The results are shown in Table 4 and Table 5.

Drape coefficient

The drape coefficient of the patterns prepared to check with drape meter and it shows to be 65.4%. This shows the fabric has good drape qualities.

Comparison of time consumption in DPOL method and manual method

Here we have compared the process and the time required in the manufacturing process of the fashion garments. All the results were taken in a lab method wherein the based on time required for the different garment making process is noted and expressed in percentage.

Time taken from the manual method:

New pattern creation=22.72%

Grading=11.36%

Laying=5.68%

Marker planning =17.05%

Cutting=9.10%

Stitching=34.09%

Total=100%

Time taken from the DPOL method: The DPOL method minimizes the pattern creation, Grading, laying and marker planning process this saves almost 56.82% of the manufacturing time. However, the DPOL processes of making garments like deciding the dimensions of the pattern based on the measurements of the required size, designing in the Bonas software and weaving increases the time required by almost 35.29%Thus, we save almost 21% of the manufacturing time in case of high fashion garments where each garment is designed specially.

Costing of the DPOL Method: As mentioned in the project that the main aim is to check the feasibility of the production of patterns on jacquard loom, whereas costing as the single piece garment it includes

1. The raw material cost for conventional method=50 to 60% (woven fabric)

2. The production cost will be as follows for the conventional method.

3. Wages and Salaries=18 to 25 Rs. Per Piece depends upon the number of operations required for the garment.

4. Power cost=It can vary from 5 to 7 Rs. Per piece

5. Store cost=2 to 3 Rs. Per piece.

6. Packing cost=10 to 15% (3 to 10 Rs. Varies with the quality of the packing)

7. Overhead=2 to 3 Rs. Per piece

As per as DPOL method is considered the cost of the processes like spreading, marking and cutting and other allied wages for the operation will be saved. And Hence it can be almost 30% savings will be there as to DPOL method of pattern construction. But the time for the designing and development on jacquard will be added to this new method.

Conclusion

The DPOL method produces high quality fashion garments along with the infinite possibilities of surface design on the fabrics of the garments. The method uses a jacquard loom running at a speed of 500 RPM and weaves garment panels directly, instead of the continuous fabric.

Designing with the Bonas Jacquard software and weaving increases the time required by almost 35.29% Thus, we save almost 21% of the manufacturing time in case of high fashion garments where each garment is designed specially. The costing as per as single piece garments are considered can be saved to 40% because of elimination of the processes like spreading, marking and cutting in conventional method of garment construction.

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