ADMISSION STARTED (2015-17)

PROFESSIONAL COURSE IN PACKAGING SCIENCE & TECHNOLOGY

POST GRADUATE PROGRAMME IN PACKAGING SCIENCE & TECHNOLOGY
(2 YEAR FULL TIME) (Including 6 months Industrial training)

(Campus Placements available)

Eligibility: BSc / BTech / Bpharm / B. E.

Provides an orientation on all aspects related to Package design & development. Packaging Materials, Machinery & Systems, Testing & Quality Control, Products Packaging, Management, Printing etc. with Library and Laboratory exposure

GRADUATE DIPLOMA IN PACKAGING TECHNOLOGY- PART TIME & DISTANCE EDUCATION
(2015-16 Batch)

In Lab Training, Industry Specific Programmes, Group Training & Package Material Testing & Consultancy Services
A man who had the simplicity and innocence of a child
And the profundity of an eminent scientist.

A man who won the hearts of many
with his gentleness and generosity.
And touched the lives of millions
with his words and deeds.

A politician who never aspired for power
But became the most loved President of India.

A man who motivated the youth
with his inspired message.

“My message, especially to young people
is to have courage to think differently,
courage to invent, to travel the unexplored path,
courage to discover the impossible and to conquer the
problems and succeed.
These are the great qualities that they
must work towards.”
MTD600/1200
High Speed Multitrack FFS Machine for Duplex Packs

Innovation in packaging

A few advantages of Duplex Packs
- LARGER BRANDING AREA
- EASE OF HANDLING
- MULTI FUNCTIONAL
- SAVES PACKAGING MATERIAL BY 11-15%
- LOWERS PRODUCTION COSTS
- AUTOMATED SECONDARY PACKAGING
- VERY LOW MANPOWER REQUIREMENTS
- ROI IN LESS THAN 18 MONTHS

Write to us about your products and we will show you how duplex packs can benefit you...

Highlights of this machine
- Three side seal packs in duplex format
- Speeds of 1200ppm
- Fills Liquids, Pastes, Powders & granules
- Very small foot print
- Completely integrated with online bagging

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The value of the packaging industry is estimated at over Rs. 70000/-crores. This however is very low compared to the global industry value placed at around US $ 600 bn. Of this 20% is accounted by Asia region with Japan and China in the lead. The per capita consumption by spend is only one seventh of the world average clearly indicating the potential for the growth and opportunities for the packaging industries in the country. Is it is true of the situation in most countries, around 50% of the total package production is consumed by the food sector. The food sector probably is exclusive in respect of using the most varieties of package types and forms including machineries. The food sector primarily caters to the domestic resources of packaging materials/packages. Whereas they also source specific technologies and packaging machinery and system for higher ends and exclusive needs. The industry has witnessed considerable new trends moving from simple pre-packaging to vacuum packaging, gas flesh packaging, CAP/MAP, Smart and Intelligent packaging, Retort and Asceptic systems, Bar coding and RFID and various types of collation and unitisation are specific areas of interest. Food packaging lines vary considerably depending on the product state, quantities required, variations in the product characteristics etc. The retail and consumer end needs like dosages and conveniences also play a role. FFS-vertical and horizontal, Thermoform-fill and seal, lined carton system, stand up and spouted pouches, flow wraps are typical in this industry. The varieties of packages vary from simple PP bags to high barrier packages and aseptic packages. Single layer polyolefin bags to pouches, 2-5 /7 layer flexible laminates, 2-9 layer multilayer films, Thermoforms from PS, PVC,PET,PP,PE and co-extruded structures besides semi rigid and rigid metal, glow, plastic formats are very common types of packages used by the food sector. These primary packaging media are supplemented by a group of ancillaries like labels, caps and closures, wads, reinforcements etc. Developments in these areas are indeed very commendable like dosage caps, smart labels, security/tamper identification labels, coding and marking systems, child resistance and elder friendly caps etc.

Innovations within the industry and value added packages are specific areas where possibly the packaging industry has tremendous scope. Responsibility lies both between the package buyers and package suppliers. No doubt this is cost oriented but soon will become an entity if the industry has to become more and more competitive. India being identified as a good source for development and supply has therefore necessarily to acquire the infrastructure and build –up as a good and dependable source of recognition, globally.

Both package conversion and packaging operations are considered reasonably developed. The existing level, however, need to be constantly updated towards higher technology levels. Opportunities are open for improvements and new material and material combinations with higher functionality. It is equally true of the machinery sector in terms of versatility, ergonomics, ecofriendliness, reduced turnover time, pollution free, easy change over and multiproduct oriented etc. Food-need to be safe and nutritious. More scope exists and innovation opportunities are higher in packaging possibilities. Consider the global scene - the one point agenda is to save food and reduce losses and make food available to all irrespective of season, location and at uniform price. The FAO/UN has estimated
that about 1.3 billion tonnes of food is wasted. Poverty alleviation and removal of famine is only possible if such waste is curtailed. The common enemy seems to be “mind set”, lack of education or importantly poor understanding of the benefits or inadequate convincing and persuasion. Primarily the laws and regulations should be clear and this yardstick can have no tolerances. Standards and specifications should be drawn up both in respect of materials and process and details should appear on the packages. If the system needs to be effective monitoring at the manufacturing/processing sites may not be enough. Market samples should be drawn and quality inspection should be done. Any malpractices or short comings or deviations should be dealt with expeditiously with stringent punishments. This cannot be a mere fear complex but an effective baton. Primary issues related to package manufacturing are raw material quality, process of manufacture site conditions, machinery and system, quality of output and their conformity to requisite standards and specification complying to statutory and other stipulations. Consumer safety, health and hygiene being the core of food, food processing and packaging all data right from procurement, in-site manufacturing and supply chain are extremely important and essential. Coding and marking-Bar codes/RFID and AIDC are helpful tools in this direction.

