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A Case Study on Physical Properties Blends Analysis of Non-Degradable Films with Gray Back Boards

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Abstract

In the printing and packaging industries blends of non-degradable plastic film and degradable paperboards is very common substrate. The gray back board is recycled pulp paperboard. The gray back boards are one side dull or gray color in physical appearances so it is called gray back paperboard. The gray back paperboards have not good strength and visual appeal as compare to other paperboards. But the printing and packaging industries are mostly using the gray back paperboards because the gray back paperboards are the cheapest material for package preservation, containment and transportation. The blends of gray back paper boards with plastic film gives good combination for packaging industries. This particular research work deals with study of gray back paperboards and plastic film blends.

Keywords: *Printing, packaging, material, friction, blends, unblended materials, coefficient of friction slip angle or tan angle etc.*

1. Introduction

Gray back Paperboards, plastic films and liner blends are the basic materials for the print and packing companies. The role of gray back paperboards and plastic film is unlimited in print and packing companies. The blended material of gray back paperboards and plastic film provide excellent strength and cheapest price material. As per the actual packaging need packaging have three main functions i.e. containment, preserve and transportability.

Physical properties: The physical properties of any substrates can be measured as GSM, thickness (caliper), bulk, density and visual appeals etc. The GSM means gram per square meter. It means the weight of material per square meter. On the other hand thickness is a mathematical parameter which are measured by the height of z axis while x and y is length and width of that particular material. The bulk or density is a parameter which is totally depended on the GSM and thickness. In another words bulk is the ratio of GSM and thickness.

Paper: Paper is the fiber based material which are using for various purposes in the printing and packaging industries. The printing and packaging is widely using the analysis paper, plastic and paperboards materials.

Paperboards: The paperboards are very common material for the printing and packaging industries. The paperboards are categories into four main categories which is gray back board, white back boards, folding box boards and solid bleached sulphate.

Gray back paperboard: The gray back paperboards have five main characteristics which are enlisted below:

i. Cheaper in prices
ii. May have 210 to 410 GSM
iii. Good strength, durability and flexibility.
iv. May be manufactured from 60 to 100 percent recycle pulp.
v. Dull shade or gray color appears on back side of board.

Plastic film: The plastic film is very useful material in many sectors. The printing and packaging industries are also using various plastic polymers for the containment, preservation and transportation purposes.

Research Objective

The main objective of this research work is study of blends combination of gray back paperboards and plastic film. Study of physical changes after the gray back paperboards and plastic film blended in packaging industries. The physical properties like as GSM, thickness (caliper), bulk, density and visual appeals etc. are measured as per the ISO standards before and after blend of gray back paperboards and plastic film.

2. Materials And Methods

The main objective of this research work is study of blends combination of gray back paperboards and plastic film. Study of physical changes after the gray back paperboards and plastic film blended in packaging industries. The physical properties like as GSM, thickness (caliper), bulk, density and visual appeals etc. are measured as per the ISO standards before and after blend of gray back paperboards and plastic film.

Research Methodology

In order to accomplish this research project all the testing instruments calibrated as per the ISO standards. The physical properties like as GSM, thickness (caliper), bulk, density and visual appeals etc were measured with respective instruments before the blend of gray back paperboards and plastic film and after the blend of gray back paperboards and plastic films. The physical changes of the blended material was measured with the help of physical properties like as GSM, thickness (caliper), bulk, density and visual appeals etc.

Data Collection and Analysis

In order to accomplish this research project GSM, Thickness and Bulk of the gray back boards were determined which is mentioned below:

For Gray Back Boards (GSM)							
Name of job and m. id.	Product types	Type and No. of substrate	Board	Film	Normal addition	After blending	Final product
Glucon-d 200gm	Solid	G.B. + gloss met pet = (2)	325	14	339	342	345
Dettol shaving crm_60+ 80gm	Liquid	G.B. + gloss met pet = (2)	314	14	327	335	338
Meshwak200g*2+200gm	Liquid	G.B. + gloss met pet = (2)	250	14	264	268	270
Meshwak 100gm & 20 % extra	liquid	G.B. + gloss met pet = (2)	323	14	337	345	347
Glu+C orange 75+50gm	Solid	G.B. + gloss met pet = (2)	338	14	352	353	357
Glucon d nimbu pani	solid	G.B. + gloss met pet = (2)	350	14	364	370	371
Glucon D tangy orange 1kg	solid	G.B. + gloss met pet = (2)	391	14	405	406	409
Gluco C orange 75+50g	solid	G.B. + gloss met pet+clear pet = (3)	356	14	370	384	384
Moov back pain30g_3091112	gas	G.B. + gloss met pet = (2)	290	14	304	306	309
Nestle nan	Semi-solid	G.B. + gloss met pet = (2)	218	14	232	235	238
Glucon D 450g	Solid precipitate	G.B. + gloss met pet = (2)	348	14	362	366	371
Glucon D tangy orange 1 kg	solid	G.B. + gloss met pet = (2)	394	14	408	415	421
Gillette shave gel	liquid	G.B. + gloss met pet = (2)	354	14	368	379	381
Zydus wellness product limited	solid	G.B. + gloss met pet = (2)	327	14	341	350	352
Meshwak 50g_300gsm	liquid	G.B. + gloss met pet = (2)	288	28	316	322	325

