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ACHIEVING CONSISTENT QUALITY IN COATED PACKAGING BOARD MANUFACTURED WITH RECOVERED PAPER – INNOVATION IN PAPER COATING LATEX

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Abstract:

Sustainable development is a universal imperative. From paper industry perspective, maximizing the usage of recovered paper is very important from sustainability point of view. But this comes with many challenges specifically related to variation in the finished product quality. In contrast to uncoated writing printing paper, the coated packaging board is subjected to converting operations also, after printing. In converting operations boxes are made for packing. Generally a brand is also printed on the box which needs excellent, defect free print. A consistently good quality print is very important for an appealing appearance at point of sale. This paper focuses on maintaining the consistency in quality of coated packaging board manufactured with recovered fiber.

Keywords: surface pores, coating, binder migration, coating immobilization time, dusting, mottling.

Introduction

"Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives." ~William A. Foster.

We all understand the importance of using recovered fiber. The processing of recovered fiber to turn it in to a good quality product is possible but maintaining the consistency in quality is a challenge. The variation in the quality of recovered paper is due to the following reasons:

- Type of paper being recycled (Writing Printing, Graphical, NewsPrint, Duplex and Kraft etc.)
- Morphology of fiber
- Varying ash content in the wastepaper
- Sourcing country

Since above variations are unavoidable to a larger extent, the paper mills using wastepaper as the main source of raw material to produce finished paper face many challenges. In case of coated packaging board, which is subjected to stringent printing and converting processes, the variation in recovered paper quality is very challenging. However some part of it can be taken care by carefully designing the coating recipes.

In this communication we will take a deep dive on the "challenges faced by coated packaging board" made with recovered fiber and "ways and means" of mitigating the same from the angle of innovation in paper coating latex.

Impact on base board quality: The ever-changing recovered fiber's structure also leads to variation in the surface of the uncoated sheet. The variation includes the changes in pore size as well as surface strength and absorption characteristics. The length of the initial fiber, how many times the fiber has already been recycled etc, influences the next re-use performance. While a packaging board is generally a multilayer structure resulting in a compact sheet, still the porosity of the top side of baseboard makes a big impact on final coated board properties.

A typical surface structure (under SEM – scanning electron microscopy) from baseboard to coated board is shown below (Fig 1)

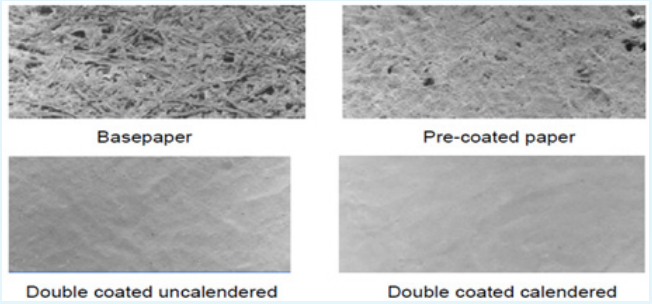

Fig. 1

We notice lot of pores in topside of basepaper, which are mostly filled after precoat. With changes in recovered fiber structure, the porosity and absorption characteristics of top side of uncoated sheet varies which leads to water migration, primarily from precoat solution. This problem aggravates when blade coating is used at precoat station. Blade exerts much higher hydrodynamic forces (than bar coater) on coating color which forces the water out from coating color to uncoated sheet through the pores. Water carries other water-soluble coating ingredients including latex, which leads to "Binder Migration". While some binder migration is required for anchoring of coating to paper, excess and varying binder migration leads to poor and inconsistent coating strength and coating coverage. Ultimately it leads to frequent dusting on printing blankets as well as mottling in final print.