Product mix- in depth and width will have to expand. Substitutes and alternates and modifications are part of the game. They will continue to be on the anvil all the time. RTE,RTC, RTP foods are typical examples. This is irrespective of the food sector-Meat and meat products, Dairy, flour based foods etc. There can be no single answer for packaging needs of these. Also a given package can not be the answer for all foods and all market conditions. Each product need to be treated on its own merit considering its characteristics, shelf life, supply chain conditions. It also should be noted that “ A package” is a good vehicle and guardian. It will keep the product as it is processed and packed, and therefore “What is put inside” and “at what conditions” are equally important. Lot of discussions are seen in respect of bio friendly packages. They are debated under different heads. Commercialisation always is governed by availability and cost. These probably are the constraints. Possibly more inputs are needed. Polymeric and coatings( barrier) will find more applications. Packaging industry has been under various constraints which affects its expansion and growth. Most of the converting sectors were under the reserved category. The shift in early 1990s clearly paved the way for their expansions and modernisation and over the last and half decade one could witness the sea change. The trend set in will continue. The country still processes a very low percentage (less than 5) of the fresh produce. The scope is indeed very large and would have large influence on the packaging sector. With the retail sector growing at a reasonable pace and shelf ready packages becoming more popular/necessity the demand for packaging will also increase in a good pace. Although the changing style, small families, more working women, demand for more and more convenience packages have shown a direct impact on the packaging needs the cost inputs for the packages in a packaged food does not seem to encourage large scale shift, yet. Having identified “Food Processing” as a priority sector and a large number of financially assisted programmes put in place by the Government, the momentum needs to be augmented.

The foregoing could throw up quite a few measures-industrial and fiscal that the government could review:
- Encourage processing and packaging centres at the orchards level.
- Create a part of above as exclusive export oriented.
- Provide financial assistance for setting up state of art processing and packaging centres and review fiscal aspects.
- Create and enlarge the cold chain supply systems.
- Set up quality assist centres at processing & packaging centres with emphasis for those at orchard levels.
- Review the contribution of cost of package to the final product selling price and the part of the duties and levies.
- Given the current situation and needs review the fiscal levies to reduce its impact on the final product pricing to increase volume of processed food packaging.
- Encourage developments in source reduction and make packages more ecofriendly.
- Encourage easily recyclable and reusable packages.
- Introduce and expand returnable packages (deposit scheme).
- Fiscal incentives for those falling under the above schemes.
- Can the fiscal support include tax holiday system with built-in conditional aspect on steadily increasing volume of packaged foods.
- Encourage R & D /Innovation in packaging and extend financial support for those bringing in advantages for the consumers adopting state of art technologies and materials.
- Consider special incentives for SME sector in the above areas.

The underlying principle and aim should be "Food safety", food preservation and packaging best suited for tropical countries and those with higher storage and distribution cost. Such developments in all types of packaging –across the cross section- will add to the choice to meet varying market segments. Packaging food more securely will also increase in a good pace. Although the changing style, small families, more working women, demand for more and more convenience packages have shown a direct impact on the packaging needs the cost inputs for the packages in a packaged food does not seem to encourage large scale shift, yet. Having identified “Food Processing” as a priority sector and a large number of financially assisted programmes put in place by the Government, the momentum needs to be augmented.

The foregoing could throw up quite a few measures-industrial and fiscal that the government could review:
- Encourage processing and packaging centres at the orchards level.
- Create a part of above as exclusive export oriented.
Breakfast is one of the most important meals of the day as it replenishes our body’s energy after an all-night fast. A healthy breakfast significantly improves mental and physical performance of both children & adults. Essentially Breakfast should be low in fat, cholesterol and high in vitamins & minerals.

Breakfast cereal is a food made from processed grains that is often eaten as the first meal of the day. It is eaten hot or cold, usually mixed with milk and sometimes yogurt or fruit.

3) A major contributors of vitamins and minerals to the diet
4) Lower in sugar than other breakfast alternatives
5) A small contributor to salt intake
6) Nutrient dense but not energy dense
7) Quick and Easy

General Flow chart for production of flaked cereals

MARKET AND GLOBAL TRENDS

The market is characterized by the growing demand for ready-to-eat breakfast cereals. Due to increasing health issues of highly processed food products, the need for the consumption of cereals are important. Hence, the changing lifestyle and the booming food industry have driven the demand for these ingredients.

Cereal Ingredient Market Share (Value), By Geography, 2013

North America formed the largest segment of the breakfast cereal ingredients market in 2013. It is estimated to grow at a CAGR of 1.8% over the projected period. Asia-Pacific is estimated to be the second-largest market due to an increase in the demand for processed food in the region. It is also projected to gain the fastest growth during the same period.

TRENDS

Breakfast cereals witnessed current value growth of 25% in 2014. The
primary consumers for breakfast cereals continued to be urban consumers. This was because urban consumers prefer a fast arrangement for breakfast due to their lifestyles, and breakfast cereals, especially flakes, provide exactly that. Hence, flakes, and particularly corn flakes in India were very popular for exactly this reason in 2014.

PROSPECTS

Breakfast cereals are expected to grow by a value CAGR of 13% at constant 2014 prices during the forecast period. This will be driven by muesli, which is expected to grow by a value CAGR of 17% at constant 2014 prices. Muesli was still relatively new in India, and consumers received it really well. Hence, the growth opportunity for the same is very high, as its retail distribution and availability both were still nascent.

