

ACKNOWLEDGEMENTS

Centre for Market Research & Social Development, New Delhi, wishes to express its sincere gratitude to the National Small Industries Corporation Ltd, Government of India for entrusting this work to us. We express our sincere thanks to the officials of NSIC, Mr. P. Udaykumar (Director- Planning & Marketing), Mr. K. Ravindranathan (Dy. General Manager), Mr. Bhupinder Arya (Manager) & Ms. Adiba Bari (Dy. Manager) for their timely suggestions and advice, and for their support throughout the evaluation.

We are also thankful to officers of ASSOCHAM, India, Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi for providing us with the best available data and information required for the study.

We gratefully acknowledge the professional contributions of all the staffs, Prof. Sanjay Chandawani, Dr. Arpita Verma, Dr. Ashish Srivastava, Mr. Prateek Mohanty and Sourav Sekhar Jena of Centre for Market Research & Social Development for their involvement in the study.



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ABBREVIATIONS

ASSOCHAM-	Associated Chambers of Commerce and Industry of India
CAGR-	Compound Annual Growth Rate
CFS-	Corrugated Fibre Board Cases
EPS-	Expanded Poly Styrene
GDP-	Gross Domestic Products
IFBC-	Intermediate Flexible Bulk Container
MSME-	Micro Small & Medium Industries
NSIC-	National Small Industries
PET-	Poly Ethylene Tetra-Phthalate
POPAI-	Point of Purchase Advertising Industry
PP-	Poly Propylene
PPP-	Purchasing Power Parity
PS-	Poly Styrene
PVC-	Poly Vinyl Chloride
PVDC-	Poly Vinyl Diene Chloride
SIC-	Standard Industrial Classification
SKU-	Stock Keeping Units
TFS-	Tin Free Steel
UPVC-	Unplasticised Poly Vinyl Chloride
WPO-	World Packaging Organization

EXECUTIVE SUMMARY

The National Small Industries Corporation Ltd. (NSIC) is an ISO 9001-2008 certified Government of India Enterprises under Ministry of Micro, Small & Medium Enterprises (MSME). NSIC has commissioned Centre for Market Research & Social Development to carry out the study "Technology Gap assessment in Packaging techniques in MSME sector and to suggest remedial measures for corrective action" on a pan India basis.

The main objective of the study was to carrying out a SWOT analysis of MSMEs in Indian Packaging Industry, identification of clusters and manufacturing hubs, factors affecting growth of packaging industry, technology gap, emerging technologies & new cost effective solutions in packaging industry.

The study is based on both primary as well as secondary research. The study was conducted to generate data/information pertaining to the areas of enquiry. For undertaking primary research, both qualitative and quantitative survey techniques were employed during collection of data. The study aimed to achieve unbiased feedback from the MSMEs about the packaging industry. The study was completed in 10 weeks from the date of award of the assignment.

The sample size of the study was 102. In order to select 102 units, we categorized the packaging in four groups i.e. Food, Material, Cosmetic & Pharmaceutical. Further, to ensure spread of the study, CMSD has covered all geographical zones of the country. The survey was done in Delhi, Haryana, Himachal Pradesh, Uttarakhand, Uttar Pradesh (North Region), Gujarat (West Region), West Bengal (East Region) and Karnataka (Southern Region).

The packaging industry in India is a heterogeneous mix of both organized and unorganized sectors. The industry comprises a large number of manufacturers of basic materials, converted packages, machinery and ancillary materials, converted packages, machinery and ancillary materials. Domestic demand for packaging has been anticipated to grow by over 100% within the next 5 years. Recognizing this trend, the industry is gearing itself to adopt scientific and functional packaging.

Indian packaging industry is highly fragmented with a large number of small scale companies and a few large integrated players. There are more than 22,000 registered packaging companies in India, more than 85 percent of which are MSMEs.

The MSMEs in India are usually companies involved in the lower value added activities like conversion, filling and production. The organized sector accounts for roughly 50 percent of the volumes whereas the balance is highly fragmented and distributed. On the other hand you look at the global scenario, the market is consolidated 75 percent of the global packaging industry by value is accounted for by 20 percent of the largest integrated global players. In India, as the industry grows and matures, there is expected to be a trend towards consolidation as the supply side companies merge and acquire smaller companies to increase scale, reduce competition and improve bargaining power with the customers.

It was observed the main problem faced by the MSMEs units are: loan, high inadequate credit flow, high cost of packaging materials, lack of skilled labour, irregular power supply, lack of marketing, distribution & branding etc.

Today, flexible packaging is the fastest-growing sector of India’s packaging industry. The shift from traditional rigid packaging to flexible packaging on account of its attractiveness, cost-effectiveness and strength is largely aided by increasing consumer demand for processed food.

To sum up, it can be stated that the future of the Indian packaging industry is very good if opportunities can be capitalized upon with suitable investments in capabilities. The growth of the domestic market will be good and drive growth in requirements; export potential is also substantial if properly addressed. If organized retail takes off as expected, growth opportunities are substantial, and enormous potential exists in converting wastages of food into productive output.

Thus, the Indian Packaging Industry needs to be ready to work on these points to meet global and domestic competition. The industry is facing the challenges due to lack of regulatory clarity in packaging, consumer awareness towards sustainable packaging and stress towards green packaging materials.

According to Thomas Schneider, president, World Packaging Organisation, the Indian packaging industry will see a substantial growth in coming years. The increasing awareness regarding clean water, safe food and pharmaceuticals will drive this growth. The challenges that the industry is facing today are lack of regulatory clarity in packaging; consumer awareness towards sustainable packaging, and stress on green packaging materials.

The packaging industry should seize the opportunity to offer eco-friendly and innovative packaging solutions. The packaging industry has to put its act together to offer packaging solutions with WTO standard compliance, eco-friendly materials, high lifecycle cost and waste management, cost effectiveness, innovation and consumer convenience.

It has been observed, during the study and discussed with different industry representatives. MSME sector is lacking with updated technologies, non availability of proper resources, R & D activities to face market and quality challenges. Some suggestive remedial measures for the packaging industry are to provide special support for packaging sector (Capital investment, interest subsidy, comprehensive insurance subsidy, special subsidy), technology improvement & technology up-gradation (facilitation of technology transfer, quality certification assistance, establish training centres for skill up-gradation, setting up of task force), Market promotion (Government may consider to develop a packaging cell, create a directory for packaging) export promotion (exposure visit, set up participation in International fairs), Tax relief to develop innovative packaging (Import duty, central excise Tax), Packaging norms, to create a world class infrastructure and promotion of education, training and awareness.

Chapter 1

Introduction

The National Small Industries Corporation Ltd. (NSIC) is an ISO 9001-2008 certified Government of India Enterprises under Ministry of Micro, Small & Medium Enterprises (MSME). NSIC has been working to fulfill its mission of promoting, aiding and fostering the growth of Micro, Small and Medium enterprises in the country. NSIC has commissioned Centre for Market Research & Social Development to carry out the study "Technology Gap assessment in Packaging techniques in MSME sector and to suggest remedial measures for corrective action" on a pan India basis.

The broad objectives of the study are to:

- Carrying out a SWOT analysis of MSMEs in Indian Packaging Industry,
- Identification of Clusters and Manufacturing Hubs for the said industry,
- Identification of factors affecting the growth of Packaging Industry,
- Identification of technology gaps in the packaging techniques in MSME sector,
- Identification of emerging technologies and new cost effective solutions in packaging and
- Suggest possible remedial measures for corrective action.

In order to achieve the objectives of the study, the study used a synthesis of exploratory, descriptive and analytical market-research approach to study the objectives in-depth with regard to the specific target audience (trade participants and end-users). The demand for any products (and that includes packaging types) is a function of various factors like market potential, product variety, price levels, availability and quality of the products and a number of intangibles like attitudes, preferences of the end users etc. Thus, the study collected cross-sectional primary data on several aspects to build the demand function.

Primary as well as secondary research was conducted to generate data/information pertaining to the areas of enquiry. For undertaking primary research, both qualitative and quantitative survey techniques were employed during collection of data. The study aimed to achieve unbiased feedback from the MSMEs about the packaging industry. The study was completed in 10 weeks from the date of award of the assignment.

The sample size of the study was 102. In order to select 102 units, we categorized the packaging in four groups i.e. Food, Material, Cosmetic & Pharmaceutical. Further, to ensure spread of the study, CMSD has covered all geographical zones of the country. Again, the states with concentration of more number of MSME units were selected after conducting extensive secondary research. In the northern region, the survey was done in Delhi, Haryana, Himachal Pradesh, Uttarakhand and Uttar Pradesh, in the Western region, Gujarat were covered, in the East, West Bengal were targeted and in the Southern region, Karnataka was covered during the survey.

The study sought to collect the information on different objectives from a variety of respondents in different areas (Material Packaging, Paramedical, Cosmetic Packaging and Food Packaging) as considered necessary for the study. Detailed questionnaire was administered through face-to-face interviews.

The field work of the survey was carried out and supervised by the senior officers of CMSD. The filled-in Questionnaires have been manually scrutinized. In case of doubts/missing information if any, efforts were made to clarify the doubts/obtain the missing information from the field.

Chapter 2

Packaging Industry: A Brief Background

All major industries create wealth but if there is one industry that plays a unique role by ways of both creation of wealth through a wide range of manufacturing activities and also by way of preserving the wealth or value created by many, many other industries, it is packaging.

In a way packaging can be described as art and science of protecting products for storage, distribution and use. The main purpose of packaging is to protect and preserve the goods for logistics, warehousing and for end use. The food and beverage industry is one of the main users of packaging. These days, around the world, lot of importance is given to packaging, as goods are being transported from one part of the world to the other. It is becoming a full-fledged industry and India is also witnessing a similar trend. Mass customization of packaging to permit its use in multiple markets is a topic that needs exposition and discussion. Environmental issues, including sustainability, will always be a subjective dimension to any packaging design. Packaging is an emerging science, an emerging engineering discipline, and a success contributor to pharmaceutical industries.

Apart from the huge value addition and employment involved in these activities, packaging has served the Indian economy by helping preservation of the quality and lengthening the shelf life of innumerable products – ranging from milk and biscuits, to drugs and medicines, processed and semi-processed foods, fruits and vegetables, edible oils, electronic goods etc., besides domestic appliances and industrial machinery and other hardware needing transportation.

The packaging industry's growth has led to greater specialization and sophistication from the point of view of health (in the case of packaged foods and medicines) and environment friendliness of packing material. The demands on the packaging industry are challenging, given the increasing environmental awareness among communities.

The World Packaging Organizations (WPO) slogan, "Better Quality of Life through Better Packaging", sums up the important place that packaging occupies in a modern economy. To

ensure that public appreciation of this role and the policy-makers’ support to the industry are not diluted, attention should be paid to basic issues like collection, segregation and reuse of synthetic packaging material and observation of regulatory requirements.

Packaging can reside, or report through research and development (R&D), engineering, operations, purchasing, marketing, or the general administrative department of a company. For the majority of products produced it is probably the single largest aggregate purchase made by a company of materials critical to the protection, distribution, and sale of the product.

Packaging today reflects our lifestyle in many ways:

- The way we eat and drink- at home, place of work, on the move, dining out or take-aways
- The way we shop- whether local store, supermarket or Internet
- The way we preserve our food and cook it-the advent of fridges, freezers and microwaves have had a dramatic impact on the use of packaging.
- The way we live- smaller households, higher expectations of health and safety, nutrition, more individual choice, fashion and more disposable income and all factors which influence the number and size of packed units and the associated volume and weight of packaging, which eventually ends up in the household waste stream
- The way we conduct business- packaging is a key element in driving business to business supply chains, whether that be moving products from manufacturers to super market shelves or moving printing inks from manufacturers to business users. Approximately 50 percent of packaging is used in this manner.

Today, packaging is produced more quickly and efficiently. It is generally lighter in weight, uses less material, is easier to open, dispense from, reseal, store, and dispose. Packaging has evolved from a relatively small range of heavy, rigid containers made of wood, glass, and steel, to a broad array of rigid, semi rigid and flexible packaging options increasingly made from specialized lightweight materials.

The packaging industry in India is a heterogeneous mix of both organized and unorganized sectors. The industry comprises a large number of manufacturers of basic materials, converted packages, machinery and ancillary materials, converted packages, machinery and ancillary materials. Domestic demand for packaging has been anticipated to grow by over 100% within

the next 5 years. Recognizing this trend, the industry is gearing itself to adopt scientific and functional packaging.

2.1 Levels of Packaging:

A *primary package* is the one which is in direct contact with the contained product. It provides the initial, and usually the major protective barrier. **Example:** Metal cans, paperboard cartons, glass bottles and plastic pouches, aerosol spray can, Beverage can, cushioning envelopes, plastic bottles, skin pack.

A *secondary package* contains a number of primary packages. It is outside the primary packaging perhaps used to group primary packages together. It is the physical distribution carrier and is sometimes designed so that it can be used in retail outlets for the display of primary packages. Ex. Corrugated case, Boxes.

A *tertiary package* is made up of a number of secondary packages. It is used for bulk handling. Example being a stretch-wrapped pallet of corrugated cases.

A *quaternary package* is frequently used to facilitate the handling of tertiary packages. This is generally a metal container up to 40 m in length which can be transferred to or from ships, trains, and flatbed trucks by giant cranes. Certain containers are also able to have their temperature, humidity and gas atmosphere controlled. This is necessary in particular situations such as the transportation of frozen foods, chilled meats and fresh fruits and vegetables.

2.2 The Role of Packaging

The role of packaging could be summarized as follows:

Identification:

It is what clearly identifies any product today and facilitates its branding
Containment: It is what provides containment of a unit quantity of a product for sale and distribution. Multiple stock-keeping units (SKUs) can be created by packaging
Protection: It provides protection, not only to the product against any external influences, but also for the consumer from the product, especially for hazardous products.

Containment:

Most products must be contained before they can be moved from one place to another. To function successfully, the package must contain the product. This containment function of packaging makes a huge contribution to protecting the environment. Faulty packaging (or under packaging) can lead to spillages and result in major losses and serious damage.

Protection and Preservation:

Packaging plays a vital role in protecting products as they go from the manufacturer to the consumer. Packaging is designed to ensure that the product reaches the consumer in good condition. It preserves the product in pristine and acceptable condition throughout its intended shelf-life and period of usage after the package has been opened. The product is protected during transport and distribution; from climatic effects (heat and cold, moisture, vapor, drying atmospheres); from hazardous substances and contaminants; from infestation.

Supplementary Product Protection:

Packaging can also provide supplementary product protection. This may be achieved by forms of cushioning such as shredded papers, sheets of corrugated paperboard, foamed plastic or wrappings. Packaging therefore contributes to food safety, quality and nutrition. Packaging technology has made major contributions to advancing food science and food safety and reduction of food spoilage.

Communication:

‘A package must protect what it sells and sell what it protects’. Modern methods of consumer marketing would fail were it not for the messages communicated on the package.

The information provided on packaging allows the consumer to make informed decisions on the product's purchase and use.

Convenience:

Packaging plays an important role in allowing products to respond to the demands and needs of modern consumers. Frozen food packs, microwavable containers, wine cardboard casks, easy-open beverage and food cans and aseptic cartons are good examples of convenience packaging. These types of packaging reflect the demand for convenience and quick food preparation in a way that guarantees freshness. Light weight medical devices are packaged in peel-open, pre-sterilized containers designed for easy use in operating rooms, patients' rooms, or laboratories. In the administration of drugs, unit-dose packaging, solid and liquid, in small containers allows sealed, unused drugs to be returned to stock. Medical packaging also reduces the risk of accidental overdose or improper use by children (child resistant closures).

Environmental Aspects:

Packaging reduces the amount of waste going to landfill. Without the benefit of packaging to preserve food, a higher proportion of food would become spoiled and consequently consigned to garbage collection for land disposal. When the food is packaged, the unwanted portions such as skins, outer leaves and trimmings, remain at the processing point where they can be economically recovered and used in the manufacture of valuable by- products.

Reduction of Pilferage:

Packaging of a wide variety of products sold from self-service counters is designed to reduce stealing. The product may be sold in a blister package sealed to a large paperboard backing. The large card makes the package more difficult to conceal and steal.

Marketing Trends:

Marketing trends are placing increasing emphasis on the look, sales appeal and quality of retail packaging. Packaging helps sell products by providing product differentiation and presentation,

greater brand awareness and convenience. The continuously changing demands of consumers will require higher quality graphics and promotional links between graphics and advertising to support brand identities, plus the ability to reflect current consumer trends and images.

Promotion:

It is today the most effective promotion tool, and Convenience: It provides convenience features for consumers like dispensing, safety, tamper-proofing and tamper evidence, authentication, reclosing for multiple uses without spoiling of the product, easy carrying around, etc.

2.3 Packaging as Essential tool for Success:

In current scenario, marketers recognize the value of packaging, understanding the vital role it can play in generating sales by connecting with shoppers at the point-of-purchase. And the expense incurred in developing an effective package is seen as a worthwhile investment that provides a huge return. But with this higher profile comes greater scrutiny and higher expectations. Packaging is one of the most cost-effective weapons in a marketer's arsenal. It requires a relatively self-effacing investment, lasts a long time, and is encountered by a tremendous number of shoppers (in promotions, at the point-of-purchase and during use). Applying a few fundamental principles to its development, creation, and employing appropriate consumer research prior to launching, can ensure that this valuable tool provides a very high return-on-investment for many years.