Bhart masala carry powder_100	solid	G.B. + clear film pet = (2)	298	14	312	313	313
Gluco plus-c orange 1kg	solid	G.B. + clear film pet = (2)	453	14	467	468	468
Nice pharma	solid	G.B. + gloss met pet = (2)	352	14	366	372	375
NICE PHARMACEUTICALS	solid	G.B. + gloss met pet = (2)	358	14	372	377	380
Dettol I shaving crm_cool 60+18g	liquid	G.B. + clear film pet = (2)	325	14	339	344	344
Gluco C orng 450 plus	solid	G.B. + clear film pet = (2)	358	14	372	376	376
Moov back pain 50gm	gas	G.B. + gloss met pet = (2)	318	14	332	333	333
Bhart masala	solid	Printed G.B. + clear pet = (2)	299	14	313	321	321
Bhart masala B	solid	Printed G.B. + clear pet = (2)	292	14	306	313	313
M Seal 100g	solid	Printed G.B. + clear pet = (2)	323	14	337	341	341
Ariel matic front load 1 kg	solid	G.B. + gloss met pet = (2)	292	14	306	311	313
Ariel matic top load 1 kg	solid	G.B. + gloss met pet = (2)	295	14	309	310	313
M Seal 60g	liquid	Printed G.B. + clear pet = (2)	287	14	301	305	305
M Seal 40g	liquid	Printed G.B. + clear pet = (2)	290	14	304	313	313
M Seal 100 gm	solid	Printed G.B. + clear pet = (2)	288	14	302	307	307
Average of unblended=	323.1333	**Maximum =**	453	28	467	468	468
Average of blended =	342.6667	**Minimum =**	218	14	232	235	238

Data comparisons between blended and unblended substrates: -

The results of GSM for the blended and unblended substrates are represented in the table 5.2.1. During the observation it was found that the ranges of GSM for unblended substrates 218 to 453 were in range of minimum to maximum respectively. On the other hand the ranges of GSM for blended substrates 220 and 468 were in range of minimum to maximum respectively. It was also being observed that the reason of increased GSM of blended board was included film and adhesive GSM with board GSM.