GLOBAL BRANDS AND OTHER MAIN PLAYERS IN INDIAN MARKET

Kellogg’s, Nestle, Godrej, ITC food, Pepsico (Quaker oats), Marico saffola, Murginns, Tasty Treat, Bagrry’s, Mohun’s,Go! Healthy, Mum’s, Tops, Savour, Haldiram, Cremica

MARKET SIZE IN INDIA

- 750 crore rupees is the size of packaged breakfast food industry 2015
- Double digit growth over the next 5 years is expected as per market survey

Popular categories
- Cornflakes 400 crore (50%), Oats 100-150 crore, Museli 50 crore

PACKAGING REQUIREMENTS OF BREAKFAST CEREALS

These products are basically highly sensitive to Moisture. Moisture ingress results in softening and microbial spoilage. Below certain levels of moisture they are fragile and brittle.

Packaging material options for breakfast cereals
- Polypropylene, Polyethylene – high density, Polyethylene – low density
- Aluminium Laminates, Outer duplex board carton, Polyester, BOPP-Metalized
- CPP

PACKAGING OPTIONS CLASSIC CEREAL BOXES

We’ve grown accustomed to boxed cereals — they’re easy to stack and display — but we might have grown to accept the design for so many years because that’s what we’re used to.

PRINTED FLEXIBLE LAMINATED POUCHES

Multi-colour printed best quality Flexible Laminated Material in various combinations of materials like Polyester, BOPP, CPP, Metalized-Polyester, Metalized BOPP, Aluminium Foil, Paper, Polyethylene, etc. for breakfast cereals.

Features
- Best quality packaging materials at most competitive price
- Prompt and accurate delivery with excellent logistics support to even very remote locations.

QUAD SEAL BAG

The QSB is designed to offer better functionality and dynamic, eye-catching packaging for products in-store. The QSB format gives a square box type appearance and allows products to stand up on shelf for excellent point-of-sale appeal and stands rigid to prevent the product being crushed.
Additionally, four surface areas offer a larger communication surface, with the square shape of the bag providing excellent space utilization for retailers.

**STAND UP BAGS**

Due to the stand-up feature and flat ‘fold over bottom’ provides superior in-store merchandising.

The stand-up bag eliminates the need for the box and uses less packaging material than the bag-in-box style, resulting in less waste and ensuring that consumers have access to key nutrition information that previously appeared only on the box which would be discarded after decanting. For brand owners, these packs offer another major advantage – bags no longer need to be removed from a box to be decanted into household containers, but can be stored in their original packaging – keeping the brand alive throughout the pack’s life. Stand up pouches offer an eye catching, versatile, cost effective way to promote the products.

**Re-sealable Packaging**

New solution of resealable packaging for cereal market can help provide added consumer convenience and reduce the environmental impact as compared to traditional bag in box.

**Features**

- Re-sealable zipper to maintain freshness
- Easy open tear notch
- Euro slot or punch hole
- Rounded corners to avoid sharp edges.

The resealable bags are mainly made of polypropylene. The main advantage of using resealable bag is that it can be opened and sealed over and over again. You can do this repeatedly without having to worry about keeping it close some other way.

**SINGLE SERVING PACK DESIGNS**

Single serving packs are also introduced in market to feed those customers who want to try the product at an affordable price.

**INNOVATIONS IN PACKAGE DESIGNS**

Single serving innovative packs: A kind of taste pack for oatmeal.

This package contains the right amount of oatmeal with added sugar and salt. The idea is to target a new audience that otherwise would not eat oatmeal, but also to those who are usually in a hurry in the morning and tend to skip today’s most important meal, breakfast. Break it fast and have a BREAK FAST!”

Many a times, different innovative package designs are made to draw attention of the customers.

- Linked pouches: strings of bags bundled and collated into shelf-ready packaging.
- Half servings packed in lightweight sachets and sold in multipacks.
- Lightweight packaging format
- Flexible portion size
- Consumer has a variety to choose from without having to store large packs for long period of time
- Opportunity to increase customer loyalty with add-ons or a range of ‘additions’.
Part time Master of Engineering in Packaging Technology

The Master of Engineering is a unique opportunity to step up your packaging career. Its subjects cover the whole value chain in packaging and range from Materials, Converting, Engineering, Machines, Fillgoods, Interaction of fillgoods and packaging, technology management to business and management. The internationally recognized degree of «Master of Engineering» will be granted by the participating universities upon successful completion of the program at IPI. This program enables the participants to take leading roles in internationally operating businesses in the packaging industry. IPI’s education programs are using many different learning methods like lectures, case-studies, assignments, discussion groups, study-visits and workshops and e-learning.

Facts about the IPI Master of Engineering Study Program:

- **Duration:** 16 weeks spread over 2 years
- **Location:** Schaffhausen, Switzerland, 40min by train from Zurich Airport
- **Language:** English
- **Title:** Master of Engineering in Packaging Technology
- **Start:** Every year in spring, in 2016 on March 7th
- **Requirements:** A first university degree in a packaging relevant discipline, 2 years work experience in the packaging industry and a good English level (TOEFL 80, IELTS 6.5 or equivalent)
- **Fee:** Euro 28’800, excl. 8% VAT, travelling, accommodation
- **More information:** [www.ipi.eu/ipi-master](http://www.ipi.eu/ipi-master)

In order to check your admission please send your curriculum together with a copy of your university degree to info@ipi.eu.
Home Dispensing
Branded, gravity-fed hoppers (already commonplace in hotels), merchandised alongside cereal.

Turning handle delivers a fixed ‘dose’ – which can be repeated to achieve correct portion size.

Counter-top convenience may encourage consumption of cereal as a snack.

Minor changes to pack dimensions or layout can generate significant storage and distribution benefits

CONCLUSION
Still in Indian Context, the ready-to-eat-cereal market faces several challenges to boost the demand. Some of them are

- Cultural factors and eating habits population not used to processed foods
- Easy availability of low-priced traditional breakfast
- Low awareness about processed foods and calorie requirements
- Price sensitive customers

Busy life style is changing the food habits of individuals all over the world. The health driven change in eating habits has extended the window of opportunity for manufacturers to roll out a variety of breakfast cereals in the market. In India, the consumers are waking up to the importance of healthy breakfast. The predictable growth over the next five year has a great future for breakfast cereal industry and hence packaging requirements of such products.

