Impact and Analysis of Variable NCO–OH Adhesive Derivatives in Solvent-Free Lamination Techniques for Biomedical Packaging and Sterile Medical Device Encapsulation

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ABSTRACT

The role of plastics and paper as food packaging materials is reviewed with a brief outlook on the historical background of food packages in general. The inherent properties of these food packages that should be considered by food processors are also discussed. The current efforts in meeting the needs of consumers in ensuring food's quality with prolonged shelf life during storage and distribution were highlighted. This review article also reflects on the emerging trends in lamination technology that address innovations on sealing, tearing and the use of green cure value for different conditions. The future of lamination technology is important in the food industries and their impacts on the environment and the society at large will continue to receive attention.

Key words: *Food, Packaging materials, Paper, Plastics and Lamination.*

I. INTRODUCTION

The variety of modern flexible packaging products that are available today would not be possible without modern adhesive systems. The evolution of the packaging industry has closely matched the development of new adhesive materials and production processes. These trends have led to high quality and technically demanding packaging structures required by the consumer.

For many applications in flexible packaging the use of a single material may not satisfy all of the properties demanded of the product. In these cases a composite consisting of two or more layers of material may provide the desired performance. A particularly common means of creating such a composite is to laminate various polymeric films to other films, foils, papers etc. with a polymeric adhesive. Film print lamination is used to protect printed paper and cardboard and to provide an elegant look to such substrates by laminating a thin plastic film on the printed substrate. Water-borne adhesives can be applied by different lamination techniques of which the "dry" and "wet" lamination processes are the most important ones. Vinyl acetate copolymer dispersions can be used for the wet lamination process. Suitable are VAE copolymers.

II. RESEARCH OBJECTIVES

Despite the lamination use of modern technology in the print sector, the lamination organizations still face the problem of machine stoppage due to various technological errors and faults. Lamination operators quickly have to correct the problem to keep machine downtime as short as possible. The objective of this research case study is:

- Various types of lamination techniques used in Parle industry.
- Various adhesives used in solvent free lamination technique.

III. FILM PRINT LAMINATION PROCESSES

Film print lamination is widely used in fields where printed paper or cardboard has to be protected against humidity intensive light exposure and fats or where an elegant surface look (e.g. high gloss, but also matt) is required. Main application areas are picture postcards protective coatings on didactical tables, book coverings, advertising materials and packaging materials for luxurious goods. In the process a printed paper or cardboard substrate is laminated with a thin plastic film that determines the final surface properties. Suitable plastic materials are e.g. bi-axially oriented polypropylene (BOPP) and cellulose acetate. Film thickness is depending on the required properties. Normally, a

thickness in the range of 10 – 20 µm is used. World-wide still mostly used for these laminations are solvent-based adhesives but solvent-free and water-borne systems are gaining market share. Chemically the solvent based but also the solvent-free adhesives are one- or two-component PU-systems.

Film and foil lamination in practice - Film lamination is used for the purposes of creative design and practical function. There are many types of films and this variety makes it possible to achieve a multitude of special creative effects and use different ways to enhance the design of book covers, exclusive brochures, maps, cards, menus, posters etc. The film also protects the surface from scratches, stains and other damage. Film suppliers produce standard interchangeable products as well as their own specialty niche products. When combined with paperboard, film lamination offers a very wide range of possibilities. The long-proven glue lamination technique widens the field of paperboard applications into areas where more complicated and expensive constructions would otherwise be required. The film lamination operation Lamination is a technique in which a film is glue laminated to the paperboard surface to achieve aesthetic effects or surface protection. The film is reel fed and the adhesive is applied to the film (except when using thermal film). The paperboard web is fed into the press and when passing through a calendar it is pressed against the plastic film. Since glue lamination involves adding and removing moisture this operation must be carried out very carefully so that the process results in strong flat products.

Films and adhesives - A wide selection of films can be used in combination with paperboard. The most common way to create a glossy surface and protection for the print is PP (polypropylene). It provides a durable material with special visual and tactile properties. The type of film may be limited by the chosen adhesive system. In the case of water-based and solvent based adhesives the film is dried to increase the tack of the adhesive.

Table – 1

S.NO.	Process	Adhesive Ratio	Machine	Process
1	Lamination machine speed 250 m/min. Printed film 18mic + Milky white film 15 mic. (BOPP)	100:15	Expert Solvent less Lamination	U/W 1 tension- 70N, U/W 2 tension- 60N, R/W tension- 70, coating pressure – 4kg, Nip temp.- 51c, Adhesive(NCO)-921, Hardner(OH) CA GA-123, Coating GSM-L-2.24, M-2.51, R- 2.79.
2	Lamination machine speed 250 m/min. Printed film 18mic + Milky white film 15 mic. (BOPP)	100:30	Expert Solvent less Lamination	U/W 1 tension- 70N, U/W 2 tension- 60N, R/W tension- 70, coating pressure – 4kg, Nip temp.- 51c, Adhesive(NCO)-921, Haedner(OH) CA GA-123, Coating GSM-L-2.38, M-1.761, R- 2.18.

Advantages of Solvent less Lamination:

- Very easy to run.
- Reduction in glue weight.
- Full range of plastic film possible
- High production speeds.
- No dryers (less energy)
- Short start-up time.
- Excellent adhesion.

IV. RECOMMENDATIONS

- An extremely smooth and uniform paper surface is very important especially when using gloss or metallic films which highlight any irregularities in the surface.
- To avoid blemishes in the laminated finish, the paper surface must be clean and completely free of dust or anti-set-off spray powder. The fast ink setting properties of the surface make it possible to minimize the amount of spray powder used.
- 3.If the glue comes in contact with the inks, it is extremely important that the ink and glue should not interact with each other or the ink layer could be insufficiently adhered.

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