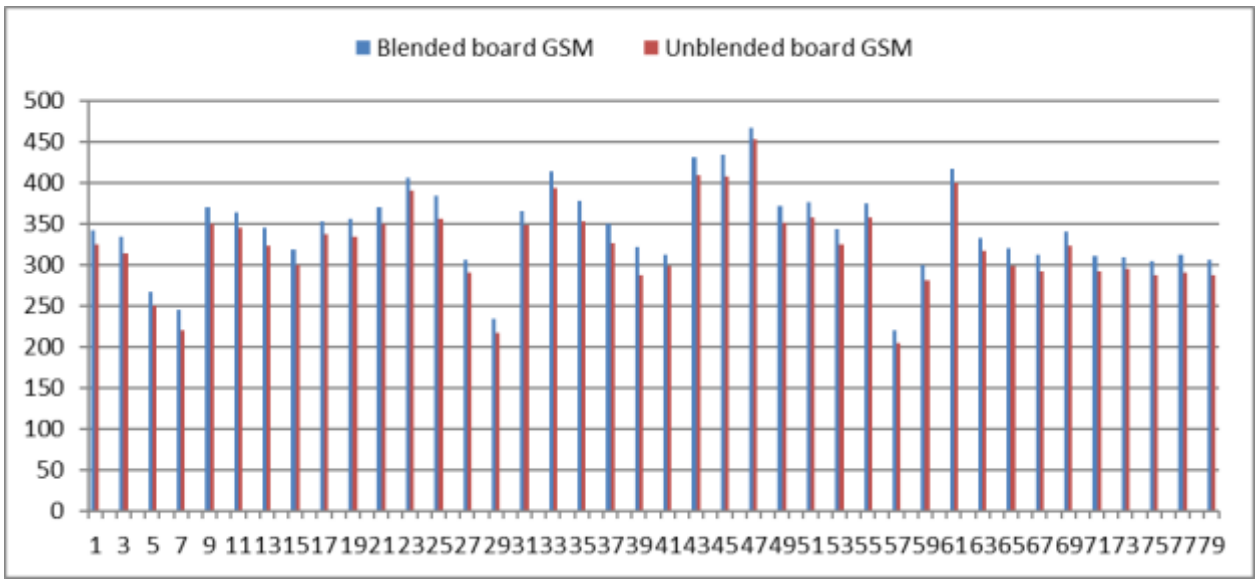

Figure 1: Comparisons of GSM between blended and unblended substrates

The results of GSM between the blended and unblended substrates are represented in the figure 1. During the observation the average of blended and unblended substrate was also being recorded i.e. 407 And 323.1333 respectively.

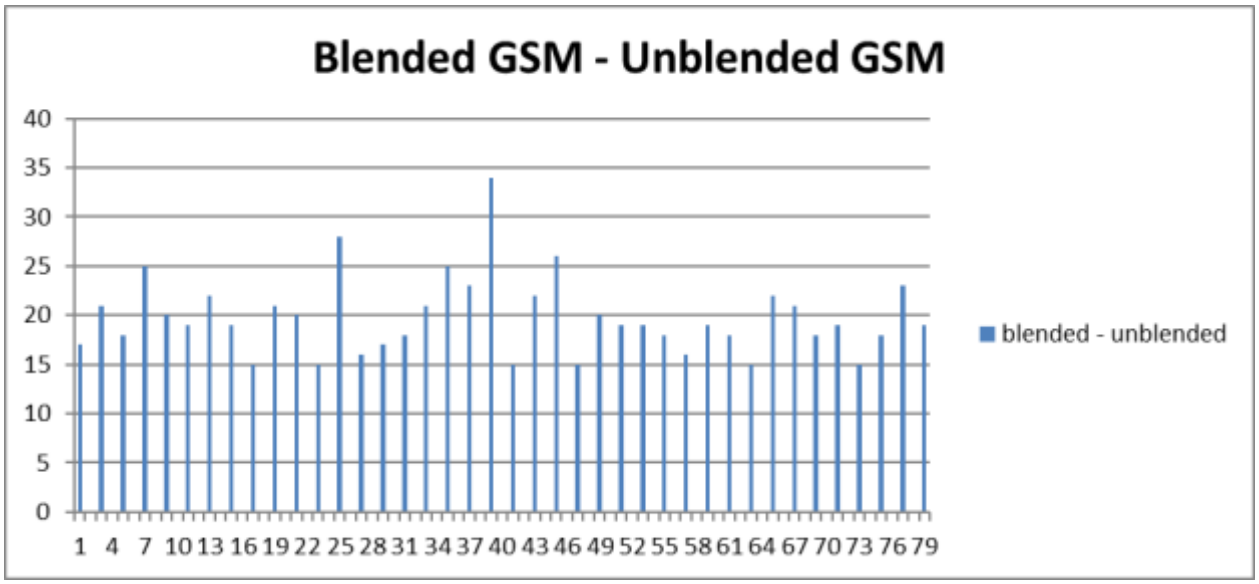

Figure 2 Differences between GSM of blended and unblended substrates.

3. Results and Discussion

The results of GSM between the blended and unblended boards are represented in the figure 1. During the observation the difference between blended and unblended substrate was also being recorded i.e., 16 to 25. That means the basic weight or GSM of the blended substrates was increased 16 to 25 GSM.

Compression between different jobs or impact of board types on the carton properties:-

The difference between the GSM of blended and unblended boards and the difference between the GSM of practical and normal addition was different with different type's boards.

Non degradable film blending impacts on gray back boards:

For gray back boards the average of GSM for unblended and blended boards was recorded 323.1333 and 342.6667 respectively. During the observation it was found that the ranges of GSM for unblended substrates 218 to 453 were in range of minimum to maximum respectively. On the other hand the ranges of GSM for blended substrates 235 and 468 were in range of minimum to maximum respectively. Gray back boards had very high differences between the GSM of blended, unblended and practical addition, normal addition. In case of non degradable film blending gray back boards were created the more variations in GSM as compare to WBB, FBB, and SBS. Gray back boards were most variable boards.

