

Absorbency Properties of Nonwoven Hygenic Pads in Turkish Market

M.Ağırın, Trakya University Lüleburgaz

M.Akalın, A.Ö.Ağırın , Marmara University

ABSTRACT

The absorption features (degrees) of the most used hygenic pads in Turkish market have been studied. The baby diapers, hygienic pads and adult incontinents pads used in this project have been chosen as the one which are most sold on the base of the sale amounts in Turkey. Besides the production analysis, width/thickness analysis liquid absorption and several absorbency tests have been carried out and the final results have been shown in the form of graphics. The pads examined in this study were bought from the market and tests were carried out after conditioning them according to TS240.

INTRODUCTION

Nowadays, The health-care products that are inevitable and vital part of our daily life are very important consumption items in Turkey and in the world. The hygenic absorber items have been produced for 1-time use certainly and they are main products in need of eliminating as rubbish (garbage) after use. In the world nonwoven market, they have an important portion by % 83 capability. When searched the yearly volume up in general, the biggest portion and top of the list is seen as "baby diapers" by %9 enlarging and 19 billion US dollar and the feminine hygienic pads follow it by 12 billion US Dollar .Latest, adult incontinents takes place by 4,5 billion US dollar.

When we search the development of the baby diapers, the export which was 319 tons in 1994 is seen on rising except the years 1998 and 2000 and in 2002, the export number was seen about 22,219 tons.

Amount: KG / Value : USD

Years	Baby Diapers		Feminien hygienic pads	
	Amount (KG)	Value(DOLAR)	Amount (KG)	Value(DOLAR)
1994	319.012	786.434	28.328	133.565
1995	734.553	1.795.932	690.487	2.499.672
1996	1.334.455	3.838.470	365.800	1.078.675
1997	4.353.289	11.133.270.	1.509.023	4.498.565
1998	3.028.021	7.569.380	2.133.598	8.533.617
1999	5.503.118	13.217.063	1.505.737	6.439.944
2000	4,673.643	11.626.595	1.926.170	11.317.285
2001	15.391.095	34.805.120	2.193.234	13.233.995
2002*	22.219.309	44.873.903	3.470.536	14.664.169

* Contains the terms of January- October

Table 1- The Export Of Baby Diapers & Feminien Hygienic Pads

Countries	2001		2002*	
	Baby Diapers	Fem.Pads	Baby Diapers	Fem.Pads
Azerbaijan	352.159	98.468	328.993	72.631
Bulgaria	448.707	20.270	1.510.588	20.248
Southern Africa	3.261.889	94.270	3.670.039	1.584.937
Georgia	750.047	152.896	590.721	123.915
Israel	3.518.592	185.051	4.596.279	327.062
Italy	-	-	1.341.238	-
Kazakystan	807.737	212.642	56	4.996
Lubenan	60.884	481	232.841	-
Hungary	664.715	84.905	47.106	125.483
Macedonia	1.180.891	734	1.683.725	71.144
Poland	345.436	150.412	-	30.925
Romania	2.115.023	106.476	4.848.126	5.447
Russia	232.950	224.780	13.854	167.500
Ukraine	40.254	97.023	53.159	113.747
Jordan	267.085	-	276.845	-
Jugoslavia	535.894	255	536.082	1.043
Free Zones	171.934	370.357	530.826	504.859
Uncertain countries 266.696	48.496	313.267	37.411	
19 country total	15.020.893	1.847.608	20.573.745	3.191.348
TOTAL	15.391.095	2.193.234	22.219.309	3.470.536
* Contains the terms of January- October				

*Table 2. The export of Baby Diapers & Feminien Hygienic Pads
According To Breakdown Based On Countries.*

In 2001, The %22,9 percentage of total number has been exported to Israel. The %21,8 of baby diaper export has been done to Romania.

In 2001, the %16,82 of total export has been done from Free Zones. In 2002, the %45,7 of Feminien hygienic pad's was exported to Southern Africa Republic.

The amount of baby diaper production in Turkey which was 1,8 billion pieces became 1,6 billion pieces in 2002 because of the economic reasons and the decrease in birth-giving portion and it became 2 billion in 2003. In 2001, the cost of baby diaper production was 78 million USD and it raised to 91 million USD in 2002.

