

Effect of Some Construction Specifications on Fabric Properties Produced for incontinence pad to Suit Functional Purpose

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Abstract

Nonwoven fabrics are used to minimize the cost of coverstock materials .cover stock must allow the rapid passage of urine or blood through the materials, but they mustn't retain liquid themselves or allow liquid to leak back to the skin . There also some requirements demand of coverstock, it should has adequate strength, impermeable to lint from the absorbent pad, good skin-compatibility, and it should also has good drape properties. It is also important that the coverstock be soft to the skin and not abrasive .

-Nappies (diapers)

Nappies (diapers) are used to absorb waste from babies for maintaining health and hygiene of baby as well as his environment .Mothers used to cover the baby with old clean and absorbent cloth .Whenever the diapers get solid ,they are changed ,washed ,dried ,and reused The types of nappies or diapers vary greatly through out the world from reusable cloth to the modern disposable type. Disposable diapers and similar have been manufactured using one or more layers of cellulose tissue which makes the diaper relatively stiff . Reusable nappy is made from woven terry cloth which is a woven, warp-pile cotton fabric covered on both sides with uncut loops . The cloth can vary in thickness and weight according to the thickness and quality of the yarn used and the density of the structure. Reusable nappies need to be changed, washed and dried.

Reusable napes can be classed into 3 categories:

One layer diaper ,one-layer diaper has the problem that all the moisture stays evenly distributed through the diaper so that a high amount of urine remains in direct contact with the baby's skin and can cause diaper rash.

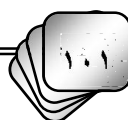
Multi layers diaper ,multi-layer diaper using 100% cotton for skin contact layer and synthetic nonabsorbent layer of polyester or equivalent to provide a wicking action to draw and hold moisture away from the skin.

A five –layers diaper, a five layers construction present the deal balance of comfort .The first layer is an interior shell of 100% cotton, The second layer is 100% synthetic nonwoven of mono-filament which allows moisture to pass through to the lower layers, the third layer is a 100% cotton wetting pad for maximum additional absorbency with minimum bulk , next is a layer of terry cloth in a cotton/ polyester blend , for extra absorbency . The fifth layer is also a terry cloth of similar blend to give a panty-like dressed appearance

The experimental Work

This research concerns with producing fabrics suitable for diapers. All samples in the research were produced with woven, nonwoven and knitted technique.

Finishing treatment



The produced fabrics were undergoing special treatments before being used. Scouring, Bleaching, antibacterial, softening, water repellency, hydrogel (superabsorbent formation) by Quat-188 , Actigard and carboxy methyl cellulous as following

-Scouting

Samples of 100 % cotton

The samples were padded in an aqueous solution containing 30 gm/ L sodium hydroxide and 5 gm/L nonionic wet ability substance (ejetol) ,using concentrations from 1 to 50

Samples of cotton /polyester

The prior same method was applied using 20 gm/L sodium hydroxide

-Bleaching

Samples were padded in an aqueous solution containing oxide hydrogen 6 gm/L , sodium silicate 3 gm/L , and sodium hydroxide 2 gm/L, at 95 °C for 30 min ,after finishing bleaching ,the samples were washed and dried at room temperature.

-Antibacterial treatment

In this study, antibacterial finishes was applied to the samples. Antibacterial finishes were applied to fabrics to prevent the growth of microorganisms exposed to the fabrics

Samples were padded in an aqueous solution containing 100 % Quat -188 and 35 g /L and then squeezed to a wet pick up 100 %.Samples were dried at 45 °C for 15 min ,then thermo-fixed at 120 °C for 20 sec.

Softening treatment

The fabric samples were padded in an aqueous solution containing 50 gm /L solusoft and then squeezed to a 100 %_wet pick up 100 %.The fabric samples were dried at 110 °C for 5 min

-Water repellency treatment

Samples were padded in an aqueous solution containing Novo NB and then squeezed to a 100 % wet pick up. The fabric samples were dried at 85 °C for 5 min, then thermo-fixed at 120 °C for 3 min.

There are three methods used to achieve medium layer superabsorbent Using Quat -188

-Wood pulp was treated with Quat -188

The fabric samples were padded in an aqueous solution containing 33 gm/ L sodium hydroxide and Quat -188 with concentrations from 25 to 100 gm/ L and then squeezed to a 150 % wet pick up.The fabric samples were dried at 85 °C for 5 min ,then thermo-fixed at 120 °C for 15 min ,

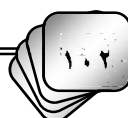
Using Actigard

The fabric samples were padded in an aqueous solution containing 5 to 15 % , at PH 5 and then squeezed to a 150 % wet pick up.Samples were dried at 85 °C for 5 min ,then thermo-fixed at 140 °C for 3 min , using carboxy methyl cellulous

Antibacterial test

Samples were treated with Quat-188 , and Actigard ,it can be seen that there is a direct relationship between Quat-188 increased concentrations and the antibacterial effect. it could be stated that the efficiency of the antibacterial finish is not affected by the repellent finish, but the effectiveness of the repellent finish varies with the add-on level of the antibacterial finish .

1-we can see from tables and figures that untreated fabrics did not provide any resistance against bacteria



2- we can see from tables and figures that treated samples have achieved the highest diameter of free activated bacteria zone as it increased from 7.5 to 8 at Staph and from 7 to 7.5 at E.Coli

3- It is also seen that samples of high weights ,pique 195 g/m² ,single jersey 170 g/m² and single jersey cotton /polyester 170 g/m² have achieved the highest diameters of free activated bacteria zone ,whereas single jersey cotton /polyester of 140 g/m² has achieved the lowest diameter of free activated bacteria zone.