For Gray Back Boards (Thickness)							
Name of job and m. id.	Product types	Type and No. of substrate	Board	Film	Normal addition	After blending	Final product
Glucon-d 200gm	Solid	G.B. + gloss met pet = (2)	395	10	405	410	412
Dettol shaving crm_60+ 80gm	Liquid	G.B. + gloss met pet = (2)	385	10	395	400	403
Meshwak200g*2+200gm	Liquid	G.B. + gloss met pet = (2)	270	10	280	283	285
Meshwak 100gm & 20 % extra	liquid	G.B. + gloss met pet = (2)	385	10	395	402	403
Glu+C orange 75+50gm	Solid	G.B. + gloss met pet = (2)	420	10	430	435	437
Glucon d nimbu pani	solid	G.B. + gloss met pet = (2)	445	10	455	460	363
Glucon D tangy orange 1kg	solid	G.B. + gloss met pet = (2)	500	10	510	515	518
Gluco C orange 75+50g	solid	G.B. + gloss met pet+clear pet = (3)	430	10	440	450	450
Moov back pain30g_3091112	gas	G.B. + gloss met pet = (2)	330	10	340	347	350

Nestle nan	Semi-solid	G.B. + gloss met pet = (2)	300	10	310	312	313
Glucon D 450g	Solid precipitate	G.B. + gloss met pet = (2)	422	10	432	444	450
Glucon D tangy orange 1 kg	solid	G.B. + gloss met pet = (2)	515	10	525	530	535
Gillette shave gel	liquid	G.B. + gloss met pet = (2)	384	10	394	400	401
Zydus wellness product limited	solid	G.B. + gloss met pet = (2)	350	10	360	370	373
Meshwak 50g_300gsm	liquid	G.B. + gloss met pet = (2)	340	10	354	364	367
Bhart masala carry powder_100	solid	G.B. + clear film pet = (2)	352	10	362	363	363
Gluco plus-c orange 1kg	solid	G.B. + clear film pet = (2)	600	10	610	613	613
Nice pharma	solid	G.B. + clear film pet = (2)	420	10	430	436	436
NICE PHARMACEUTICALS	solid	G.B. + clear film pet = (2)	410	10	420	425	425
Dettol I shaving crm_cool 60+18g	liquid	G.B. + clear film pet = (2)	388	10	398	405	405
Gluco C orng 450 plus	solid	G.B. + clear film pet = (2)	460	10	470	473	473
Moov back pain 50gm	gas	G.B. + gloss met pet = (2)	365	10	375	380	383
Bhart masala	solid	Printed G.B. + clear pet = (2)	340	10	350	355	355
Bhart masala B	solid	Printed G.B. + clear pet = (2)	323	10	333	335	335
M Seal 100g	solid	Printed G.B. + clear pet = (2)	400	10	410	415	415
Ariel matic front load 1 kg	solid	G.B. + gloss met pet = (2)	315	10	325	328	330
Ariel matic top load 1 kg	solid	G.B. + gloss met pet = (2)	318	10	328	330	333
M Seal 60g	liquid	Printed G.B. + clear pet = (2)	365	10	375	377	377
M Seal 40g	liquid	Printed G.B. + clear pet = (2)	333	10	343	345	345
M Seal 100gm	solid	Printed G.B. + clear pet = (2)	350	10	360	363	363
Average of unblended=	387	**Maximum=**	600	10	610	613	613
Average of blended =	402.1667	**Minimum =**	270	10	280	283	285

Data comparisons between blended and unblended substrates:-

The results of thickness for the blended and unblended substrates are represented in the table 5.2.2. During the observation it was found that the ranges of thickness for unblended substrates 270 and 606 were in range of minimum to maximum respectively. On the other hand the ranges of thickness for blended substrates 283 to 620 were in range of minimum to maximum respectively. It was also being observed that the reason of increased thickness of blended board was included film and adhesive thickness with board thickness.

