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Node Parameters and Its Relation with Constructional and Bending Properties of PC Blended Fabric.

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Abstract:- Drape is the most important aesthetic concept characteristics. Various methods have been employed to study this concept objectively. For many years textile researchers studied this fabric attribute in order to evaluate the drape quality, improve and design the drape ability of garments. In this present study the concept of drape parameters in terms of Node parameters have been studied using software made in Macromedia Flash Player thus removing the chances of human error. Here, this study also analyses the correlation between the Node parameters with constructional and bending properties of PC blended fabric. Results obtained show that the drape properties of the fabric can be connected to various fabric structure parameters. The greatest correlation is obtained between Node parameters and GSM, thickness, Flexural rigidity, and good correlation with other parameters.

Key words:- PC blended woven fabric, drape, Node parameters, GSM, Thickness, Flexural rigidity.

I. INTRODUCTION

Drape of fabrics is one of the most important aesthetic concept characteristics. (2)Drape is the ability of a fabric to assume a graceful appearance in use. (3)Broadly, speaking the Drapeability is deformation under the weight of a fabric partially supported. (4) 'Drape' is a term used to describe the way a fabric hangs under its own weight. It has an important bearing on how good a garment in use looks (15) many investigations have been done to objectively define and measure fabric drape. Along these lines drape was measured on Cusick's drape meter (7) and now progress to use of image analysis (6), web camera, photovoltaic cells (16).This was extended through the concept of Three Dimensional Drape using suitable apparatus (17) and modeling the same (18).Drape is one of the subjective performance characteristics of fabric that contributes to aesthetic appeal; it is a complex property involving bending and shearing deformations. (1, 5, 6).The relationship between Drape and fabric mechanical properties has been discussed earlier. (8-12) Bending Stiffness is one of the most important parameters controlling fabric drape. (13). Conventional Drape coefficient alone is not enough to describe drape. The use of three dimensional drape coefficient and Node parameters like Nodal length, Nodal distance & No of Nodes should be also done to describe drape completely. The measurement of drape parameters has been done earlier (7).but here software is used to measure node parameters, the method of which discussed. (17). So, the purpose of present work is to analyze the Nodal parameters such as Nodal length, Nodal distance, and No of nodes of woven fabrics; Effects of Bending and constructional properties on these parameters are investigated.Also, to investigate the correlation with these parameters.

II. EXPERIMENTAL

Materials and method

Sample consists of 100% cotton, 100% polyester, and range of P: C Blend. The notations of nodal length, nodal distance and no of nodes are depicted in the figure 1 .Here, the investigation of Nodal parameters was carried out by the method discussed in earlier paper (17).In this method a software was prepared using Macromedia Flash Player and then the ammonia paper cutting was placed on a scanner to capture the image of draped fabric samples and the values of node parameters was directly obtained by this software from the scanned image. The image was Calibrated by setting the dimension of the sample size as 25 cm as an annular ring. A known distance is taken and the image is resized and set at the Centre of the annular ring. The no of nodes are fed and the distances are measured automatically by setting markers at the nodes. The details of steps of using the software for the purpose of testing have been given schematically in figure 2.

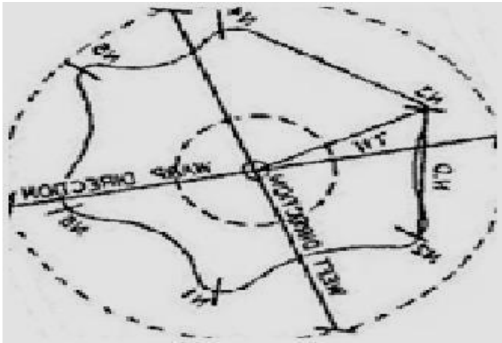

Figure 1: Depiction of Nodal parameters (2, 7)
N.D = Nodal distance; N.L = Nodal length; N1….N_6 = No of Nodes

