Pre Calendering Effect after Primary Coating in Double Coating System(1)

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Abstract

It is well known that smoother surface in substrate for coating or converting can obtain better results. Generally paper substrate is taking machine calendar process in papermaking system to give more uniformity and to get better coating runnability.

This paper was prepared to find better idea for obtaining smoother surface after precalendering precoated paper as a substrate of double coating system. It was shown precalendering had effect on roughness improvement for precoating layer but was difficult to say it was effected to supercalendering results for double coating. The porosity and ink evaluation with precalendered double coated paper is needed to identify more essential clue for precalendering effect.

Introduction

Some researchers did research effect of surface smoothness of substrate on coating. They found that precalendering for paper board showed some effect to birng smoother surface and printing results. However, it is too sensitive to bear any kind of water because of multiple structure.

In this paper, we can imagine that uncoated paper is substrate for

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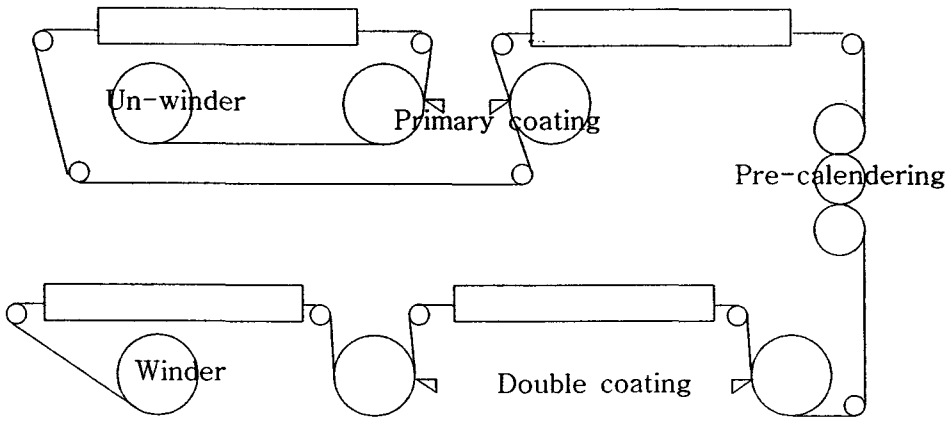
precoating and precoating can be another substrate for double coating. However, it is very expensive and difficult to obtain better results in final double coated paper from coating color compositions. As coated paper passed super calendering procedure, final surface characteristics are determined whether it is good surface or not. Even though supercalendering did good job to improve surface smoothness of coated paper. We know that the procedure exchanged better smoothness with less thickness. Especially in double coating system, coating layer's weight is minimum 50% in coated paper. If we compare paper substrate and coating layer in view point of elasticity, higher ratio of coating to substrate has smaller room for super calendering to keep certain thickness.

If we can use paper substrate that is not passed calendering in paper making system, we could reserve more room for super calendering so that we can make some hypothesis about these relationships. In this point we have to choose to get smoother surface through super calendering because of reserved substrate thickness. One is that we can give more severe super calendering after double coating. The other possibilities that we can introduce pre calendering device in coating process after primary coating so that runnability of top coating process can increase and reserve more thickness room for severe super calendering. Pre calendering system can be install like fig 1.

Therefore, this research was performed to identity precalendering effect on final coated properties in double coating system.



Experimental and materials

a.Basepaper

Used base paper was prepared in pilot paper machine and was consisted with 10% ash contents and 80% bleached hardwood and 20% bleached hardwood. Basis weight was 70g/㎡.

b.Precoating

For preparing pre coating color, coarse calcium carbonate (hydrocarb60, Omya) was blended with 12 pph SB latex(NA620, Jencorp), 0.5pph lubricant(C104, Nopcote) and 0.3pph CMC(LMW, Hercules) in 60% solids content. Prepared coating was applied 10~15 g/㎡ at auto draw down coater. Microwave was used for drying wet coating for 60sec.

c.Precalendering

Pre calendering was performed at laboratory calender (Beloit Model 753) with hard roll. The linear pressure to the pre coated sheet was various from 0psi to 400psi. These pre calendering schedules were intended to make determine whether high pre calendering condition can substitute more expensive materials from top coating formulations and can decrease final super calendering pressure to give mild calendering condition so that thickness of the double coated paper can be save from them.