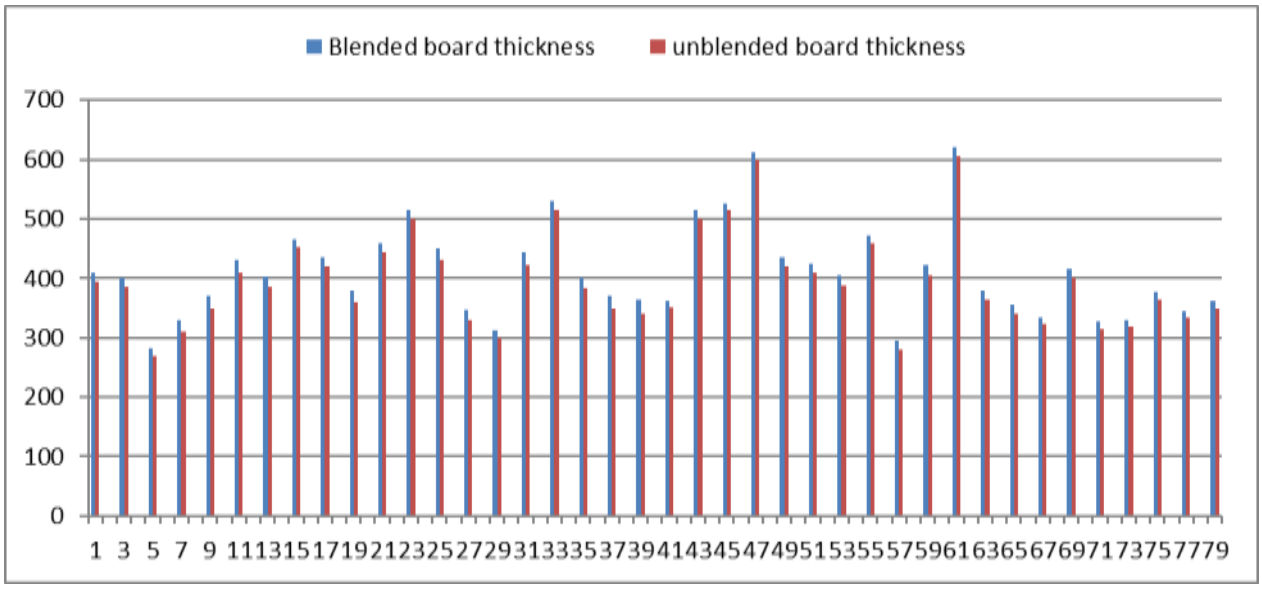

Figure 3 comparisons of thickness between blended and unblended substrates

The results of thickness between the blended and unblended substrates are represented in the figure 3. During the observation the average of blended and unblended substrate was also being recorded i.e. 387 And 473.3333 respectively.

