What is the impact of water that comes in contact with paper during the printing process?

Although the impact of water absorbed by paper during the printing process is often quoted as a reason for linting in four-color printing presses, the mechanism of this influence is not fully understood. There are two mechanisms of water absorption during the printing process – absorption in the nip (milliseconds) and absorption after the nip. According to studies performed by KCL, the amount of water absorbed in the image area is approximately twice the amount absorbed in the non-image area, 0.8-1.2 g/m^2 per unit and 0.2-0.5 g/m^2 per unit, respectively. Water absorbed during printing may also contribute to problems other than linting, such as misregister and runnability problems. Despite the fact that the exact mechanism of water absorption is not fully understood, its negative impact on linting is confirmed by the fact that some anti lint approaches used to make the sheet surface more hydrophobic are often successful.

How is linting measured on the printing press?

The linting is quantified on the printing press by collecting the lint sample from the blanket, either through adhesive tapes (separately from image and non-image areas) or by washing lint with special collectors from the blanket. Weighing and microscopic characterization of the lint sample allows Nalco to quantify the problem and to determine lint composition. This analysis should be done on both sides of the paper. Lint particles are analyzed by shape, size and potential origin. It is also useful to analyze the paper surface with the use of light microscopy and/or scanning electron microscopy (SEM). Determination of filler and fine two-sidedness or z-direction distribution can also contribute to the determination of origins of a linting problem. Nalco has analytical capabilities that can be employed in solving linting and other sheet quality issues.

How is the degree of a linting problem quantified?

One of the most often but not very objective ways to evaluate a linting problem is to determine the number of copies printed between wash-ups. Other more quantitative methods include:

- PLI – Paper Linting Index – number of fibers crossing a standard line grid corresponding to a given area of blanket
- PLPI – Pulp Linting Propensity Index – weight fraction of pulp having specific surface less than 2.5 g/m^2

How can linting propensity of paper be predicted?

There are a number of tests available, but despite the numerous claims, users are often disappointed by the lack of correlation between the predictive tests and practical experience. Part of the reason may be explained by the fact that individual pressroom variables play a large part in whether a given sheet will lint or not. It is therefore difficult to find a test that can be universally applied. Several of the tests commonly used include:

- MB lint tester
- IGT fluff tester
- Apollo print test
- "Black cloth test"
- Surface strength tests such as wax pick and z-directional tensile.

What should be the general strategy in combating linting?

Linting is a problem that may originate from many individual factors or a combination of more than one factor (many of these factors were discussed earlier). Before any solution is applied, the papermaking practices must be reviewed to ensure proper fiber development minimizing linting propensity. Nalco can assist customers in this process with papermaking expertise and analytical services. Mechanical and chemical solutions to the linting problem are discussed below.

What furnish preparation and mechanical strategies can be used to combat lint?

The most important methods that should be considered include:

- Control of fiber length and refining specific energy to improve fibrillation
- Control of stability of wood species, wood age, etc.
- Control of reject level and reject refining – sewering of fines and ray cells
- Control of wood moisture to an optimum level during storage
- Reduction in temperature of the first few dryers and ensuring clean, smooth dryer surfaces to minimize surface disruptions
- Application of increased press loadings
- Minimization of sheet sticking and surface disruption on press rolls and the center roll