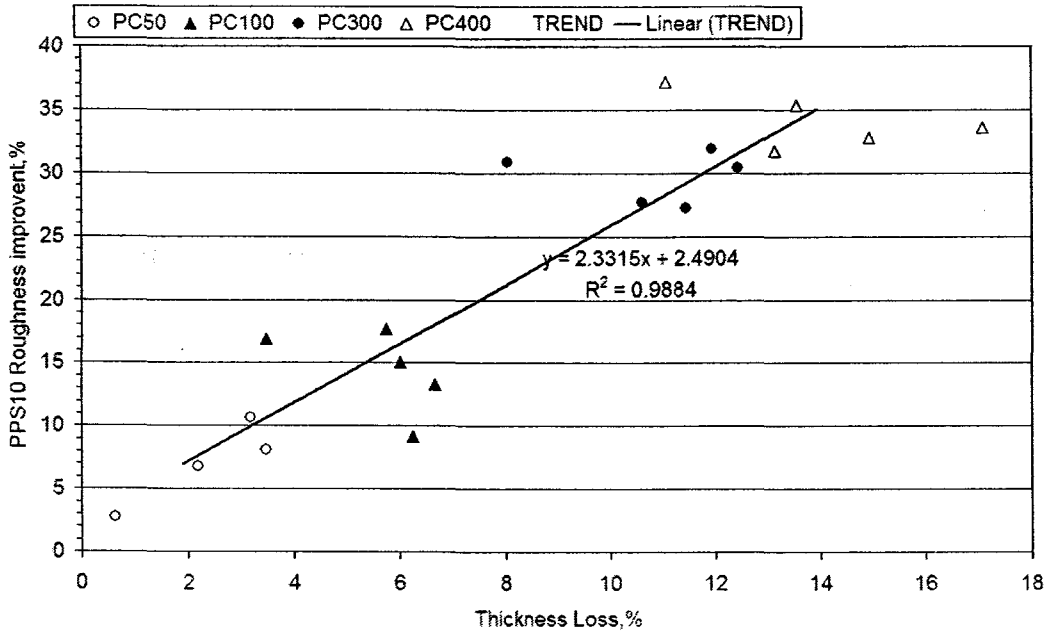
d.Topcoating

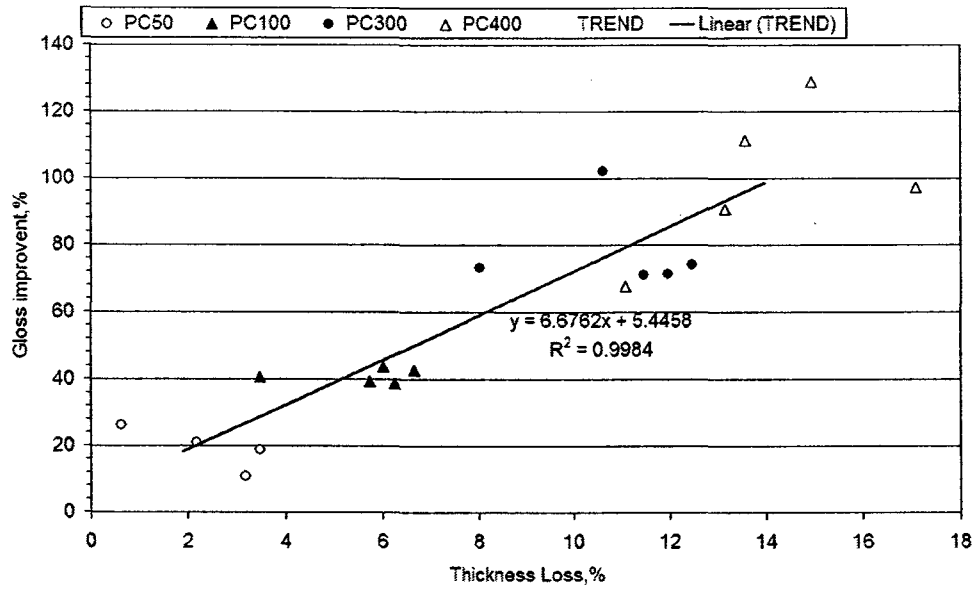
Top coating was prepared with #1clay 50pph, fine GCC 50pph (hydrocarb90, OMYA) with 12pph SB latex, 0.5 pph Lubricant and 0.2pph CMC in 63% solids content. The top coated paper was dried in microwave for 60 sec.