Undoubtedly, the role of packaging in business has undergone a major change, and it has today assumed a very major role. Traditionally, packaging was defined as the activities of designing and producing the wrapper or container for a product. This definition is no longer adequate. Today, packaging has emerged as a major technology in itself – a technology that is highly complex and specialized, highly multi-functional and cross-functional and very application-oriented. It has many vital implications that require intense scrutiny and study.

2.4 The Power of Packaging

How powerful packaging was clearly established by a path-breaking survey carried out by the Point of Purchase Advertising Industry (POPAI) in the USA about a decade ago. The survey studied consumer behaviour in today's self-service selling environments and came up with the following findings:

- An average consumer spends 22 minutes per visit to a department store;
- The average number of products or variants on display is over 1,700 per store;
- The number of brands that catch the consumer's eye or are seen by the consumer during the visit is 146;
- Seventy per cent of purchase decisions are made on the spot at the point of purchase;
- Seventy per cent of the products picked up and examined by the consumer are added to his cart and purchased;
- In the consumer's mind, he/she equates package quality to product quality, and
- The package graphics exert a powerful influence on the purchase decision.

Based on these findings, packaging was termed a nine-second window (i.e. 22 minutes divided by 146). In other words, every package seen has nine seconds to make a favourable impression. Over time, the window has come down and research shows that it now only five to six seconds.

This has led to a new concept postulated by Procter & Gamble called the First Moment of Truth (FMOT). It is defined as the all-important moment when a product or package catches a consumer's eye and thus sells itself. It is FMOT considerations that primarily dictate the product and packaging design. It is packaging that totally influences FMOT, and it is the prime tool for product differentiation and innovation. Another all-important factor in today's world is sustainability and this is where packaging, especially flexible packaging, plays a crucial role.

2.5 Packaging Industry: The Trends

Packaging in India today is influenced by several factors. These could be summed up as follows:

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- Globalization: All brands compete against the best available anywhere in the world;
- Liberalization: Almost all leading global brands are freely available here;
- Consumerism/choices: The Indian consumer is very aware of his needs and choices available internationally. He is also acutely conscious of his consumer rights;
- All Indian products have had to upgrade quality to state-of-the-art to be competitive;
- Distribution and selling systems are rapidly graduating to self-service leading to the growth of organized retail, and

Sustainability is becoming more and more a global imperative. Consumers are looking for more sustainable products. As a result, the key market and business trends that have emerged are:

- Globalization of markets and brands;
- All brands compete against the world’s best;
- There is micro-segmentation of brands;
- Consumer awareness and demands are much higher;
- There is higher consumer spending – both qualitative and quantitative;
- Consumers are prepared to pay more for convenience and quality;
- There is a demand for better products that satisfy lifestyle and safety requirements;
- There is a growing demand for affordable price-point packages;
- There is demand for more natural (green) products;
- Packaging is becoming increasingly potent as a marketing tool;
- There is a greater demand for high-quality process work in terms of both incidence and quality levels. Promotions are becoming increasingly important;
- There are frequent design changes and production runs are getting smaller. Turnaround times are getting very short and becoming keys to market share;
- The cost of being in the market is getting higher & absolutely no room for failure, and
- Sustainability is getting more important all the time.

A very key factor is the potential growth of the Indian market. Compared to other global economies, the Indian market is set to virtually explode. Consider the following:

- As of 2011, we already have 246.7 million households;

- Fifty-nine per cent of our population is under 25 years of age;
- Tremendous growth is expected in the number of households and in market numbers;
- Tremendous growth is expected in the numbers of professionals and working women, and
- The growth of organized retail, if unfettered by regulation, is expected to significantly drive packaging demand.

In due course of time, India is expected to become one of the world's three largest consumer markets. To get down to more specifics, some of the more significant trends in packaging will be as follows:

- More growth for flexible packaging due to its cost-effectiveness and sustainability credentials;
- More growth for plastics;

Chapter 3

The Packaging Industry: Current Scenario in India

The packaging market in India seems set for the next level of growth. Strong favourable demographics aside, factors such as increasing disposable income levels, rising consumer awareness and demand for processed food, and the multinational giants taking rapid strides in the food, beverages, cosmetics & toiletries and pharmaceuticals space, are expected to be the key drivers of this growth story. These factors are forcing both packaging suppliers and end-user industry to shift from bulk packaging to retail, and unit-level and small-sized packaging. In addition, exploding organized retail growth and newly relaxed FDI investment norms in retail and other sectors augur well for packaging market in India.

At more than USD 15.6 billion (approx. Rs. 85,000 crore at current conversion rates), India is estimated to be growing at more than 15 percent CAGR to Rs. 1,500,000 crore by 2015. While the sector presents a lot of opportunity for larger players, there are attendant challenges due to gaps in the uses of technologies to match the world trends and secondly, lack of regulatory clarity arising from multiple legislations that define the sector; the need to meet more stringent packaging norms laid down by the entry of global players; as well as the rising consumer awareness on sustainable packaging, requiring a shift to more green materials and innovations that require investments in R&D as well as infrastructure.

Indian packaging industry is highly fragmented with a large number of small scale companies and a few large integrated players. According to one estimate, there are more than 22,000 registered packaging companies in India, more than 85 percent of which are MSMEs.

The larger companies are highly capitalized and usually involved across the higher value added activities like material production, innovative products and design and higher volume supplies catering to the larger demand segments like F&B and cosmetics.

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The MSMEs in India are usually companies involved in the lower value added activities like conversion, filling and production. The organized sector in India accounts for roughly 50 percent of the volumes whereas the balance is highly fragmented and distributed. Globally the scenario is somewhat more consolidated – roughly 75 percent of the global packaging industry by value is accounted for by 20 percent of the largest integrated global players. In India, as the industry grows and matures, there is expected to be a trend towards consolidation as the supply side companies merge and acquire smaller companies to increase scale, reduce competition and improve bargaining power with the customers. Not many people realize how big and important the packaging industry is. Here are some salient facts:

- The global packaging industry is worth over \$800 billion and is growing between five and eight per cent per annum;
- It is the world’s third largest industry. Only the food industry and the energy and petroleum industries are bigger. As it happens, packaging has an extensive interface with both these industries;
- It is the only industry that has to do with every single product produced;
- It is one of the top five industries in every country, and
- In almost every country, it has a rate of growth that is higher than the growth of the country's gross domestic product (GDP)

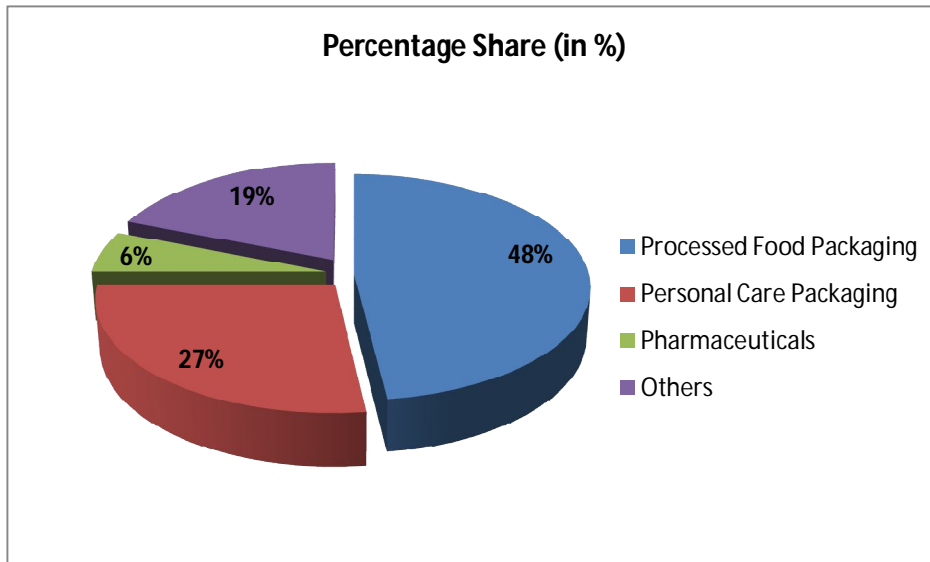
The Indian packaging industry has 22,000 firms comprising of raw material manufacturers, machinery suppliers, ancillary material suppliers etc., of which 85% units are MSMEs. The per capita consumption of packaging in India is merely 4.3 kg per person per annum, as against Germany’s 42 kg and Taiwan’s 20 kg, which is very low compared to global standards.

Sector-wise break-up of the Indian packaging industry can be given as follows:

Table 1.0 Sector-wise break-up of the Indian packaging industry can be given as follows:

Sector	Percentage Share (in %)
Processed Food Packaging	48
Personal Care Packaging	27
Pharmaceuticals	6
Others	19

Chart-1 Sector-wise break-up of the Indian packaging industry



In India, the value addition to food products is only 7% as compared to 23% in China, 45% in Philippines and 188% in UK. According to a study by Tata Strategic Management Group, the Indian ready-to-eat food market is estimated to grow to USD 727.09 mn. by 2015 from the current level of USD 32.09 mn. The growth trend of the Indian packaging industry is in line with the global packaging industry.

Plastic packaging is growing at 20-25%, rigid containers at 15%, PET bottles at 25% and tubes at 10-12%. The total flexible packaging market is valued at USD 671 mn. The domestic demand for paper is 7.6 mn. tonnes, which is 40% of the total production that goes into packaging. All in all, with increasing middle class, changing consumer habits and retail boom coming in with FDI, the Indian packaging industry would surely go a long way.

The global packaging industry is expected to grow to \$ 820 billion by 2016, and the Indian packaging industry is growing at a rate of about 18 percent annually. It is projected to become the fourth-largest packaging market in the world, with revenues of \$ 43.7 billion in 2016.

Global Packaging Industries and India: An Analysis

India, one of the top ten economies in the world has the second largest GDP among emerging economies based on Purchasing Power Parity (PPP). Country is the 4th largest economy in the world by PPP basis and the sheer size of economy has opened up new business opportunities to the world in all walks of business in general and packaging industry in particular. Packaging industry in India is one of the fast growing industries which have its influence on all industries directly or indirectly.

The Indian packaging industry is currently US\$ 15.6 billion approx with a growth rate of about 15% per annum. Growth rate is expected to be doubled with in next two years. India's per capita packaging consumption is less than worldwide average which offers mammoth business opportunity to Indian Packaging Industry. The large and fast growing Indian middle class population and the growth of organized retail sector are the catalysts to growth in packaging. The Indian middle class population is above 50 million and is expected to reach 583 million by 2025. The Indian retail market is the 5th largest retail destination globally and has been ranked the second most attractive emerging market for investments. This market is currently valued at US\$ 511 billion and is expected to rise to US\$ 1.3 trillion by 2018.

Packaging of essential products like food, beverage, milk, vegetable, food grains and pharma are the key driving segments because of the huge domestic consumption. Indian packaging machinery market was valued at US\$ 300 million in the year 2000. The annual growth rate for the indigenous packaging machinery is maintained at as 11.8%, indicating that large section of the Industry still dependent on Indigenous equipment. If we look at some of the important trends in the Indian and global packaging markets, the major ones are:

- The Indian packaging market is worth about Rs 1,50,000 crore (\$27 billion) with a compound annual growth rate (CAGR) of 12 to 15 per cent per annum;
- This expected to grow to \$43 billion (Rs 2,40,000 crore) by 2016;
- The Indian packaging market is today the world's sixth largest but will become the world's fourth largest in the next three years;
- The Indian packaging industry is technologically advanced in many sectors but needs to

upgrade to state-of-the-art in the other areas;

- As mentioned earlier, the global packaging industry is worth over \$800 billion;
- Mature markets (developed countries) are growing at three to five per cent per annum;
- Markets in the developing countries are growing at five to eight per cent per annum;
- High growth will be witnessed in Asia (especially China and India), followed by South and Central America;
- The region-wise shares of the global packaging market are: Asia (34 per cent); Europe (30 per cent); North America (24 per cent), and the rest of the world (ten per cent), and
- In terms of Packaging materials, the shares are: Plastics (37 per cent); paper and board (34 per cent); metals (15 per cent); glass (11 per cent), and others (three per cent)

Chart-2 World Packaging Industry

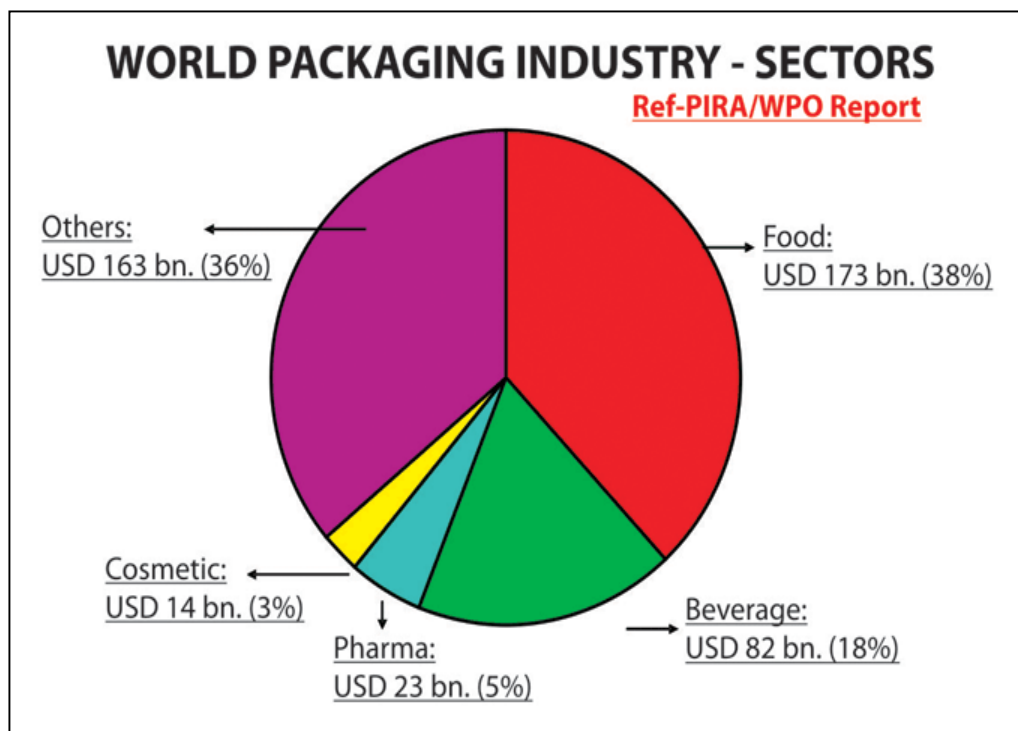


Chart-3 India in the Global Packaging Market

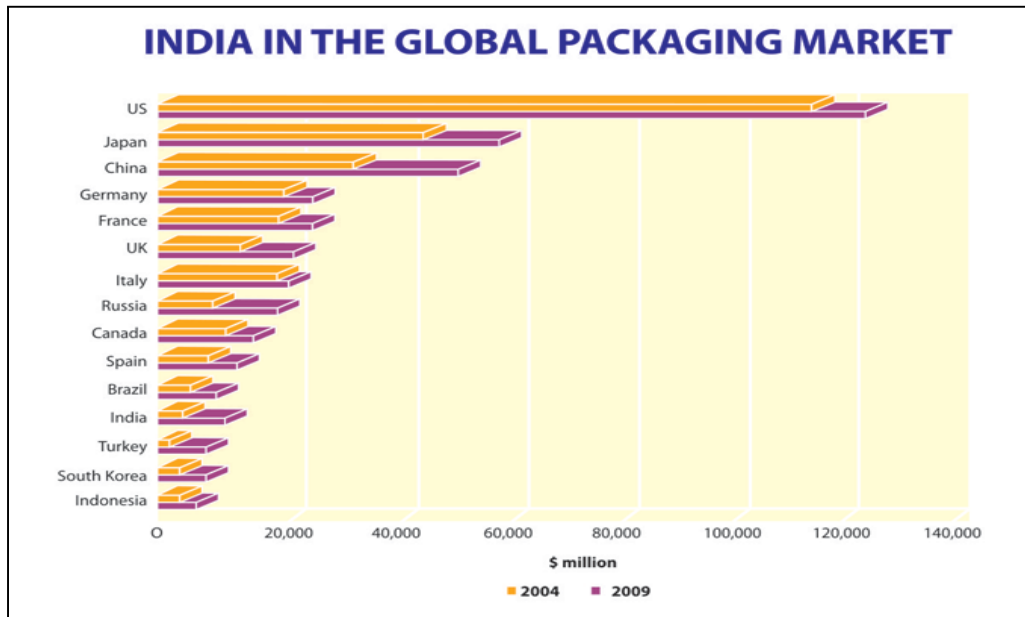
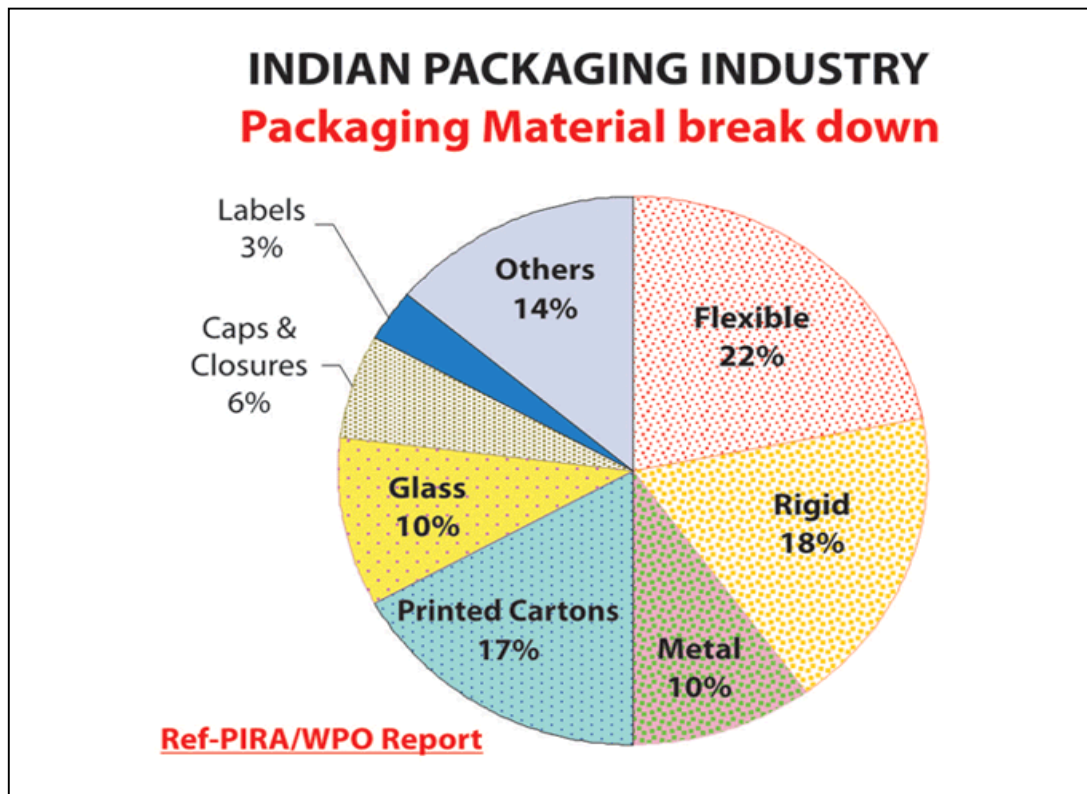


Chart-4 Indian Packaging Industry



Indian share in Global Packaging Market – An Overview

The study tried to assess the share of India in Global Packaging Market. The details of the findings are: the share of India in Rigid Packaging is 4 percent, in Glass Packaging (3 percent), Paper and Board Packaging (3 percent), Glass Packaging (2 percent), Flexible Plastic Packaging (2 percent) and Metal Packaging (3 percent). The share of leading countries is described in the below charts.