Fig.2 - Example of dusting during offset printing (appears as white dot on print)

Fig. 2

Fig.3 -Examples of good and bad print from mottling point of view

Clear Print Cloudy Print

Fig. 3

It is essential to work towards key industry challenges through continuous stream of R&D innovations to address the challenges faced in the usage of recovered fiber in packaging industry. In recent past, during the development of special latexes for applications where improved water retention is required (for examples in packaging board made with recovered fiber) we identified below two tests which give good indication on the required performance on reducing migration:

1. Gradek Water Retention in static conditions: This test represents the water holding capacity of coating color. This test measures the amount of water in grams lost by coating color to 1 square meter are of base paper. Lower values are preferred which means coating color will lose lesser water upon contacting baseboard.

2. Anton Paar Dynamic Water Retention: This test measures the coating immobilization time. Moving coating color is in touch with a standard paper while its viscosity is being measured in Pa.S, (1 Pa.S = 1000 cps). The viscosity of the coating color keeps increasing as it loses water into the paper and ultimately becomes too viscous to move. The time is noted down till the coating color becomes too viscose to move. Higher time is preferred as coating loses waster slowly to the paper sheet.

In following paragraphs are the results of application studies carried out during the development of special latexes to suit paper coating where base is manufactured using recovered fiber as the main source of raw material. Please note below the recipes* used for evaluation. In the regular and trial recieps, only latex was changed, while are other coating additives were kept same.

Precoat ▶ C60 (100 pts), Dispersing Agent (0.04 pts), Rheology Modifier (0.4 pts), Latex (11 pts), Caustic.

Topcoat ▶ Clay (30 pts), C95 (70 pts), Dispersing Agent (0.8 pts), Rheology Modifier (0.45 pts), Crosslinker (0.5 pts), Latex (12.5 pts), Caustic,

**Coating additives are calculated as dry parts on pigments*

Gradek Water Retention Values (Static WR), Tabel 1:

Coating	Latex	Gradek Water Retention (gsm)
Precoat Solids – 66%, pH - 9 Viscosity – 800 cps	Conventional Latex	65 gsm
	Development Grade	50 gsm
Topcoat Solids – 64%, pH - 9 Viscosity – 1000 cps	Conventional Latex	90 gsm
	Development Grade	68 gsm

Table 1

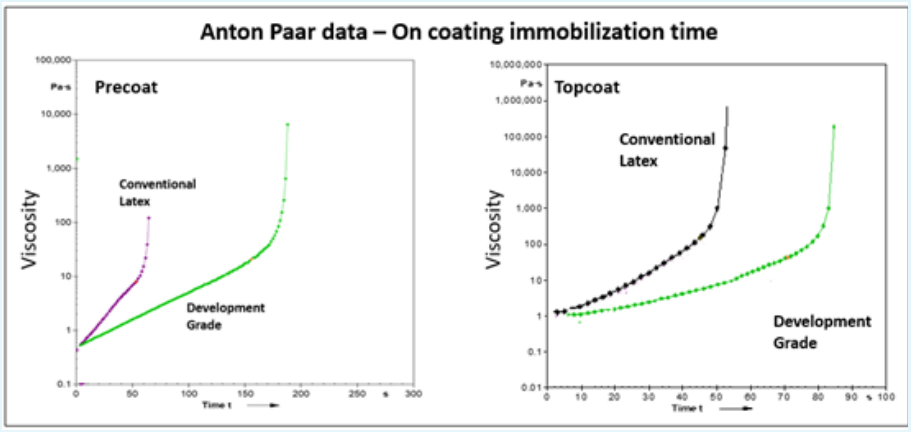

Table 2

Both results on Gradek as well as Anton Paar equipment shows much better performance with the development grade of latex. The scaled-up paper latexes were put to actual paper mill trials and results are as per expectations of enduser. In most of the cases the number of complaints on mottling and dusting are much lesser than earlier.

Conslusion: Consistency in quality is a big concern in paper manufactured with recovered paper. For coated duplex board the stakes are much higher as it goes through multiple and stringent printing & converting processes. With focus on more and more recycling, paper manufacturers need to adopt new technologies in their processes. We are committed to invest in continuous innovation to address customer's challenging key issues and to offer step-forward technology that can provide a competitive advantage to paper and board industry.