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Sustainable and Functional Packaging

Abstract :

Paper and Board sector has a long standing commitment to the protection of the human health and for the interest of the consumers through the provision of safe and functionally effective material. It has a long and successful history of involvement in packaging to the food industry in a wide range of application including intimate contact in close co operation with producers and manufacturers in the whole supply chain. The Paper and Board packaging industry is working continuously on improvement to design the packaging, taking in to account both economics and ecological consideration. There has been a concentrated focus in recent years in developing new barrier technology that is either renewably sourced, readily recyclable, bio degradable or all the three.

A comprehensive approach is a move towards renewable packaging material with dispersed barrier coating replacing fossil oil polymers.

Key words: Renewable. Flexible packaging. FMCG, BOPP, HDPE, LDPE, PET, PP, MVTR, Phthalates, Bio polymers, epoxides

Introduction:

There is a pull from the market to develop sustainable, novel and convenient packaging for extended shelf life foods. At the same time there is an industry drive to increase the functionality of the Paper and Board and adding commercial value. This is an opportunity for dispersed barrier coating on

Paper and Board. Such technologies have existed for many years, though market adoption till date is relatively limited. The challenge has been to find out an effective balance between cost and performance to achieve a sufficient match with extrusion at lower applied coat weight.

Indian Packaging Industry:

Packaging is an integral part of the logistic system and the principal role is to contain, protect/preserve and inform the user. Indian packaging Industry is rapidly growing and spanning across various end use segments like food, pharmaceuticals, health, personal and home care among others. The annual turn over of Indian packaging Industry 33.8 US billion dollars and expected to grow 15 % (FICI 2014). The packaging Industry broadly classified to rigid packaging and composed 80 % of the market and consists of metal container, wooden crates and plastic container etc. Flexible packaging is composed of remaining 20 % and comprised of jute, cotton, plastic bag and paper board. The demand of flexible packaging in India is growing and the driving factors are considered to be the growing population, rise in food processing, focus on health care and the over all demand would be increasing.

Indian consumer dynamics has been continuously evolving with times as there is a rise in the disposable income of Indian consumer which has changed the life style. With the evaluation of urbanization, the flexible packaging usage also increasing. The growth in fast moving consumer goods has given rise a major boost and product like

tea, snacks, Ready to eat (RET) and Ready to Cook (REC) foods, cosmetics, skin care , confectionary and staples. The growth of flexible packaging segment is directly related to the consumption of FMCG in India. Pharmaceutical too is an avid consumer of flexible packaging and the main driver to sustain the growth.

With the increase in the total food production over the past, due to improved methods in animal husbandry, the use of advanced seed varieties and crop protection products that boost the crop yield and quantity. Packaged food has been enabled by technological innovation in food production, processing and logistic with the packaging playing a key role. Consumer demand for pre packaged food is on rise in advanced economies and is increasingly the case in the newly industrialized countries experiencing rapid urbanization.

Indian Packaging industry is growing in terms of value and revenue, but has failed to grow proportionately on the technological front. Western countries have accessed to the newest technology and are ahead of us and a major hurdle.

Challenges for Flexible Packaging

Indian Government has imposed a ban on plastics, because of environmental and health concerns. This has forced many firms in the flexible packaging sector to find an alternative answer to adopt a technology which is either bio degradable / recyclable and making “ Green Package “. In addition to above there is a huge surge and volatility on the prices of Bio-axially oriented Poly Propylene (BOPP) , Low density Poly Ethylene (LDPE) , High Density Poly Ethylene ,(HDPE) , Poly Vinyl Chloride (PVC) , Poly ethylene Phthalate (PET) due to the demand and supply gap.

Paper Board and Packaging application

Paper and Board comes in variety forms.

- Paper Packaging – Natural or bleached, uncoated, coated, associated with other material. It can be found in the shape of bags, for tea, fruits and vegetables, vegetable parchment paper etc.