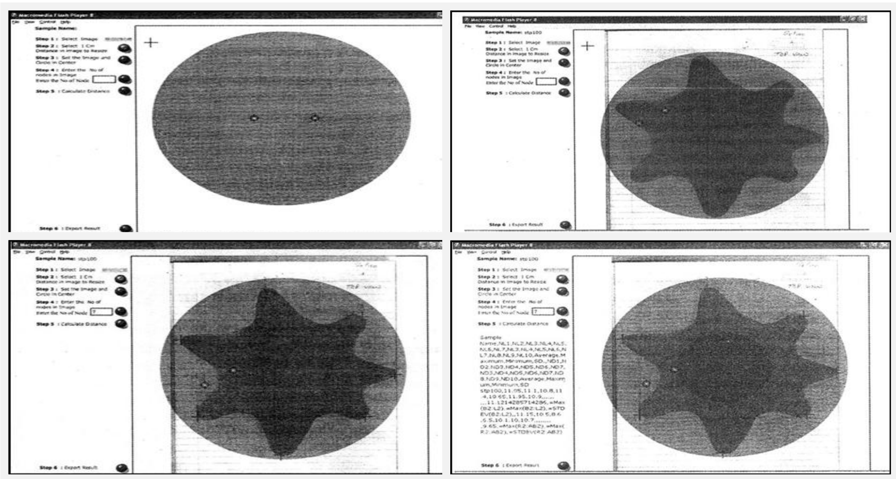

Figure 2: Clockwise from left a) Home page of software used for Node parameters b) Calibration of image for Node parameters calculations c) Node identification for Node parameters calculations d) Node parameters calculations [17]

The Bending length, Flexural Rigidity and Bending Modulus were measured on standard Shirley stiffness tester. The summary of various structural and bending parameters checked along with methods adopted for testing is given in Table 1.

Table 1: Various structural and bending parameters measured along with their methods.

Type of Test	**Test Method Details**
Structural Properties	
GSM	***Cut and weigh***
Structural Characteristics: (EPI,PPI)	***Pick glass***
Thickness	***Thickness Gauge***
Bending Properties	
Bending length	***Shirley stiffness tester*** $\{c=lf(\theta)\}$***(3)***
Flexural rigidity	***Shirley stiffness tester*** $G=w_2*10^3$***(3)***
Bending Modulus	***Shirley stiffness tester*** $q=(12G*10^{-6})/g_2^3$ ***(3)***

III. RESULTS AND DISCUSSION

1) Relationship between structural parameters and node parameters.

The structural parameter of the PC Blend fabric samples has been given in Table 2. The nodal parameters are presented in Table 3. The Fabric weight range from 106-140 g/m^2.The Thickness range from 0.022-0.037 cm

Table 2: Structural parameters of the sample fabric construction

SR NO	SAMPLES ID	BLEND RATIO (P:C)	GSM	EPI	PPI	THICKNESS (cm)	WARP COUNT (Ne)	WEFT COUNT (Ne)	THREAD COUNT	COVER FACTOR
1	S_1	100:0	114.33	86	132	0.017	49.64	46.11	218	31.65
2	S_2	90:10	112.35	58	72	0.029	22.81	25.12	130	26.51
3	S_3	80:20	110.59	66	66	0.031	31.46	29.80	132	23.86
4	S_4	75:25	116.15	58	78	0.032	21.24	27.01	136	27.59
5	S_5	70:30	108.26	100	86	0.022	32.97	40.70	186	30.90
6	S_6	67:33	114.21	72	106	0.023	38.66	38.43	178	28.68
7	S_7	60:40	106.46	80	80	0.026	68.07	41.18	160	22.16
8	S_8	50:50	121.95	80	80	0.037	32.50	31.77	160	28.23

Table 2 depicts that addition of percentage of polyester was increased in the union fabric than the thickness

Was also increased. Only, in samples where finer count of yarn was used for warp and weft this trend was not followed. Also, Sample S_8 having highest thickness has high Nodal length value & Nodal distance is also high but there is no clear trend as no of nodes affects the nodal distance value. Also, here the weight and cover factor fabric plays an important role.