Bursting resistance

It is clear from the diagrams that cotton samples produced of 195 g/m² and single jersey structure have achieved the highest rates of bursting resistance , whereas cotton / polyester samples produced of 140 g/m² and 170 g/m² and single jersey structure have achieved the lowest rates . we can report that the increase in number of yarns per unit area, cause the increase in bursting resistance because of the increase in friction between yarns.

we can also notice from the diagrams that samples made of polyester /cotton have recorded the highest rates of bursting resistance, whereas samples made of 100% cotton have recorded the lowest rates. We can report that polyester yarns have high tensile strength and durability compared to cotton yarns , which increase the bursting resistance.

Absorption

From tables and figures ,it is obvious that the increase of Quat-188 concentrations 0 % (which is made of methyl cellulous in cross correlation with methylene bisacrylamide)gives the highest content of Hydrogel absorption in SRV to 2000 % and WRV to 2500% . Also it is obvious that the carboxy methyl cellulous gives the lowest area of surface of bacterial for both bacterial and fungal activity .Where ,the diameter of free activated bacteria zone for Staph bacteria was 3 mm and E.Coli 0 mm.From tables and figures ,it is also obvious that the increase of Quat-188 concentrations from 1 to 6 % gives the highest content of water absorption Hydrogel in SRV to 5000 % and WRV to 4500% . Also it is obvious that the carboxy methyl cellulous gives the biggest area of surface of bacterial for both of bacterial and fungal activity .Where, the diameter of free activated bacteria zone for Staph bacteria was 7 mm and E.Coli 5 mm .It is obvious from results that the viscose samples have achieved the highest rates of absorption, whereas cotton samples have achieved the lowest rates, this is due to that the moisture regain of viscose is 14 % whereas the cotton 8.5 %.

Water repellency

From tables, and figures , that samples achieved zero of water repellency before treatment ,we can state that cotton material is a highly absorption material, beside of the used structures had pores and didn't achieve water repellency .After treatment the samples achieved high water repellency ,but the effect of fabric structure was insignificant ,so the plain weave 1/1 achieved the highest rates of water repellency (80 %) whereas the others structures have achieved 70 %

Nonwoven samples

From results obtained before treatment , samples of cotton or viscose have achieved 0 % water repellency whereas samples of synthetic fibers have achieved the highest rates ,and after treatment with Novo NB ,the water repellency has increased as samples of natural fibers have achieved 50 % water repellency whereas the samples of synthetic fibers have achieved 100 % water repellency, we can report that the natural fibers have high absorption rates compared to synthetic fibers .

Tensile strength

Samples of polyester blended with viscose fibers of 45 g/m² have achieved the highest rates of tensile strength, followed by 100% viscose samples of 45 g/m² , cotton samples of 36 g/m² , and then viscose samples of 16 g/m² ,

It is also obvious from the statistical analysis of the tensile strength results after antimicrobial treatment that there is loss of tensile strength from 5 to 33 % ,and this loss increases after softening treatment , besides that water repellency also cause loss of tensile strength but in some samples the tensile strength was increased , we can report that alkali treatment caused samples to be crimped..

Elongation

It is also obvious from the statistical analysis that elongation in machine direction is lower than the elongation in cross machine direction. This is due to that carding machine make fibers straight in machine direction which cause an increase in friction between fibers in machine direction and decrease the ability of fibers slippage which cause decrease in the elongation.

It is also obvious from the statistical analysis that tensile strength in machine direction is higher than the tensile strength in cross machine direction. This is due to that carding machine make fibers straight in machine direction which cause an increase in the friction between fibers.

It is also obvious from the statistical analysis of the elongation results after antimicrobial treatment that there is loss of elongation in machine direction and in cross machine direction ,and ratio of loss was from 1% to 36%

Bursting resistance

We can notice from the diagrams that samples made of polyester /cotton blend have recorded the highest rates of bursting resistance, whereas samples made of 100% cotton have recorded the lowest rates. We can report that polyester yarns have high tensile strength and durability compared to cotton yarns , which increase the bursting resistance. It is also obvious from the statistical analysis of the bursting resistance results after antimicrobial treatment that there is loss of tensile strength from 1.49 to 9.2 % but this loss was insignificant ,and this loss has increased after softening treatment , beside that the water repellency also caused loss of tensile strength but in some samples the bursting resistance was increased , we can report that alkali treatment caused samples to be crimped.

Handle test

In fabric handle test , the less angle value ,the more smoother the fabric .According to this ,it is clear from the diagram that mock leno weave is considered the most smooth fabrics among all woven fabrics followed by regular hopsack weave 3/3 ,honeycomb weave and then plain weave 1/1.This is probably because mock leno structure have the advantage of containing long floats and less intersections besides that it has ridges and hollows and so reduce the friction between the diaper and skin, besides that the warp and weft threads float freely on both sides, so that friction points between the tested fabrics and the standard woolen fabric ,used in the test are minimized allowing easily sliding of fabric down the slope .

Water permeability

It is obvious from the table, that effect of fabric structure on water permeability was insignificant before and after treatment .

From the results it is obvious that samples produced of viscose fiber have achieved the



highest rates of water permeability among all produced samples .this is due to that viscose fibers are higher than in water absorbency (14%) compared to polyester fibers (0.4%), and so allow the free passage of water through the fabric ,.