- Folding Box board – Often referred to as carton board , it may be single or multiply, coated or uncoated and it can present various properties like barrier to grease, humidity, gas and it can be found in the shape of pastry boxes or container. It is mainly used for frozen food and liquid container.
- Corrugated Board – Brown and white of high density, resistant to bursting, to humidity or to compression. It can be found in different shape such as show cases for use in stores or small boxes for mass market product.

Paper and Board Packaging has to help to sell products as much as to perform its basic function. Food packaging solution comprises various facts and the choice of the material to be used is governed by factors such as branding, shelf life, food safety and cost.

Paper and board alone or associated with other materials has been used in food packaging and food contact for many years. A particular effort to the adoption environmental concern and the user's need was made at the same time as the use of paper and board increasing. There has been significant increase in the use of Paper and board packaging in the past for many reasons.

- It is robust and adoptable with different shapes and sizes.
- Low / high density material
- Excellent substrate for inexpensive printing
- Cartons can be delivered flat to the packager , reducing space and thus transport cost
- Made from renewable , recovered papers and easily recycled

Regulation in food packaging Industry

Food packaging materials are regulated by the ministry of health and family welfare under the prevention of Food adulteration act 1954. The key stipulations are.

- The material for packaging must be kept in a clean and sanitary condition , must not be used for non food storage purpose, and must be stored to prevent contamination
- Plastic container used in contact with food must confirm to the standards promulgated by

- BIS including the standards for Polythene, Styrene polythene, PVC, PP and nylon etc.
- Requires less municipal solid waste disposal
- Communicates the important information about the food
- Extends the shelf life with the benefit of prolonged product use, thereby reducing wastage.

Trends and Developments

To comply with the regulations of food packaging, following are the new trends and developments emerging in the food packaging segments.

- Focus shifting on sustainability Packaging.
- Plastic coated paper and board considered problematic.
- Desire for Paper / Board packaging to be recyclable/ bio degradable.
- Alternative to extrusion coating
- Development of aqueous dispersion. (Recyclable Barrier coating)
- Gaining market importance but slow in progress. Initial successes are in replacement of wax coated.
- Development of aqueous dispersions, like Olefins and Poly Lactic Acid

- Global Green initiative.
- Wal-Mart packaging score card.