It can be seen sample S_{10} has quiet high fabric weight than most other fabrics. Also, thread count (epi+ppi) and cover factor is also highest, the Nodal length and Nodal distance value is highest as compared to most other fabrics. These values also justify the end use of fabrics which is intended for shirting does not need to be very drapeable.(14) When fabric hangs and creates folds, bending and shear deformation act on the fabric. So, higher values of aforementioned parameters are good indication and explanation of high node parameters. The correlation between a) Nodal length b) Nodal distance with GSM is (0.71), (0.56), with thickness is (0.21), (0.38), with EPI is (0.27, 0.14), with PPI is (0.008, 0.027). (Figure 1-4)

Table 3: Nodal parameters of sample fabric

SAMPLES ID	No of Nodes	Nodal length	Nodal distance
S_1	7	9.51	10.97
S_2	5	14.86	12.7
S_3	6	12.41	12.4
S_4	5	14.2	12.16
S_5	5	14.26	12.1
S_6	5	14.62	12.58
S_7	7	10.67	12.16
S_8	5	15.52	13.44
S_9	4	21	14.86
S_{10}	5	19.93	13.74
S_{11}	5	14.76	12.58

2) Relationship between bending parameters and node parameters.

The Bending parameters having higher influence on Nodal parameters are stated in Table 4.It can be seen Sample S_{10} having highest Bending length (warp-way) and Flexural rigidity (warp-way) is having highest Nodal length value from most other fabrics. The samples S_1 having minimum bending length and Flexural rigidity have minimum Nodal length and Nodal distance. The correlation between a) Nodal length b) Nodal distance with Bending length (warp-way) is (0.13), (0.20) resp, with Bending length (weft-way) is (0.05), (0.09) resp, with Flexural rigidity (warp-way) is (0.3), (0.3) resp, with Flexural rigidity (weft-way) is (0.06), (0.08) resp. It was also observed that these properties were not affected by the bending modulus values. Also, no significant relation is found between No of nodes and these properties. From the graphs it is seen that Nodal length and Nodal distance represents a better relationship with GSM, Thickness, Bending length (warp-way) Flexural rigidity (warp-way) as compared to other properties.

In case of P/C blended fabrics, the value of Nodal length, Nodal distance increases with the increase in cover factor but there is lack of a clear trend. The reason may be when there is increase in picks per inch creates two types of forces. If the warp threads are not increased then the load bearing capacity of these threads remains the same but the load increases. So, there will be more bending .whereas in case of weft the load remains the same but the load bearing threads increase. So, there will be bending but less drape. But the ends per inch are not constant hence the thread count value is considered. Hence, the overall influence of increasing thread count will be the result of these two opposing forces and hence, not necessarily the increase in Nodal length, nodal distance values need not be expected. However, it may be observed that the final appearance of fabric improves with increase in GSM and cover factor.

Table 4: Mechanical parameters of sample fabrics

SAMPLES ID	***Bending length (warp)*** *cm*	***Bending length (weft)*** *cm*	***Flexural Rigidity (warp)*** *mg/cm*	***Flexural Rigidity (weft)*** *mg/cm*	***Bending Modulus (warp)*** *kg/cm²*	***Bending Modulus (weft)*** *kg/cm²*
S_1	1.29	1.065	24.4	13.69	59.59	33.43
S_2	2.105	2.3	104.03	135.83	49.46	64.58
S_3	1.815	1.865	65.85	71.41	55.69	27.86
S_4	1.935	1.99	83.28	90.92	290.57	32.28
S_5	1.35	1.3	26.58	23.78	29.96	26.8
S_6	1.855	1.55	72.29	42.53	71.3	41.95
S_7	2.1	1.665	98.51	48.91	69.91	34.71
S_8	1.865	1.84	78.36	75.53	18.56	17.89
S_9	1.915	1.6	92.46	54.17	38.47	22.54
S_{10}	2.325	1.665	176.88	65.4	87.03	31.74
S_{11}	0.95	1.79	10.05	66.98	11.33	75.49