The trend toward flexible packaging includes the move towards more affordable and convenient packaging. Price sensitive customer has further pushed the demand of packaging material in form of small single serving packs. This has surely increase usage of packaging material per unit weight of products which is a good sign for packaging industry. Easy opening, storage and re-sealability are key convenience drivers. Flexible is the future of packaging in breakfast cereal industry.

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OPTIMIZING PACK DESIGNS FOR DISTRIBUTION BENEFITS
Improving pallet volume efficiencies can significantly reduce the costs associated with product storage and distribution. This can be done with or without a noticeable visible change to the primary pack. Figure below illustrates how pallet load can be improved for a typical 500g cereal carton; first by optimizing the secondary packaging whilst keeping the primary pack the same, and second by altering the primary pack in order to achieve maximum efficiency.
Are bioplastics really an alternative?

Biodegradable plastics have been proclaimed as the solution for environmental issues with regard to packaging. Yet, there are many reasons that prevent a commercial breakthrough.

Without packaging, our lives would be completely different. It has reduced food waste, disease, and pilferage, allows for our modern lifestyle, reduces cost, and offers countless other positive benefits. Yet, by some, it is villainised, portrayed as the cause of pollution, consumption of resources, wildlife destruction, and more. Therein lies the conundrum. How do we, the industry, educate consumers and work with government and watch groups to find the delicate balance which maintains our modern lifestyle with preservation of the environment at a cost we all can afford?

Historic wrap-up
Before the age of plastics came to be, that is, in the early 1900’s, all packaging was either biodegradable or recyclable. This is of course because all packaging was made from either paper, glass, or metal. As waxes and emulsions came into industry use, coatings or saturated papers were introduced into the marketplace. The most famous of these, 2-side wet-wax coated paper, is still in use today. The wax being simple paraffin wax. Today it is simply referred to as “wax”- or “waxed”-paper”. Wax paper offered the industry moisture vapour barrier and grease resistance, and saw many a sandwich in the lunch box of children worldwide. Next in the development of novelties came films made from cellulosic polymers, i.e., cellophane. Cellophane was very common 60 years ago, but today barely a handful of cellophane manufacturing facilities exist in the world. According to Dr Stephen McCarthy, professor of plastics engineering at the University of Massachusetts-Lowell, “Cellophane is a biopolymer film that is cast out of an xanthate solution, and cellulose acetate films are cast out of water, acetone and/or chloroform. Cellophane films have desirable physical attributes, such as high modulus and dead fold (the ability to retain shape when creased or folded), but lack barrier properties expected in today’s high barrier films. As such, to achieve high barrier properties, cellophane films were general coated with PVDC. The addition of a thin chlorine-based layer renders the film non-recyclable and non-compostable. The advent of new high polymers, coextrusion, and advanced product techniques caused the demise of cellophane and the growth of modern-day films”.

While cellophane is derived from a renewable resource and is readily biodegradable, the manufacturing process to make cellophane was far from ”green”. According to Dr Robert Whitehouse of Whitehouse Consulting (Boston, Massachusetts, USA), “The process by which cellophane is made is not necessarily friendly to the environment, and special care must be taken to recapture process solvents so as not to cause ecological damage. New biodegradable polymer technology exists which is more ecologically friendly to manufacture, provides properties roughly comparable to traditional petroleum-based primers, and is eco-friendly”.

Many new polymers and polymer processes were developed over the next 60–70 years, to the point where today we have many, many different options available. With these new developments, progress was made, but biodegradability and recyclability were lost. As such, it was only a matter of time before the success of the flexible packaging industry would grow to a point where public & governmental pressure, as well as market conditions would demand biodegradable and recyclable packaging materials.

“Without packaging, our lives would be completely different. Yet, by some, it is villainised, portrayed as the cause of pollution, consumption of resources, wildlife destruction, and more.”
With global sales of flexible packaging materials in excess of USD 100 billion, it is accurate to say that plastics and flexible packaging are everywhere. It is everywhere that we want it to be, and also everywhere that we don’t want it to be. What is truly a societal issue has now become a political problem, that being the improper disposal of used packaging materials. While recycling and collection systems vary around the world, from non-existent, to very efficient and complete, the fact still remains that approximately 20% of landfill usage is consumed by flexible packaging materials. Despite endless awareness campaigns, many people continue to pollute, i.e., improperly dispose of waste. This in turn gives rise to the notion that packaging, versus the behaviour associated with the act of polluting, is the problem. Figure 1 breaks down flexible packaging by region.

Landfill costs in the USA are approximately USD 50/ton, with a low of USD 11/ton in Mississippi to a high of USD 142/ton in Washington State [2]. In comparison, landfill costs and “gate” fees average about EUR 87/ton in the major industrialised European countries [3]. This might help explain why the USA is lagging behind Europe in terms of recycling and “green awareness”, that is, it is simply less expensive in the USA, and the market considers the cost to be insignificant. This is a short-sighted view of the “cradle-to-grave” cost, utilisation of resources, and the environmental impact of packaging waste. While individual states such as California seem to be taking isolated action to reduce the amount of plastic waste in landfills, it seems that nothing short of federal government intervention will change American habits, and that seems unlikely any time soon.

Standards and definitions
While the notion of biodegradable polymers has existed for many, many decades, it is still in its infancy in terms of standardisation, market acceptance, and infrastructure required to allow the widespread usage of “biodegradable” or “bio-based” packaging materials. The situation being what it is, the industry is forced to deal with the situation in the way it knows best, that is, through competition, the use of standards, and education.