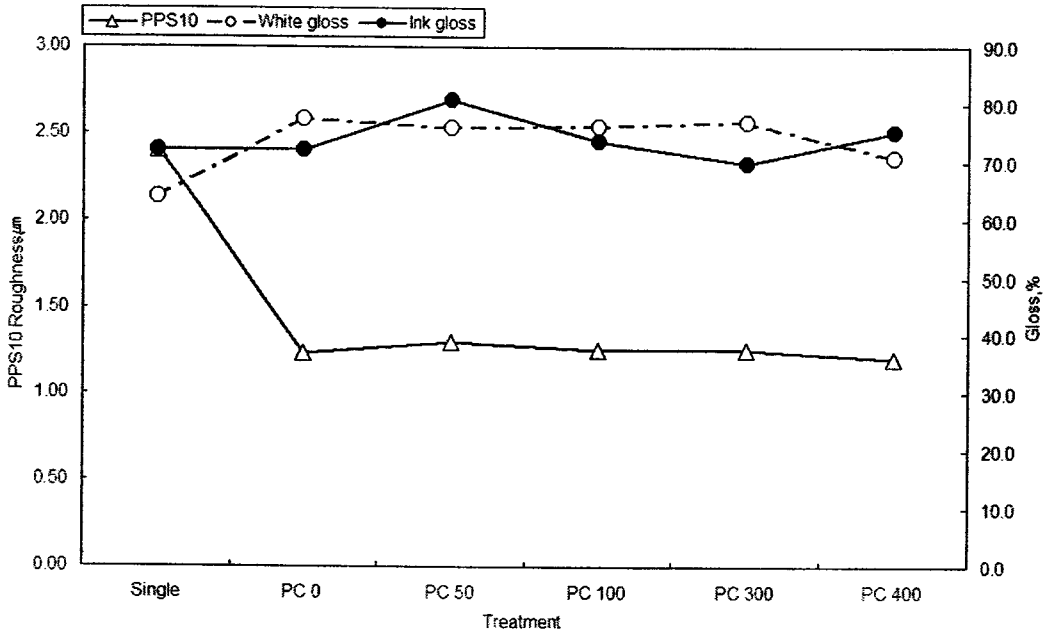
e.Super calendering

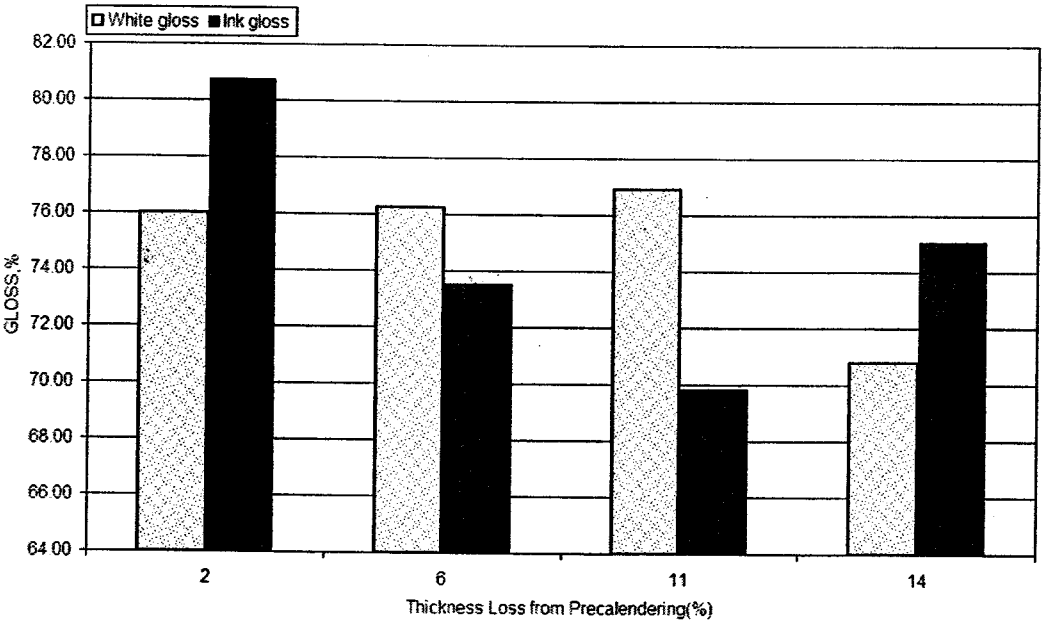
Super calendering condition to finish single coated and precaledered double coated paper was 400PLI with hard roll in laboratory calender. The chilled roll was remained as cool. Calendering speed was 5m/min