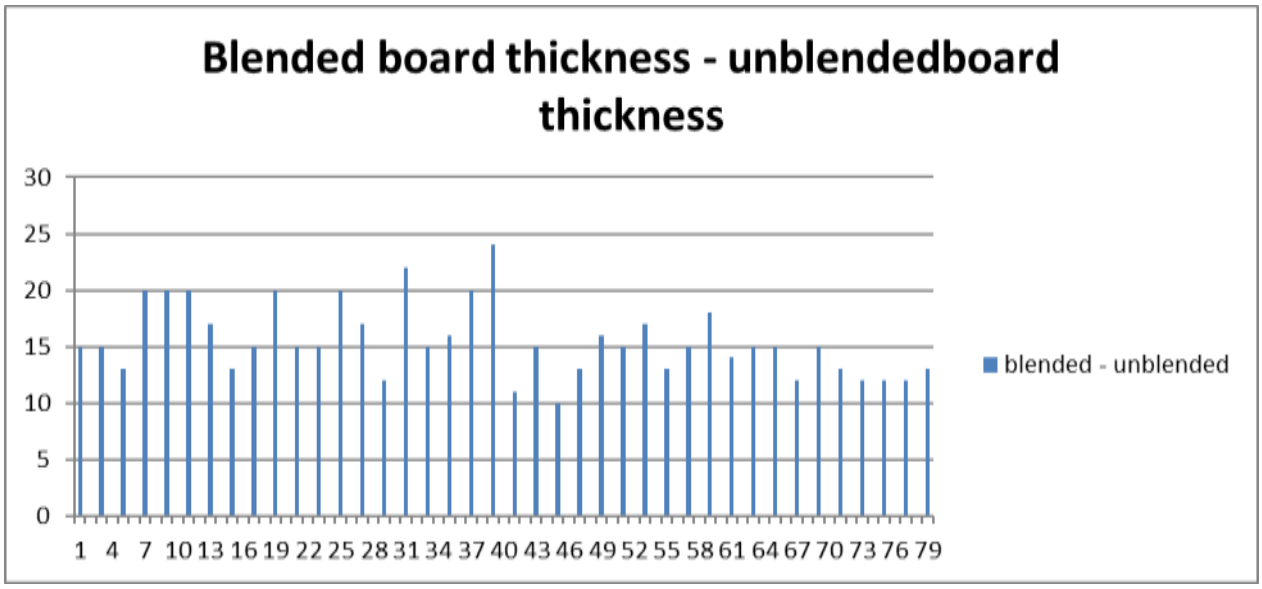

Figure 4: Differences between thickness of blended and unblended substrates

The results of difference between thickness of blended and unblended substrates are represented in the figure 4. During the observation the difference between blended and unblended substrate was also being recorded i.e. 10 to 20. That means the thickness of the blended substrates was increased 10 to 20 thicknesses.

Compression between different jobs or impact of board types on the carton properties:-

The difference between the thickness of blended and unblended boards and the difference between the thickness of practical and normal addition was different with different type's boards.

Non degradable film blending impacts on gray back boards:

For gray back boards the average of thickness for unblended and blended boards was recorded 387 and 402.1667 respectively. During the observation it was found that the ranges of thickness for unblended substrates 270 to 600 were in range of minimum to maximum respectively. On the other hand the ranges of thickness for blended substrates 283 and 613 were in range of minimum to maximum respectively. Gray back boards had very high differences between the thickness of blended, unblended and practical addition, normal addition. In case of non degradable film blending gray back boards were created the more variations in thickness as compare to WBB, FBB, and SBS. Gray back boards were most variable boards.

For Gray Back Boards (Bulk/Density)							
Name of job and m. id.	Product types	Type and No. of substrate	board bulk E/J	film Bulk F/K	normal addition bulk G/L	practical blending H/M	final product bulk I/N
Glucon-d 200gm	Solid	G.B. + gloss met pet = (2)	0.822785	1.4	0.837037	0.834146	0.837379
Dettol shaving crm_60+ 80gm	Liquid	G.B. + gloss met pet = (2)	0.815584	1.4	0.827848	0.8375	0.83871
Meshwak200g*2+200gm	Liquid	G.B. + gloss met pet = (2)	0.925926	1.4	0.942857	0.946996	0.947368
Meshwak 100gm & 20 % extra	liquid	G.B. + gloss met pet = (2)	0.838961	1.4	0.853165	0.858209	0.861042
Glu+C orange 75+50gm	Solid	G.B. + gloss met pet = (2)	0.804762	1.4	0.818605	0.811494	0.816934
Glucon d nimbu pani	solid	G.B. + gloss met pet = (2)	0.786517	1.4	0.8	0.804348	1.022039
Glucon D tangy orange 1kg	solid	G.B. + gloss met pet = (2)	0.782	1.4	0.794118	0.78835	0.789575
Gluco C orange 75+50g	solid	G.B. + gloss met pet+clear pet = (3)	0.827907	1.4	0.840909	0.853333	0.853333
Moov back pain30g_3091112	gas	G.B. + gloss met pet = (2)	0.878788	1.4	0.894118	0.881844	0.882857
Nestle nan	Semi-solid	G.B. + gloss met pet = (2)	0.726667	1.4	0.748387	0.753205	0.760383
Glucon D 450g	Solid precipitate	G.B. + gloss met pet = (2)	0.824645	1.4	0.837963	0.824324	0.824444
Glucon D tangy orange 1 kg	solid	G.B. + gloss met pet = (2)	0.765049	1.4	0.777143	0.783019	0.786916
Gillette shave gel	liquid	G.B. + gloss met pet = (2)	0.921875	1.4	0.93401	0.9475	0.950125
Zydus wellness product limited	solid	G.B. + gloss met pet = (2)	0.934286	1.4	0.947222	0.945946	0.9437
Meshwak 50g_300gsm	liquid	G.B. + gloss met pet = (2)	0.847059	2.8	0.892655	0.884615	0.885559
Bhart masala carry powder_100	solid	G.B. + clear film pet = (2)	0.846591	1.4	0.861878	0.862259	0.862259
Gluco plus-c orange 1kg	solid	G.B. + clear film pet = (2)	0.755	1.4	0.765574	0.763458	0.763458
Nice pharma	solid	G.B. + gloss met pet = (2)	0.838095	1.4	0.851163	0.853211	0.860092
NICE PHARMACEUTICALS	solid	G.B. + gloss met pet = (2)	0.873171	1.4	0.885714	0.887059	0.894118
Dettol I shaving crm_cool 60+18g	liquid	G.B. + clear film pet = (2)	0.837629	1.4	0.851759	0.849383	0.849383
Gluco C orng 450 plus	solid	G.B. + clear film pet = (2)	0.778261	1.4	0.791489	0.794926	0.794926
Moov back pain 50gm	gas	G.B. + gloss met pet = (2)	0.871233	1.4	0.885333	0.876316	0.869452
Bhart masala	solid	Printed G.B. + clear pet = (2)	0.879412	1.4	0.894286	0.904225	0.904225
Bhart masala B	solid	Printed G.B. + clear pet = (2)	0.904025	1.4	0.918919	0.934328	0.934328
M Seal 100g	solid	Printed G.B. + clear pet = (2)	0.8075	1.4	0.821951	0.821687	0.821687
Ariel matic front load 1 kg	solid	G.B. + gloss met pet = (2)	0.926984	1.4	0.941538	0.948171	0.948485
Ariel matic top load 1 kg	solid	G.B. + gloss met pet = (2)	0.927673	1.4	0.942073	0.939394	0.93994