The desire for sales and profits drive companies to produce goods and services that it deems to be within their best interest. Competition being what it is, many different companies are vying to make an impact with their own technologies, and as such, a “standard” has yet to be agreed by all. According to Dr McCarthy, who specialises in biopolymers and biomedical engineering research, “At this time, there are more than two dozen major corporations that have developed, or are developing, a variety of biodegradable polymers. The major biodegradable polymer types are natural polymers, bacterial polymers, synthetic polymers made from a renewable resource, and synthetic polymers derived from petroleum.”

The word “biodegradable” can mean something as simple as the susceptibility of a substance to decomposition by microorganisms [4], or more refined such as “a degradable plastic in which degradation results from the action of naturally occurring microorganisms such as bacteria, fungi, and algae” [5]. Neither definition prescribes that the raw materials for the biodegradable polymer be derived from a renewable resource, such as corn or wood pulp, opening up the realm of biodegradable polymers being derived from petroleum.

“In contrast, “biopolymers” can be defined as polymers which consist of raw materials derived from a renewable resource. This class of materials is also sustainable, carbon neutral, biodegradable and compostable [6]. The two most abundant naturally occurring biopolymers are cellulose and starch [7]. Both biodegradable polymers and biopolymers are compostable. A compostable plastic has been defined by the same ASTM D6400 standard as a plastic that undergoes degradation by biological processes during composting to yield CO₂, water, inorganic compounds, and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue. Industrial composting is becoming more and more common, the conditions in which are much more aggressive than can be achieved with backyard composting.
Biodegradable polymers are made either from an agricultural source (cellulosics), biosynthesis (polymers, through the use of bacterial and fungal agents, or other microorganisms), synthetic renewal resources (PLA) or petroleum. Biopolymers are basically either cellulosic or polyester materials, with the major commercialized grades being the latter. The major exception being bio-based polyethylene resins, which are made by fermentation of sugar and corn into ethanol which is then dehydrated. Bio-based polyethylene resins are virtually indistinguishable from their petroleum based counterparts.

The issue in the past with biodegradable polymers has been that, in general, they lacked the molecular properties required to make them easily processable and at the same time possess physical properties suitable for most packaging applications. Specifically, the balance of molecular weight, molecular weight distribution, density, and chain branching required in a melt processable polymer seems to be an elusive target for biopolymers to achieve. Falling short of the perfect balance of these properties makes it difficult to obtain the desired output, melting point, brittleness, strength properties, and barrier properties at a cost to compete effectively with petroleum-based polymers. The most common biopolymer, PLA (polylactic acid) for example, possesses a glass transition temperature (Tg) high enough to make it quite brittle at room temperature. Other materials, such as PHB (poly-3-hydroxybutyrate) possess lower Tg, and thus are more flexible at room temperature [8]. In an effort to address these shortcomings, research has been directed towards polymeric blends and copolymers which process on traditional manufacturing equipment [9, 10]. This in turn means they can be used in more applications. The growth in usage and production of these materials will hopefully provide economies of scale, and thus reduce biopolymer resin prices which are now more than double the market price of LDPE.

Polylactic acid, polycaprolactone and poly 3-hydroxy butyric acid (PHB) homo and copolymers. The change in structure of the repeat units creates significant changes in the physical properties that can be achieved and this leads to specific commercial applications where they have had the most success. One significant benefit of PHAs is that they are biodegradable under specific conditions such as industrial composting as defined by ASTM D6400 and EN 13432. Hence fabricated parts may be composted back to carbon dioxide and water, recycled through separation and plastic processing operations, or incinerated for energy as alternatives to landfill operations. Poly 3-hydroxybutyrate polymers have a wider versatility with regard to biodegradation performance and can readily degrade under home composting conditions, ambient soil (farm applications), aquatic (rivers and ponds), marine, and anaerobic degradation. The short story is that PLA is a biodegradable polystyrene analogue and PHB is a biodegradable PP analogue”.

Dr Whitehouse, who has extensive experience and numerous publications in the field of biodegradable polymers explains that, “Polyhydroxyalkanaote (PHA) polymers are a large family of aliphatic polyester derived from hydroxyacid repeat units and include such products as

<table>
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<tr>
<th>Packaging films</th>
<th>Super market carrier bags</th>
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<tr>
<td>Folding cartons/ cold drink cups</td>
<td>Agricultural films and bags</td>
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<td>Sandwich wraps</td>
<td>Thermoformed food trays, drink cups and yogurt cups</td>
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<td>Lidding films</td>
<td>Various injection moulded food service items</td>
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<td>Various medical devices</td>
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Table 1: Application for Biodegradable polymers, adapted from(9)
coat due to the narrow molecular weight distribution, which in turn leads to unfavorable elongational viscosity characteristics. This translates to much slower lines speeds and much heavier coating weights than typically seen on modern commercial equipment. The combination of slow speeds (120 m/min vs. 600 m/min), heavier coating weight (45 gsm vs. 15 gsm) and higher raw material costs (~USD 4.00/kg vs. <USD 2.00/kg) may be devastating to the long-term viability of biopolymers in the extrusion arena. In any case, completely biodegradable cold cups are currently available on a commercial basis from major manufacturers in the USA and Europe. This is currently an attractive application for biopolymers because of the ratio of coating weight to paperboard weight. That is, though the biopolymer costs 2–2.5 times more than polyethylene, the additional cost of the biopolymer in the total structure is a relatively small percentage when compared to the total.

**Market and product overview**

The major markets for these biopolymers are more or less segmented into food service items, automotive, woven and non-woven textiles, durable goods, and many miscellaneous categories. The major manufacturing processes in which biopolymers find application are: sheet extrusion, thermoforming, injection molding, and some film manufacturing.