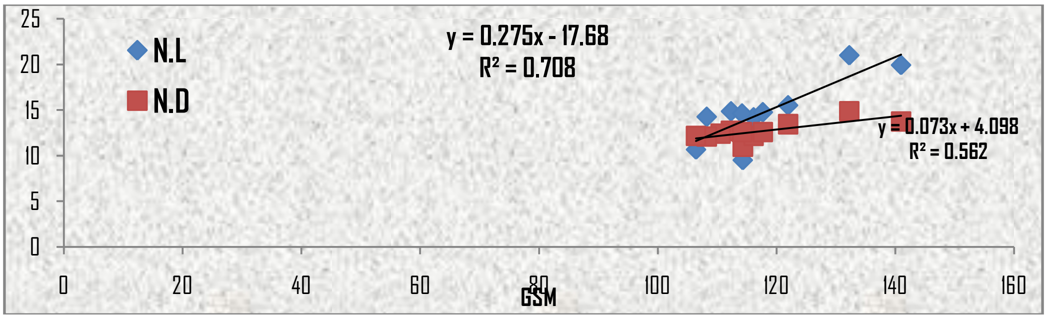

Figure1: Correlation between N.L, N.D with GSM.

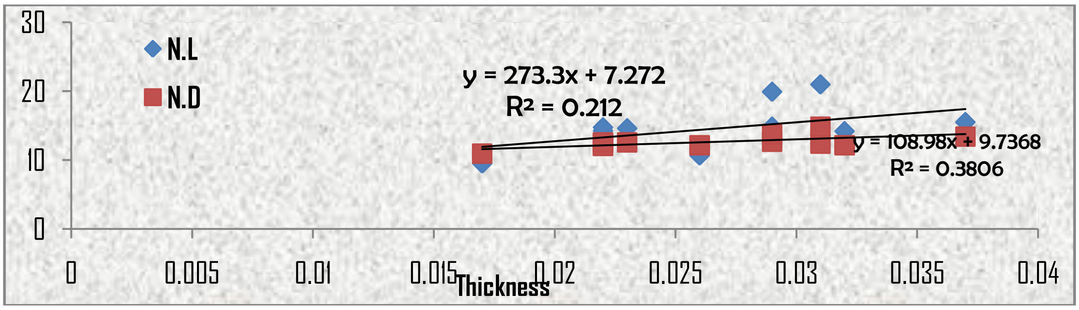

Figure 2: Correlation between N.L, N.D with Thickness.