M Seal 60g	liquid	Printed G.B. + clear pet = (2)	0.786301	1.4	0.802667	0.809019	0.809019
M Seal 40g	liquid	Printed G.B. + clear pet = (2)	0.870871	1.4	0.886297	0.907246	0.907246
M Seal 100 gm	solid	Printed G.B. + clear pet = (2)	0.822857	1.4	0.838889	0.84573	0.84573
Average of unblended=	0.840947	**Maximum=**	0.934286	2.8	0.947222	0.948171	1.022039
Average of blended =	0.858375	**Minimum =**	0.726667	1.4	0.748387	0.753205	0.760383

Data comparisons between blended and unblended substrates:-

The results of bulk for the blended and unblended substrates are represented in the table 5.2.3. During the observation it was found that the ranges of bulk for unblended substrates 1 to 0.660066 were in range of minimum to maximum respectively. On the other hand the ranges of bulk for blended substrates 0 to 0.674194 were in range of minimum to maximum respectively. It was also being observed that the reason of increased bulk of blended board was included film and adhesive bulk with board bulk.

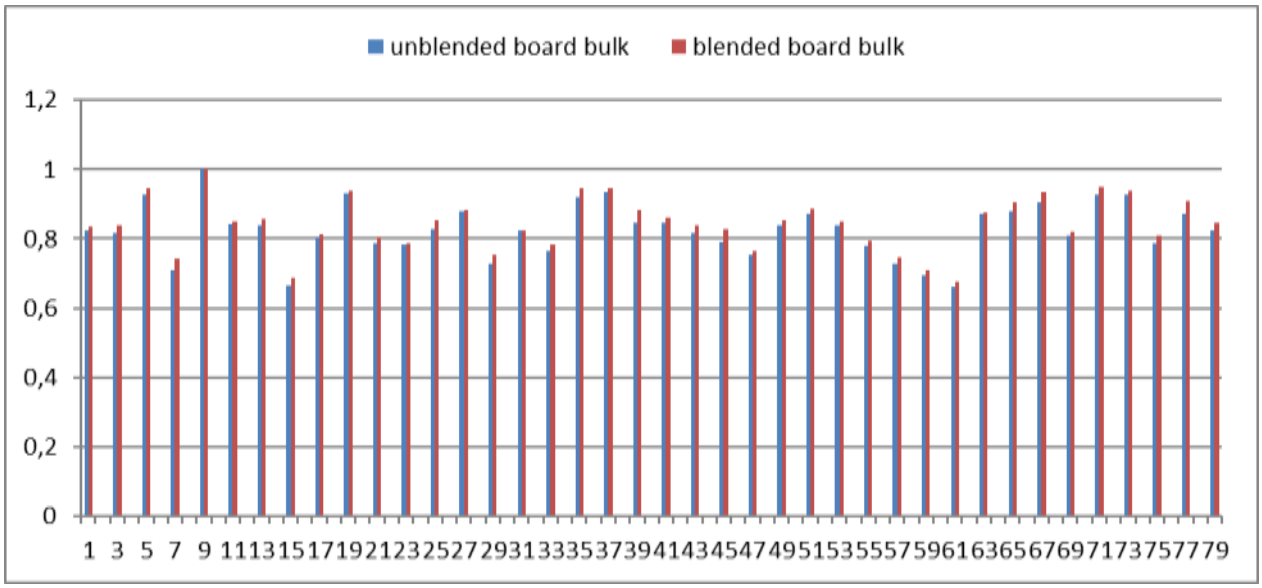

Figure 5: Comparisons between bulk of blended and unblended substrates

The results of bulk between the blended and unblended substrates are represented in the figure 5. During the observation the average of blended and unblended substrate was also being recorded i.e. 0.866801 and 0.699438 respectively.

