حساب قابلية الاقمشة للتفصيل

الجزء الأول: البنية الأساسية

Computational Mechanics of Fabric Tailor ability

Part I: Build Infrastructure

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الملخص:

تعتبر عملية الحياكة قلب مصنع الملابس الجاهزة، ومن ثم يجتهد الباحثين فى مراقبة عناصر الحياكات(الخيط–القماش–الماكينة) بغرض الحصول على أزياء دون مشاكل اوما يعرف بقابلية الحياكات.

ويتكون هذا البحث من ثلاثة اجزاء حيث يهتم الجزء الاول بتصميم منظومة القياس وكذا المعالجات الرياضية الخاصة بحساب قابلية الاقمشة للتفصيل، بينما الجزء الثاني يدرس تأثير المعالجة بالبلازما وقابلية القماش للتفصيل، واخيرا الجزء الثالث الذى يدرس العلاقة بين الاجهاد النوعى للحياكات والتلف الحادث بالقماش بسبب الحياكات بطريقة تجريبية ومعملية.

ومعروف ان نظام "فاست (FAST) يتكون من أربعة اجهزة معملية لتقييم قابلية القماش المختبر للتفصيل، بينما يضم نظام "كافاباتا (KES–fabrics) نظاما معمليا اخر يتكون من أربعة أجهزة قياس ومعادلات رياضية لتقيم ملمس القماش المختبر، ويعتبر جهاز (L&M) مقياسا جيدا للتعبير عن خاصية قابلية الحياكات. والنظم السابقة عليها العديد من الملاحظات، منها انها تحتاج الى عمليات قياس كثيرة وطويلة ومملة ولا تصف بطريقة مباشرة أيا من قابلية القماش للحياكات (Sew ability) او التفصيل اوالتلف الحادث بسبب الحياكات.

ويقدم هذا البحث، جهازا جديدا لقياس قابلية الاقمشة للحياكات
(ST_2 Modified Fabric Sew ability Tester) الذى يضم اختبارا معمليا وحيدا ومعادلات رياضية لتقيم التلف الحادث بالقماش بسبب عملية الحياكة وكذا دلائل قابلية

القماش للحياكات – قابلية القماش للقص– قابلية القماش للتشكيل ومنهم أمكن حساب دليل قابلية القماش للتفصيل.

اشار مقياس "كندل" الى درجة اتفاق عالية ((W=0.7) بين نتائج جهاز قياس قابلية الحياكات المعدل(ST_2) و نتائج جهاز قابلية التفصيل(FAST) بحيث يمكن ان يحل اى منهما مكان الاخر.

الكلمات المفتاحية:

عناصر الخياطة (خياطة الاقمشة – خيوط الخياطة – ماكينة الخياطة) – تقدير قابلية الاقمشة للتفصيل – إجهاد الخياطة النوعى (SSS) – قابلية الاقمشة للتشغيل (FP) – قابلية قص الاقمشة (FSa) – قابلية حياكة الاقمشة (FSe) – تقدير مدى قابلية الاقمشة التشكيل.

Computational Mechanics of Fabric Tailor ability
Part I: Build Infrastructure

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Abstract
Sewing operation is the heart of the garment factory, so researchers work hard to monitor the performance of sewing elements (thread-fabric-machine) in order to obtain garments without problems or what is known as tailor ability. This investigation consists of three parts. The first part is dealing with the infrastructure and sewing machine sew ability index, while the second concentrated on the influence of plasma treatment ,on overall fabric tailor ability index. Last part is the relation between specific sewing stress and sewing degradation.

It is known that, fabric assurance by simple test (FAST) offers a laboratory system of four mechanical tests to assess the tailor ability, while Kawabata evaluation system for fabrics (KES-F) includes another laboratory system consisting of four measuring machines and mathematical method to assess the fabric handle. On the other hand (L&M) sewabilty tester measured fabric resistance to sewing needle penetration, as a measure of fabric sewabilty.

The previous systems have many negative features, such as they are tedious and lengthy, they cannot used to assess direct sew ability/and or tailor ability, noncan give reliable information about fabric anisotropy, fabric wearabilty assessment, fabric skin-comfort, fabric roughness and specific sewing stress.

