Study of Some Non-Woven Hygiene Products Properties Manufactured In Egypt

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Abstract: The properties of non-woven women's sanitary pads locally made were studied. Four locally made non-woven absorbent pads samples namely; Roro absorbent pad (sample A), AoFu absorbent pad (sample B), Always ultra thin absorbent pad (sample C) and Cinderella absorbent pad (sample D), were analyzed. They were subjected to physical and performance test such as weight, thickness, length/width, air permeability, absorbent capacity, and fluid test using standard equipment. The results obtained showed that pad's length, width, and thickness affect the density of the sanitary pads. This also greatly affects the free absorbent capacity of the pads. Thus, sample D appeared to have the highest absorbent capacity than the rest of the absorbent pads, while sample A had the least absorbent capacity.
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1- Introduction:

Hygiene products such as diapers, incontinence products, nursing pads, toddler training pants and feminine hygiene have to meet certain requirements: absorption, air permeability, fluid run-off quantification and more over comfort in order to satisfy the user, especially women's sanitary pads or napkins. The pad is specially designed to absorb and retain body fluids, and the non-woven fabric gives the diaper a comfortable shape and helps prevent leakage [2]. These diapers are made by a multi-step processes in which the absorbent pad is first vacuum-formed, and then attached to a permeable top sheet and impermeable bottom sheet [2]. The components are sealed together by application of heat or ultrasonic vibrations [3].

Pads have been worn throughout human history, and made of cloth or disposable materials. Whereas cloth pads are composed of layers of fabric such as micro fiber and can be washed and re-used multiple times, disposable pads contain absorbent chemicals and are thrown away after use. Currently, disposable diapers are the most commonly used. Plastic pants can be worn over diapers to avoid leaks, but this is no longer necessary.

Basically the production of sanitary pads involves the following stages: Pulverization, Core Formation, Covering Layer, Accessories Formation, Sterilization, and Packaging, and they are normally made up of three layers: surface layer, absorbent layer and underlying layer. The choice of sanitary napkins should be based on considerations relating to the materials and functions of these three layers. Firstly, the surface layer should preferably have a cotton net surface with rapid absorption to avoid wet skin surface. The middle layer should have effective absorption agents that can turn the absorbed liquid discharge into a jelly-like state so that it would not back flow when pressed and would not cause the sticky feeling and the underlying layer should be made of air permeable materials to allow diffusion of water molecules in the gaseous state. This would keep away the moist air to effectively reduce the moisture and heat between the sanitary napkins and the body so that there is a dry and refreshed feeling. [1]

When selecting suitable sanitary pad, there are such factors to be considered like different styles, brands, sizes, thickness and also properties. Sanitary pads or napkins come with or without wings and are curved or contoured to prevent leakage on the sides. Adhesive strips on the bottom of the pad and wrap-around wings keep the napkin in place. Most pad designs accommodate a size 6 panty size; consider a plus size, extra long, (thick or thin) or overnight protection for full coverage of larger panty sizes. A sanitary pad or napkin must have very high level of absorbency for dryness and comfortable, with air permeability to avoid itching, pain and ensure safety.

Although some non-woven sanitary pads are manufactured locally in Egypt and used for various applications, their qualities need to be assessed so that a comparison can be made. In this present study, some locally made non-woven sanitary pads were obtained. The properties of these pads were analyzed and their qualities assessed.

2- Materials and Methods

Four different brands of women's sanitary pads manufactured in Egypt were purchased. These were:
Roro absorbent pad (sample A),
AoFu absorbent pad (sample B),

Always ultra thin absorbent pad (sample C), and Cinderella absorbent pad (sample D),

The samples were tested for their thickness, weight, dimensions, absorbent capacity, and fluid.

2-1- Dimension of pad samples:

The dimensional measurements of the pad samples were done by carefully removing the outer wraps from it. The inner non-woven absorbing mass was weighed and the length and width of the samples were measured.

2-2- Thickness of pad samples:

Determination of thickness of fabric samples in laboratory is usually carried out with the help of a precision thickness gauge. In this equipment, the fabric whose thickness is to be determined is kept on a flat anvil and a circular pressure foot is pressed on to it from the top under a standard fixed load. The Dial Indicator directly gives the Thickness in mm. The covering layer in the samples was removed and the products were laid flat, and the thickness read.

2-3- Weight of pad samples:

The mass of a fabric expressed in grams per square meter or ounces per square yard.