Chart-5 Share of India in Paper & Board Packaging Market:

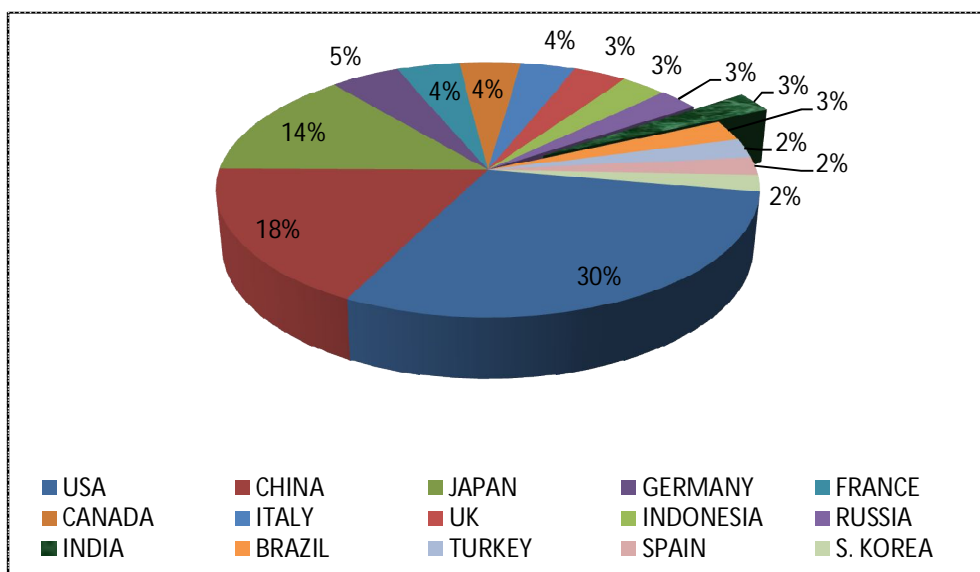


Chart-6 Share of India in Rigid Packaging Market:

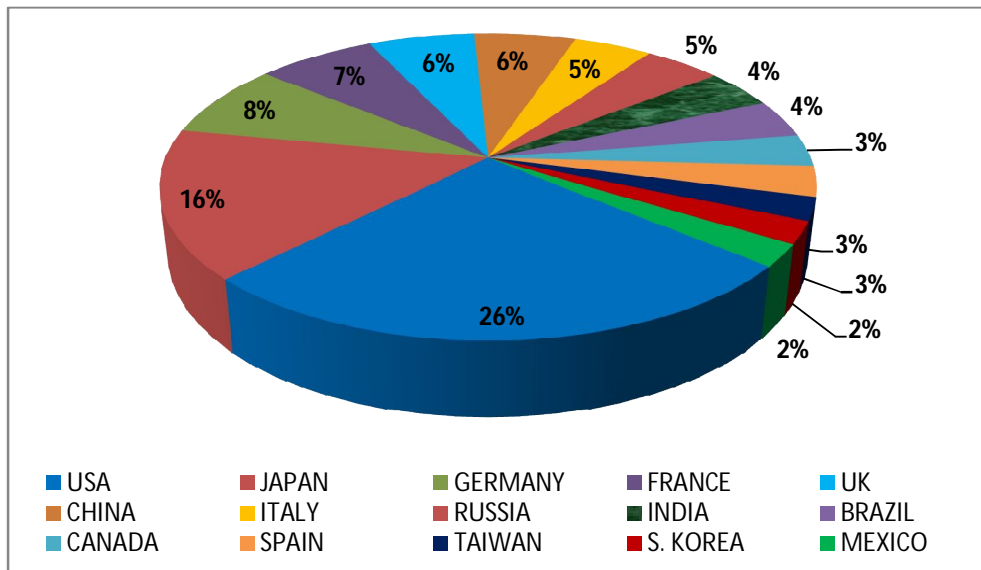


Chart-7 Share of India in Flexible Plastic Packaging Market:

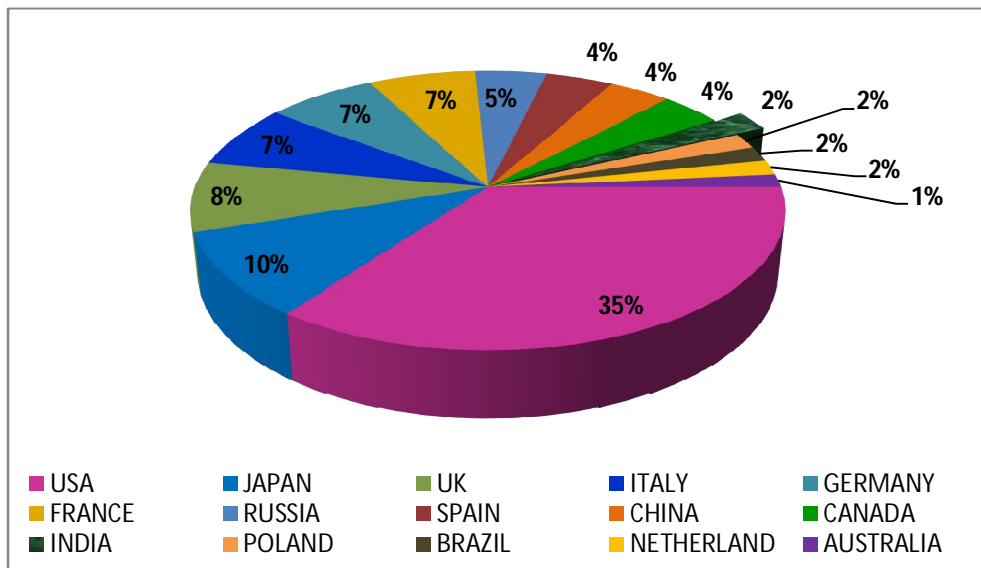


Chart-8 Share of India in Metal Packaging Market:

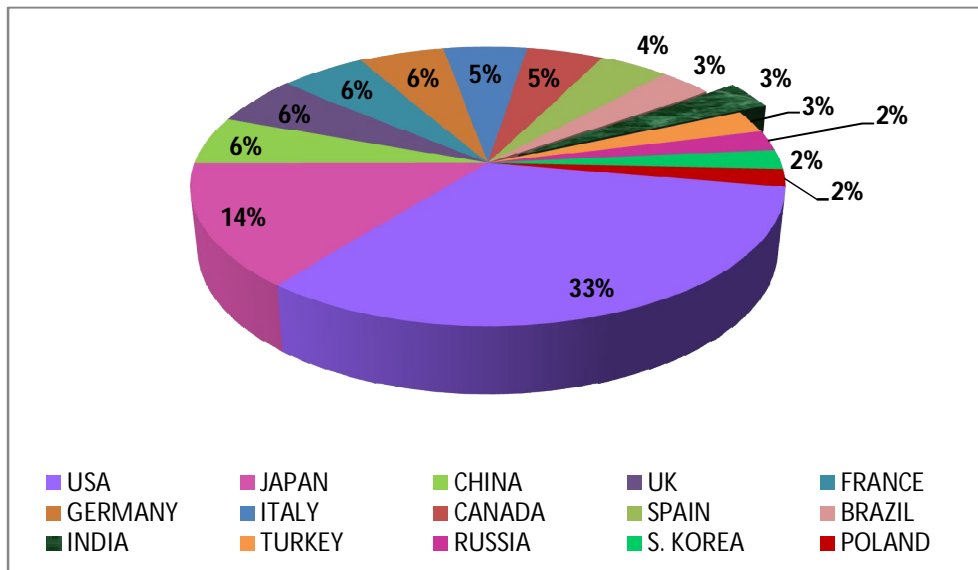
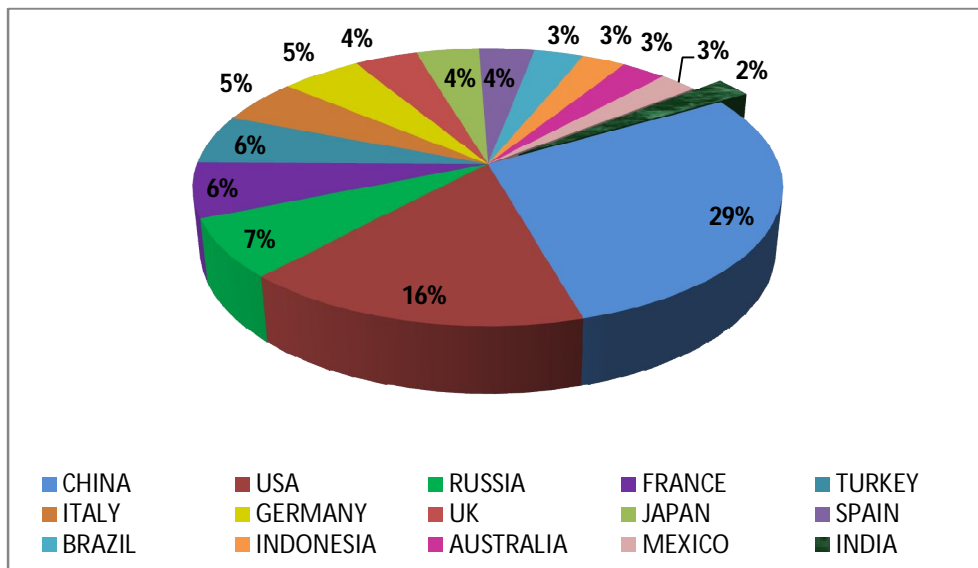


Chart-9 Share of India in Glass Packaging Market:



The Indian packaging industry is one of the fastest growing sectors spanning across almost every industry segment. Right from packaging of food and beverages, fruits and vegetables, drugs and medicines, to highly dangerous products, the packaging industry has led to greater specialisation and sophistication over a period of years. In fact, packaging involves one of the highest standards of technological expertise, and the entire process from packing to shipment can be right called as the art and science of packaging.

Chapter 4

Packaging Machine Industry: An Insight

Packaging machine is an equipment or series of equipment used to pack and seal a product in a container. Thus packaging machinery facilitates in packaging a product so as to contain, protect and preserve it.

The packaging machine industry faces a unique set of challenges that stretches its engineering capabilities to the limits. Consumer goods producers are striving to evolve containers into new shapes to appeal to continually changing customer needs and tastes. Nearly every machine produced by a packaging machinery company is a one-of-a-kind creation designed to bring a package designer's creation to life, to increase production rates, or to lower costs.

The importance of packaging machines

The packaging operation consists of various operations like, forming, filling, sealing, coding, collating etc. Hence, packaging companies often utilise more than one packaging machine, since one device simply cannot handle the different packing methods required by the various products on the market. A machine can create several types of packages, spanning products from different industries. With several machines working simultaneously, the company can cater to multiple clients



at once. The machines are highly efficient, producing dozens of packages in minutes. This way the company can earn sizable profits each month, paving the way for even more machines, which speed up the production process.

How do packaging machines work?

Operating a packaging machine is as easy as reading the user’s manual. Once you get familiarised with its functions, you can place the raw materials in their slots, tweak the settings, and in a few minutes, you’ll produce a huge number of packages.



The more advanced the machine, the easier it is to operate. Like new electronic gadgets, machine developers improve the user-friendliness of their models for faster production, and more importantly, to boost sales.

Types of packaging machinery

A choice of packaging machinery includes technical capabilities, labour requirements, worker safety, maintainability, serviceability, reliability, ability to integrate into the packaging line, capital cost, floor space, flexibility (change-over, materials, etc.), energy usage, quality of outgoing packages, qualifications (for food, pharmaceuticals, etc.), throughput, efficiency, productivity, ergonomics, etc.

Earlier, a single machine was used to produce a certain package. Over the years, after a succession of technological advancements, some machines could create several types of packages, catering to different industries. The machines were, of course, more expensive, but the benefits that they provided were overwhelming. Ideally, for a packaging company owner, investing in more than one device was the way to go.

Packaging machines may be of the following general types:

- Blister, Skin and Vacuum Packaging Machines
- Capping, Over-Capping, Lidding, Closing, Seaming and Sealing Machines
- Cartoning machines
- Case and Tray Forming, Packing, Unpacking, Closing and Sealing Machines
- Check weighing machines
- Cleaning, Sterilizing, Cooling and Drying Machines
- Conveying, Accumulating and Related Machines
- Feeding, Orienting, Placing and Related Machines
- Filling Machines: handling liquid and powdered products
- Package Filling and Closing Machines
- Form, Fill and Seal Machines
- Inspecting, Detecting and Checkweighing Machines
- Palletizing, Depalletizing, Pallet Unitizing and Related Machines
- Product Identification: labelling, marking, etc.
- Wrapping Machines
- Converting Machines
- Other specialty machinery

Different types of items can also be processed through packaging machinery. This includes

everything from liquid to powder to bulk packaging. There are also different types of packaging that can be used, with everything from bags to bottles. Closing methods that are used on the machinery include everything from corks to tape. Several companies will offer creative varieties to use in order to package whatever is needed.

Within packaging machinery are different types of timing mechanisms that could be used to determine how fast the machinery will package the material. Most machines have the option of manual, semi-automatic or automatic operations. They are usually classified by how many packages they can fill or seal per minute.

Role of automation in packaging machinery

By definition, an automatic device is one in which through the automatic or remote control method one is able to complete the task of a machine. In packaging industry, automation is changing the way of the packaging process and packaging of container movements and materials processing methods.



Automatic control of the packaging system can greatly improve production efficiency and product quality, significant elimination of packaging and printing processes and as a result the ones created by labelling errors, effectively reducing the labour intensity and reduce energy and resource consumption.

Design and installation of automatic packaging systems, in terms of improving product quality and production efficiency, or for elimination of processing errors and reduce labour intensity, have shown a very significant role. Particularly for food, beverage, pharmaceuticals, electronics and other industries, this is essential.

Yet another aspect in automation is the Robotics. This has changed the way man-machine co-exists. Some of the robotics are devices like mechanical hands or robots, wherein the choice depends on the needs and characteristics of the process. It can be simple, for example, move

from one location to another location of the structure of a single-axis pneumatic pressure linkage device; it can be complex, for example, has a six-axis structure of the dynamic surgical robots.

Product /packaging relation has a direct impact on the structural design of automation devices and materials needed to deal within the form of delivery. Product / packaging structure, size, shape, material and weight will determine the structure of manipulator tip design and automatic payload needs.

Shape features with complex structural design of packages, such as the oval-shaped containers are more difficult than the standard round or square pieces of packaging because of orientation. During filling of packs the mechanical hand end automation devices generally provide a process that can seize a sufficient volume of product at one-time for filling. In this way, the automatic operation of the mobile devices to minimize the distance and maintain the product conveyor or production lines continuously moving.

The main driving force for packaging automation is the total production throughput. The production line speed not only affects the processing of products but also automated device for visual inspection and labelling operations. In order to achieve an effective visual detection technology, must be shown a number of related issues.