Thus, it is obvious that rapid and simple method for assessing fabric sews ability and/or fabric tailor ability is badly needed. The results of this study gives a test method and/or mathematical procedure for calculating overall fabric tailor ability index (OTI), as a function of fabric process ability (FP) ,fabric saw ability (FSa) ,fabric sew ability (FSe) and fabric form ability (FF).

To test the relationship between specific sewing stress (SSS-cN/tex) measured by modified fabric sew ability tester (ST2), and fabric tailor ability index, measured by fabric assurance by simple testing (FAST), coefficient of concordance,"W", has been calculated. It was found that "W" value reaches 0.702, i.e., good agreement. That result was expected, cause, "SSS”, is measured the fabric sew ability phenomena only, while "FAST" measured fabric tailor ability phenomena, which sew ability is a part of it.

Keywords:
Sewing elements (sewed fabric - sewed thread-sewing machine)
- sewability (FSa) ability index - Specific sewing stress (SSS) -Fabric process ability(FP) - Fabric saw - Fabric sewabilty (FSe).

1. Introduction:

Sew ability of fabric is a characteristic property of fabric which allowed to be seamed at the full limit of high-speed sewing machinery without the mechanically degradation of sewed fabric. Generally, the strength of the woven fabric is considerably reduced by the seaming operation which intern reduces the overall life of a garment. Fabric sew ability is one of the top ten quality problems in the garment industry.

Before manufacturing any garment product in readymade garment industry, fabric should be tested whether it is perfect or not for sewing. In fabric sew ability assessment method, some tests should be followed which are mentioned in this article. To assess the sew ability of fabric, it necessary to do the following tests:

1-Seam strength, 2-Seam puckering, 3-Seam slippage, 4-Seam fraying, and, 5- Seam lubricating content.

Fabric sew ability is usually assessed by Needle/fabric penetration (Simmons, University of Bradford, Hatra sew tester, L&M sew ability tester, NCSU sewing dynamometer, Tester of fabric penetration behavior (Kyoto University of Industry Arts and Textile fibers, where's fabric tailor ability is assessed by Kawabata evaluation for fabrics, Fabric assurance by simple testing, Computer-interfaced fabric tailor ability tester [1]. Disadvantages of this method are:

They are tedious and lengthy, they cannot used to assess direct sew ability/and or tailor ability, noncan give reliable information about fabric anisotropy, fabric wearabilty assessment, fabric skin-comfort, fabric roughness and specific sewing stress. Thus, it is obvious that rapid and simple method for assessing fabric sews ability and/or fabric tailor ability is badly needed. This work، undertaken to fill this gap.

2. Theoretical Part:

2.1. Overall sew ability Index:

Sew ability means sewing without problems, which depends on sewing thread, sewed fabric and sewing machine, for all types of fabrics. To calculate overall sew ability index, the simplest equation is chosen. In fact, it is the product of sub-index related to the sew ability parameters as presented in the following equation:

Overall Sew ability Index (OSI) = $\sqrt[3]{}$ Fabric sew ability (FS)*Thread sew ability (TS)*Machine sew ability (MS). (1)

Where: OSI: Overall sew ability index, FS: Fabric sew ability, TS: Thread sew ability, MS: Machine sew ability .TS and FS are evaluated with physical and mechanical properties of thread and fabrics, while MS is evaluated according to Z score standardization. Therefore, overall sew ability index is unit less factor.

2.2. Overall Fabric Tailor ability Index:

To calculate overall fabric tailor ability index, as a function of fabric process ability, fabric saw ability, fabric sew ability, and fabric formability as presented in the following equation:

Overall Fabric Tailor ability = $\sqrt[3]{FP * FS_a * FS_e}$ (2)

Where:

FP= Fabric process ability, FS_a=Fabric saw ability, and FS_e = Fabric sew ability, respectively. The unit of Overall fabric tailor ability is cN/tex

2.3. Modified Fabric Sew ability Tester (ST2),

"ST2", has been developed as a result of research carried out in the Textile Engineering Department of the Mansoura University.