In 2001, the Feminien hygienic pad's cost was 126 million USD and in 2002 it raised to 134 million USD.

In 2000, the production of Feminien hygienic pad's was 353 million pieces and in 2001, 323 million pieces and in 2002, it raised to 348 million again.

As hygienic products as Feminien hygienic pads and baby diapers, there have been 16 companies into production in our country nowadays. In the sector of Feminien hygienic pads and baby diapers, the leader company Procter Gamble has the biggest portion according to sales and biggest capacity and production.

On the other hand, we can mention about some other companies going to increasing such as Astel, Toprak, Hayat, Rozi ve Paksel.

COMPANIES	YEAR ESTABLISHED	PLACE	PRODUCT	BRAND
PROCTER GAMBLE Tüketim Malları San. A.Ş	1990	Kocaeli	ÇB,HP,Ghp	Prima, Pampers,Orkid,Orkid yaprak,Alldays
ASTEL Kağıtçılık San. Ve Tic. A.Ş	1990	İstanbul	ÇB,HP,YB	Canbebe,Bello, Canleydi, Can ped,Windelhosen
TOPRAK İlaç ve Kim. Mad. San. Tic. A.Ş	1996	Sakarya	ÇB,HP	Libero,Nova,Libresse
HAYAT Kimya San. Ve Tic. A.Ş	1998	İstanbul	ÇB,HP	Molfix,Bebem,Molped
ROZİ Kağıt Tem. Ür. San. Ve Tic. A.Ş	1997	İstanbul	ÇB,HP	Rozi,Lilibebe,Yes
ELHADEFLER Kağıtçılık San. Ve Tic. A.Ş	1989	İstanbul	ÇB,HP,YB,Ghp	Lila,Lilafiks,Popi
PAKSEL Kimya San. Ve Tic. A.Ş	1992	Tekirdağ	ÇB	Bebiko,Diana
ÖZBEY Hijyenik ürünler San. Ve Tic. A.Ş	2001	Karaman	ÇB	Elbebek,Albodo
YÜZAL İntern.Tic. Ve San. A.Ş	2001	İstanbul	ÇB,HP	Pomiks,Babyline, Pomiksped
OVİSAN Sıhhi Bez San. Ve Tic. A.Ş	1989	İstanbul	ÇB	Pedo
FANY SOFT Kağıt San. Ltd. Şti.	1993	Adana	ÇB	Fany,Bebeteks
İDA Kim. Ve Sıh. Md. Paz. San. Ve Tic.	1998	Yalova	ÇB	Bambola,Gülenbebe
PAKTEN Sağlık Ürü. Ve Tic. A.Ş	2000	Gaziantep	ÇB	Joyful,Önlem
İŞSEVEROĞLU İplik Tic. San. A.Ş	2000	Adana	ÇB	Samo,Deyzi
AAK Gıda San. Dış. Tic. A.Ş	2001	Kırklareli	ÇB	Markasız
HES Kimya San. Ve Tic. A.Ş	2002	Kayseri	HP	Polped,Notped

Table 3. The Companies Into Production Of Femenien Hygienic Pad's

In 1999, Eczacıbaşı which was named as "Sanipak Health Care Products" has become an US invested company by contribution of Procter&Gamble. In the same year, Ovisan Health Care Industry has been bought by an American company called Kimberly Clark and in 2002, a British Company named Ontex bought the Astel Paper Industry.

When we focused on the Turkish market, as market portion, we can see Astel Paper Industry by %28,3, Procter-Gamble by %18,6 , Ovisan by %16,7 and Hayat Chemistry Industry by %13,3 . About Femenien hygienic pads , Astel company is the leader as market portion. And it follows by Astel by 14,5 % and Hayat Chemistry Industry by 12,4%. About adult incontinents, there is no obvious value but 3 brands in the market has been concluded to the project .

LITERATURE CONSIDERATION

In this project, 4 different baby diaper's brands, 3 different Feminienien hygienic pad's brand and 3 different adult incontient's brands have been used.