Chapter 5

Packaging Industry: The Present Technology Status

Packaging has come a long way in India. There has been a sea change in the packaging practices from it was couple of years back. The contribution of packaging towards value addition is now being appreciated after the success stories of several consumer products. There are also several innovations and developments taking place all over the world almost daily. It is important to therefore clearly assess and understand various technology options available today. Major technologies currently practiced in India as well as in advanced countries are described below:

5.1 Vacuum Packaging:

Vacuum packing or **vacuum packaging** is a method of packaging that removes air from the package prior to sealing. It can involve both rigid and flexible types of packaging. The intent is usually to remove oxygen from the container to extend the shelf life of foods and, with flexible package forms, to reduce the volume of the contents and package.

Vacuum packing reduces atmospheric oxygen, limiting the growth of aerobic bacteria or fungi, and preventing the evaporation of volatile components. It is also commonly used to store dry foods over a long period of time, such as cereals, nuts, cured meats, cheese, smoked fish, coffee, and potato chips (crisps). On a more short term basis, vacuum packing can also be used to store fresh foods, such as vegetables, meats, and liquids, because it inhibits bacterial growth.

Process of Packaging:

In this process all the oxygen is sucked out of the packaging. This makes the food last 3 to 5 times longer and preserves its appearance because microorganisms, such as bacteria, grow at a much slower rate inside of a vacuum seal. Also, freezer burn is virtually eliminated because the food is not in contact with cold air. For someone who plans to regularly vacuum pack food, purchasing a machine that automates the process may be worth the additional cost. Vacuum packaging is either done by an automatic machine or a manual pump.

Method of packing using Automatic Machine:

Step 1: Clean and prepare the food that you wish to vacuum pack.

Step 2: Place the food inside the plastic bag. Most machines require using a specific brand of bag.

Step 3: Put the open edge of the bag into the sealing machine.

Step 4: Start the vacuum and sealing process. Many vacuum pack Food Machines have an automatic sensor that alerts the machine when a bag has been placed inside and automatically starts the sealing process.

Step 5: Watch as the vacuum pack food machine withdraws the air and the plastic bag shrinks.

Step 6: Wait for the machine to stop its operation, which signaling that the plastic bag has properly been sealed.

Step 7: Remove the vacuum packed food and store it in the pantry, fridge or freezer.

Method of packing using Manual Pump:

Step 1: Clean and prepare the food that you wish to vacuum pack.

Step 2: Place the food inside the plastic bag.

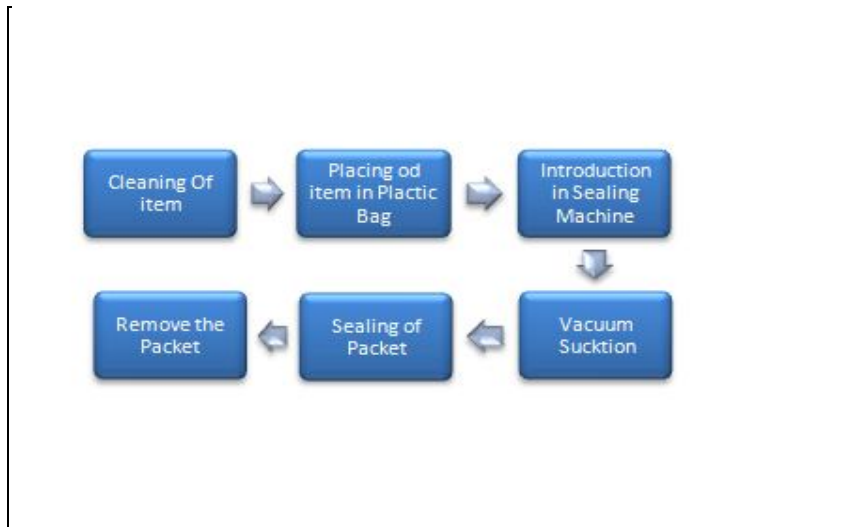
Step 3: Place the lid on the container or seal the bag.

Step 4: Put the nozzle end of the pump into the provided hole on the plastic bag or container lid.

Step 5: Press down on the pump repeatedly until all the oxygen is sucked from the bag or container.

Step 6: Remove the nozzle from the pumping hole. (Many of the manual systems have a one way nozzle so that air won't escape once the nozzle has been removed.)

Step 7: Store the food in the pantry, fridge or freezer.



Output: Vacuum packaging products, using plastic bags, canisters, bottles, or mason jars, are available for home use.

Vacuum packaging delicate food items can be done by using an inert gas, such as nitrogen. This helps prevent crushing fragile items and delicate foods.

Benefit: Vacuum packing greatly reduces the bulk of non-food items. For example, clothing and bedding can be stored in bags evacuated with a domestic vacuum cleaner or a dedicated vacuum sealer. This technique is sometimes used to compact household waste, for example where a charge is made for each full bag collected.

Plant and Machineries used in Vacuum Packaging:

- **Single Vacuum Chamber Machine:** Single chamber sealers require the entire product to be placed within the machine. Like external sealers, a plastic bag is typically used for packaging. Once the product is placed in the machine, the lid is closed and air is removed. Then, there is a heat seal inside the chamber that will seal the bag, after sealing the bag the chamber is refilled with air by the automatic opening of a vent to the outside. This oncoming



pressure squeezes all remaining air in the bag. The lid is then opened and the product removed. Chamber sealers are typically used for low-to-medium-volume packaging, and also have the capability to vacuum seal liquids.

- **Double Vacuum Chamber Machine:** Double chamber sealers require the entire product to be placed in a plastic bag within the machine. Once the product is placed in the



machine on the seal bar, the lid is closed and air is removed. Then a seal bar inside the chamber seals the product in the bag, after sealing the bag the chamber is refilled with air by the automatic opening of a vent to the outside. This oncoming pressure squeezes all remaining air in the bag. The lid is then opened and the product removed. Double chamber sealers are typically used for medium-volume packaging, and also have the

capability to vacuum seal liquids. The lid generally swings from one side to another, increasing production speed over a single chamber model. Double chamber vacuum packaging machines generally have either spring-weighted lids or fully automatic lids.

- **Automatic Belt Vacuum Chamber Machine:** Automatic belt chamber sealers require



the entire product to be placed in a plastic bag or flow wrapped pouch within the machine. The product travels on the conveyor belt, it is automatically positioned in the machine on the seal bar, the lid is closed and air is removed. Then a seal

bar inside the chamber seals the product in the bag. After sealing the bag, the chamber is refilled with air by the automatic opening of a vent to the outside. This oncoming pressure squeezes all remaining air in the bag. The lid is then opened and the product removed. Automatic belt vacuum chamber machines are typically used for high-speed

packaging of large items, and also have the capability to vacuum seal liquids. The lid generally travels straight up and down.

- **Thermoforming (rollstock) Vacuum Chamber Machine:** Vacuum Packaging in large production facilities can be done with thermoforming machines. These are Form-Fill-Seal style machines that form the package from rolls of packaging film. Products are loaded into the thermoformed pockets, the top web is laid and sealed under a vacuum, producing vacuum packaged products. Thermoforming can greatly increase packaging production speed. Thermoformed plastics can be customized for size, color, clarity, and shape to fit products perfectly, creating a consistent appearance.



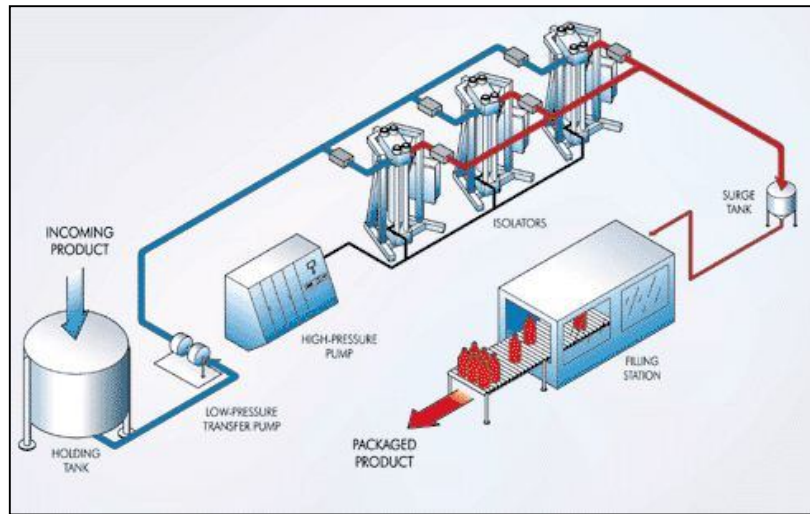
5.2 Aseptic Packaging:

Aseptic processing is the process by which a sterile (aseptic) product (typically food or pharmaceutical) is packaged in a sterile container in a way that maintains sterility.

Sterility is achieved with a flash-heating process (temperature between 195° and 295°F (91° to 146°C)), which retains more nutrients and uses less energy than conventional sterilization techniques such as retort or hot-fill canning. Pharmaceutical Sterile processing includes use of clean rooms, bacteria retaining filters, dry or steam heat. Aseptic food preservation methods allow processed food to keep for long periods of time without preservatives, as long as they are not opened. The aseptic packages are typically a mix of paper (70%), polyethylene (LDPE) (24%), and aluminum (6%), with a tight polyethylene inside layer. Sterile pharmaceuticals are usually packaged in plastic or glass. Together these materials form a tight seal against microbiological organisms, contaminants, and degradation, eliminating the need for refrigeration.

Aseptic processing makes worldwide export and import of new, economical and safe food products possible. Bag-In-Box technology is commonly used because it provides strong containers that are light weight and easy to handle prior to being filled. Other common package

types are drink boxes and pouches.



Process of Packaging:

Aseptic processing packaging is widely known as Tetra Packaging and it has three major components: flash-pasteurizing the contents, sterilizing the container and filling the container.

Method:

Step 1: Flash-Pasteurizing of the Content

This involves heating the content (e.g., juice, soup, nectar, milk) to a high temperature (165 degrees F) for a short amount of time (15 to 30 seconds). The heat kills all the microorganisms in the liquid by causing their cellular proteins and enzymes to denature. Yet, because the process is so brief, the liquid maintains its color, flavor and aroma better than longer heat sterilization processes.

Step 2: Sterilizing the Container

This involves sterilizing the inside of the individual containers. There are two approaches to decontamination: "wet" and "dry."

- **Wet Sterilization:** In "wet" sterilization (also known as "washing"), a solution of water and hydrogen peroxide (H₂O₂) is heated into steam and shot into the opening of the containers. This burst of super-hot water vapor heats microorganisms until their protein

denature while the hydrogen peroxide molecules attack viruses and other pathogens. To remove any lingering hydrogen peroxide, the interior is usually rinsed with a second burst of pure steam.

- **Dry Sterilization:** In "dry" sterilization, hydrogen peroxide is vaporized along with other cleaning agents and mixed with pressurized nitrogen gas. These gases are then injected into a plastic preform, inflating it into its final bottle shape (a.k.a. "blow molding") while sterilizing the inside with the hydrogen peroxide. The "dry" term comes from the fact that no water vapor is present in the pressurized gas. And, because of the high temperatures involved, the hydrogen peroxide does not condense into a liquid, allowing it to simply escape from the inside without rinsing.

Step 3: Filling the Container

In a fully-automated, sealed and decontaminated filling chamber, the liquid product is gently injected into the sterilized containers with a special nozzle. Once a pre-measured volume has been injected, an instrument lowers itself around the nozzle to form a seal against the container. The nozzle then retracts and the instrument creates a vacuum and permanently closes up the container, preparing it to leave the chamber and ship out to stores.

5.3 Blow Fill Seal (BFS) Packaging:

This packaging technology refers to the manufacturing technique used to produce small, (0.1mL) and large volume, (500mL +) liquid filled containers. Blow-Fill-Seal technology was originally developed in Europe in the 1930s and was introduced in the United States in the 1960s, but over the last 20 years it has become more prevalent within the pharmaceutical industry, and it is now widely considered to be the superior form of aseptic processing by various medicine regulatory agencies including the U.S. Food and Drug Administration (FDA) in the packaging of pharmaceutical and healthcare products.

The basic concept of blow fill seal (BFS) is that a container is formed, filled, and sealed in a continuous process without human intervention, in a sterile enclosed area inside a machine. Thus this technology can be used to Aseptically Manufacture sterile pharmaceutical liquid dosage forms.



Process:

The process is multi-stepped, firstly pharmaceutical-grade plastic resin is vertically heat extruded through a circular throat, to form a hanging tube called the Parison. This extruded tube is then enclosed within a two-part mould, and the tube is cut above the mould. The mould is transferred to the filling zone, or sterile filling space where filling needles mandrels are lowered and used to inflate the plastic to form the container within the mould. Following the formation of the container, the mandrel is used to fill the container with liquid, following filling the mandrels are retracted and a secondary top mould seals the container. All actions take place inside a sterile shrouded chamber inside the machine. The product is then discharged to a non-sterile area for labelling, packaging and distribution.

Blow fill seal technology reduces personnel intervention making it a more robust method for the aseptic preparation of sterile pharmaceuticals. BFS is used for the filling of vials for parenteral preparations and infusions, optphalmonic products and inhalation products for example Respules (TM). Generally the plastic containers are made up of polyethylene and polypropylene. Polypropylene is more commonly used to form containers which are further sterilized by autoclaving as Polypropylene has greater thermo stability.

5.4 Blister Packaging:

Blister pack is a term for several types of pre-formed plastic packaging used for small consumer goods, foods, and for pharmaceuticals.

The primary component of a blister pack is a cavity or pocket made from a formable web, usually a thermoformed plastic. This usually has a backing of paperboard or a lidding seal of aluminum foil or plastic. A blister that folds onto itself is often called a clamshell.

Blister packs are useful for protecting the product against external factors such as humidity and contamination for extended periods of time. Opaque blisters also protect sensitive products against daylight.

Material Used in Blister Packaging:

Mostly three type of material is used in blister packing, which are **polyvinyl chloride (PVC)**, **Polychlorotrifluoro ethylene (PCTFE)** and **Cyclic olefin copolymers (COC)**.

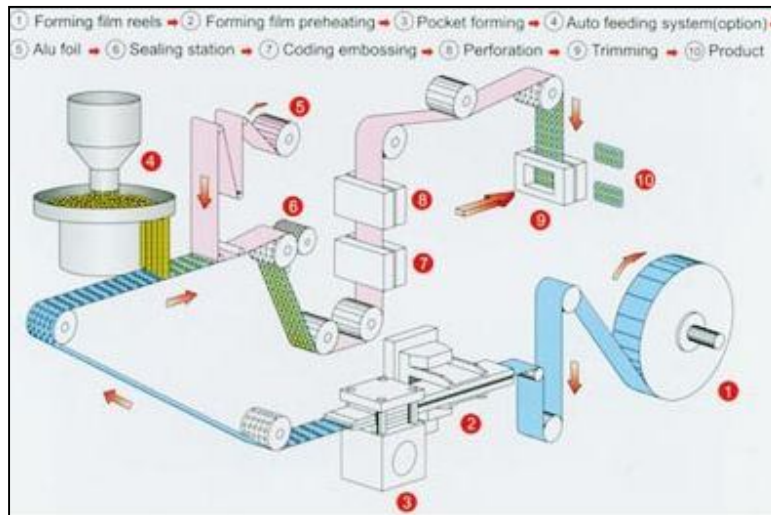
Process of Packaging:

There are two type of process used in Blister Packing Process i.e. **Thermoforming & Cold forming**.

Thermoforming: In the case of thermoforming, a plastic film or sheet is unwound from the reel and guided through pre-heating station on the blister line. The temperature of the pre-heating plates (upper and lower plates) is such that the plastic will soften and become pliable. The warm plastic will then arrive in a forming station where a large pressure (4 to 8 bars) will form the blister cavity into a negative mold. The mold is cooled such that the plastic becomes rigid again and maintains its shape when removed from the mold. In case of difficult shapes, the warm film will be physically pushed down partially into the cavity by a "plug-assist" feature. Plug-assist results in a blister cavity with more uniform wall distribution and is typically used when the cavity size and shape is larger than a small tablets & capsules

Cold Forming: In the case of cold forming, an aluminum-based laminate film is simply pressed into a mold by means of a stamp. The aluminum will be elongated and maintain the formed shape. In the industry these blisters are called cold form foil (CFF) blisters. The principal advantage of cold form foil blisters is that the use of aluminum offers a near complete barrier for water and oxygen, allowing an extended product expiry date. The principal disadvantages of cold

form foil blisters are: the slower speed of production compared to thermoforming; the lack of transparency of the package (a therapy compliance disadvantage); and the larger size of the blister card (aluminum cannot be formed with near 90 degree angles).



Uses:

Unit dose packaging of pharmaceuticals: Blister packs are commonly used as unit-dose packaging for pharmaceutical tablets, capsules or lozenges. Blister packs can provide barrier protection for shelf life requirements, and a degree of tamper resistance. In the USA, blister packs are mainly used for packing physician samples of drug products, or for Over The Counter (OTC) products in the pharmacy. In other parts of the world, blister packs are the main packaging type since pharmacy dispensing and re-packaging are not common. A series of blister cavities is sometimes called a blister card or blister strip as well as blister pack. The difference between a strip pack and blister pack is that a strip pack doesn't have thermo-formed or cold formed cavities; the strip pack is formed around the tablet at a time when it is dropped to the sealing area between sealing moulds. In some parts of the world the pharmaceutical blister pack is known as a Push-Through-Pack (PTP), an accurate description of two key properties (i) the lidding foil is brittle allowing to press the product out while breaking the lidding foil and (ii) a semi-rigid formed cavity being sufficiently collapsible to be able to dispense the tablet or capsule by means of pressing it out with the thumb. The main advantages of unit-dose blister packs over other methods of packing pharmaceutical products are the assurance of product/packaging

integrity (including shelf life) of each individual dose and the possibility to create a compliance pack or calendar pack by printing the days of the week above each dose. Blister packs are created by means of a form-fill-seal process at the pharmaceutical company or designated contract packer. A form-fill-seal process means that the blister pack is created from rolls of flat sheet or film filled with the pharmaceutical product and closed (sealed) on the same equipment. Such equipment is called a blister line. There are two types of blister machines.