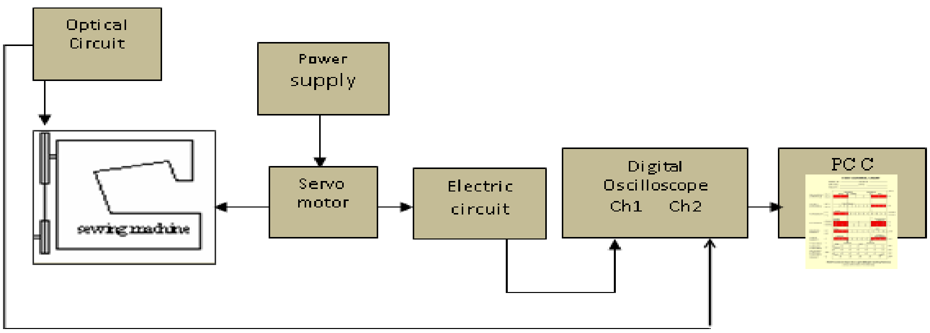

Fig. (1) Modified Fabric Sew ability Tester (ST_2),[12&13].

The sewing needle penetration force is the quantities measure of the damage which appears in agreement as the result of the sewing process. A high penetration force means a high resistance of fabric and thus a high risk of damage [13-19] .

2.3.1-Overall Fabric Tailor ability Assessment [12]:

Fabric tailorability.It is a function of: Fabric process ability, Fabric Saw ability, Fabric sew ability, and Fabric formability.
Where: Fabric process ability, "FP", Fabric Saw ability, "F S_a", and Fabric Sew ability, "F S_e". These Indexes may predictor as follows (See Fig.2):

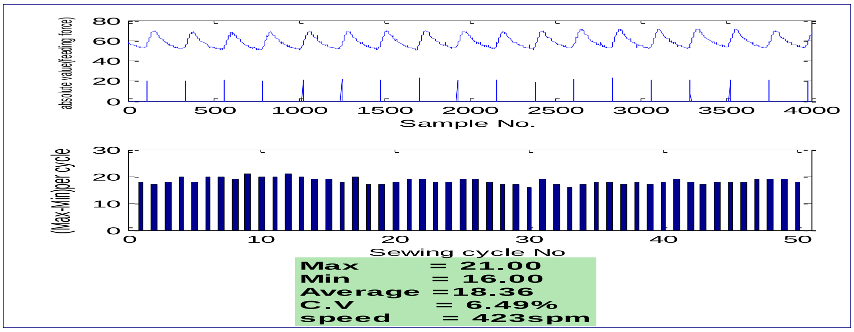

Fig. (2) Output of ST_2

FP = FRNP (min.) / W x SS, (4)
F Sa = FRNP (max) / W x KS, (5)
F Se = FRNP (average) / W x NS, (6)

2.3.2. Overall Fabric Tailor ability "OFT"[13 &14]:

OFT, is given by the following equation:

$$OFT = (FP \times FSa \times FSe)^{1/3} \quad (2)$$

And the Critical Value of overall fabric tolerability is:

$$0\ (\text{Acceptance}) \geq OFT \leq 1(\text{Rejected}), \quad (7)$$

Where:

W, SS, KS, NS, BS, OFT, are fabric weight (g/m^2), Spreading Size, Knife Size, Sewing Needle Size, and, OFT is the voice of process, respectively.

2.3.3. Fabric wear ability Assessment [16]:

Fabric wear ability index = 1 – (FRNP2/FRNP1). 100 (8)

2.4. Fabric Skin-Comfort [13]:

Specific Sewing Stress = Fabric Needle Penetration Force (cN) / Fabric weight (g/m2) x Sewing Needle size/100 (mm) cN/tex (1)

Where:

SSS (min.) ………..means high comfort level (9)

SSS (max) …………means low comfort level. (10)

2.5. More about Specific sewing stress [12&13]:

Testing fabric sew ability using set-up (ST_1), (MSc, Mansoura University, Faculty of Engineering, Textile Department, Abd-EL-Sallam, D.,2004,[6]), this is a device used in many studies on needle penetration force. This equipment simulates a sewing machine by penetrating the tested fabric with an unthreaded needle, with needle size 70. The modified fabrics sew ability system (ST2) has been modified such as follows [13]:

1-New test method, (Sample Size, Test Direction, and Sample size),

2- R & R Tools (Repeatability &Reproducibility) analysis,are given,

3-New approach to sew ability of sewing machine, and

4-Predicting the following characteristics: Fabric wear ability assessment, Fabric anisotropy assessment, Overall fabric tailor ability index and Fabric skin- comfort assessment, all has been modified by EL-Hadidy, A, (2006 -2012) [13].