The materials were chosen according to sale rates by buying. To these pads, the following methods such as production analyse, absorbency before leakage, re- wetting and gaining time, free re-wet, total absorbency and keeping after santrifuge liquit absorption detention, SAP density and hydrostatic water proof tests have been applied. The results have been checked and the codes used in the project have been named as AD,BD,CD,DD for baby diapers, AP,BP,CP for Feminienien hygienic pads and AI,BI,CI for adult incontient.

PRODUCT ANALYSE

Code	GRAM AGE (g)	Product PARTS
AI	110,23	Upper part PP thermal connection 20 g/m2.Center part Cellulose+Root (petiole) 7 ply PE film
BI	80,4	Upper part PP thermal connection PP 30 g/m2.Transfer Center part Cellulose+Root (petiole) repeated 7 ply PE film PP barrier thermal connection 18 g/m2 band and plastic plain film
CI	58,18	Upper part PP thermal connection PP 30 g/m2 SAP+Cellulose Pad Center part Cellulose+SAP 3 ply PE film PP barrier thermal connection

Table 4 Technic Features of the adult incontient pads

Code	DENSITY (g/cm ³)	GRAM AGE (g)	Product PARTS
AP	0,145	5,74	3,5 mm PE film with hole, air laid thermal connection PP 60 g/m2 center part and SAP part PE film with hole , the hole closes when upper part is enlarged, it doesnt transfer liquid due to the narrow surface but it circulates the air. Breathable PE film ply and sticker paper.
BP	0,167	6,92	3,5 mm PE film with hole, chemically connected Tule PP 30 g/m2, E film SAP set into the Cellulose
CP	0,186	10,32	2,80 mm PE film with hole, chemically connected Tule PP 30 g/m2, E film SAP set into the Cellulose Sticker paper

Table 5. Tecnic Features of the Feminienien hygienic pad's

Code	GRAM AGE (g)	Product PARTS
AD	42,83	Upper part PP thermal connection 18 g/m2, AloeVera absorbed 30 mm PP micro yarn mixed tule 30-40 g/m2 Cellulose wood pulp, center part SAP+cellulose pad PE breathable film 15 g/m2 Surface 15 g/m2 PP thermal connection, other, elasthane PU band and sticky face PE barriers water proof 18 g/m2 thermal connection PP
BD	43,36	Upper part SMS thermal connection,cellulose paper,SAP,PE breathable film,Nonwoven thermal connection,other, barriers thermal connection,Elasthane lycra PV, band and sticky tule bands in PE.
CD	41,5	Upper part SMS thermal connection Upper part thermal connection, laying on by air PP 18 gr/m2, tule, viscose 20 gr/m2, center part+ cellulose
DD	40,45	Upper part thermal connection PP 18 gr/m2, chemistral connection PP tule 30 g/m ² , center part+ cellulose pad+ SAP, PE film,band,,Texturized Elasthane

Table 5. Tecnic Features of the Baby Diapers

TEST METHODS

Absorbency Before Leakage

Brand	Dry Weight (W_1)	Wet Weight (W_2)	$W_2 - W_1$ (gram)
AP	4,64	33,90	29,29
BP	5,95	29,43	23,48
CP	6,47	7,20	0,73

