Surface strength

During modern multicolour printing using the offset process, high print speeds in combination with tacky inks place very high demands on the surface strength of the paperboard. (Compare to a tape strip rapidly lifted from a paper.)

The term surface strength is used to describe the strength between the paperboard’s coated surface and inks, varnishes or films, or the strength perpendicular to a level just underneath the surface.

This property is very similar to delamination or interlaminar strength and is measured using similar techniques and with the same types of difficulties applying. Surface strength is an important parameter which relates to the forces created during printing. Due to the printing speed and viscosity of inks and varnishes, the surface must withstand lifting forces. Numerous methods are used which combine various tacky inks or waxes to simulate the lifting forces during printing, or which use peeling to check how well coatings or films bond to the paperboard surface. Depending on the method used many different results are obtained.

Surface strength test methods cannot fully express the complexity of the opposed forces but experience over the years has established certain levels that indicate satisfactory performance. Many factors influence the surface strength. The delamination strength of the interior of the paperboard is important, as is the strength of the coating and its bonding to the paperboard. The viscosity, tack of inks and the speeds used during printing may vary considerably and affect the intensity and type of loading applied to the paperboard surface. Therefore values for surface strength, as for many of the other less well-defined physical properties, should be regarded as indicative of the actual performance on the printing press.

Measurable properties

Surface strength, IGT (ISO 3783)
Surface strength in this context means the ability of the paperboard surface to resist the pulling forces, thus avoiding delamination or picking of the printed surface, or both.

Test method and equipment
The commonly used test method for evaluation of surface strength is the IGT printability test. The test instrument simulates, in a simplified way, the offset litho printing process. By using an ink of specified viscosity (e.g. IGT medium viscosity oil), the speed at which delamination and picking occur may be determined by comparison with a distance/velocity chart. The result is usually recorded in metres per second (m/s).

Key characteristics
Surface strength properties are strongly influenced by the type of fibre used (long fibres improving the strength), the treatment of fibres, surface sizing, type of coating pigment, and type and proportion of binder in the coating.
**Measurable properties**

Surface strength, Dennison number (CPI RTM 30)

Tack-graded waxes can be used in a similar manner to the tack-graded inks as used in the IGT test. They are, however, only suitable for uncoated surfaces and should not be used on coated surfaces.

**Test method and equipment**

A series of tack-graded waxes are melted, applied to the paperboard surface and allowed to set. The cooled wax stick is then pulled from the surface and any evidence of surface disruption identified. The picking resistance is the highest wax number that does not disrupt the surface.

**Key characteristics**

Surface strength properties are strongly influenced by the type of fibre used (long fibres improving the strength), the treatment of fibres, and the surface sizing.