Sew ability was considered to be only fair even though no great difficulties arose during sewing. Specific sewing stress "SSS" may calculate using formula 2, as follows:

Specific Sewing Stress = Fabric Needle Penetration Force (cN) / Fabric weight (g/m^2) x Sewing Needle size / 100 (mm) cN/tex (3)

3. Materials and methods:

3.1. Sew ability of sewing threads:

Technology of clothing production is still based on sewing and sewing threads, for modern automatic sewing machines the threads breakage represents crucial problem. There are a lot of parameters describing the failure process at sewing process. such as:

1-No. of threads breaks per some length of threads.

2-No. of threads breaks per some time interval,

3-Time between two successive thread breaks.

3.1.1. Techniques for sew ability evaluation.

3.2. Tested Sewing Threads:

The information's given in this part are mainly abstracted from Refs. [2-11].

Sew ability is defined as a thread's ability to perform on the sewing machine. The thread must perform flawlessly at high machine speeds without breaking and without skipping stitches. The critical factors necessary for good sew ability are thread strength, optimum twist levels, low fault levels, low and controlled elongation, tenacity and lastly even lubrication. While spun threads are the most common types, core-spun sewing threads are produced to achieve optimum strength-with-fineness of continuous-filament threads together with sewing performance and surface characteristics of spun-fibre hreads.

The physical and mechanical properties of sewing thread (thread sew ability) such as breaking strength, elongation at break and young's modulus reflect the performance of thread and thread behavior during the sewing. Table [I] shows the properties of tested sewing threads.

Table [I] shows the properties of tested sewing threads.

Thread type	Twist factor	Tenacity g/tex	Elongation %	Work done cN .Cm	Friction µ	Hairiness / Cm
Ring	90	18	21	32	0.20	30
Open End	85	17	18	25	0.22	50
Vortex Spinning	80	16	16	20	0.23	20
Compact Spinning	83	17	15	17	0.22	15
Siro Spinning	95	19	20	22	0.19	17
Ring Spinning	75	15	22	18	0.21	20
Hollow Spinning	70	13	13	22	0.20	21

3.3. Tested Fabrics:

Sew ability of fabric is the characteristic property of a fabric which allows it to be seamed at the full limit of high-speed sewing machinery, without the mechanical degradation of fabric. Generally, the strength of the woven fabric is considerably reduced by the seaming operation which intern reduces the overall life of a garment. Cutting, scorching, or fusing of yarns in fabric by a sewing needle are the reasons behind the loss in fabric strength as well as poor seam appearance. Fabric sew ability is one of the top ten quality problems in the garment industry. Sew ability of fabric (The degree of its resistance to needle damage) can be assessed by determining:

1- The proportion of fabric yarns cut by the needle (Needle Cutting/Yarn Severance).

2- Loss in fabric strength caused by needle damage.

3.4. Sewing machine

Sewing machine sew ability assessment may be helps in control these defects. In this work the singer sewing machine with needle whose shaft is round and not flat on one side of the shaft, was used. Supper imposed seam, was used for knitting materials. Sew ability of sewing machine may be predicted by making use of specific sewing stress (SSS-cN/Tex).

3.4.1 Needle Cutting Index/Yarn Severance

Needle cutting or yarn severance in a fabric is unreceptive because due to frayed yarns it may result in reduced seam strength, poor seam appearance, or both.

3.4.2. ASTM test method for needle cutting or yarn severance:

Sewn seams are prepared for testing. After the seaming operation is over, the sewing threads are removed from the test specimens. The count of the number of yarns in fabric and the count of the number of severed (detached/disengaged/ cut) and fused fabric yarns in the direction nearly perpendicular to the direction of sewing are used to calculate the needle cutting index.