According to Dr Whitehouse, “Various marketing reports such as Fredonia, report the current market size of biodegradable polymers is estimated to be 435,000 metric tons. My analysis corroborates this figure. Of these 435,000 tons, the largest market segment is packaging, in one form or another, including films, coated paperboard, and thermoformed trays and cups. While most cast sheet is thermoformed into food trays, some is oriented into film products. Because of the linear nature of these polymers, oriented biopolymers, such as PLA, exhibit very good barrier properties.

“Though the biopolymer costs 2–2½ times more than polyethylene, the additional cost of the biopolymer in the total structure is a relatively small percentage when compared to the total.”

We have shown at UMASS-Lowell that it is feasible to produce blown film using PHA resins”. Various well-known, multinational brands such as Unilever & P&G have been using biopolymers, such as PLA because of its clarity, for use in cosmetic bottles. According to Professor McCarthy, a major market segment not yet penetrated by biopolymers, but which he feels can participate, is packaging film applications which have relatively short time horizons, such as candy packaging. The shelf life is not excessive, so moisture and humidity will have relatively little impact on the performance of the packaging film.

As far as printability, the surface tension of most biopolymers is approximately 45–55 dynes/cm. Though dyne level is not an absolute indicator of printability and ink adhesion, films made with these resins handle and print like traditional films used in the industry today. That is, corona treating may be necessary for improved ink adhesion, primers may be needed for improved adhesion to a substrate, and film additives may be required to obtain the required COF.

**Benefits/drawbacks over conventional plastic**

No single plastic possesses all the attributes required of a packaging film. This means that there is no plastic that is durable, possesses high barrier, is readily fabricated and processable, has the proper stiffness required in the end use, AND is biodegradable and compostable. That being said, the major advantage of biodegradable resins over traditional resins is its biodegradability. Within the definition embodied in ASTM D6400/EN 13421 varies among biopolymers. PLA is biodegradable under industrial composting conditions (severe) whereas PHB resins are biodegradable under backyard composting conditions.

“There is no plastic that is durable, possesses high barrier, is readily fabricated and processable, has the proper stiffness required in the end use, AND is biodegradable and compostable.”

With the exception of bio-based polyethylene resins, biopolymers do not process the same or are equal to traditional polymers in film manufacturing processes. Line speeds have been observed to be up to 80% slower. Mixed post-industrial waste is not recyclable because of the wide difference in melting points and viscosities between biopolymers and traditional polymers.

At this point in time, at least in the Unites States, the infrastructure to separate biodegradable products from non-biodegradable products does not exist. Even if it did, the handling and processing of postconsumer biodegradable polymer products into an industrial composting facility does not exist on a large scale. It is done in parts of California, but not nationally.
And finally, if the infrastructure existed, wide-scale pubic support simply does not exist yet.

“Biopolymers do not process the same or are equal to traditional polymers in film manufacturing processes. Line speeds have been observed to be up to 80% slower.”

If separation of waste to recycle mixed polymers is not an option, waste-to-energy facilities are. However, the lack of waste to energy facilities in the US also inhibits this avenue to recapture resources. And those areas that have constructed waste-to-energy are challenged to find the raw materials to keep the generator operating fulltime, which of course is problematic. [11] The USA has quite a way to go to catch up to Europe with regard to recycling and waste-to-energy policies. Unfortunately the NIMBY (not in my back yard) philosophy is pervasive in many parts of the USA. Without an infrastructure to either separate and compost or collect to incinerate, the future of biodegradable resins seems unsure.

**Forecast**

Recent published reports indicate that current global demand for all biopolymers is slightly less that 500,000 tons annually [12]. As more imagination and effort is put into product and market development, usage is likely to grow. One report predicts that by the year 2020, the consumption of biopolymers will increase to 3.45 million tons, representing a current annual growth rate of approximately 37% [10]. This seems aggressive given what appears to be all the hurdles in processing and recovery.

“One report predicts a current annual growth rate of approximately 37%. This seems aggressive given what appears to be all the hurdles in processing and recovery.”

**Conclusion**

Excessive amounts of packaging materials in the waste stream are being viewed as a problem with the raw material itself. The industry has gone full circle, from once using packaging materials that were completely recyclable to those that were not until now demanding materials that are “recyclable”. The problem is not with the material, but with the behaviour of the people using the materials and the lack of infrastructure to collect and re-use those materials. Biopolymer chemistry developments have created materials that are biodegradable and processable, and that process physical properties similar to traditional petroleum based polymers. While processability in sheet extrusion and injection molding are adequate to be productive, film extrusion and extrusion coating of biopolymers is much less efficient that traditional petroleumbased polymers. The cost of these new materials is approximately 2-2½ times that of traditional materials, which slows their acceptance and market growth. Biopolymers face other challenges too, since mixed waste is not recyclable, and the necessary infrastructure to collect, separate and process this waste stream efficiently does not yet exist.

In summary, much technical progress has been made in the field of biodegradable polymers. Much more progress is needed in terms of price parity with petroleum-based polymers, and the widespread installation of industrial composting and waste-to-energy facilities before this technology can be used to its fullest. Technology can be used to its fullest. Technology and chemistry cannot correct these issues, but education can. The solution to the problem of excessive contribution into the waste stream is technically solvable. The answer will come in many years when the public is educated about the consequences of their actions.

**Acknowledgements**

The author wishes to acknowledge the contributions of the following individuals in the preparation of this article.