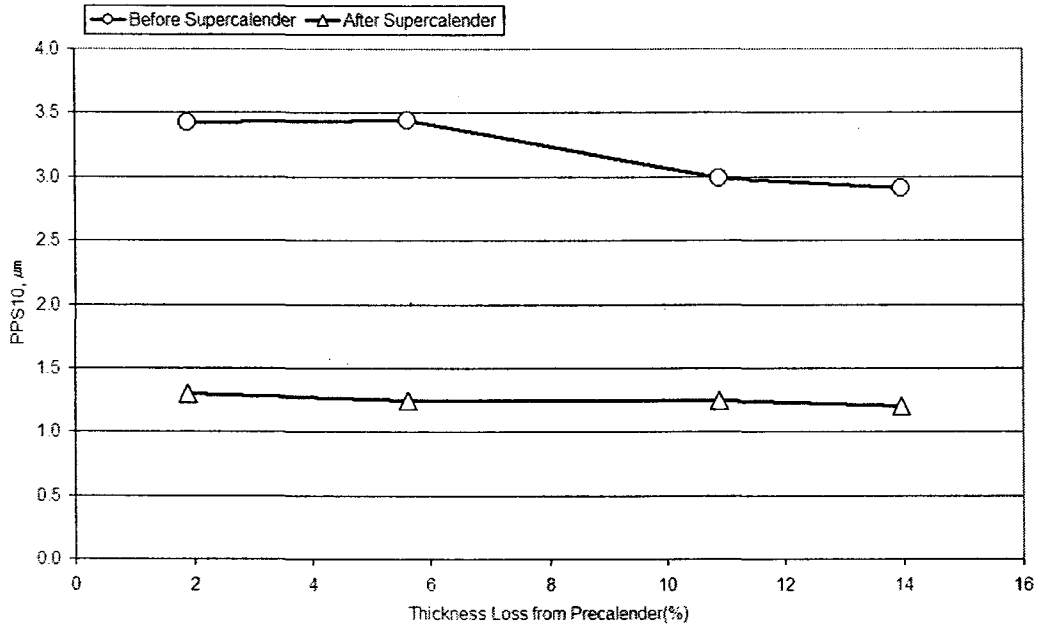
Result and discussion

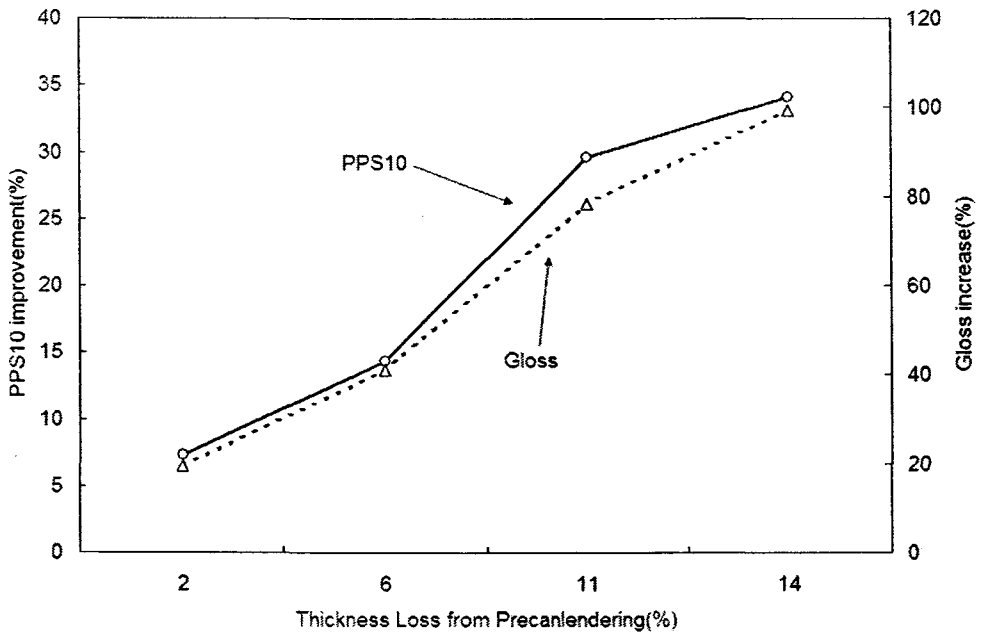





PPS10
White gloss
Ink gloss
PPS10 Roughness,μm
Gloss,%
3.00
2.50
2.00
1.50
1.00
0.50
0.00
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Single
PC 0
PC 50
PC 100
PC 300
PC 400
Treatment


White gloss
Ink gloss
GLOSS,%
82.00
80.00
78.00
76.00
74.00
72.00
70.00
68.00
66.00
64.00
2
6
11
14
Thickness Loss from Precalendering(%)


Before Supercalender
After Supercalender
PPS10, μm
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
2
4
6
8
10
12
14
16
Thickness Loss from Precalender(%)


PPS10 improvement(%)
Gloss increase(%)
PPS10
Gloss
40
35
30
25
20
15
10
5
0
120
100
80
60
40
20
0
2
6
11
14
Thickness Loss from Precanlendering(%)

Conclusion

Paper coating can be achieve better appearance and printability for high grade paper. However, material cost is too expensive compare to its performance. In this research, pre calendering system was tried to substitute high cost material for coating color. From trials, the follows were obtained as result.

a. Paper thickness for precoated paper was reduced 2 ~ 14 % after precalendering. Especially 300PLI was dramatically reduce the thinkness.

b. Thickness reduction brought improved sheet gloss and it means precalendering make precoated paper smaller porosity.

c. Precalendering effect to coated paper appearance and printability because of its structural changes.

d. The porosity and ink evaluation with precalendered double coated paper is needed to identify more essential clue for precalendering effect to final double coated paper.

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