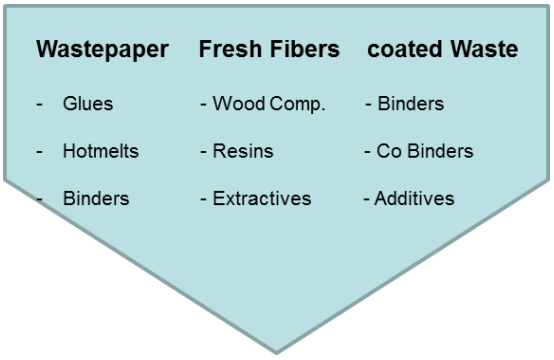
BONDSTAR® – a Way for an Efficient Treatment of Impurities

Fig.1



Soluble and insoluble impurities

Due to the ongoing closure of the water circuits in paper production and to the increasing amounts of waste paper there is an accumulation of so-called impurities. These impurities they can be distinguished by to their origin as well as by their chemical composition. However, for principle considerations, it is sufficient to distinguish between soluble and partially soluble or insoluble impurities.

Impurities are characterized by their fundamental physical / chemical parameters.
In this context the most important parameters are the weight-specific charge density and the particle size. Soluble impurities are molecules or macromolecules and therefore they have a size of less than one micrometre. Several studies in water circuits of numerous paper mills have shown that more than 90 percent of the partially soluble impurities have a particle size between 1 micron and 50 microns. (fig. 2)

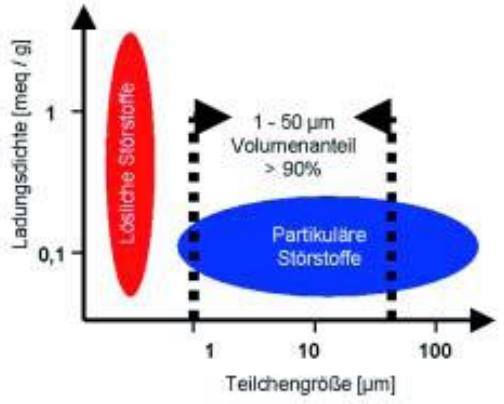


Fig. 2: Specific weight and charge density Particle size are the most important parameters

For the treatment of impurities in paper production a clear distinction between charge neutralization and deposit control is important. For the treatment of insoluble impurities the focus usually is on charge neutralization, for the treatment of partially soluble impurities it is on the deposits. In aqueous media - during the stock preparation and in the wire section and press section -many partially soluble impurities have the tendency to deposit; that is closely related to their "stickiness".

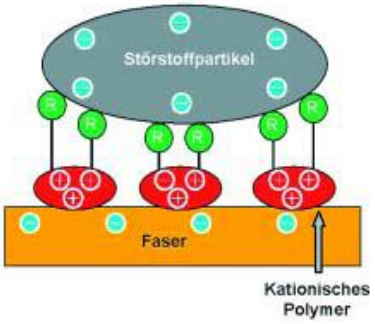


Fig. 3: The fixing agent acts as a link between fiber and contaminant

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The deposition tendency of the impurity particles increases with an increasing particle size. During long retention times even impurities, which initially have a low deposition potential due their small size coagulate with other particles and so their deposition potential can be increased. A now well-established method for the removal of impurity particles of this size is the fixation with cationic polymers. It is important that the particles are fixed in finely dispersed condition not to form coagulum.
Among others the cationic polymers of the Bond Star-series offer many chemical options for special applications.

The Chemistry of the Fixing Agents

The fixing agent acts as a link between fibre and impurity particles. This attractive forces act between polymer and fibre, as well as between the polymer and the impurity particles.
In the case of shearing of the impurity particles the polymer would remain on the fibre. To adjust the interactive forces several molecular parameters of the polymer can be optimized. The key parameters are the molecular weight, the charge density and the molecular structure. The molecule can be modified by the addition of functional groups.
The variety of material systems and the different applications require an ideal combinations of the different molecular parameters. The products of ACAT BondStar® series offer a high degree of flexibility.

Over a very wide pH range (3-10) the products of the BondStar® series have very high cationic charges (up to 15 meq /g). For a punctual fixation the BondStar® products can be optimally used for many different paper productions: in the production of wood free and fine papers up to papers that are produced from 100 percent recycled paper as well as in board production.

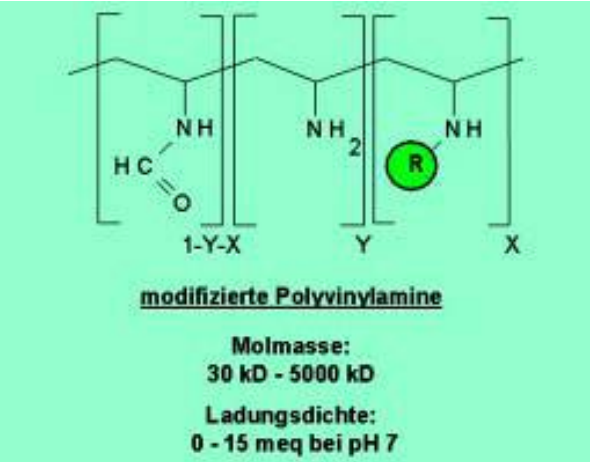

Fig. 4: BondStar®
Molecular Weight: 30 kD - 5000 kD
Charge Density: 0 - 15 meq at pH 7

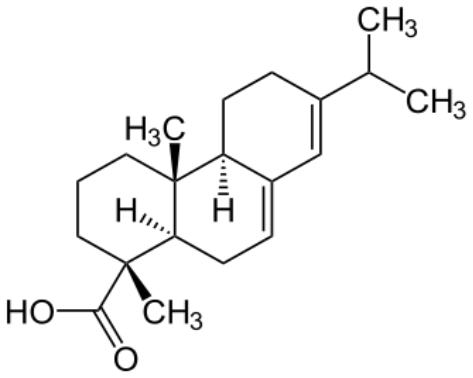

Fig.5: Abietic

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Practical Application

Problems in runnability with bright specks, holes, breaks and others on a paper machine, which produces standard newsprint (500 t/ day), were the reason to carry out various tests over a longer period to reduce hydrophobic particles originating from the resin acids of the TMP.
Several preliminary tests proved that Bond Star® reduces these particles efficiently.

Resin Acids:

Chemically resin acids are carboxylic acids based on terpenes. Typical representatives of resin acids are the abietic acid, the neoabietic acid, the levopimaric acid, the pimaric acid and palustric acid.

In addition to the conventional measurement methods for the analytical detection of impurities, such as

- COD measurement
- BOD measurement

- Turbidity measurement
- Measurements of pH value and conductivity
- PCD measurement (using the polyelectrolyte titration to determine the consumption of cationic aids)

ACAT pays special attention to the evaluations in

- FCM methodology (flow cytometer measurement) - Determination of particle number and size, for example, of the hydrophobic particles
- Microscopic evaluation of stickiness

Improvements by the Use of BondStar®:

The use of Bond Star shows a significant reduction of hydrophobic particles (Fig. 6).

Dosing point BondStar®:
in the TMP unbleached to the blending chest
Dosage BondStar®: 0,5%

- Improvement of runnability (reduction of standstills for cleaning per month)
- Significant reduction of sheet breaks
- Reduction in bright specks and holes (Fig. 7)
- Relief of the paper machine circuit
- BondStar® supports the retention (Savings of retention additives)

Fig. 7: Reduction of bright spots and holes

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Fig. 6: