

Recent Trends & Industry Challenges in Coated Paper & Board market



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Introduction

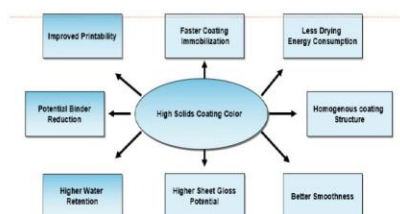
The near-future outlook of the coated paper and board market across Asia is looking very gloomy due to various geo economic-political reasons. The coated paper and board mills are facing huge challenges to off-load their products into the market due to sluggish market demand. Some mills are even forced to take down-time to reduce their inventory to improve their cash-flow. Currently, the coated paper and board mills in China are facing the biggest impact of this challenging economic environment due to market over-supply and ever challenging key monomer raw material price fluctuation. In addition to this, the market requirement has not softened but in fact even more emphasis given towards sustainability and quality of the coated grades.

Sustainability and food safety have become more prominent topics, where higher stringent requirements for food packaging coated grades are being seen in the Asian market, especially in China. To further optimize the cost-use, more and more mills are exploring the use of high coating color solid formulation, knowing there are many added technical and commercial advantages. BASF is working towards key industry challenges through continuous stream of R&D innovations to address food-safety & suitability and cost-in use solutions.

High Solid latex technology

High coating color solid formulation is the ability to operate the coating recipes above 68% without any coater runnability issues. In some highly optimized coating formulation, mills are even able to run the coating formulation up to 72% coating solids. The use of high coating color solid formulation has many added technical and commercial advantages. The coated paper and board benefit do not only limit itself to superior coater runnability but also imparts enhanced coated properties and printability (see diagram below). In addition to this, the total cost in use can be highly optimized.

The given benefits are highly advantageous but the implementation of high coating formulation in the mill can be very challenging. There are certain limitations in the coating recipes that can be a bottle-



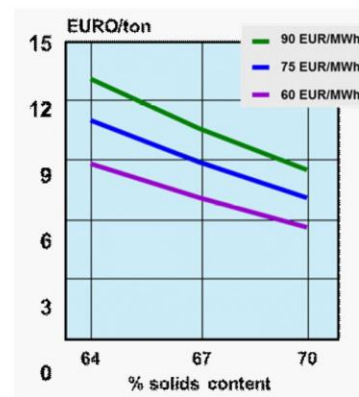
neck to attain coating formulation with high solids. An example would be latex, where the typical solid content of latex currently available is around 50%, which can be a bottleneck for high solid coating formulation in certain mills. High solid latex is very rare in paper coating industry due to its unique technical challenges in inherent viscosity and latex stability to produce.

Technology-driven Solutions Approach - High Solid Latex, Styronal® 7926 X

Knowing that these benefits are very crucial for the success of our customers, highest priority was emphasized in the development of Styronal® 7926 X, an important step forward in high coating color solid formulation. An innovative technical approach taken to address this challenging task, where deployment of optimized monomer feeding technology used in combination with suitable choice of colloidal stabilizer, during the polymerization process. The polymerized latex has solids content reaching above 55%. The highly stable latex, Styronal® 7926 X offers many commercial and technical advantages as highlighted above. The cost optimization can come from potential binder-in-use reduction,

reduction in energy consumption and logistic cost. The technical performance and commercial advantage give both BASF and the customer a perfect win-win situation in this current market dynamics. Keeping abreast with the recent stringent regulatory requirements, Styronal® 7926 X also complies with GB9685 and with all other relevant standards including European Commission, BfR and FDA.

Below picture indicates the saving during a study where drying demand after coating was evaluated at different coating color solids. There is significant reduction in energy demand at higher coating color solids.



Trend towards Zero Odor, low VOCs, GB9685 compliance for Food Packaging Grades

Conventionally, these food packaging grades are required to comply with FDA (USA) and BfR (Germany) regulations. However, China has recently set additional food safety regulations. This new food safety standard for Food Contact Materials (FCMs) in China is GB 9685-2016 (GB9685) which specifies the hygienic standard for use of additives in food containers and packaging materials. GB 9685 recommends that companies check if they have added specific food contact additives into FCMs and confirm the required test items. As for the Food & Safety regulation, BASF have been able to identify & eliminate the non-permitted food contact additives from the current latex. Further process optimizations were carried to encapsulate all the requirements needed for coated paper and board. All future lattices produced comply to, European (EC), FDA (USA), BfR (Germany) and **GB9685:2016** compliance

Approach taken to minimize Odor and VOC

The source of VOC and odor in lattices mainly comes from (1) unreacted monomers during the polymerization,

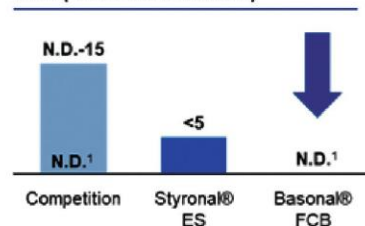
(2) key odor-causing components, such as 4-Phenylcyclohexene (4-PCH) and 4-Vinylcyclohexene (4-VCH) that are typically found in conventional styrene-butadiene chemistry. In addition to that the presences of certain chain transfer agents used in polymerization process, can be apotential source of strong odoremitted during the converting and UV printing process.

Two parallel R&D developments were initiated, the first addressing odor free lattices with lowest possible total VOC levels and removal of conventional chain transfer agent to eliminate the formation of branched alkenes, which is main source of odor during the converting/UV printing process. This approach deploys highly optimized chemical (redox system) and physical deodorization (advance column) process to reduce the VOC levels to extremely lower levels compared to conventional styrene-butadiene lattices. The highly optimized low VOC grade, **Styronal® ES** able to achieve total VOC levels to below 40 ppm.

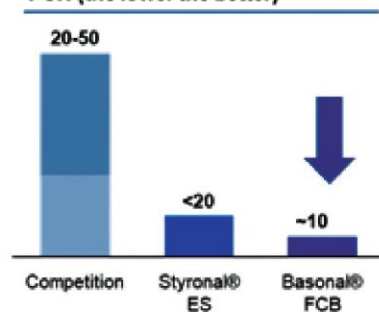
In the second approach, to reduction/minimize key odor-causing components. This Technology-driven solution allows the usage of key choice of monomer in the emulsion polymerization process to further reduce 4-Phenylcyclohexene (4-PCH) and 4-Vinylcyclohexene (4-VCH).

This new grade, **Basonal® FCB** able to minimize the VOC & odor levels to almost non-detectable levels and impact excellent printability properties (see. chat below)

VCH (the lower the better)



PCH (the lower the better)



Summary

In-line with the recent trends for food safety compliance and high Solids coating Color technology, BASF is committed to invest in continuous innovation to address challenging customers' key issues and to offer step-forward technology that can provide a competitive advantage to paper and board industry.