3.4.3. Seam Efficiency:

There is a loss in fabric strength after sewing which is because of damage caused by needle to yarn in fabric during needling.
The measurement of the loss in fabric strength due to needle damage consists of sewing a seam in the fabric, breaking the fabric at the line of stitching, and establishing a ratio between the original and the seamed fabric strength.
If seam efficiency falls below 80%, the fabric has been excessively damaged by the sewing operation

3.4.4. L&M Sew ability Tester:

This test measures the needle penetration force to predict the sew ability of the fabric. The apparatus is called the L & M Sew ability Tester. The fabric is fed forward by rollers beneath a needle that penetrates it. It can operate at a speed of 20 penetrations per minute, which means a test of 100 penetrations takes no longer than five minutes.
Properties of tested fabrics are:
The weight of commercial samples of knitted in range of 130g/m^2 to 300g/m^2 were used for testing specific sewing stress, sew

ability, and tailor ability of tested apparels. Table [II] shows the properties of tested knitted fabrics.

Table [II] shows the properties of tested knitted fabrics.

Properties	F1	F2	F3	F4	F5	F6
Weight	191.8	197.3	152.4	234	273.3	231.7
Thickness	0.57	0.82	0.65	1.12	1.09	1.36
Hardness	360	409	333.3	191.5	181.3	140.6
Softness	0.125	0.11	0.135	0.235	0.61	0.32
Compression Ratio%	51.6	58.5	54.7	56.8	66.8	56.1
Air permeability	13.9	22.4	22.4	31.6	19.1	22.4
Absorption %	61.4	72.8	74.4	74.6	70.8	80
Anzotropy	0.67	0.89	0.72	0.58	0.76	0.95
Bending Modulus	2.8	0.37	0.18	30.9	36.3	0.02
Crease %	49.4	53.6	47.8	63.1	48	46.4
Bursting index	13.6	10.4	5.4	10.2	10.2	5.9

4. RESULTS:

4.1. Results of sewing threads:

There are two ways to scale each parameter on a radius:

1-parameters without data normalization process,

2-parameters after normalization, using one of the following methods:

$$X\,j = X\,max - Xi \,/\, X\,max - X\,min \qquad (11)$$

$$Xi - \ddot{x} \,/\, \sigma \qquad (12)$$

$$Xi - X\ med / X90 - X10 \qquad (13)$$

Where equation 15, 16, and 17, are range standardization, Z-score standardization, and inter-docile range standardization respectively,

σ =standard deviation, X med = median, X_{90}, X_{10} distance percentile.

Table [III] shows the results of tested sewing threads after normalization. By combining the results in Table [I] and Table [III].

Table [III] the selection of necessary parameters can be processes.

Thread type	Twist factor	Tenacity	Elongation	Work done	Friction	Hairiness.	Average
1	77.8	94,7	95.5	100	95	50	85.5
2	82.4	94.7	81.8	78.1	86.4	30	75.6
3	87.5	94.7	72.7	62.5	82.6	75	79.2
4	84.3	94.7	68.2	53.1	86.4	100	81.1
5	73.7	94.7	90.9	68.8	100	88.2	86.1
6	93.3	94.7	100	56.3	90.5	75	84.9
7	100	94.7	59.1	68.8	95	71.4	81.5

It was found that, thread No.5 (Compact spinning) is the best selection. From results presented above follows that for specification of sew ability characteristics computed from parameters of Gumbell Distribution can be used.

4.2 Results of fabric sew ability:

The same procedure was applied for fabric sew ability, Table [IV], shows that results.

Fabric Type	F1	F2	F3	F4	F5	F6
Weight	79.4	77.2	100	65.1	55.8	65.8
Thickness	100	69.9	87.7	50.9	25.1	42.1
Hardness	39.1	34.4	42.2	73.4	50	100
Softness	20.5	18	22.1	38.5	100	52.5
Comp. ratio	77.3	87.6	81,9	89.5	100	83.9
Air permeability	44.2	70.8	70.8	100	60.3	83.9
Absorption	44.2	70.8	70.8	100	60.2	86.9
Anzotropy	76.8	90.9	93	93.3	88.5	100
Bending Modulus	80.3	65.4	81.6	100	76.5	61.2
Crease %	94.4	86.7	97.1	73.5	96.7	100
Bursting index	100	76.7	39.6	74.7	75	43.9

Fabric sew ability is calculated as follows:

Fabric ploy gone area=

$$0.5 * \sin \Theta \, [P1*P2 + P2*P3 + P3*P4 + P\,n*P1] \quad (14)$$

$$\text{Ideal ploy gone area} = 0.5 * \sin \Theta \, [P1ideal*P2max + P2ideal*P3ideal + \ldots\ldots\ldots P\,n\,ideal*P1\,ideal] \quad (15)$$

$$\text{Fabric sew ability index} = \text{Equ.14} / \text{Equ.15} \quad (16)$$

Where n=no. of tested properties, and

$$\Theta = 360 / n \quad (17)$$

It was found that fabric No. five is the best selection from physical-mechanical point of view.