Consumer goods: Other types of blister packs consist of carded packaging where goods such as toys, hardware, and electrical items are contained between a specially made paperboard card and clear pre-formed plastic such as PVC.

Clamshell: A hinged blister is known as a clamshell, used for a variety of products. It can be used as a security package to deter package pilferage for small high-value items, such as consumer electronics. It consists of one sheet folded over onto itself and sometimes fused at the edges. They can be securely heat sealed, making them difficult to open by hand to deter tampering. A pair of scissors or a sharp knife is often required to open them (although these are often sold in similar packages). Care must be used to safely open some of these packages, as 6,000 Americans are sent to the emergency room each year by injuries suffered in opening such packages. Wrap rage is sometimes the result.

Medical blisters:

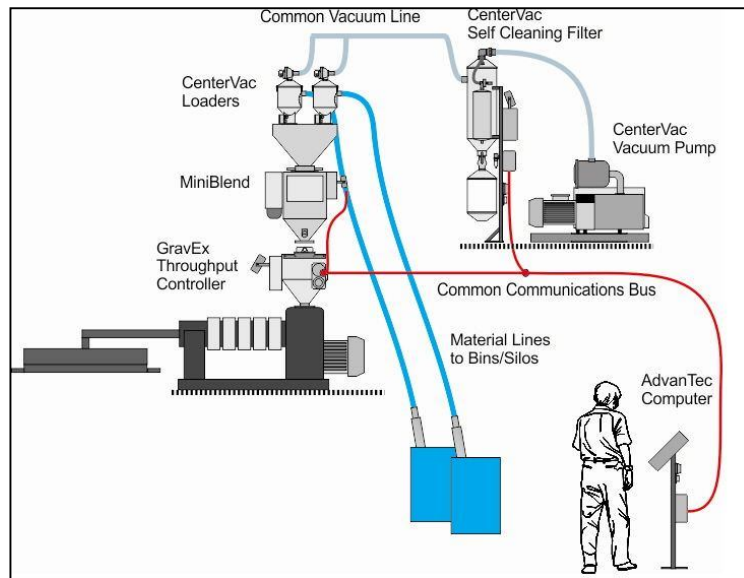
Medical blister trays differ from Pharmaceutical blister packs in that these are not push-through packs. The thermoformed base web is made of a thicker plastic sheet, generally between 500 μ to 1000 μ and can not be collapsed, thus forming a solid tray. The lidding film provides a peel-open feature and is generally porous to allow sterilization. Such medical blister packs are used for medical devices, used in hospitals.

Plant and machinery used in Blister Packaging.

- Rotary thermoforming
- Flat forming and rotary sealing
- Flat forming & flat sealing

5.5 Extrusion Coating Packaging:

Extrusion coating is the coating of a molten web of synthetic resin onto a substrate material. It is a versatile coating technique used for the economic application of various plastics, notably polyethylene, onto paperboard, corrugated fiberboard, paper, aluminium foils, cellulose, Non-wovens, or plastic films.



Process:

Coating- The actual process of extrusion coating involves extruding resin from a slot die at temperatures up to 320°C directly onto the moving web which may then pass through a nip consisting of a rubber covered pressure roller and a chrome plated cooling roll. The latter cools the molten film back into the solid state and also imparts the desired finish to the plastic surface. The web is normally run much faster than the speed at which the resin is extruded from the die, creating a coating thickness which is in proportion to the speed ratio and the slot gap.

Laminating- Extrusion laminating is a similar process except that the extruded hot molten resin acts as the bonding medium to a second web of material.

Co-extrusion- Co-extrusion is, again, a similar process but with two, or more, extruders coupled

to a single die head in which the individually extruded melts are brought together and finally extruded as a multi-layer film.

Uses: The market for extrusion coating includes a variety of end-use applications such as liquid packaging, photographic, flexible packaging, mill and industrial wrappings, transport packaging, sack linings, building, envelopes, medical/hygiene, and release base.

5.6 Heat Seal Packaging:

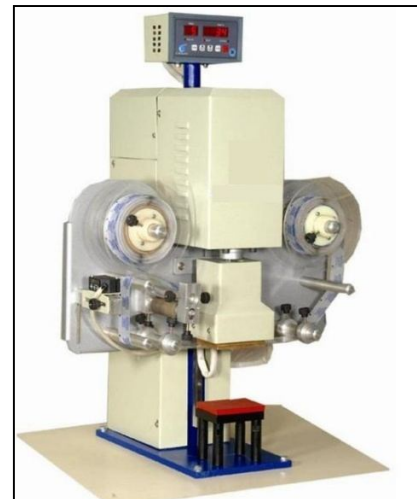
It is the process of sealing one thermoplastic to another similar thermoplastic using heat and pressure. The direct contact method of heat sealing utilizes a constantly heated die or sealing bar to apply heat to a specific contact area or path to seal or weld the thermoplastics together. Heat sealing is used for many applications, including heat seal connectors, thermally activated adhesives, film media, plastic ports or foil sealing.

Common applications for the heat sealing process:

Heat seal connectors are used to join LCD displays to PCBs in many consumer electronics, as well as in medical and telecommunication devices.

Heat sealing of products with thermal adhesives is used to hold clear display screens onto consumer electronic products and for other sealed thermo-plastic assemblies or devices where heat staking or ultrasonic welding are not an option due to part design requirements or other assembly considerations.

Heat sealing also is used in the manufacturing of bloodtest film and filter media for the blood, virus and many other test strip devices used in the medical field today. Laminate foils and films often are heat sealed over the top of thermoplastic medical trays, Microtiter (microwell) plates, bottles and containers to seal and/or prevent contamination for medical test devices, sample collection trays and containers used for food products.



Medical and fluid bags used in the medical, bioengineering and food industries. Fluid bags are made out of a multitude of varying materials such as foils, filter media, thermoplastics and

laminates.

Type of Heat Seal:

- **Hot bar sealers**- have heated tooling kept at a constant temperature (also known as Direct Contact Thermal Sealing). They use one or more heated bars, Iron or Dies which contact the material to heat the interface and form a bond. The bars, Irons, and Dies have various configurations and can be covered with a release layer or utilize various slick interposer materials (i.e. Teflon films) to prevent sticking to the hot tooling.
- **Continuous heat sealers**- (also known as Band type heat sealers) utilize moving belts over heating elements.
- **Impulse heat sealers**- have heating elements (one or two) of Nichrome placed between a resilient synthetic rubber and a release surface of film or fabric. The heating elements are not continuously heated; heat is generated only when current flows. When the materials are placed in the heat sealer, they are held in place by pressure. An electric current heats the heating element for a specified time to create the required temperature. The Jaws hold the material in place after the heat is stopped, sometimes with cooling water: this allows the material to fuse before stress can be applied.
- **Hot melt adhesive** can be applied in strips or beads at the point of joining. It can also be applied to one of the surfaces during an earlier manufacturing step and reactivated for bonding.
- **Hot wire sealing** – involves a heated wire that both cuts the surfaces and joins them with a molten edge bead. This is not usually employed when barrier properties are critical.
- **Induction sealing** is a non-contact type of sealing used for inner seals in bottle caps.
- **Ultrasonic welding** uses high-frequency ultrasonic acoustic vibrations to work pieces being held together under pressure to create a weld.

A type of heat sealer is also used to piece together plastic side panels for light weight agricultural buildings such as greenhouses and sheds. This version is guided along the floor by four wheels.

5.7 Shrink Packaging:

Shrink wrap, also **shrink film**, is a material made up of polymer plastic film. When heat is applied, it shrinks tightly over whatever it is covering. Heat can be applied with a hand held heat gun (electric or gas) or the product and film can pass through a heat tunnel on a conveyor.

Composition: The most commonly used shrink wrap is polyolefin. It is available in a variety of thicknesses, clarities, strengths and shrink ratios. The two primary films can be either crosslinked, or non crosslinked. Other shrink films include PVC and several other compositions.

Coextrusions and laminations are available for specific mechanical and barrier properties for shrink wrapping food. For example, five layers might be configuration as EP/EVA/copolyester/EVA/EP, where EP is ethylene-propylene and EVA is ethylene-vinyl acetate copolymer.

Process: The process of shrink packaging comprises of three phases, Padding Phase, Layering Phase and Final Packing Phase.

Padding Phase: First we start by covering any sharp or protruding objects with protective wrap. The "padding phase" is actually one of the most important steps. We are careful to make sure that anything that can poke through is covered thoroughly. We are also careful to make sure that any stress points or areas that might rub on the item being wrapped are carefully padded. Without padding the item correctly, it could lead to an object poking through and thus damaging the shrink wrap.

Layering Phase: Next we lay the VpCI and shrink film under the package. By doing so it allows us to give the item being wrapped a complete 6 sided enclosure. Here we have already sized and shrink wrapped the VpCI sealing it tight. By using the VpCI as our first coat of wrap, we are insuring the package will not rust or corrode, due to the physical properties of VpCI. Then we cut and size the outer coat of shrink film and drape it over the package and seal it tight. Thus we have covered the package with 2 coats of shrink film ensuring that our package is seemed and sealed tight.

Final Packing Phase: The final phase is extremely important. Here is your last



chance to scan your finished product one last time. Double check all your stress points, coverage of material, padding and seams. Use your shrink wrap tape where necessary. Your item is now sealed tight and ready for shipment. You can rest assured that your product will arrive at its final destination in the same condition as it left your facility.

Uses: Shrink wrap is applied over or around the intended item, often by automated equipment. It is then heated by a heat gun or sent through a shrink tunnel or oven for shrinking.

Shrink wrap can be supplied in several forms. Flat rollstock can be wrapped around a product, often with heat sealing to tack the film together. Center folded film is supplied on a roll with the plastic folded in half: product is placed in the center portion, the remaining three edges are sealed to form a bag, and the package then heated which causes the bag to shrink and conform to the product placed in the bag. Pre-formed shrink bags plastic bags are used with one end open: the product is placed in the bag, sealed, and sent for heat shrinking.

Shrink wrap can be used to wrap buildings. It can wrap roofs after hurricanes, earthquakes, tornadoes and other disasters. Shrink wrap can be used for environmental containments to facilitate safe removal of asbestos, lead and other hazards.

Software on carriers such as CDs or DVDs are often sold in boxes that are packaged in shrink wrap. The licenses of such software are typically put inside the boxes, making it impossible to read them before purchasing. This has raised questions about the validity of such shrink wrap licenses.

Shrink wrap is commonly used as an overwrap on many types of packaging, including cartons, boxes, beverage cans and pallet loads. A variety of products may be enclosed in shrink wrap to stabilize the products, unitize them, keep them clean or add tamper resistance. It can be the primary covering for some foods such as cheese, meats, vegetables and plants. Heat-shrink tubing is used to seal electric wiring.

Shrink bands are applied over parts of packages for tamper resistance or labels. It can also combine two packages or parts.

Shrink wrap is also commonly used within more industrial applications using a heavier weight shrink film. The principles remain the same with a heat shrinking process using a hand held heat gun. The following shrink wrap applications are becoming more widely used and accepted:

- Industrial shrink wrap containment of large plant equipment/components,
- Scaffold wrap containment of buildings/bridges,
- Building temporary shrink wrap structures for storage or other business operational uses,
- Marine shrink wrapping of boats and other vehicles,
- Shrink wrapping of palletized freight
- Disaster contingency and relief projects such as damaged buildings/roofs.

5.8 Skin Packaging:

Skin pack, or skin packaging, is a type of carded packaging where a product (or products) is placed on a piece of paperboard, and a thin sheet of transparent plastic is placed over the product and paperboard.

The printed paperboard usually has a heat-seal coating. The plastic film (LDPE, PVC, ionomer, etc.) is softened by heat and draped over the product on the card. Vacuum is sometimes used to assist a firm fit. The film bonds to the heat-seal coating on the paperboard. The skin-packed piece then may need to be cut into individual units.

Skin packaging somewhat resembles a blister pack, with the major difference being that the plastic surrounding the product is formed over the product, instead of being pre-formed.



Process of Packaging: This is a simple heat sealing process in which a pre heated film is loaded on the product and substrate. After placing the heated film on the product vacuum pressure of 60-80 psi is applied, this sucks the air out, leaving with a smooth and tight packing.

Chapter 6

Packaging Industry: The Clusters & Manufacturing Hubs

A cluster is defined as a concentration of enterprises producing same or similar products or strategic services and is situated within a contiguous geographical area spanning over a few villages, a town or a city and its surrounding areas in a district and face common opportunities and threats. Accordingly, we have not considered activities which are of daily use services and/or where scope for joint action or passive cooperation is minimal or where the product grouping is too wide for common threats/opportunities to emerge. Clusters may be broadly divided into the following broad categories:

Industrial cluster: Having at least 100 enterprises and/or a minimum turnover of Rs.100 million. Units in these clusters are functioning from factory premises with hired workers. Such clusters have a mix of micro, small, medium, few large and at times all micro units.

Micro-enterprise clusters: Such clusters are all micro units and are mostly done by household based units by mostly utilizing home based workers. These include artisanal (handicrafts and handloom) and other micro enterprise clusters.

CMSD has categorized the packaging industry in four types: Food packaging, Cosmetics, Pharmaceuticals & Material Packaging. The clusters were identified in all over the country, which are given below:

LIST OF MAJOR CLUSTERS IN INDIA

S.NO.	SECTOR	STATE
1	Pharmaceutical	Himachal Pradesh, Maharashtra, Andhra Pradesh (Hyderabad), Uttarakhand, Gujarat, Goa, Chennai
2	Food	Maharashtra, M.P., Gujarat, Kerala, Odisha, Bihar, Himachal Pradesh, Delhi
3	Cosmetics	Mumbai, Kolkata, U.P.
4	Material	U.P., Haryana, Delhi, Karnataka, Punjab

1- Pharmaceutical Clusters:

The Indian pharmaceutical industry ranks third in terms of volume of production with a 10 per cent of global market share and is the 14th largest by value. Himachal Pradesh (HP) and Uttarakhand are among the fastest growing regions in the pharma industry in the country. This growth is primarily driven by the incentives announced by the state government in its Industrial Policy, 2004. Main clusters & hubs in pharma are H.P., Maharashtra, Uttarakhand etc.

Pharma Cluster Odisha- Special Purpose Vehicle (SPV) Utkal Pharmaceutical Manufacturers' Association

Utkal Pharmaceutical Manufacturers' Association (UPMA) was constituted during 1985 with a view to cater the various needs of pharmaceutical industries of the state. UMPA comprises of 75 pharmaceutical industries out of which 36 firms are engaged in manufacturing of drugs. 18 drugs manufacturing units are still beyond the purview of the association.

Thane Pharma Cluster, Maharashtra- The total numbers of firms is 37 & total number of workers is 1700. The major problems faced by the cluster are:

- Need for easy Finance to meet Revised GMP standards and increase exports.
- Role of Banking Sector: It has been pointed that whenever a SSI account is categorized as Non Performing Asset (NPA), the unit is immediately threatened to be put in DRT

- The investment limit for plant and machinery in the small scale sector has been reduced from Rs. 3 crores to Rs. 1 crore Non-availability of Skilled manpower
- The Small Scale units does not pay much more attention in improving their managerial skills Burden of Taxes
- There are very few Small Scale units which export bulk drugs to the formulation units in abroad countries
- The development of pharmaceutical sector is dependent on the support of Food & Drug Administration.
- Technical Problems faced by the Cluster
- Issues relating to WHO-GMP compliance have been a relatively major area of concern for the industry as a whole.
- The international quality norms especially those related to exports are also a major area of concern.
- Low investment in R&D
- Small firms are finding it difficult to avail right information as regards market, finance, technical, Govt. procedure etc. Need for Common Testing Laboratory Lack of knowledge of Govt. rules and regulations

Dehradun Pharmaceuticals Cluster, Uttarakhand: The total number of firms is 290 & total number of works is 16074. There are some association cluster i.e. Drug Manufacturers Association (DMA), Dehradun, Pharma Manufacturers Association (PMA), Roorkee Association of Pharma Manufacturers (APM), Haridwar.

2- Food Clusters:

The main hub & clusters of food packaging industry are Bihar, Andhra Pradesh, Madhya Pradesh, Poha Cluster, Bhatapara, Raipur, Chhattisgarh, Gujarat, Maharashtra etc.

MSMEs involved in the food packaging industry will continue to see sustained growth, due to the expansion of the food processing industry in an under-served Indian market. The growth of the Indian food processing sector has nearly doubled to 13.7 per cent during the last four years. There are opportunities and challenges. Packaging is extremely crucial to the success of the food

product being sold. It has aesthetic, functional and safety attributes that influence their success with the consumer. Advances in packaging materials and techniques are helping food processors position their products in newer segments.

Packaging has become an important differentiator for brands. The quality of labeling and graphics has also undergone a major shift. Overall, the trend is that Indian packaged food is coming of age to conform to international standards.

The major trends that are having a major effect on food packaging innovations are convenience of usage, sustained freshness and increased shelf life and brand positioning. Meanwhile, the country's largest food processing park was inaugurated in the district of Chittoor in Andhra Pradesh. Srini Food Park is an end-to-end mega facility which has the latest in process and machinery. Packaging and labeling operations are expected to be on par with international standards. Chittoor has the country's largest fruit processing cluster.