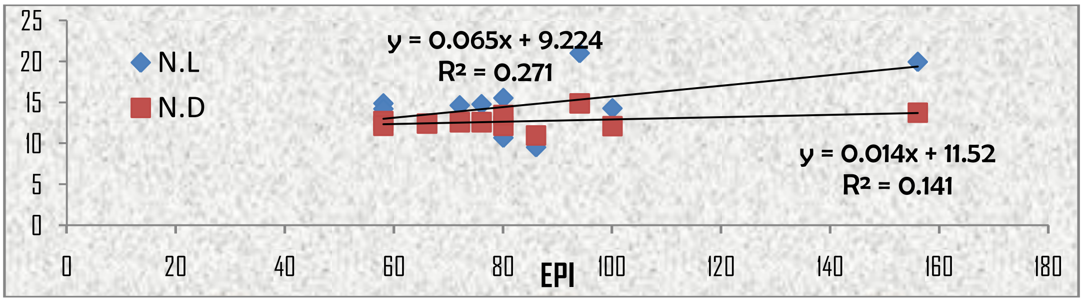

Figure 3: Correlation between N.L, N.D with EPI

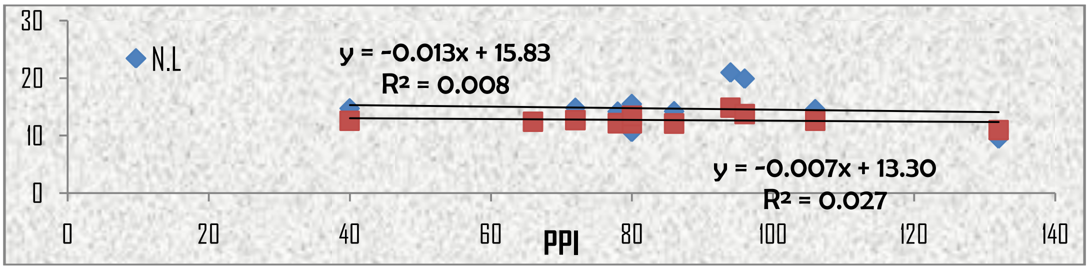

Figure 4: Correlation between N.L, N.D with PPI

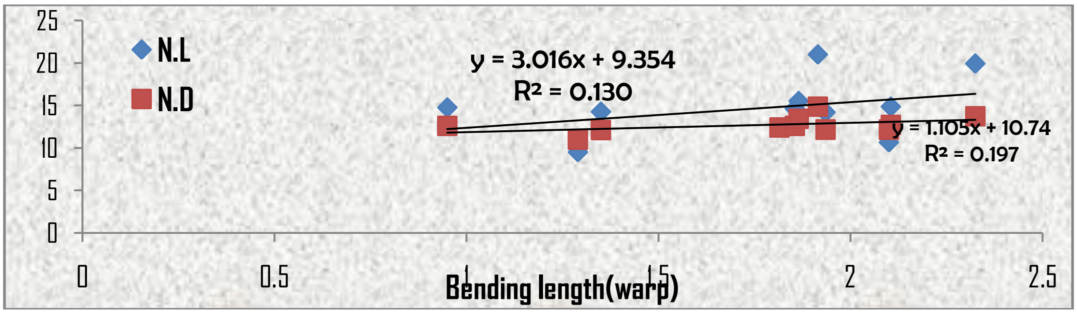

Figure 5: Correlation between N.L, N.D with bending length (warp).

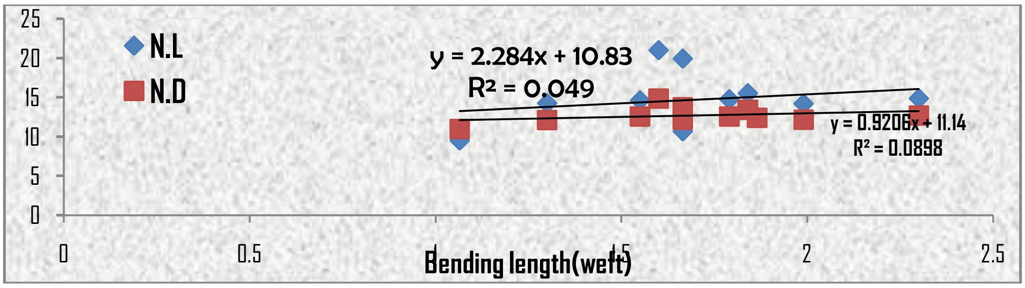

Figure 6: Correlation between N.L, N.D with bending length (weft).

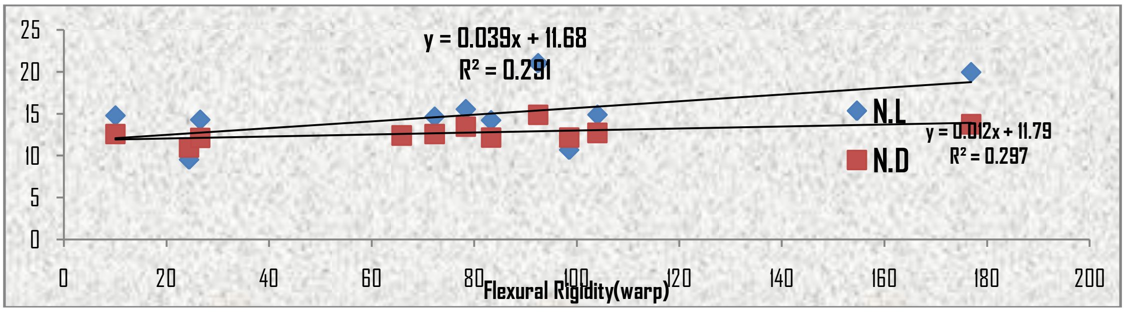

Figure 7: Correlation between N.L, N.D with Flexural Rigidity (warp).