Professor Stephen McCarthy, Plastics Engineering, Biomedical Engineering Massachusetts Medical Device Development Center, Center for Irish Partnerships, Stephen_McCarthy@uml.edu, +1-978-934-3417, http://www.uml.edu/Engineering/Plastics/faculty/mccarthy-stephen.apx,

Dr. Robert Whitehouse, Whitehouse Consulting, Boston, Massachusetts, USA, rswhitehouse@rcn.com, +1-857-928-6064.
Importance of Product Packaging in Marketing

Whether you’re getting ready to create packaging for a product you’re selling or you’re considering changing the packaging of an existing product, you may be wondering if the appearance of a product’s package is important. Many product providers may think that the product and its performance is more important than what the packaging looks like, but the product packaging can play a role in the success or failure of the sales of the product.

Function
The purpose of product packaging is to protect the product from damage. Product packaging not only protects the product during transit from the manufacturer to the retailer, but it also prevents damage while the product sits on retail shelves.

Most products have some form of packaging. For example, soups must have a container and package while apples may have packaging for transport but not to sell the product from the produce department of the local grocery store.

Attraction
How a product is packaged may be what attracts the consumer to take a look on the product as is sits on store shelves. For this reason, many companies conduct extensive research on color schemes, designs and types of product packaging that is the most appealing to its intended consumer.

Promotion
Packaging also plays an important role for portraying information about the product. Outside packaging may contain directions on how to use the product or make the product.

Facilitates Purchase Decision
Packaging may also contain ingredients and nutritional information about the product. This information can help to sell the product because it allows potential customers to obtain the necessary information they need to make a purchase decision. Information contained on a package may propel the reader to buy the product without ever having to speak to a store clerk.

Differentiation
Packaging can also differentiate one brand of product from another brand. Because the product packaging can contain company names, logos and the color scheme of the company, it helps consumers to identify the product as it sits among the competition’s products on store shelves.

For example, as a shopper walks through the coffee aisle of the local grocery store, the bright orange, pink and white packaging of the Dunkin’ Donuts coffee brand may be easily recognizable for the consumer to grab on his way by the coffee shelf.

The shopper may identify with the company brand, which propels them to buy the product.

If the product packaging changes, it may alter the brand perception of the company, which doesn’t mean that the consumer would not still purchase the product, but it may delay the purchase until the person is able to identify the product according to its new packaging.
With more and more consumers shifting their focus from loose to packaged products, packaging has attained a totally new dimension in our day-to-day life. This trend is clearly visible in the edible oil sector as well. The 'Third National Seminar on Edible Oil' recently organized by Reliance Industries Limited along with the other industry majors in Hyderabad had detailed on the niche advantages of using PET bottles for edible oil packaging and filling & also the emerging global trends in PET packaging and filling.

The seminar deliberated on different issues in the edible oil industry. Mr Nishith Patel, HOD of RIL-PET Division gave the welcome address, highlighting the potential for rigid packaging for edible oil in India. The Chief Guest Shri. P . V . Narayana, Secretary of AICCA (All India Cotton Crushers Association) delivered the welcome address stressing on PET as a today's packaging need in the changing scenario of today. The Keynote speaker, Dr. Pradosh Prasad Chakraborti of IICT Hyderabad explained the various packaging challenges in edible oil sector and briefed how PET can be a good solution provider for the same. Ms Prem Sajani Patnala from BIS enlightened audience on various BIS standards & necessity of its compliance

Shri Madhob Chakroborty from IIP, Hyderabad explained various criteria’s for selection of different packaging materials and how PET is definitely one of the best packaging material available for edible oils. Shri Rajesh Gera from Reliance delivered a presentation on use of PET for different pack variants & apprised about new developments in India & abroad. The potential for bulk packages like 10 L & 15 L PET packages, which are used globally along with solutions for increasing the shelf life of oil were also captured in his presentation.

Mr Anoop Arya from Sidel unfolded his presentation to show case proven PET solutions to increase the value for brand owners. Mr. D’Cruz from Spheretech Packaging India illustrated different liquid filling systems and solutions for PET packaging. Mr Pradeep Damle from Bericap India Ltd gave overview on different capping solutions available for PET as well as other packaging material variants. Mr. Ankit Kedia from Manjushree stressed on innovations in PET packaging for Edible oil and other sectors and...
shared thoughts on the likely shift from flexible packaging to rigid packaging mode.

The seminar also had two interesting presentations from the brand owners, who strongly opined on the role of packaging in establishing a brand. Mr. Chandra Shekhar Reddy from Gemini threw light on the importance of packaging in making a consumer-centric brand and the role which PET packaging can play in this regard both in the near and long term. Mr Ajay Shah of Lohiya Oils explained how easy it is when it comes to logistics and transport systems using PET packaging in edible oil for different pack sizes.

Over 100 plus invitees from the end-to-end community including brand owners of edible oil majors from all over the country, PET preform and bottle suppliers and downstream industry attended the seminar. It was equally heartening to note that there was good attendance from the prestigious ‘Oil Technologists Association of India’ (OTAI) in the seminar.

In overview, the event covered a wide range of topics ranging from ‘role of PET package in today’s retail scenario, availability of quality bottles, optimising weights, design solutions, closures, filling lines, logistics & shelf life improvements’, to further enhance awareness of brand-owners and brought all stake holders on a common platform, much to the delight of oil industry of India.

This seminar was the 11th in series for the sectoral promotion by RIL PET Divn. along with industry majors. The interactive sessions gave perfect opportunity to all the solution providers to holistically understand finer requirements of edible oil industry. It would also help to address changing trends in the oil Industry and showcase the growth, challenges and future of this industry in India focusing on consumer consumption habits.

The feedback from the industry is that the two national level seminars held in 2008 and 2009 in Mumbai and Agra resp. by RIL and Team had led to in-organic growth of PET bottles usage for this sector. The subsequent years then saw some of the major brand-owners shifting to in-house blowing and filling of PET bottles, which resulted in over-all improvement and cost-competitiveness for this sector. In this seminar too, it is opined that moving forward would help to hasten the in-organic growth of PET packaging materials and machinery for the oil sector.
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IMA-PG is Pioneer in understanding the dynamics involved in handling and separating tablets for counting, the cutting edge technology makes IMA PG the leading company in the world of counting. Our machines have built their reputation on the foundation of quality, accuracy and performance. Below are major features which make us stand apart from competition.