Fruits & vegetable processing cluster, Pune

Pune district and Panchgani are thriving hubs of food processing units today. Pune/Panchgani is surrounded by vast tracts of arable, agricultural land and is known for its agriculture and agrobusiness. Proximity to urbanized markets such as Mumbai, Nasik, Nagpur, Aurangabad etc., changing food habits, cosmopolitan nature of the city, connectivity to JNPT and hence convenience of exports etc. are the factors that have given the required boost to make this segment a fast-growing one in Pune.

The cluster produces a range of products comprising semi-processed ready mix products, pickles, jams, jellies, squashes & syrups, Ready to Eat/Ready to Cook products ground & processed spices and papad. The units are located in the district of Pune and others agglomerated in and around Panchgani (District Satara).

Food Cluster Industry, Pune (Maharashtra): Number of firms by type is 956 and total number of workers is 11500. There is some association clusters i.e.

- Maharashtra Chamber of Commerce & Industry, Pune

- Maharashtra Papad manufacturers association Farsan Wafers and Milk Products Association
- All India Food Preservers Association (Pune Chapter)
- Maharashtra State Masala Producers Association, Pune
- Pune Zilla Bakers Association

The major products of the cluster is Jams and Jellies, Squashes, Pickles, Dehydrated ready food mixes, Bakery product, Milk products, Confectionery items, Ground and processed spices. Specific and relevant technical institutions (R&D, Testing Lab accredited facilities in this clusters i.e. Public Health Laboratory , MITSAN laboratory, Community Food & Nutrition Extension Unit, Central Food & Technological Research Institute International Development Research Center, Maharashtra State Institute of Hotel Management & Catering Technology.

Some major problems faced by the cluster are:

The industry is highly heterogeneous in terms of the range of products, technology used, problems faced and facilities required therein Nature of industry not conducive for subcontracting relationship. In the case of smaller and tiny units, the need to cooperate on process parameters does not exist. Unhealthy competition remains the trend among smaller units Co-operation limited to common enemy as Government None of associations provided technical, marketing, training, advisory and legal services to its members. Government extension institutions considered to be ornamental only Bigger units have different problems. Most important observation of these industrial units are related to the Government policies, lack of expensive testing equipment specially required for exports, lack of training facilities and Provision of timely and correct information. Provision of working capital finance Lack of raw material standardization.

3- Cosmetic Clusters:

The main cosmetic clusters & hubs are Mumbai, U.P. Kolkata etc. **Herbal & Cosmetic Cluster, Mumbai**, institute with the approval of O/o. DC (MSME), New Delhi had selected Herbal & Cosmetic Cluster, Mumbai for providing necessary support and assistance for the cluster members. Soft interventions in respect of marketing support, capacity building, technology &

quality up-gradation, developing trust amongst the cluster members, awareness regarding various financial schemes of MSMEs etc. were carried out.

Cosmetic & Packaging Cluster has 240 functional units and 2200 direct and 5000 indirect employee. The average Investment in Plant & Machinery, Micro Enterprises is 25 Nos. The major problems faced by cluster are skill up-gradation of personals and finance infrastructure development.

4- Material Clusters:

The main material packaging hub & clusters are in Karnataka (Bangalore), Himachal Pradesh, Uttar Pradesh, Maharashtra, Delhi, Punjab etc.

Parwanoo Paper Based Packaging Industry, Solan (Himachal Pradesh): The total numbers of firms are 70 and total numbers of workers are 1500. There are many associations in cluster such as follows:

- Parwanoo Industries Association
- Single Window Clearance Agency (SWCA)
- National Small Industries Corporation
- MSME Development Institute
- Himachal Pradesh Centre for Entrepreneurship Development (HPCED)
- National Research & Technology Consortium
- Bureau of Indian Standards
- Baddi, Barotiwal, Nalagarh Development Authority
- Baddi Barotiwal Nalagarh Industries Association
- Banks & Financial Industries (B & FIs)
- Himachal Pradesh State Pollution Control Board (HPSPCD)
- Himachal Pradesh Small Industries & Export Corporation (HPSI&EC)

Major problems faced by cluster is Technology up-gradation , capacity building of the cluster actors, Marketing & diversification , Common facility creation, Monitoring & reviewing of cluster development programme.

Printing & Packaging Cluster, Ludhiana: The cluster consists of more than 600 units. About 450 units are under micro sector rest of them are under small sector. The cluster directly employs 12000 persons approximately and about 10000 persons receive indirect employment in the cluster. The principal products manufactured in the cluster are: folding carton, corrugated cartons, lables, price tags & stickers, books & magazines, stationery, poster and cards etc.

Pilakhua Textile Printing, Ghaziabad (U.P.): The cluster consists of 400 units and all are micro sector. The cluster has 20000 employee and the major products are textile printing, bed sheets and pillow cover and packaging of materials. The major problems faced by cluster are lack of knowledge on packaging material and labelling, lack of infrastructure facilities like washing facility and process houses, lack of quality assurance mechanism and lack of new production innovation.

Noida Plastic, Gatum Buddha Nagar, UP.: The cluster consists of 350 units (70- micro, 280 small). The cluster has 6500 employee and associated with Indian Industries Association. The major products of cluster are Automobile components, Household Goods, Electrical/ Electronic goods, Packaging Materials, PVC/HDPE pipes, Plastic Toys, Water Storage Tanks etc.

Major problems faced by cluster are : the cluster units are facing problems due to use of old technology. They are not able to produce quality products. The cluster lacks innovative design due to lack of proper moulds, facilities and guidance. Due to lack of awareness and proper training the units face problems in respect of repairing of moulds and its maintenance. Due to break down the cluster units suffer a lot due to loss of production. The cluster units are totally dependent on the manufactures of Electric/Electronic manufacturers. Because of poor quality and lack of awareness, they are exploited by these manufactures or their sub contractors for rate and quality. Since the units are not aware of the quality of their products due to lack of testing facilities for raw materials as well as finished goods they are unable to earn more margin than available despite use of good raw materials.

Chapter 7

The Packaging Industry: Profile and Problems of the MSMEs

Indian packaging industry is highly fragmented with a large number of small scale companies and a few large integrated players. According to estimates of Indian Institute of Packaging, Mumbai, there are more than 22,000 registered packaging companies in India, more than 85 percent of which are MSMEs.

The larger companies are highly capitalized and usually involved across the higher value added activities like material production, innovative products and design and higher volume supplies catering to the larger demand segments like F&B and cosmetics. The MSMEs in India are usually companies involved in the lower value added activities like conversion, filling and production.

The organized sector in India accounts for nearly 50 percent of the volumes whereas the balance is highly fragmented and distributed. Globally the scenario is somewhat more consolidated nearly 75 percent of the global packaging industry by value is accounted for by 20 percent of the largest integrated global players.

With increasing globalization where competitions with foreign competitors are occurring even on home grounds or local traditional markets, the packaging challenges for MSMEs are likewise enhanced. This problem can be viewed instead as an opportunity in terms of an untapped potential for the packaging sector to cater to. The key is to know what the market requirements are and which cost effective packaging solutions will meet them best. Therefore, a field survey was conducted to ascertain the profile of the MSMEs units and identify key problems that the MSME units face on day-to-day functioning. The findings of the survey are described below:

Profile of the MSMEs

The brief profile of the MSME Units currently doing businesses in the Packaging Industries is described in the below tables:

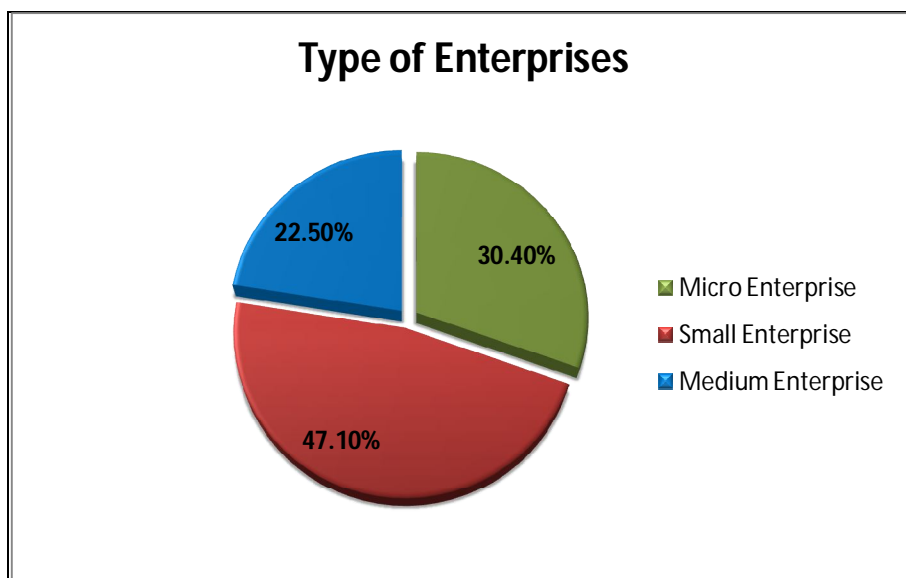
Type of Enterprises

Out of the total industries, the survey observed the representation of Medium Enterprises is relative less in comparison to Small and Microenterprises. As the findings reveal majority of industries are small enterprises (47.1%) followed by micro enterprises i.e. 30.4% and medium enterprises i.e. 22.5%.

Table-2 Types of Enterprises

Type of Enterprises	Number	Percentage
Micro Enterprise (upto Rs. 25 Lakh)	31	30.4
Small Enterprise (> Rs. 25 lakh and upto Rs. 5 crore)	48	47.1
Medium Enterprise (> Rs. 5 crore and upto Rs. 10 crore)	23	22.5

Chart-10 Types of Enterprises



Type of Ownership

The survey observed the representation of enterprises registered under Companies Act is relative less in comparison to Proprietary firms. As the findings reveal majority industries are proprietary firms (55.9%), followed by private limited companies (23.5%) and Partnership firms (20.6%).

Table-3 Type of Ownership

Type of Ownership	Number	Percentage
Proprietary	57	55.9
Partnership	21	20.6
Private Ltd. Company	24	23.5

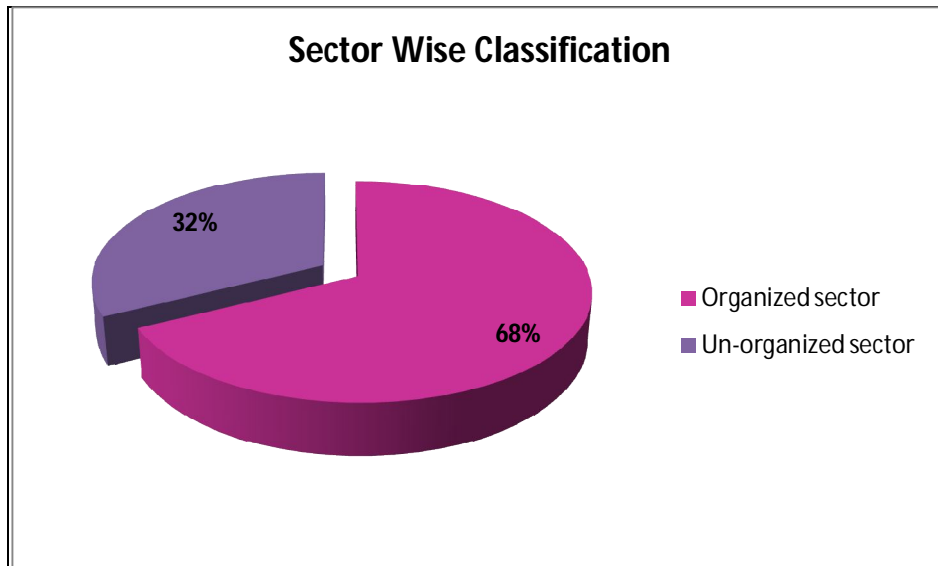
Sector wise Classification:

The survey observed that 67.6 percent of the industries are under organized sector and 32.4 percent belongs to un-organized sector. This concludes that almost 2/3rd industries are registered under ISI, ISO, BSI, Agmark, NSIC etc. These industries follows the Government & International guidelines therefore the packed products available in the market are good in quality resulting in better and hygienic product, which plays a very vital role in the food sector where quality, hygiene and shell life of product.

Table-4 Sector Wise Classification

Sl.No.	Classification	Number	Percentage
1	Organized sector	69	67.6
2	Un-organized sector	33	32.4
Total		102	100

Chart 11- Sector Wise Classification



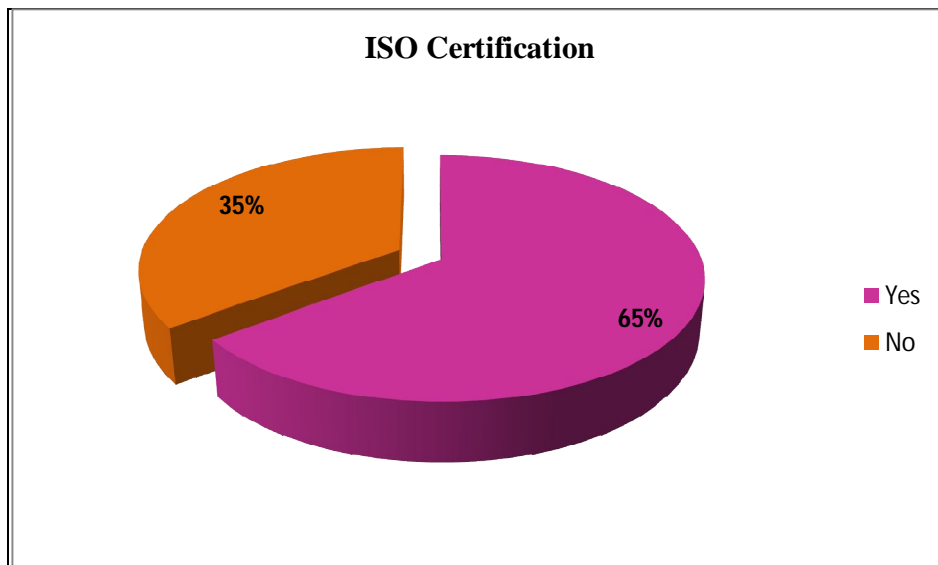
Certification with ISO

The findings of the survey brings that all the packaging industries are not ISO certified. Out of the total industries surveyed 64.7% industries have ISO certification and 35.3% do not have ISO certification.

Table-5 ISO Certification

Certification	Number	Percentage
Yes	66	64.7
No	36	35.3

Chart-12 ISO Certification



Other Certification (BSI, GMP, Agmark etc)

When asked about the availability of other certifications, the survey shows that 65.7% industries have other certifications like BSI, GMP, Agmark etc. and 34.3% mentioned that they don't have any type of certifications. As the findings highlight almost one-third MSME packaging industries are carrying their production without having quality certification.

Table-6 Other Certification (BSI, GMP, Agmark etc)

Certification	Number	Percentage
Yes	67	65.7
No	35	34.3

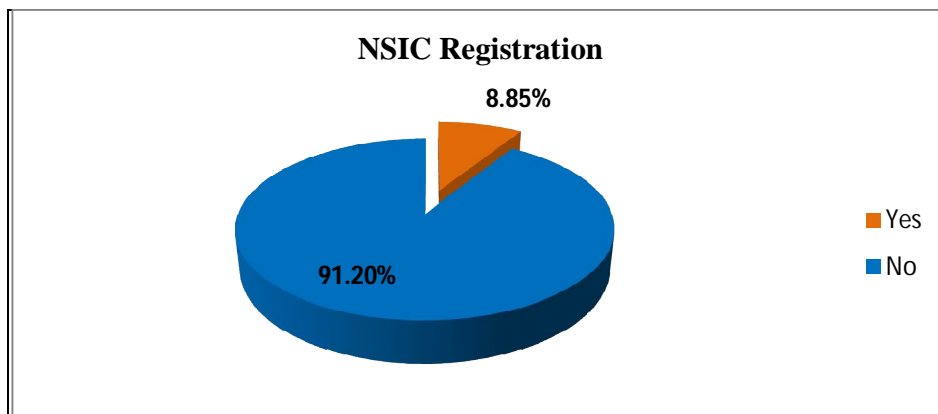
Registered with NSIC

The study findings out of the total industries surveyed only 9 industries are registered with NSIC, rest of the 93 industries are not registered with NSIC. It shows that NSIC registration of packaging industries is very low.

Table-7 Registered with NSIC

Registration	Number	Percentage
Yes	9	8.85
No	93	91.2

Chart-13 NSIC Registration



Membership in Packaging Associations

The study intended to find out whether MSME units are registered with Industry Associations or not. The findings highlight majority of packaging industries (76.7%) do not have joined any Packaging Association currently functional in India. On the other hand, only 23.3% MSME units have joined Associations and getting the benefits.

Table-8 Membership in Packaging Association

Membership	Number	Percentage
Yes	24	23.3
No	78	76.7

Profitability Status of MSME Packaging Industries

The study intended to find out whether the packaging industries currently operating in the sector are earning profit or incurring loss. The findings indicate 91.3% manufacturers are earning profit while 8.7% packaging industries are incurring financial loss.

Table-9 Profitability Status of MSME Packaging Industries

Particulars	Number	Percentage
Profitable	93	91.3
Not profitable	9	8.7

Financial health of the Packaging Industries (Sick Unit)

The findings indicate 97.1% packaging industries have never become sick while only 2.9% packaging industries units have become sick because of lack of finance, low production, change in technology and infrastructural related problems.