Table 7. Absorbency Before Leakage Of Femenien Hygienic Pad's

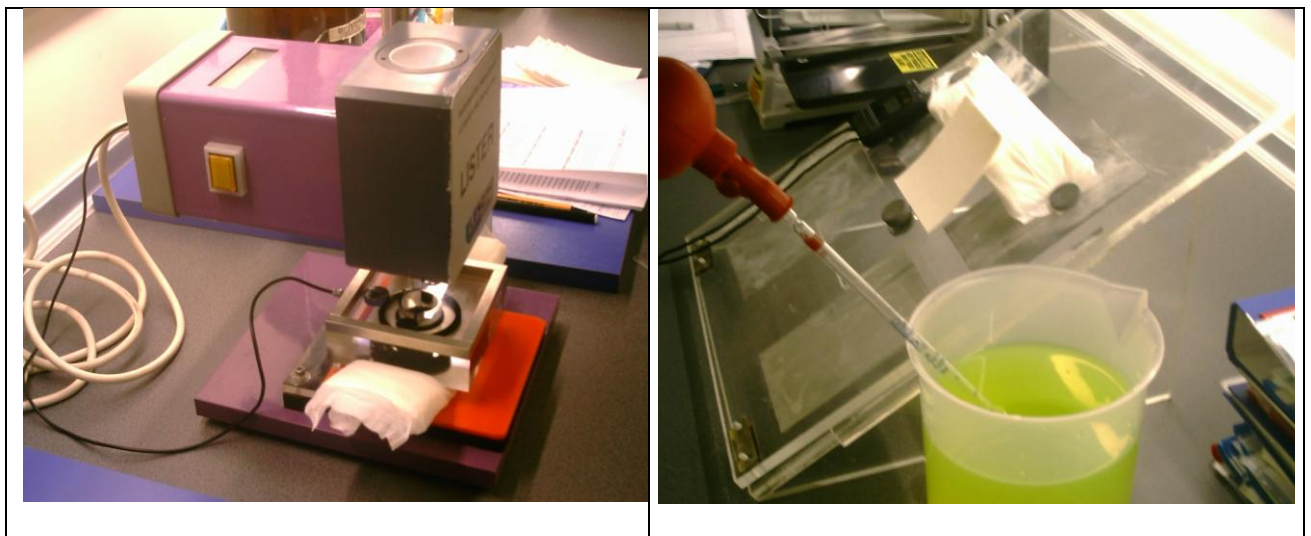
After weighing the pads dry, this method is used for testing how much liquid absorbed. Pads have been waited into NACL mixture about 30 minutes. Then, they have been considered the effect of this.. How much liquid absorbed has been found.

Liquit Strike Through Time

Pads Type		Pads Weigth (g)	Liquid strike-through time (sn)	Rewet1	Liquid strike through time (sn)	Rewet2	Liquid strike through time (sn)	Rewet3
AP	1	5,75	6,04	0,34	9,19	1,69	11,08	2,57
	2	5,68	6,28	0,65	12,77	1,39	12,02	2,46
BP	1	6,24	11,53	0,03	18	0,02	28,55	0,04
	2	6,07	59,6	0,76	12,46	0,09	18,04	0,05
CP	1	10,65	2,54	1,77	1,72	2,65	1,66	2,72
	2	10,14	4,35	1,95	2,00	2,89	1,87	2,96

Table 8. Re-weting Of The Femenien Hygienic Pad's And Liquit Strike Through Time

This test has been done according to EDANA 150.4-99 standard. In this test, LISTER absorbation machine has been used. A urine cynthetic pad of %0,9 has been absorbed and the results have been shown in the table 8.



Picture1. Lister Absorbency Tester

Picture2. Absorbency Before Leakage

Rewet Test

This method is used after %0.9 NaCl mixture is poured to several place without absorbing Psi under 0,72 pressure for guessing the liquid amount leaked.

	1. Re-wet	2. Re-wet	3. Re-wet
Baby Diapers 3 kg'dan az 3 - 6 kg 4 - 9 kg	80 mL	40 mL	40 mL
Baby Diapers 7 - 18 kg 9 - 20 kg 11 - 25 kg	100 mL	50 mL	50 mL
Adult In.	150 mL	150 mL	150 mL

Table 9. The liquid Amounts Used For Testing The Hygenic Items.

2.1. Free Rewet Test for Baby Diapers

(100 ml+50ml+50ml)

Diaper Brand		Weight (g)	1. Rewet (100 mL)	2. Rewet (50 mL)	3. Rewet (50 mL)	Average
AD	1	44.80	0.11	0.05	6.06	2,07
	2	43,91	0.08	0.06	1.80	0,64
BD	1	46,41	0.09	2.04	2.18	1,40
	2	43,55	0.07	0.09	0.17	0,11
CD	1	46,19	0.11	0.11	5.25	1,82
	2	45,74	0.09	0.09	4.30	1,49
DD	1	47,52	0.09	2,23	5,97	2,76
	2	50,31	0,16	0,16	1,19	0,50

Tablo10. Results of Free Rewet Test for Baby Diapers

In this re-wet test applied to the materials, the required degree is 3,3 or under values for baby diapers and Femenienien hygienic pads. The numbers like 4,5,6 is considered as high values. In the table 10, the values are around limits but for DD brand, it is a high value as you see on the table.