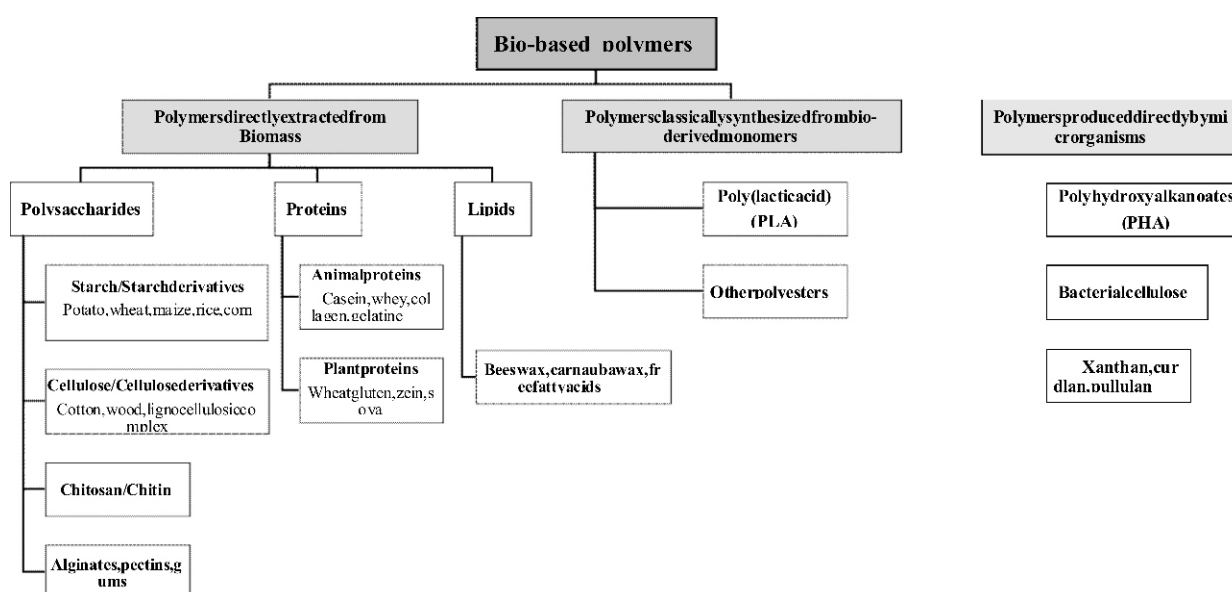
Dispersed Barrier Coating

Historically, polythene and wax coating have been used to seal the porous paper board structure to prevent moisture, gas and moisture vapor entry to the substrate. Most solutions on the market are based on fossil based polymer formulation. Such coating can release phthalates, epoxides, styrene or mineral oil components. It is too designed to be applied under a wide range of condition and temperature. The coating composition comprises a bio polymeric binder and an amine stabiliser. Bio based polymers are generally hydrophilic in nature and works very effectively with conjunction of a suitable co polymer which improves the hydrophobicity of the substrate. Water based coating also offer tailor made formulation to meet the customer requirement and is more flexible, environmental friendly compared to extrusion coating.

Barrier Layer
Paper Board
Barrier Layer

- | | |
|-------------------|---------|
| • Water | • Light |
| • Aqueous liquids | • Heat |
| • Water vapour | • Fire |
| • Fats and oils | • Aroma |
| • Solvents | • Gas |
| • Chemicals | |

Following are the Schematic overview of bio based polymer and their origin.