4.3. Results of sewing machines sew ability:

Table [V] shows the results of sewing machine sew ability assessment.

Fabric Types	Weight(g/m2)	SSS (cN/tex)
F1(Jersey)	126	3.492
F2(Rib)	130	1.775
F3(Pique)	140	1.918
F4(Jacquard)	152	2.068
F5(Melton)	170	2.286
F6(Plush)	197	1.015

It was found that sewing machine with single Jersey fabric is the best selection.
From Tables III, IV, and V, one calculate, "TS","FS", and "MS", then overall sew ability index can be calculated. It was found that overall sew ability index reaches 0,088. That value can be used as bench maker value for control sew ability phenomena of tested fabrics, i.e., values more than that gives, problems and defects during sewing process.

4.4. Results of specific sewing stress of multi-layered fabrics:
The number of fabric layers has a significant influence on "FRNP", when fabric weight and needle size are held constant.
Table IV. The effect of number of fabric layers on the needle penetration force under sewing with different fabric weights (g/m^2) (a): 75, (b): 82, (c): 43, (d): 106., (e):37, (f) :302, and (g) :360.
In all fabrics, the values of "FRNP" increase with fabric layers. (Table IV). It is clear that with increasing the number of fabric layers, the needle passes through a thicker structure leading to a higher needle penetration force. However, in the other cases the differences between NPF for all layers are meaningful.
The results of the regression analysis of "FRNP" as a dependent variable and fabric layers as independent variable depict that the cubic curve
exhibits higher values of R2 than linear and exponential curves- Table [IV].

Table [IV] shows the results of needle penetration force of multi-layered interning fabrics.

Samples (1)	Max	Max (CN)	Min	Min (CN)	Aver	Aver (CN)
one layer	16.13	491.3586	2.13	11.67925	7.83	129.323
two layer	21.69	849.1203	10.69	229.8369	15.06	432.8531
three layer	33	1843.288	15	429.6733	23.07	951.5832
four layer	54.75	4695.624	22.75	927.3475	32.62	1804.275
Samples (2)	Max	Max (CN)	Min	Min (CN)	Aver	Aver (CN)
one layer	13.66	361.4725	2.66	17.60574	7.06	106.8169
two layer	14.18	387.2967	2.18	12.19065	7.32	114.1957
three layer	17.39	564.5874	1.39	5.309409	8.79	160.1199
four layer	22.77	928.8538	5.77	73.58505	12.5	306.8249
Samples (3)	Max	Max (CN)	Min	Min (CN)	Aver	Aver (CN)
one layer	16.24	497.5655	2.24	12.81758	8.11	137.9937
two layer	15.28	444.6043	3.28	25.92488	8.98	166.5709
three layer	19.82	718.8666	8.82	161.1307	14.02	379.2638
four layer	25.89	1177.478	9.89	199.079	17.16	550.8727

To test the relationship between specific sewing stress (SSS-cN/tex) measured by modified fabric sew ability tester (ST2), and fabric tailor ability index, measured by fabric assurance by simple testing (FAST), coefficient of concordance,"W", has been calculated. It was found that "W" value reaches 0.702, i.e., good agreement. That result was expected, cause, "SSS", is measured the fabric sew ability phenomena only, while "FAST" measured fabric tailor ability phenomena, which sew ability is a part of it.

CONCLUSION:

It was found that, modified fabric sew ability tester (ST_2) was succeeded in determining fabric tailorabity. Therefore, this study recommended to use it, as a tool for evaluating fabric tailor ability.

Where, needle penetration force is a dynamic phenomenon and represents quantitative measure of the fabric damage, where a high value of needle penetration force is associated with high risk of fabric damage / and or sewing defects. In the present study knitted samples, were analyzed regarding their specific sewing stress as a measure of sewing machine sew ability index using the ST2 system. Results showed that fabric weight has influence on needle penetration force, whereas specific sewing stress may predict the rate of sewing defects. More about these results will be discussed in Part 2 and Part 3 of this series of articles.