Picture3 Free Rewet

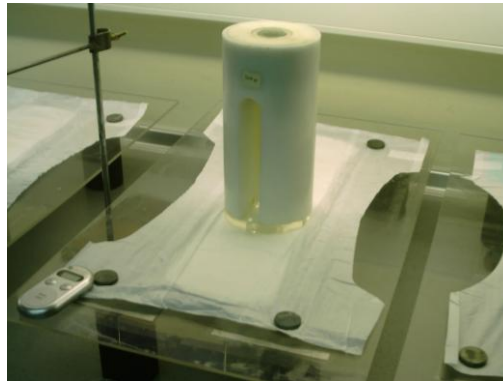
2.2. Under Weight Rewet Test

Diaper		Weight (g)	Time of Absorbing	1. Rewet	Time of Absorbing	2.Rewet	Time of Absorbing	3.Rewet
AD	1 2	44.05	55.80 sn	0.10	49.20 sn	0.18	55.04 sn	0.44

		44.10	56.19 sn	0.08	43.14 sn	0.11	47.91 sn	0.32
BD	1 2	44.01	145.13 sn	0.10	157.68 sn	0.32	152.00 sn	0.54
		44.00	93.75 sn	0.17	103.00 sn	0.32	98.74 sn	0.63
CD	1 2	46.19	125.20 sn	0.09	132.50 sn	0.27	128.14 sn	0,35
		45.24	151.18 sn	0.11	168.31 sn	0.31	163.90 sn	0,43
DD	1 2	45.39	138.24 sn	0.15	145.56 sn	0.42	141.40 sn	0.46
		44.86	100.56 sn	0.10	113.88 sn	0.32	122.70 sn	0,52

Table 11. results of Under Weight Re-wet Test of baby diapers

Under weight in this absorption test, "A" brand was the one which was absorbing the liquid and transfer to center part. Besides, it gave back very few liquid without absorbing.



Picture4 Under Weight Rewet Test

3. After Santrifuge, Total Liquid Absorbing Test

Diaper		Dry Weight	Wet Weight
AD	A S	44.51 g	707.08 g
		44.67 g	429.93 g
BD	A S	44.66 g	781.53 g
		44.68 g	416.98 g
CD	A S	44.78 g	826.24 g
		44.91 g	457.68 g
DD	A S	44.97 g	737.01 g
		44.85 g	354.05 g