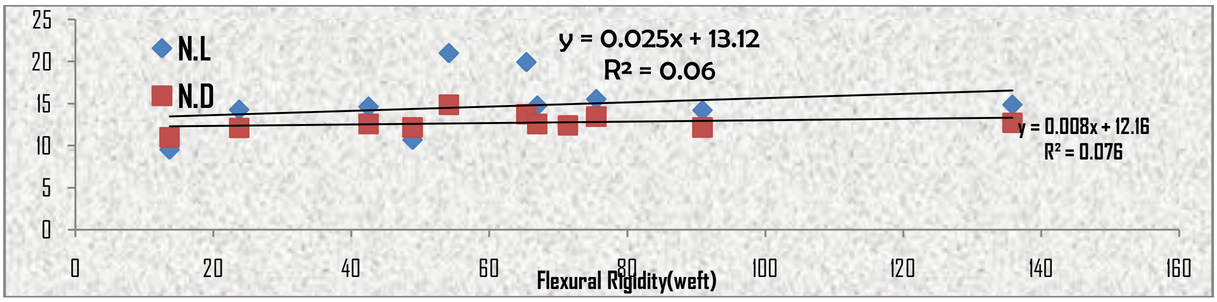

Figure 8: Correlation between N.L, N.D with Flexural Rigidity (weft).

IV. CONCLUSION

Drape coefficient alone is not sufficient for understanding the draping behavior of fabric. Along with other drape coefficients Nodal parameters like Nodal Length, Nodal Distance, and No of Nodes are also necessary to be specified to get the complete idea of drape. Due cluster of data available, it becomes difficult to handle it, so basic aim is to develop a method with which the draping behavior can be compared easily and fast. It can be seen sample that has quiet high fabric weight than most other fabrics. Along with high thread count and cover factor, the Nodal length and Nodal distance value of this sample is highest as compared to most other fabrics. Also, this sample has highest Bending length (warp-way) and Flexural rigidity (warp-way). The high correlation between the nodal parameters and bending properties along with structural properties shows that these properties do have an effect on the nodal parameters. Thus, affects drape.

REFERENCE

[1]. IS: 8357-1977.Method for assessment of Fabric Drape.
[2]. G.Thilagavathi and V Natarajan,"3-D measurement of fabric drapeablility'ITJ, 2003, pp 27-31.
[3]. J.E.Booth,"Principles of Textile Testing", London Heywood Books.
[4]. Ayse Okur & Tansel Cihan,"Prediction of fabric drape co-efficeint from FAST data,Textile Asia,2002,pp 28-31
[5]. Y.J.Joeng,"A study of fabric drape behavior with Image Analysis Part-I:Measurement,Characteristics,Instability,JTI,1998,pp 59-6
[6]. B.K.Behera & Ajay Pangadiya,"Drape measurement by digital image processing, Textile Asia
[7]. G.Thilagavathi and V.Natarajan,"Development of a method for measurement of fabric three Dimensional drape and studies on influencing factors,IFJTR,2003,pp 41-49
[8]. Kawabata.S and Niwa.M,"Fabric performance in Clothing and Clothing Manufacture.JTI,80,1989,pp 19-50
[9]. Kawabata.S,"Characterization Method of the Physical property of Fabrics and the measuring system for hand feeling Evaluation, JTMSJ, 26(10), 1973, p721-728.
[10]. Owen .J.D,"The Bending Behaviour of Plain-weave Fabrics woven from Spun yarnsJTI,59,1968,pp 313-343
[11]. Yang,M. and Matsudaira,M.,"Measurement of Drape Coefficients of Fabrics and Description of those hanging shapes.Part-4",JTMSJ,52,1999,pp 167-175
[12]. Yang,M. and Matsudaira,M.,"Measurement of Drape Coefficients of Fabrics and Description of those hanging shapes.Part-5",JTMSJ,53,2000,p 115-120
[13]. Yang,M. and Matsudaira,M.,"Measurement of Drape Coefficients of Fabrics and Description of those hanging shapes.Part-2",JTMSJ,51,1998,p 65-71
[14]. Jedda H.,Ghith A. and Dakli F.,"Prediction of Fabric Drape using the FAST system".JTI,98(2),pp 219-225
[15]. Saville BP 'Physical testing of textiles'. Cambridge: Woodhead.2000.p.310.
[16]. V.Natarajan and A.K.Vikaram Apparaj:Development of web-camera based 3D Drape meter.(website)
[17]. S.A.Agrawal & D.A.Vasavda,"Three Dimensional Measurement of Drape", Journal of the Textile Association, Nov-Dec 2009, pp 155-162.
[18]. S.A.Agrawal,D.P.Patel& D.A.Vasavda,"Numerical Simulation of Three Dimensional Drape, Man-made Textiles in India, October 2011,pp 363-366