References:

[1] Ann, B.M. and Little T (1988): Sewing Dynamics, Part I Measuring sewing machine force at high speed, Textile Research Institute, July (1988),pp.383-391.

[2] EL-Hadidy, A. (2013): Influence of Plasma Treatment on Cotton Fabric Tailor ability, 3rd International Conference on Recent Advanced in Material Processing Technology (RAMPT, 13),7 – 9 Jan.(2013), India.

[3] EL-Hadidy, A. (2013): Tailor ability Analysis of a Value – Added Fabric of Plasma Treatment of Apparel Fabrics, International Congress, Innovative and Functional Textiles, 30th – 31st May (2013), Istanbul, Turkey.

[4] EL-Hadidy, A. Aid, R. And Abd - Elaziz, L. (2013): Effects of Plasma Treatments on Enhancing Tailor ability of Cotton Fabrics, Journal of Home Economics, Monwfia University.

[5] El-Hadidy, A. and El-Sisy, W. (2012): Influence of Plasma treatment on fabric tailor ability. International Conference, Faculty of Applied Arts, Cairo, 8 – 10, Oct. (2012).

[6] EL-Hadidy, A. (2009): Fabric Hand Sewabilty Characterization, MEJ, Vol. 34, No. 2, June (2009)

[7] EL-Hadidy, A. (2010): Assessment of Fabric Tailor ability with Innovative On-Line Wireless alerting System, The Fifth E-

Services Symposium in the Eastern Province, March 22 -24 ,(2010), Al-Khubar, Saudi Arab Kink dame.

[9] El-Hadidy, A. Saad, M. and El-Ghandour, N. (2004): Quality and Sew ability of Sewing Threads, Proc. of 1st International Conference of Textile Research Center, Cairo, 2 – 4 March (2004).

[10] El-Hadidy, A. (2001): Quality and sewabilty Assessment, Proc. 2nd International Conference, Faculty of Eng., Alex. University, April (2001).

[11] El-Hadidy, A. and El-Tahan, A. (2000): sewabilty of Cotton Fabrics, Proc. of Home Economics Conference, Helwan University, Cairo, April (2000).

[12] El-Hadidy, A. and El-Tahan, A. (1999): Sewing Thread sewabilty Assessment, Mansoura Education Journal, No. 41, Sep. (1999).

[13] El-Hadidy, A.: (1992): The Influence of Stitch Density on Seam Quality and Seam Strength, MEJ, Vol. 17, No. 4, Dec. (1992).

[14] Abd-El-Salam, D., (2004): Study of the effect of fabric and sewing machine parameters on the dynamic behavior of sewing MSc, Textile Engineering Department, Mansoura University, (2004).

[15] EL-Hadidy, A.M. (2011): Utilization of modified fabric sewabilty tester in diagnostic of fabric – skin comfort index, 7th International Conference, National Research Center, Cairo, (6 -8 /4/2008)
(10-12/10/2011)

[16] EL-Hadidy, A, M. (2010): Assessment of Fabric Tailor ability with Innovative On-Line Wireless Alerting System, E-

Services Symposium March (22 -24, 2010) Al-Khubar, Saudi Arab.

[17] EL-Hadidy, A. (2013) :Tailor ability Analysis of a Value – Added Fabric, International Congress 2013, Innovative and Functional Textiles, 30th – 31st May (2013), Istanbul, Turkey.

[18] El-Hadidy, A.M. (2015): Fabric Wear ability, 3rd national Conference, Textile Research center, Dokki, Cairo, (9 – 10) March (2015).

[19] EL-Sisy, W.S. (2013): Implementation of Gas Plasma Treatment on Cotton Fabric Tailor ability - American Journal of Engineering Research (AJER) - Volume (0.2) - Issue (12) - Page (1 - 8) December (2013).

[20] Militky,J. and Kovacic,V.(1993), Modeling of time to failure of sewing threads, Textile Scince"93",International Conference ,Technical University of Liberec,CZ,14 – 16 Sep.1993,
pp 604 – 609.