Table-10 Financial health of the Packaging Industries (Sick Unit)

Sick Unit	Number	Percentage
Yes	3	2.9
No	99	97.1

Availed Facilities from the Government

The survey highlights majority of manufactures (95.1%) did not avail any facilities/benefits from the Government while 4.9% packaging industries received benefits/supports from the Government. This clearly brings that the support of the government to MSME Packaging Industries is almost negligible. They don't have avail the facilities because of high margin.

Table-11 Aailed Facilities from the Government

Availed Facilities	Number	Percentage
Yes	5	4.9
No	97	95.1

Investment in Plant and Machinery (Book Value)

The study collected information from MSME enterprises about the investment that they have made in plant and machineries. The study reveals 32% enterprises have invested upto 25 lakhs in plants and machineries while 23.4% enterprises have invested between 26 to 100 lakhs.

Table-12 Investment in Plant and Machinery (Book Value)

Particulars	Number	Percentage
Investment upto 10 lakh	10	9.7
Investment between 11 to 25 lakh	23	22.3
Investment between 26 to 60 lakh	18	17.5
Investment between 61 to 100 lakh	6	5.9
Investment between 101 to 400 lakh	12	11.6
Investment of more than 401 lakh	13	12.6
Did not mention	20	19.4

Packaging done under One Roof

The study reveals 81.6% industries are manufacturing and packaging facilities in the same plant. Only 18.4% industries are not doing the packaging in same plant. These manufacturers are dependent on outside sources for packaging.

Table-13 Packaging are done under one roof

Packaging	Number	Percentage
Yes	83	81.6
No	19	18.4

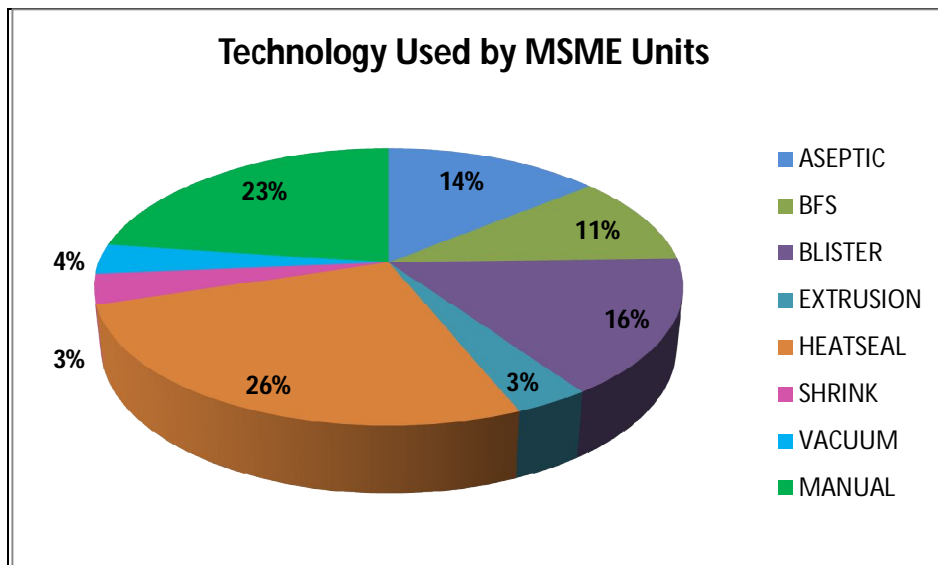
Technology used by the MSME Units

The study tried to map the technology status of the current MSME units engaged in the Packaging sector. The findings suggest 14.0% units are using aseptic technology, BFS (10.5%), Blister (15.8%), Extrusion (3.5 %), Heat Seal (26.3%), Shrink (3.5%), Vacuum (3.5%) and Manual (22.8%). As the findings indicate the MSME units remain far off from the modern technologies practiced by the organized sector and big industries.

Table-14 Technology used by the MSME Units

Technology	Number	Percentage
ASEPTIC	8	14.0
BFS	6	10.5
BLISTER	9	15.8
EXTRUSION	2	3.5
HEATSEAL	15	26.3
SHRINK	2	3.5
VACUUM	2	3.5
MANUAL	13	22.8

Chart-14 Technology used by the MSME Units



Awareness on Latest / Up-to-date / Modern Technologies

The study reflects that 66.7% manufacturers are not aware of the modern technologies practiced in the packaging industry. Awareness on latest / modern technologies is known to only 33.3% manufacturers. As the findings reveal, majority manufacturers in the MSME sector are not in touch with the latest developments happening in the sector.

Table-15 Awareness on Latest / Up-to-date / Modern Technologies

Awareness on Modern Technologies	Number	Percentage
Yes	32	33.3
No	64	66.7

Interested in Technology Up-gradation

The study intended to get the views of the MSME units on technology up-gradation of their respective manufacturing units. The findings reveal 64.1% manufacturing units believes that do not require technology up-gradation because their market requirement is fulfilled with the support of the available technologies. On the other hand, 35.9% manufacturers are keen to

upgrade their technologies to meet the current demand of the market and enhance their production capacity.

Table-16 Interested in Technology Up-gradation

Technology Up-gradation	Number	Percentage
Yes	37	35.9
No	65	64.1

Problems of the MSMEs in Packaging Sector

Though packaging industry has witnessed considerable progress over the last few years and government has accorded high attention to the sector, the situation is that we are still miles away from achieving the right status for the industry. We are still way behind the other developing and developed countries in terms of per capita consumption, the technology of packaging, professional orientation, the quality of raw material used, the infrastructure support and consumer awareness levels.

Quality of packaging material used in India by MSMEs is not matching the world standards. The buyers of packaging material accept or reject the material only by looking to the performance on the packaging lines. At the same time, the R&D facilities available with the MSMEs are inadequate for development material/systems or for carrying test on new material in order to gauge their performance under Indian conditions. There has been a lack of R&D effort and application engineering in the introduction of new packaging material/concepts/systems and processing formulation for different products vis-a-vis Indian conditions. We have till date not been able to come out with plastic pouch which could be 100% suited to edible oil/ghee packaging despite considerable efforts. No effort has been made so far in industry to present the factual data with regards to real value addition through packaging. In fact there is absence of reliable statistic on capacities, turnover, and other statistics about this industry.

As evident, the industry is facing various challenges such as rapid changes in technology, shortage and rising cost of raw material, high levels of inflation, rising input costs, highly-

inadequate credit flow, lack of market access, lack of exposure to best management and manufacturing practices, marketing, distribution and branding, and 100 per cent commitment to the quality standards. The non-availability of skilled manpower is also another challenge. It is a fragmented industry sub-divided on the basis of pricing strategies. There are counterfeit products and the industry is continuously evolving, with a constant requirement of new products and consequently, for new packs styles. There is also a requirement for end-to-end solutions, automation and integration of primary and secondary packaging machines.

During the survey, the MSME industries were asked to state the details of the problem that they face while running their respective industries. The details of the problems that they face during their day-to-day operations are high cost of packaging materials (23.2%), followed by Loan /Bank/Financial Institution (17.4%), lack of skilled labour (12.6%), highly inadequate credit flow (12.1%), irregular Power supply (8.4%), lack of marketing, distribution & branding (8.4%), lack of training facility (7.8%), storage of product & packaging materials (4.7%), procurement quality of packaging materials (4.7%). In a nutshell, the major problems that the MSME units are currently facing are high cost of packaging materials, loans, lack of skilled labours, highly inadequate credit flow, lack of marketing, distribution & branding and lack of training facilities etc.

Table-17 Problems that the MSME Units faced during Operation

Particulars	Number	Percentage
Loan (Bank/Financial Institution)	33	17.4
Highly inadequate credit flow	23	12.1
Procurement quality packaging materials	9	4.7
Storage of product & packaging materials	9	4.7
High cost of packaging materials	44	23.2
Irregular Power supply	16	8.4
Lack of skilled labour	24	12.6
Obsolete machinery	1	0.5
Lack of marketing, distribution & branding	16	8.4
Lack of training facility	15	7.8

Remedial Measures to Improve the Conditions of the MSMEs

The MSME units were also asked to give their views on remedial measures that they perceive are vital to improve the condition of the MSMEs working in the Packaging industry. The major suggestions received are Up-gradation of Technology to meet the current market demand (25.8%), Subsidy by the Government (10.6%), Financial Support / Bank Loan (13.6%), Advanced Machinery at a cheaper rate by the Government (9.1 %), Reduction in raw material cost (15.2%), Availability of Labour - skilled and non-skilled (7.6%), increase in production demand (3.0%), reduction in labour cost (3.0%), More training on latest technology and exhibitions (7.6 %) and Uninterrupted Power supply (4.5%).

Table-18 Remedial Measures to Improve the Conditions of the MSMEs

Particulars	Number	Percentage
Upgradation of Technology	17	25.8
Labour Availability	5	7.6
Financial support / Bank loan	9	13.6
Subsidy	7	10.6
Reduction in Raw Material Cost	10	15.2
More training and exhibition	5	7.6
Cheaper machinery by Government	6	9.1
Reduction in Labour Cost	2	3.0
Uninterrupted power supply	3	4.5
Increase in Production Demand	2	3.0

Factors affecting the growth of the Packaging Industry in MSME Sector

The study intended to find out the key factors that are affecting the overall growth of the MSME Packaging Industries in India. The major factors that affect the overall growth of the industry are as follows:

- High Labour Cost and Low Demand
- Consumer awareness and brand value
- Quality of Product
- Financial Problem of the MSME Industries
- Unavailability of incentives / subsidies by the Government
- High Cost of raw material
- Intense competition in the Industry
- Lack of training facilities for MSME industries on Advance Technology
- High Cost of Packaging Raw Material and

- Unavailability of trained / skilled manpower

Today market demands are getting stronger for packaging development supporting a sustainable society. Packaging must perform well in all three dimensions of sustainability, i.e. people (social), profit (economy) and planet (environment). A good package should be cost-efficient and provide value to generate revenue, it should have a good user interface (hand leability, information etc) and should be lean on resources, recoverable and prevent its contents from being spoilt. Innovation, knowledge generation and transfer are key elements to realize this and WPO – World Packaging Organisation tries to contribute through e.g. the World Star (Student) Award Scheme, within the framework of its mission: “Better Quality of Life through Better Packaging to More People”.

The health of the Indian packaging industry is strongly linked to that of the world economy as a whole. However, reliant upon upstream industries for their raw materials, packaging converters have to cope with fluctuations in raw material prices, dependent upon levels of supply and demand. In a climate of low overall inflation, rising prices for raw materials have put something of a squeeze on converters. Downward pressure on prices is being exerted by brand owners and retailers alike – exacerbated by moves towards consolidation at all levels of the supply chain. In addition, moves towards central purchasing by packaging buyers have also impacted upon packaging margins. To summarize, also in limited growth, mature markets in Western Europe, Japan and North America, there remain opportunities for growth driven by more functional and convenient packaging, as well as general growth across a range of consumer goods areas. At the same time, rapid growth in packaging usage in the fast-growing economies of Asia, Middle East, Latin America and also Eastern Europe has presented new opportunities for packaging suppliers.

Chapter 8

SWOT Analysis of MSMEs in Packaging Industry

Packaging is a large and important business both in the India and globally. It is an unusual sector in that it cannot exist on its own. The nature of packaging is such that it is intertwined with many other industries, such as food & drink, personal care, pharmaceuticals, chemicals etc. The role of packaging is vital to the commercial success of both consumer and industrial products in that it offers product protection, information and, in some cases, plays a key marketing role.

Packaging Industry is an important sector, adding value to the various manufacturing sectors including agriculture and FMCG segments. Worldwide, the industry is facing various challenges of meeting the consumer preferences and driving sales of different products. The industry has adopted various upgraded technologies such as aseptic packaging, retort packaging and biodegradable packaging to enhance the shelf life of food products. More than 600 to 700 types of packaging machines and equipments are manufactured by MSME sector.

Particularly in MSME sector a number of factors tend to limit the actual adoption of upgraded technologies, as well as inadequate support facilities to sustain usage of upgraded technology. The perceived lack of purchasing power of potential consumers is a good reason for entrepreneurs not to upgrade technology or even produce at all. The same is true for problems related to poor distribution, lack of sales promotion of these technologies or the inability to repair and maintain facilities necessary for their continued adaptation. Analysis of strengths, weaknesses, opportunities and threats (SWOT) for the packaging industries in MSME sector has also been conducted. The analysis given below has been established during the interview and discussion with the different officials and industry representatives

		Helpful	Harmful
		To achieving the objective	To achieving the objective
Internal origin (attributes of the system)	<i>Strengths</i>	<ul style="list-style-type: none"> • Never ending sector • Strong supply chain partnership • Low cost producer • Customer- oriented Strong relationship • India is freight advantageous zone. • Good no of industry representation • Flexible and self managed business • Skilled manpower with more than 100 years of experience • Availability of low cost labour 	<ul style="list-style-type: none"> • Inadequate focus on quality control mechanism • Lack of proper R & D facilities and activities • MSMEs are not able to invest on required technologies. • High cost of input material. • Continuous fluctuation of raw material prices. • Lack of better quality data in terms of raw materials, buyer and supplier. • Inadequate regulatory mechanism • Highly fragmented packaging market • Inadequate prevention of usage of lower grade raw material • Inadequate mechanism for health sensitive packaging
	<i>Weaknesses</i>		

External origin (attributes of the environment)	<i>Opportunities</i>	<i>Threats</i>
	<ul style="list-style-type: none"> • Increasing demand for processed and packaged food. • Retail boom will increase packaged food products • Indian GDP will provide opportunity for growth of packaging spends. • Changing food habits and health consciousness of next generation Indians • Rising as lifestyles get busier and the size of the middle class increase. • Consumer desired for added convenience with stimulates growth. • Online shopping may stimulate sophisticated packaging. • Increased usage of recycled materials can improve environmental performance • Packing should be sold on the basis of supply chain cost not, on price. • Convince the public the environmental benefits of packing • ISO certification for the maintaining world class standards in the globalization. 	<ul style="list-style-type: none"> • Rising cost of raw material which has to be imported completely from outside. • Lack of IT capability may damage to serve market effectively. • Lack of innovation • Non availability of most of the equipments and raw materials in India • Inappropriate SIC (The Standard Industrial Classification) code • Pricing pressure • International labour and environmental laws. • Reducing tariff levels on imports result in unscrupulous dumping of lower grade raw material

In the era of globalization where competitions with foreign competitors are occurring even on home grounds or local traditional markets, the packaging challenges for MSMEs are likewise enhanced. This problem can be viewed instead as an opportunity in terms of an untapped potential for the packaging sector to cater to. It is important to know the market requirements and

which packaging solutions will meet them best. The major strength of packaging in MSME sector, it is self managing business, availability of low cost of resources and the huge market is developing day by day because of changing mind-set of consumers in India. With this, the consumers are highly sensitive towards the quality standers of packaging. Most of industries in MSME sector are not able to maintain the quality per customer requirements. This is because of the lack of updated technologies, better R & D facilities, non availability proper data, low quality standers etc. In the packaging sector, the huge opportunities are available for MSME sector because, the most of the packaging business is outsourced by big manufactures and this sector is never ending sector. The oppotunities may be availed by the development and enhancement of technologies, R&D, process control, ISO certification etc.

In addition, strategic challenges that are ahead of the Indian MSME manufacturers as a whole have been identified. The four areas included global challenges, business level issues, tactical issues and customer front. The strategic challenges and their options have been summarized below.

Type	Strategic Challenges	Strategic Solution
Global	<ul style="list-style-type: none"> Upgraded Technology and focus on R & D activities 	<ul style="list-style-type: none"> Improve quality standers
Business	<ul style="list-style-type: none"> India’s per capita packaging consumption is less than \$ 15 against worldwide average of nearly \$ 100. Competition with substitute forms of packaging Value innovation Maintain of quality standards Cost effectiveness 	<ul style="list-style-type: none"> Growth of MSME market share in Indian Packaging Industries. Enhancement of cost competitiveness of packaging solutions and innovations. Continuously checking of the process and maintain quality standards
Operational	<ul style="list-style-type: none"> Proper capacity utilization. 	<ul style="list-style-type: none"> Increase through inputs

Consumer	• Consumer satisfaction	• Maintaining quality standards and process control
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The strategic solutions to face the challenges are the capacity enhancement of the existing facilities and upgrading the technology. Improvement of quality standards can be achieved through the implementation of initiatives, such as the Statistical Process Control (SPC) and implementation of IT. The greatest advantage of globalization is the continuous growth in the market and per capita consumption of the end-product.

The operational improvements can be achieved through the implementation of the Total Operational Performance (TOP), which is a three-pronged strategy to improve upon throughput, reduce costs and improve quality. This may be called for improving the Overall Equipment Effectiveness (OEE), thereby improving on all organizational aspects of losses on the account of productivity, quality, safety, environment, cost, etc. by the industries under MSME sectors.

Through this MSME industries can face the challenge posed by the increased cost of raw materials. Customer satisfaction is also major challenge for the MSME sectors because consumers are more sensitive towards the quality and attractive packaging. This challenge can also face by the adaptation of Total Quality Management (TQM).

In the Indian economy growing and the purchasing power also rapidly rising, it is being observed that cost, which is, being considered as one of the main factors for purchasing decisions, may not remain the same in the times to come. Therefore, the new value curve at the consumer level should be established. This can be helpful to identify the factors that matter most to the consumers, who are going to be the driving force for decision-making in packaging.