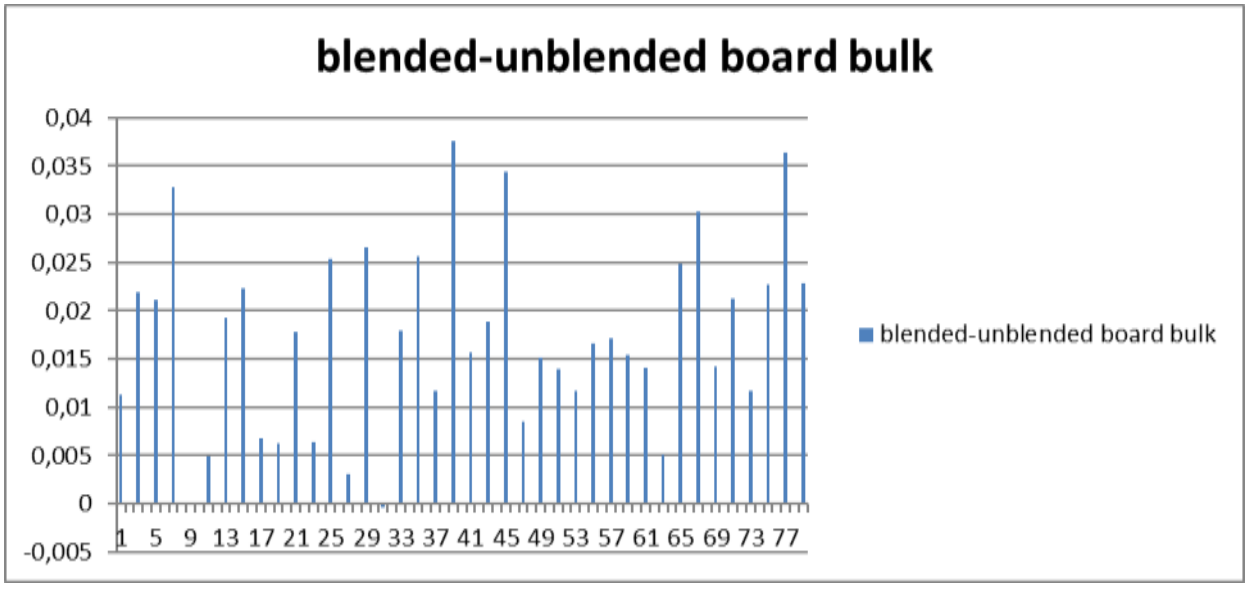

Figure 6: Bulk difference between blended and unblended substrates

The results of difference between bulk of blended and unblended substrates are represented in the figure 6. During the observation the difference between blended and unblended substrate was also being recorded i.e., 0.004935 to 0.032747. That means the bulk of the blended substrates was increased 0.004935 to 0.032747 bulks.

Compression between different jobs or impact of board types on the carton properties: -

The difference between the bulk of blended and unblended boards and the difference between the bulk of practical and normal addition was different with different type's boards.

Non degradable film blending impacts on gray back boards:

For gray back boards the average of bulk for unblended and blended boards was recorded 0.840947 and 0.858375 respectively. During the observation it was found that the ranges of bulk for unblended substrates 0.726667 to 0.934286 were in range of minimum to maximum respectively. On the other hand the ranges of bulk for blended substrates 0.753205 and 0.948171 were in range of minimum to maximum respectively. Gray back boards had very high differences between the bulk of blended, unblended and practical addition, normal addition. In case of non-degradable film blending gray back boards were created the more variations in bulk as compare to WBB, FBB, and SBS. Gray back boards were most variable boards.

4. Conclusion

During the observation the difference between blended and unblended substrate was also being recorded i.e. 16 to 25. That means the basic weight or GSM of the blended substrates was increased 16 to 25 GSM. During the observation the difference between blended and unblended substrate was also being recorded i.e. 10 to 20. That means the thickness of the blended substrates was increased 10 to 20 thicknesses. During the observation the difference between blended and unblended substrate was also being recorded i.e. 0.004935 to 0.032747. That means the bulk of the blended substrates was increased 0.004935 to 0.032747 bulks.

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