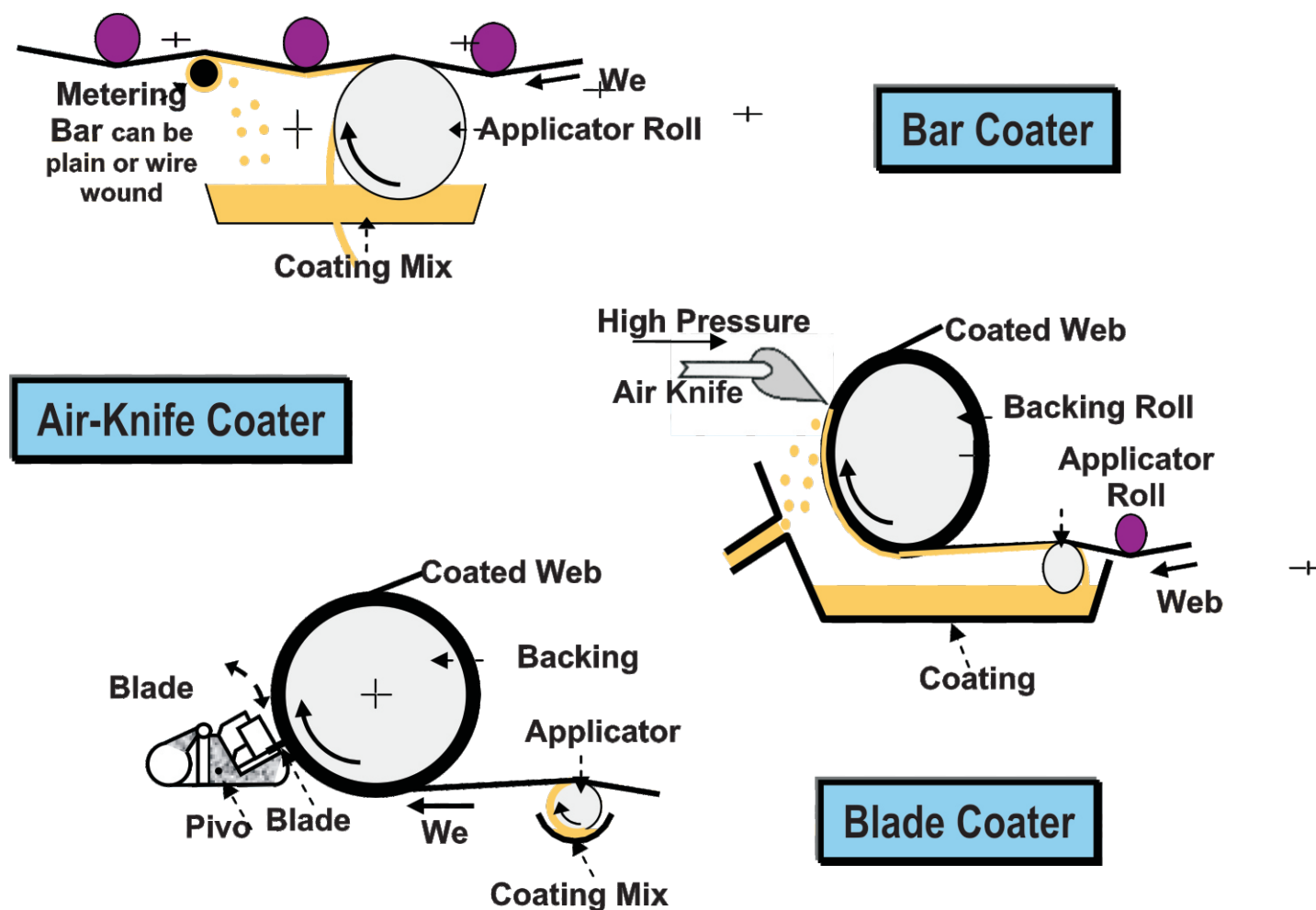


Following are the key product features attainable which are superior to the product manufactured under the conventional manufacturing process.

- Very low moisture vapor transmission rate (MVTR) comparable to that of poly wax coated.
- Excellent oil or grease resistance
- Complies with FDA regulations under 21 code of Federal regulation :
 - 176.170 – components of Paper and board in contact with aqueous and fatty food
 - 176.180 - components of Paper and Board in contact with dry food.
- Additionally enhancement of other functional properties like burst, tear, tensile and elongation.

The principle of the application is very similar to the conventional coaters with bar/ blade/ air coater in place. In certain cases a part of chemical is recommended to be used at size press looking to the end application. Dispersed coatings dry physically by means of absorption of the coating on to the substrate and evaporates the water. The drying is achieved through hot air / infrared. The polymer particles approach each other and form the coating film. The final product caters to a wide range of food and non food segments.

How Barrier Coatings are Applied



Achievable critical to Quality with disperse coating

Kit : 16	Pet Food Ice Cream
WVTR : 1 gm ² /Day	Frozen Food
Cobb (30 min) : 0.1 g/m ²	Cups, Wet Vegetables
Heat Resistance : 2300C	Oven Trays, Corrugated Board
Anti-Slip : 2.0 (C.O.F)	Ant-slip Packaging
Fire Resistance (M1)	Flame-proof Paper/Board

Barrier Coated Products ... End use

- Food Packaging
 - Pizza Boxes
 - Pet food Bags/Boxes
 - Ice Cream
 - Frozen Food
 - Fish Trays
 - Meat Packaging
 - Paper Cups/Plates
 - Cakes/Cookies
 - Wet Vegetables
 - Sandwich Boxes



- Non-Food Applications
 - Poster Paper
 - Detergent Board
 - Soap Wrap
 - Ream Wrap
 - Heat Sealable Packaging
 - Pharmaceutical Packaging
 - Release papers

Way forward

From a sustainable point of view, this has augmented the interest in alternation of Bio polymer films and coatings with similar properties. It has the potential to replace the traditional fossil- oil polymers .They are based on renewable re sources and offer numerous favorable advantages such as bio degradability,better recyclability, non-toxicity and bio compatibilitycompared to the conventional synthetic polymer. There is a need for a comprehensive and concentrated effort in working out the strategy and becoming a partner in Global Green initiative. Last but not the least , Paper and board manufactures, packaging institutions, technocrats , the Bio Polymer suppliers and the other stake holders in this journey need to put their brain together to have an unified and integrated effort to carry forward the available knowledge / technology further , a step forward to compete with the world market.

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