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IMA-PG Swiftvision electronic tablet counter, Electrostatic field sensing (EFS) is a completely different option for counting.

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- Different for Easy to Clean
- Different for Count Accuracy

The IMA-PG Swiftvision Counter comes with a revolutionary Electrostatic Field System (EFS) to create an extremely accurate assessment of the tablet parameters including size, shape and weight during the counting process.

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There is nothing comparable with the Electrostatic Field System (EFS) in the market place. It allows the introduction of a new generation of counters that will revolutionize tablet counting, delivering new dimensions of accuracy and quality.
SIES School of Packaging had organized an industrial visit as part of the curriculum for the current batch of full time students to Bangaluru. The visit was arranged for the period of 27th March 2015 to 6th April 2015 covering 13 companies, 1 institute and 1 exhibition.

OBJECTIVE:
- To enlighten them on the growth of the sector.
- With an aim to go beyond academics, showing students a practical perspective on the job board.
- To provide students an insight regarding internal working of companies.
- To provide students with an opportunity to learn practically through interaction, know working methods and employment practices.
- To give them exposure to current work practices in compared to theoretical knowledge being taught at college.
- To make them aware on new technologies.

Companies that were visited are as follows:
1. Accuprint
2. Sai Packaging
3. Indian Plywood Industries Research & Training Institute
4. Nordson
5. Precis Pharma
6. Nandini
7. Festo
8. Allied Plasto Moulding
9. Srij Plastics
10. Dairy Classic Ice-Creams
11. Paramount Nutrition (I) Pvt. Ltd. (Britannia)
12. Print Plus Exhibition
13. Big Bags International
14. CIPET
15. Met Cans / Am - Tech

The visit covered all the sectors related with the course like printing / plate – making manufacturing, pharmaceutical industry, food industry, adhesives, machinery, plastic industry, tin cans, FIBC. The companies not only shared their working pattern and supply chain management systems but also explained the different machineries that are used in the production and its importance with respect to the product, packaging, output rate considering the market demand. Students also got to know the importance and various methodologies of quality control / quality assurance pertaining to the raw-material, on-line checks done and final product quality checks.

Apart from the companies, a visit was made to an exhibition called ‘South Pack – 2015’; students were exposed to the upcoming trends in terms of processing, materials, various new technologies in the field of packaging and its applications.

Furthermore, visit was arranged to ‘Central Institute of Plastics Engineering & Technology’, where the students were explained thoroughly on the subject of polymer processing and various testing methodologies.

CONCLUSION
The industrial visit has enabled the students to broaden their knowledge, bridging the gap of theoretical study and by practical observation. Students were also given the current market overview for the companies which were visited, making them aware for the need of new development, quality improvement, market mapping etc.
Packaging Events

Pack & Packtech world Expo – 2015
International trade fair
Date : 4-6 September 2015
Place : Dr. Prabhakar kote convention centre, Bengaluru
Organiser :
Triune Exhibitors Pvt. Ltd.
Pack print International 2015

PackEX India
Date: 14-16 September 2015
Place : Pragati Maidan,
New Delhi, India
International exhibition on packaging material & Technology

NDIAPACK 2015
Date: 8-11 October 2015
Place: Bombay Exhibition Centre, Goregaon (E), Mumbai, India

NDIAPACK has grown as a brand to be reckoned with Indian Packaging Industry and world over after the successes of previous editions. Recognizing that the new trends and developments are essential for the industry’s better future, the Indian Institute of Packaging, through INDIAPACK seeks to provide a perfect platform to bring the packaging industry under one roof. With the support expected from Ministry of Commerce & Industry, Ministry of Food Processing Industry and Ministry of Textiles, Govt. of India and many trade associations from India and abroad including World Packaging Organisation and Asian Packaging Federation, INDIAPACK is all set to continue the success story.

Date : 15 – 16 September 2015
Place: Hotel Grand Hyatt
Mumbai, India
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Email : registration@eliteplus.co.in

IPLEX’15
International Plastics Exposition, September 25-27 2015, Bangalore Exhibition Center, Bengaluru, India
Contact : Ms. Padma
Tel : 080 2310 0434 / 2315 7860
Mob : 93417 16055
Email : iplexindia@gmail.com

ETHIO 5P EXPO –
5th Ethiopia International Exhibition for Plastic, Petrochemicals, Printing, Packaging
23rd -26th October 2015
at Addis Ababa Exhibition Center – Ethiopia.
Contact : Deepak Lawale, Secretary General, OPPI
Email id – oppi@vsnl.com

44TH FCBM CONFERENCE
Date: 20 - 22 November 2015
Place : Le Meridian Hotel, Kochi.
44TH; Conference of the Federation of Corrugated Box Mfrs. of India is being held from 20th to 22nd November, 2015 at Le Meridian Hotel, Kochi.
It is an established and proven fact that this annual event of the Federation is an excellent platform for meeting major corrugated packaging manufacturers from India and neighboring countries. The three day programme will comprise of Annual meeting, technical seminars, Exhibition, cultural programme etc. The event will be organised by Kerala Corrugated Box Manufacturers Association. Kerala CBMA is an affiliated Association of the Federation. The details of the conference will be available in our web site www.keralacbma.org.

Messe Düsseldorf Introduces New ‘SWOP - Shanghai World of Packaging’ in 2015
Date: 17 - 20 November 2015
SWOP - Shanghai World of Packaging, to be launched from November 17 - 20 November 2015 at the Shanghai New Exhibition Center (SNIEC)
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