AEGO™ SIZER F – The PMT Film Size Press

How to improve paper strength properties, surface and machine runnability.

Effects on main paper grades

Paper Properties

Sizing and coating have several impacts on paper properties. Properties can be grouped as profiles, strength, printing and dimensional properties.

In terms of profiles, both basis weight and moisture profiles are affected by starch or colour application. Most strength properties are of course also influenced by starch sizing as well as printing properties, and are a direct result of surface application. Paper stability also depends on sizing.

Strength Properties

The impact on strength properties is the explanation of why sizing is a good way for saving fibres and meeting at the same time the paper quality requirements of the market.

Sizing

An example of the result of starch application (Sizing) on Test Liner from waste paper in terms of SCT improvement is given in Figure 2. One can see here how the SCT index is increased by 5 to 25% with an increasing amount of starch applied.

A good mechanical strength improvement of the paper is given by a good penetration of the starch into the sheet (see Figure 3).

Applicator Rolls

Applicator rolls can have the following standard shell diameters, depending on paper machine speed and width:

- 36” (915 mm)
- 40” (1055 mm)
- 48” (1260 mm)
- 52” (1565 mm)

Applicator rolls of the same pair have a slightly different diameter in order to avoid continuous load on the same Nip line.

The shell material is Cast Iron 50 (EN-GJL350) and shell thickness is recommended to be 70 mm or more in order to limit deflection. Operating Nip load varies from a minimum of 20 kN/m for light graphic grades to a maximum of 50 kN/m for packaging grades, where starch penetration is more important.

Applicator roll covers can be rubber or polyurethane, depending on application. Cover hardness is between 15 and 10 P&J for starch application while higher hardness is used for pigment, depending on colour viscosity.

Applicator Roll Crown

An important target when using sizing and coating is the stability of the paper sheet after the starch / colour application. Sheet wrinkles exiting the sizing unit are often an issue which can be kept under control by means of a suitable applicator roll design.

Roll Crown (B = DM – D) compensates deflection of the rolls when coupled. The difference in paper sheet speed between centre and edges is proportional to Roll Crown:

\[ V_M = \frac{w D_M}{2}, \quad V = \frac{w D}{2}, \quad \Delta V = V_M - V = w (D_M - D)/2 = \frac{w B}{2} \]  

where \( E \) is the Young Modulus of the paper and \( w \) is the rotating speed

\[ \Delta T = c \Delta x E \]  

which shows that the differential tension on the sheet between centre and edges is proportional to the Roll Crowns. This means that the applicator roll crown has a sensitive impact on the paper stability, i.e. wrinkles are directly related to the roll crowns in addition to moisture profile and paper elasticity. Stronger applicator roll shells with less bending under the Nip help paper stability thanks to reduced or even no crown.

Rolls / Heads Closure Mechanism

Parallel closure of Heads and Rolls is mandatory for best runnability, avoiding paper sheet breaks when
opening and closing rolls and heads on the run. Head and Roll fine adjustment is performed by hydro-mechanical jacks (see Figure 5).

Applicator Head Design

Runnability is also influenced by applicator heads and rolls cleanliness. Accessibility for cleaning is always important (Figure 6).

Starch flows through the main beam from an inlet to the starch chamber and is applied by means of a rod (12 to 35 mm diameter) loaded by a pneumatic tube. Screws regulate the position of the rod. A sealing blade leads the exceeding amount of starch into a saveall.

The head can be quickly opened and closed for cleaning by means of hoses allowing access to the starch chamber.

Starch comes across the back part of the head to give thermal balance to the beam. The straightness of the beam is ensured by uniform expansion. The pipe in the back part is quick to inspect by removing the inlet pipe and/or the connection pipe.

Deposits of starch on the roll cover edges and on the roll sides must be avoided. Rolls are kept clean by wipes. ■

U.S. paper mill achieves more than 1.24 MM gallons of fresh water savings/year by utilising MOC approach and PARETO mixing technology

A North American paper mill producing 90,000 tonnes per year of high quality printing and converting papers from recycled materials was looking for ways to improve their sustainability by optimising the performance of their operations. Through a combination of de-poly and de-inking processes, the mill reclaims fibre from poly laminated food and pharmaceutical packaging, undelivered mail and sorted office waste. The waste effluent streams from these operations is processed through the mill’s waste treatment plant which consists of a dissolved air flotation unit (DAF) followed by a clarifier. The final effluent from the mill is passed to a publicly owned treatment works (POTW) for additional processing.

SITUATION

The mill felt that they were using an unusually high amount of polymer to treat their wastewater and they asked for assistance from several chemical providers to reduce their chemical usage and costs in this area. After two chemical suppliers failed to reach the targeted savings and dosage goals, a Nalco team consisting of the local account manager and a wastewater treatment expert were contacted to see if we would be able to provide a suitable solution that would meet the mill objectives.

Nalco utilised the MOC; mechanical, operational, chemical approach to develop a holistic solution to the customer’s needs. The first step was to complete a comprehensive survey of the waste treatment facility and the treatment programmes being used to identify all potential factors contributing to the high polymer usage rates. Following the assessment, the Nalco team found several deficiencies in the customer’s current programme with respect to chemistry selection and programme application methodology. During testing, the Nalco team discovered that the optimal lab dosages were significantly lower than the actual quantities being applied to the process. With this understanding, the Nalco team presented the customer with a multi component solution which consisted of applying Nalco’s best practice for polymer make-down to increase polymer activity, switching to Core Shell® 71301 to improve polymer effectiveness, and implementing PARETO mixing technology to assure effective product mixing in the process stream. The integration of these three elements; Operational Best Practices, advanced Core Shell 71301 polymer and PARETO mixing technology not only decreased the chemical usage by the desired 50 percent; it was able to exceed that requirement by an additional 20 percent as well as decrease the fresh water consumption in the polymer handling system and increase the waste treatment plant contaminant removal (BOD/TSS) effectiveness and responsiveness. These actions have saved the customer over $40,000 per year in chemical costs as well as reduced their fresh water demand by over 1.24 MM gallons, for chemical make-up and dilution, which relates to an additional $13,000, per year in operational savings.

CONCLUSION

With assistance from Nalco, the customer has been able to improve their overall sustainability by improving their operational efficiency, optimising their chemical consumption, and reducing their fresh water demand. As a result of the successful programme, the customer has asked the Nalco team to assist with developing sustainability action plans for their raw water and DAF applications at the mill. ■