Table (1): Specifications of Sanitary Pads Samples

Code	Dimensions (cm)		Weight (g)	Thickness(mm)
	L	W		
A	24.5	3.7	625	5.5
B	24.8	3.7	541	5
C	26	5	316	1.9
D	22	4.7	644	8.4

3- Experiment:

3-1- Air Permeability

Air permeability of a fabric is a measure of how well it allows the passage of air through it. The ease or otherwise of passage of air is of importance for a number of fabric end uses such as industrial filters, tents, sail cloths, parachutes, baby diapers, tissues, paper towels, sponges, and personal and feminine hygiene products raincoat materials, shirting, down proof fabrics and airbags. It is defined as the volume of air in milliliters which is passed in one second through 100s mm2 of the fabric at a pressure difference of 10mm head of water. Table (2) shows the average results for air permeability and absorbent capacity tests for pads samples.

Table (2): Average Results for Air Permeability and Absorbent Capacity Tests

Code	Air Permeability	Absorbent Capacity
A	5.365	37
B	0.799	41
C	1.	45
D	0.742	50

3-2- Absorbent Capacity

An absorbent-capacity test is used to determine a nonwoven material's ability to absorb a fluid and how fast it does this, which is known as its rate of absorption. It is used by companies that make products such as baby diapers, tissues, paper towels, sponges, and personal and feminine hygiene products. In order to do this the specimen is weighed before the test and then after the shower. To remove excess water the fabric is shaken 10 times using a mechanical shaker and then weighed in an airtight container:

$$\text{Absorption} = \frac{\text{Mass of water absorbed}}{\text{Original mass}} \times 100\%$$

Four specimens each 80mm X 80mm are cut at 45° to warp direction. The first step is to condition the samples and weigh them. They are then immersed in distilled water at a temperature of 20±1ºC to depth of 10cm. A wire sinker is used to hold the specimens at the required depth. The samples are left in the position for 20min. After the specimens are taken from the water the surface water is removed immediately from them by shaking them 10 times in a mechanical shaker.

They are then transferred directly to pre weighed airtight containers and then reweighed and weight of water absorbed is calculated as a percentage of the dry weight of the fabric. The mean percentage absorption is calculated. Table (3) shows the results for fluid tests for pads samples in different speed.

Table (3): Results for Fluid Tests

Code	Fluid (Different Speed of Absorption)		
A	4	14	22
B	5	9	22
C	2	16	23
D	1	0	13

4- Results:

The results of the various specifications studied are shown in Table (1). The sample weight indicates that, sample D had the highest weight, while sample C had the least weight. As shown in Table (1), the pads' thickness decreased in the order D>A>B>C.

The results shown in Figure (1) indicate the air permeability in cm^3 /cm^2/s of each sample which is a measure of how well it allows the passage of air through it. Results shown in Figure (2) indicate the absorbent capacity in (g/ml) of each sample which is the ability to absorb a fluid and how fast it does this. Figure (3) shows the results of fluid which is the material ability to absorb a fluid.

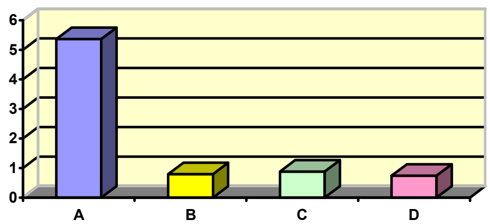

Fig (1): Air Permeability

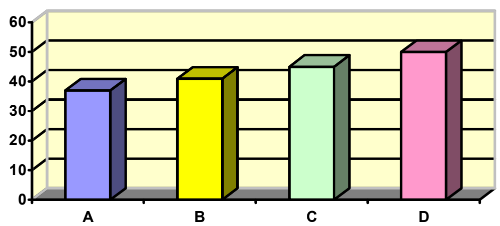

Fig (2): Absorbent Capacity

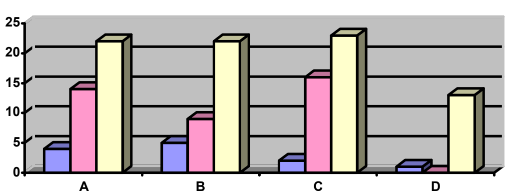

Fig (3): Fluid

5- Discussions:

The decreasing orders of the air permeability of the pads samples are given as A>C>B>D. Thus, sample A had the highest air permeability. Air permeability decreases as thickness, weight or fabric density increase. [4]

The decreasing orders of the absorbent capacities of the pads samples are given as D>C>B>A. Thus, sample D had the highest absorbent capacity and the least fluid absorb which means it is the best. Thickness per unit mass affects the absorbency of the nonwoven pads.

6- Conclusion:

From the results it is obvious that no two different sanitary pad brands had the same properties. There were some small variations in the properties tested, and this may be due to the process control variations in the pad production line. The air permeability showed some level of differences in the samples, which were as a result of the different speed of absorption and the top permeable outer wrap of the samples. The absorbent capacity of the pad samples also differed as a result of the differences in their thickness. Thus, sample D appeared to have the highest weight and absorbent capacity than the rest of the absorbent pads, while sample A had the least absorbent capacity. As for fluid run-off; the best result was sample D with the least value.

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