Northwest Coatings

TECHNICAL BULLETIN

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Coupon Construction

INTRODUCTION

Coupon constructions are frequently used for instant redeemable or promotional pressure sensitive label constructions. They consist of two functional substrates which include a bottom release-base and a removable top-ply (coupon). Ideally these two substrates maintain an interlaminer bond which is strong enough to allow manufacturing processes such as die cutting, rewinding, labeling, and shipping, while providing long-term non-destructive, tack-free (dry) removal of the coupon upon delamination after aging.

REMOVABLE ADHESIVE

Since the primary function of the top ply in a coupon construction is consistent and controlled removeability, the adhesive used to hold the ply in place must possess unique properties. A combination of application ease and post-dry, tack-free properties across a broad temperature range dictates the use of a water base adhesive. Water base adhesives are easy to apply flexographically and can exhibit excellent wetting and flow characteristics over relatively low dyne-level base substrates. When suitably formulated, they can be designed to act as non-permanent wet laminating adhesives. When applied to a suitable release-base and over-laminated with the absorptive, uncoated side of a paper substrate, they can act as the binder in a coupon construction. A dry, tack-free surface remains following delamination of the coupon from the release base.

RELEASE BASE

Various materials can act as release bases for coupon constructions. Untreated (low dyne level) films such as polypropylene, polystyrene, and polyester can be used, as well as release coated paper stocks. UV curable topcoats, such as Northwest Coatings FT33HG, or FT34HG when suitably formulated applied and cured, can also act as coupon release bases on print-treated films or clay coated paper stocks.

DRYING AND SUBSTRATES

A water base laminating adhesive, such as Northwest Coatings 20000C, is designed to laminate the top coupon ply to a release base while still wet. Drying prior to laminating is unnecessary, and typically undesirable. The tack of the wet adhesive is used to hold the two plys together during processing. Since the adhesive is applied to the base and laminated wet, it is imperative that the top ply be an absorptive material.

The non clay-coated side of a C1S paper stock is the coupon material of choice. Clay-coated two side (C2S), synthetic and poly top-ply coupon stocks are not as absorptive and are highly undesirable and not recommended for coupon constructions.

ADHESIVE PERFORMANCE ISSUES

The apparent strength and consistency of the adhesive's bond or holding power is controlled by three primary factors. These factors include applied coat weight, coupon basis weight, and release-base properties.

Higher coat weights of adhesive will bond more tightly after drying, but may lead to post-aged coupon lock-up or substrate and ink picking or fiber tear. Conversely, lower coat weights of adhesive may provide insufficient holding power which may lead to premature coupon dispensing and/or flagging during processing and product labeling. Additionally, consistency in the applied adhesive's film thickness is paramount in obtaining precise coupon release properties. Therefore, precise metering of the adhesive with an anilox doctor blade is a necessity.

The apparent adhesive bond is also affected by the basis weight of the construction's top-ply. Thicker, heavier weight papers will require larger amounts of adhesive, at the risk of coupon lockup, to properly hold them in place. On the other hand, lighter weight stocks may require significantly less adhesive to anchor them properly, although the potential for coupon premature delamination becomes a concern.

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ADHESIVE PERFORMANCE ISSUES (cont'd)

The third factor affecting the adhesive's bond deals with the properties of the release base. A material with a higher level of release will require a higher coat weight of adhesive while the converse is also true. Concerns with respect to adhesive coat weight and coupon performance still hold true as previously discussed. Since the properties of the release base are integral to adhesive performance and subject to variation, it is important to understand their properties on their own.

RELEASE PERFORMANCE ISSUES

Release properties for both untreated synthetic and UV topcoated base films are controlled primarily by the solid surface tension or "dyne-level" and the inherent moisture/chemical resistance of the films. Dyne levels under 34 dynes are desirable for both types of release bases.

Suppliers of synthetic films create the solid surface tension of their products during manufacturing. Dyne levels of cast, blown, or extruded poly films vary by chemical composition, manufacturing process, and age. Dyne-levels of UV release topcoats, on the other hand are primarily controlled by the cure, or "dose" supplied to the coating by the converter.

When UV release base coatings are cured they undergo shrinkage which effectively "squeezes" silicone-type release agents to the surface. The stronger the cure, the higher the applied shrink/squeeze and resulting release level, due to the dyne-level drop caused by silicone migration. Curing the UV release base less will reduce the silicone migration and provide a relatively high dyne level at the coating's surface, thereby tightening the release of the coupon adhesive.

Changes to the cure applied to the UV release base (dose) can be implemented by adjusting one or two variables. The first involves adjusting the line speed up or down, to effect a change in exposure time under the UV lamp, while the second would be adjusting the input voltage and resulting output of the lamp. Both changes will impact the energy applied to the UV topcoat and subsequent changes in dyne (release) level.

RELEASE PERFORMANCE ISSUES (cont'd)

Base release films in coupon construction must provide a chemical and moisture barrier against attack of the underlying print and substrate by the residual moisture and tackifiers contained in the laminating adhesive. Failure to do so will most definitely result in ink picking or smearing and/or coupon lock-up. Synthetic manufactured films are inherently resistant to adhesive attack due to their uniformity in thickness and molecular structure. Converter applied UV release coatings, on the other hand, are much more susceptible to attack.

Inconsistent application methods due to dirty or worn aniloxes, applicator rolls, or plates, will result in low coat weights, voids, or pinholes in the UV coating. This can provide openings for the laminating adhesive to penetrate and anchor into the coating and underlying substrate. Just as doctor blades are a necessity when applying the adhesive they are a must for consistency in the application of the UV coating. Additionally, a marginally cured UV release base can possess a relatively low molecular cross-link density which can result in a weak polymer matrix which the adhesive can more readily penetrate and potentially degrade. Insufficiently dried inks can also generate a surface which is difficult for the UV release to wet out and flow properly.

TESTING

Once assembled, coupon constructions may display performance changes and be susceptible to variations in environmental temperature and humidity. While adhesive bond strengths will typically increase over a 24-48 hour period, sudden changes in ambient temperature or relative humidity can dramatically impact the release properties of the coupon and adhesive from the release base. It is for this reason that comprehensive long-term and accelerated age testing, including low to high temperature and humidity conditions, must be conducted to assure stability of the finished construction. Furthermore, process control verification should be conducted prior to every production run and should include but not necessarily be limited to coating adhesion, UV cure/dose, release and adhesive coat weights and applied film uniformity.