Table 12 Result Of Total Liquit Absorbing Test

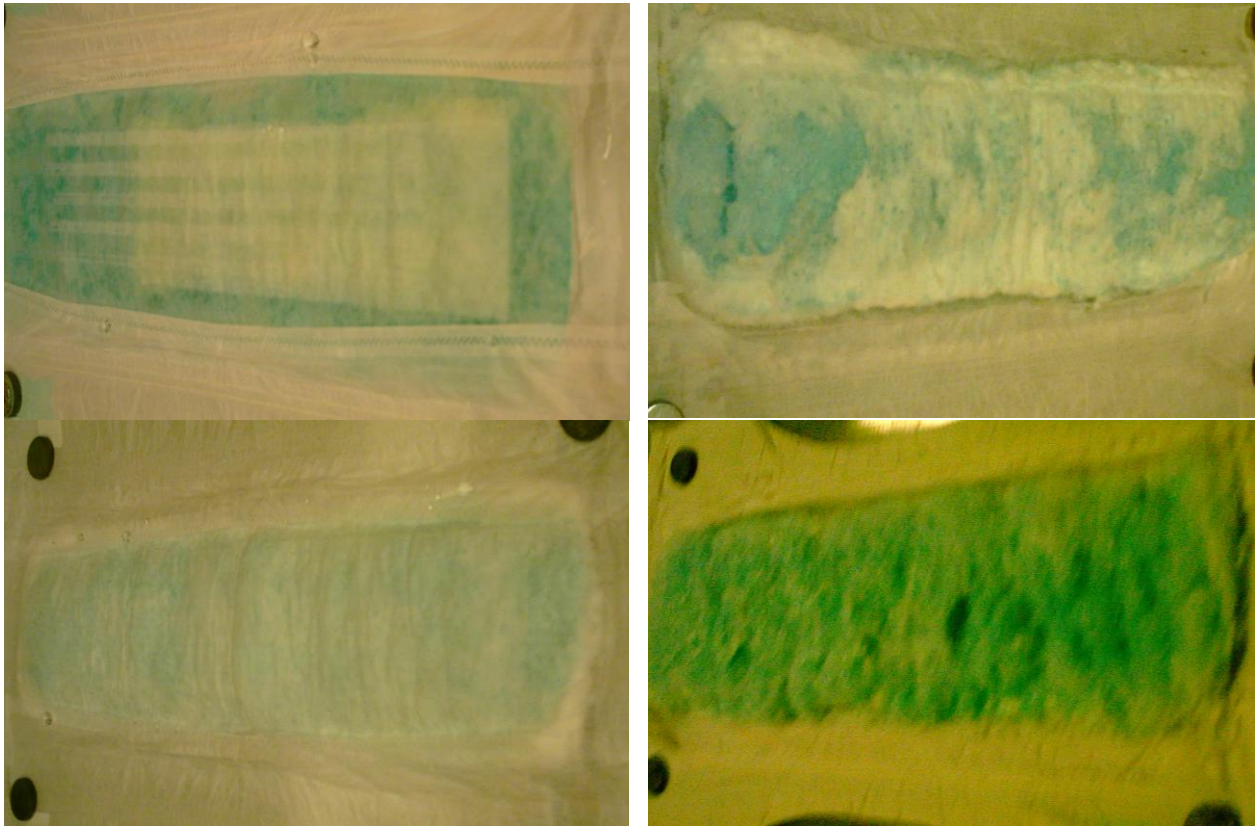
In the table 12, it is shown how much liquid is absorbed and after santrifuge, is seen how much liquid is left over. One pack of baby diapers has been weighted and the heaviest one is chosen. At least, it has been waited into 8 litre %0,9 NaCl mixture. After a while, the pads has been hangered and enabled to dry off the liquid. 2 minutes later, it has been weighted again and decided how much liquid is absorbed. After salt mixture, it has been dried in santrifuge for 3 min. 1400 d/d and found by weighting again.

S; the weight after keeping the liquid

When the results are searched, it is seen that AD is the best one which keeping the liquid and after santrifuge, AD is the best brand which retaining the liquid.

4. Super Absorber Polymer (SAP) Test

(CuSO₄) Copper Sulphat has been poured to core plate and has been waited for 5-10 minutes. By observing the change is followed. The row of the applications on pad is important. This row is kept certainly. After test, the AD brand has shown the best performance in SAP breakdown.



Picture5. SAP Test

6. Water Resistance (Hydrostatic Pressure Test)

Water Heat : 27 C the raising of the base 60 mbar/dk, It has been tested in conditioned zone. (20±2⁰C - 65%±2). This test has been done according to EDANA 150.4-99 standard

DiAPER	RESULT	Hygienic Fem. Pads	RESULT	Adult Incontinence	RESULT
AD	48	AP	73	C	85
BD	43,5	BP	82	C1	18,5
CD	39,5	CP	42	E	60
DD	39,5				

Table 13. Result Of Hydrostatic Pressure Test



Picture6. Hydrostatic Test Machine

DISCUSSION AND CONCLUSION

The best performance in Absorbency Before Leakage test is supplied by AP coded hygienic pad and the worst performance is by CP coded. In the Liquid Strike Through Time test, the best is BP and CP is the worst. In Free Re-wet test, the best is BD coded diaper and the worst is DD coded product. In the Under Weight Rewet test AD is best and BD is found as the worst .

In the After Santrifuge test when the results are searched, it is seen that AD is the best one which keeping the liquid and after santrifuge, AD is the best brand which retaining the liquid. The worst value is seen on DD coded product. In the super absorber polimer SAP test, AD brand is supplied the best SAP spreading..

Water Resistance (Hydrostatic Pressure Test) test is applied to the surface barrier layers to Hygienic products and it has been checked if the barrier has been leak or not. In this test, the best performance is in AD, BP, C and the worst is CD, CP, C1.

Market portions and sales prooves the results. These products has been chosen according to the market portions. As a result, we can see that Turkey has a conscious consumer profile. This profile and values will be supported by other tests that will be done.

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