In order to overcome the new challenges, it can be concluded that now is the right time for the MSME sector to implement strategies in terms of innovating value. The manufactures should stop operating in the given industry conditions and the conditions set by their competitors. Competitive benchmarking cannot help to create a new strategic position and increased market

share. Imitative approaches should be avoided. The manufacturers should shift their mind-set from a competitive one to value innovation.

In an era of competition with challenges from global the initiatives help in gaining competitive advantage in terms of cost, productivity and quality. However, the time is sharp to undertake future strategies for the MSME sector has to innovate in terms of value and create a position for itself.

Chapter 9

Technology Gaps in the Packaging Techniques in MSME Sector

Technological capabilities can be best described in terms of three levels: the basic level involves the ability to operate and maintain a new production plant based on imported technology, the intermediate level consists of the ability to duplicate and adapt the design for an imported plant and technique elsewhere in the country or abroad, while an advanced level involves a capability to undertake new designs and to develop new production systems and components.

Indian Packaging Industry firms present a full spectrum of technological capabilities - while there are few firms close to the international frontier in terms of product design capability and process technology, technological capabilities of most players are extremely limited due to growing technological obsolescence, inferior quality, limited range and high costs. This adversely affects the ability of the organizations to respond to the challenges, not only of increasing international competition from other low-wage countries like China, but also from trade liberalization within the context of WTO. Most Indian firms appear to be stuck at the basic or intermediate level of technological capabilities. Though Indian packaging industry has mastered standard techniques it has remained dependent for highly expensive and complicated technologies.

PHARMACEUTICAL:

Segment	Technology (MSME)	Current Trend
Tablet	Blister Packaging	Blister Packaging
I.V.	Blow Fill Seal (BFS)	BFS
Oral Solutions	Oral Filling Machine	Oral Filling Machine
Ointments	Tube filling and sealing machine	Tube filling and sealing machine

There are four major types of products manufactured by Pharmaceutical industry i.e. Tablets, Intravenous (I.V.) Solutions, Oral Solutions & Ointments. In comparison with the current trend of packaging technology in this sector, Indian MSMEs are at par. Indian Pharmaceutical (MSMEs) is following the international guidelines and trends. These industries are maintaining the General Manufacturing Procedures (GMP) and Quality Standards in there manufacturing and packaging procedures.



FOOD INDUSTRY:

Food industry is sub-categorized in four segments i.e. Raw Food, Processed Food, Semi-Processed and Frozen Food.

Segment	Technology (MSME)	Current Trend
Raw Food	Pouch Packaging	Vacuum Packaging
	Heat Seal Packaging	Freeze-Thaw Dehydration Technology
	Manual Packaging	
Processed	Pouch Packing	Tetra Pack
	Aseptic Packaging	Aseptic Packaging
	Vacuum Packaging	Injection molded Plastic Container Packaging
	Heat Seal Packing	Inert Gas Packaging
Semi-Processed	Vacuum Packaging	Vacuum Packaging
	Pouch Packing	Tetra Pack
	Aseptic Packing	Aseptic Packaging
	Heat Seal	Skin Packaging
Frozen	No Technology (Cold Storage facility is unavailable in MSMEs)	Freeze-Thaw Dehydration Technology

Technology Gap Assessment in Food Segment

In order to assess the gap; the food sector is divided into four segment. The details of the analysis are given below:

Raw Food: This segment consists of food items as Raw Meat, Fruits & Vegetable etc. This segment of food is most vulnerable. The effect of environment and microbes is most prominent in this segment, reducing the shell life the food item dramatically. For enhancement of the shell life and retention of nutrients of raw food many kind of packaging techniques are used (depending upon the nature of the food item).



The current technologies used in raw food packaging are **Vacuum Packaging** and **Freeze-Thaw Dehydration Technology**. In vacuum technology all the air is sucked out of the packing in disables the growth and metabolic activates and in freeze-thaw dehydration Technology the water content of the food is dehydrated which stops the activity of the microbes. In both the technologies the packaging is done such a way that it controls the activity and growth of the microbes enhancing the shell life of the food.

On the other hand most of the unorganized MSMEs are still using traditional packaging techniques such as **Pouch Packaging**, **Heat Seal Packaging** and **Manual Packaging**. In these packaging techniques minimal technology is used and no procedures are used to enhance the shell life of the food item. Do to this the storage of raw food is very difficult.

Processed Food: This segment consists of food items such as Juice, Ketchups, Wafers, Bakery Items, Ready-to-Eat food, etc. This is the most consumed segment of the food industry. This segment of food item is least effected from environmental conditions and microbial activity as while processing of these food item preservatives are generally added.



The current technologies used in **Processed Food** segment is **Tetra Packaging, Aseptic Packaging, Inert gas Packaging** and **Injection Molded Plastic Container Packaging**. In Tetra Packaging, Aseptic Packaging, Inert gas Packaging, the packing material/container and the products are made separately, but the main concern of these techniques is to minimize the chances of contamination, while packaging. Whereas in Injection Molded Plastic Container Packaging technique the formation of the container, filling/packing of product and sealing of the packing is done simultaneously, this eliminates the chance of contamination.

Indian MSMEs are adapting some current techniques such as Aseptic Packaging & Vacuum Packaging but most of the unorganized MSMEs are still using Pouch Packaging and Heat Seal Packing. These types of traditional packaging do not control the environmental and microbial effects, resulting in decrease in the shelf life of the food items.

Semi-Processed Food: This segment consist of food items such as, milk, half cooked food, Semi-processed meat products etc. The main challenge for this segment is to retain the nutrients and flavor as they are semi-processed. It is very important that the packaging of semi-processed food is done in such a way that its interaction with the outside environment is minimal.



Current technologies used in semi-processed food items are **Vacuum Packaging, Tetra Packaging, Skin packaging, Aseptic Packaging** etc. These technologies reduce the contact of outside environment. It enables the food items to retain their nutrients and flavor for a longer time, also increasing its shelf life.

MSMEs of India are also practicing these technologies to some extent. Aseptic Packaging, Vacuum Packaging but still majority of MSMEs are still using the traditional packing methods like Pouch and Heat Seal Packaging. Retention of nutrients and flavor is very difficult from these methods. These packaging technologies don't control the effect of environment and microbes on the food to the desired level. This reduces the shelf life of the product making it difficult to store.

Final Report on “*Technology Gap Assessment in Packaging Techniques in MSME sector*”

Frozen: This segment of food items such as Fruits, Vegetables, Raw Meat, Fish and many Semi-processed food items. In this the food items are packed and frozen in deep freezers and cold storage facilities. It enables us to store the food items for a very long time and use them in off seasons.



Currently Freeze- Thaw Dehydration Technology and Deep Freeze Technology are used in this segment. It is the best way to preserve the food with its nutrients. The ultra cold storage disables the metabolic activity of the microbes enabling us to preserve food items for years.

Currently majority of the Indian MSMEs are not dealing in this segment and they don't have the facility of cold storage.

COSMETIC INDUSTRY:

Cosmetic industry is segmented in two categories: Color Cosmetic and Chemical/Herbal Cosmetics depending upon their nature, composition and usage.

Segment	Technology (MSME)	Current Trend
Normal/ Herbal Cosmetic (Solution filling Machine)	Corrugated Packaging	Shrink Packaging
Color Cosmetics (Mould filling technology)	Heat Seal Packaging	Blister Packaging

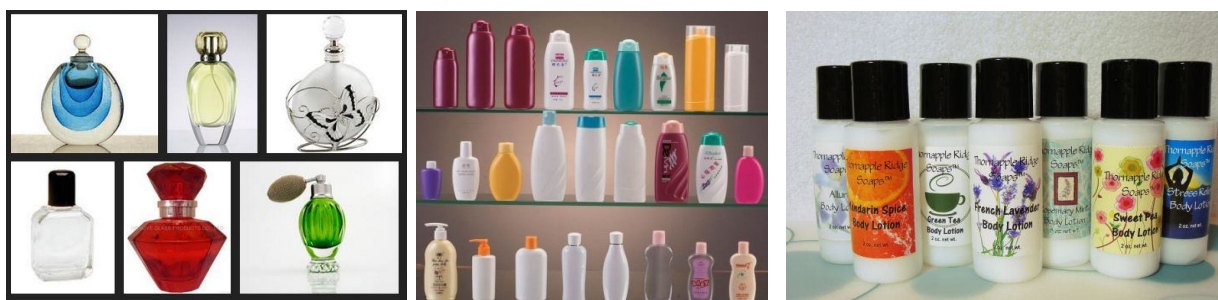
Color Cosmetics: This segment consists of items like Nail Polish, Lipsticks, kajal, Mascara etc.



Current trend of packaging technique for these items is Blister Packaging, Shrink packaging and Counterfeit Packaging. This disables the product from duplicacy and enhances the look of the product.

On the other hand MSMEs of India are still using traditional method of packaging such as Corrugated Packaging and Heat Seal Packaging. Although these are secondary packaging and does not play much role in quality of the product but affect the consumers psychology thorough looks and branding.

Chemical/ Herbal Cosmetic: This segment consists of items such as Face Creams, Body Lotions, Perfumes, Shampoo & Conditioners etc.



Current trend of packaging of these items are Shrink packaging and Counterfeit Packaging. This disables the product from duplicacy and enhances the look of the product. On the other hand MSMEs of India are still using traditional method of packaging such as Corrugated Packaging and Heat Seal Packaging. Although these are secondary packaging and does not play much role in quality of the product but affect the consumers psychology thorough looks and branding.

MATERIAL PACKAGING:

Material Packaging industry is segmented in to three categories, Heavy, Medium & Light Material depending upon the shape, size and weight of the material.

Segment	Technology (MSME)	Current Trend
Heavy Material	Minimal Packaging	Shrink Packaging
Medium Material	Corrugated Packaging	Shrink Packaging
Light Material	Bubble Rap Packaging	Skin Packaging

Current trend of material packaging consists of wide type of packaging techniques. Latest Shrink and Skin Packaging methods are practiced as they provide better protection and easy handling of the material.

As these items of segments are less likely to get ruined and is more stable Indian MSMEs doesn't pay much attention to their packaging. Minimal packaging methods are used for items of this segment such as Corrugated Packaging & Bubble Rap.

Factors in Technological Competitiveness

The technology competitiveness of a country is determined by a combination of policy factors and industry specific factors. This section outlines the factors and their status in Indian context.

Policy Factors

Import Substitution

The import strategy of the Indian government, which fostered the development of a wide range of industries, also facilitated the un-packaging of technology imports, and hence helped absorption and accumulation of technological learning. Though India achieved self-reliance in technologies for local production and consumption owing to the policy of import-substitution and self-reliance, it could not build capacity to create internationally competitive technologies to produce for international markets. As a result, export competitiveness capabilities could not be acquired.

Human Resource Development and Technology Infrastructure

The expansion of infrastructure for technical and higher education under the Scientific Policy Resolution, 1958 has ensured an adequate supply of qualified technical personnel and high degree of self-reliance – facilitating quick replacement of foreign personnel and absorption of imported technology. Although Indian organizations are served by a network of national laboratories and institutional infrastructure, these institutions generally fall short of quality when compared to those in industrialized countries – putting India at a comparative disadvantage. The role of national laboratories in designing and innovations varies from industry to industry. The main determinants of success of national R&D institutes appear to be the nature and extent of

laboratory-industry interaction, the extent of market orientation of products and accessibility. Since most of the R&D effort is limited to specialized institutes, rather than in-house, market orientation is a weak link.

The culture of collaborative research involving different institutes has not been promoted in past and the limited resources are not pooled through networking to develop core technologies in sectors where Indian industry has potential. Another vital link missing is the isolation of universities from R&D. While universities are the major research centres in almost all developed countries, especially Germany, Taiwan and Korea, in India they are isolated from scientific research and advancements. This is largely because government funding of the research institutes does not goad them to seek funding from industry and industry associations through fees and royalties charged for work performed. This results in low commercial orientation. This has also affected the quality of higher scientific education, which is becoming increasingly irrelevant over the years.

Structural and Industry-specific factors

However it is necessary to continuously upgrade the manpower skills in technical and techno-managerial dimensions. In a labour -surplus economy, new and efficient technologies tend to be discouraged unless sufficient redeployment opportunities are created. This result in a vicious cycle where new technologies are not introduced, the engineers and technicians continue to work inefficiently, and the technical manpower quality deteriorates with respect to the world.

Thus the advantage accruing from the rich pool of engineers has been frittered away by not continuously upgrading the talent pool. This has, in turn, resulted in the brain drain phenomenon leading to flight of talent to advanced countries where the opportunities to upgrade exist. India has been ranked low on the ability to retain its qualified manpower when compared with the reference group of countries. Therefore, Indian scientific and engineering talent pool is at the disposal of countries that create conditions conducive to the nurturing and advancement of this talent pool.

Technology Acquisition

Technology acquisition has traditionally been viewed as a source of techniques necessary for initiating production and hence was considered as substituting domestic R&D. In the absence of the inflows of new and advanced technologies, however, there has been little incentive, direction and capability to update the existing technologies. Technology continues to be sourced from other nations, but the firm-level technology absorption is low. This is in sharp contrast to firms in Taiwan and Korea, which absorb sourced technology and improve upon it.

Nature of international technologies markets

The nature of international markets, in respect of the seller concentration and the degree of vertical integration in an industry, affects national attempts to achieve technological self-reliance. The choice of the mode of technology import has been found to influence local technological capability building.

Product Technology

World Bank study (1990) on the Indian Capital Goods sector notes that the share of human resources devoted to design and engineering activity in Indian Capital Goods enterprises is low compared to other industrialized countries - roughly 20 to 50 per cent of what might be expected in comparable enterprises in those countries.

Sound product design and engineering work could have greater impact on ultimate product cost, value and quality than comparable efforts undertaken further down the manufacturing chain. In the firms that were sampled during the World Bank survey, there was evidence that greater engineering resources are devoted to downstream manufacturing activities than upstream conceptual design activities.

Process Technology

India has the technical ability to achieve a high level of precision, yet Indian firms are unable to produce quality products due to lack of supporting technologies, such as precision measuring, material engineering and process control. The defect rates of final products are many times 5-10 times than that of Japan and those of USA. In addition, about 20 per cent of the firms have

equipment, which is more than 20 years old, and therefore obsolete. Most Indian firms are vertically integrated and rely far less on subcontracting arrangements, although such trend is beginning to emerge.

The competing imports of products, increasingly allowed on quality and cost considerations, have led to a greater consciousness of quality and costs on the part of domestic manufacturers. The more liberalized technology import policy is also helping to bridge the technology gap. All these factors are putting pressures on the organizations to develop best-practice technology, either by importing or by generating their own. Few solitary achievements notwithstanding, there is clear evidence that technological dynamism has not taken firm root in the Indian industry. In sum, the disjointed policies in India with lack of focus have resulted in a weak innovation system and under-utilization of research capabilities created during the first phase of growth.

Thus, the overall problem relates to the lack of appropriate linkages between different actors of the national innovation system. India needs to address constraints on technology development as an important part of its overall strategy for improving manufacturing sector competitiveness. The role of government in enhancing technological competitiveness is critical to make this happen.

Technology Status:

Machine Tool industry is the backbone of any economy. It is the mother industry of Capital Goods Sector which in turn determines the share of manufacturing in GDP of any country. The Indian machine tool industry's growth is directly linked to the growth of the manufacturing/engineering industry. The Indian engineering industry, user of machine tools of all types, manufactures goods worth \$32.6 billion. Due to India's rapid modernization, engineering industry is now focusing on green field projects as well as the upgrading of existing facilities.

The primary users of machine tools are in the automotive, automobile and ancillaries, railways, defense, agriculture, steel, fertilizers, electrical, electronics, telecommunications, textile machinery, ball and roller bearings, industrial valves, power -driven pumps, multi-product engineering companies, earth moving machinery, compressors and consumer products industry

sectors. After an economic slow-down in 2000-2003, many of these industry sectors have shown positive growth trends in the fiscal year 2003 -2004.

The Indian machine tool industry manufactures a range of both conventional and computer numerically controlled (CNC) products such as metal cutting and metal forming tools. Indian firms also offer many special purpose machines, robotics and handling systems. The Indian Machine Tools Manufacturers’ Association (IMTMA) believes that CNC will be the growth driver for the Indian machine tool industry in the future.

Approximately 75 percent of Indian machine tool producers have received ISO certification. Government of India-owned Hindustan Machine Tools Limited (HMT) is the single largest producer with a 32 percent market share. Public Sector Enterprises like Hindustan Machine Tools Limited and Heavy Engineering Corporation (HMTP) Limited besides Mysore Kirloskar Limited played significant role in industrialization of India in the pre-liberalization era. In a period of 50 years, India also established more than 1000 companies in private sector to produce machine tools both in small sector as well as medium sector to meet the need of the manufacturing sector. However, Liberalization of Indian Economy in 1991 seriously impaired the performance of this sector because of various ailments of protected economy: high cost, obsolete technologies, fragmented size, low investments, poor R & D base etc. Today, the structure of the machine tool industry is rather skewed, 80% production coming from 25 companies and balance from over 300 fragmented small size companies.

The technological competitiveness of the Indian Machine Tools sector is low. Indian machine tools firms present a full spectrum of technological capabilities - while there are few firms close to the international frontier in terms of product design capability and process technology, technological capabilities of most players are extremely limited. The advantage due to high availability of quality engineers and scientists is lost, partly due to brain drain and partly due to stagnation of skill sets of scientists and engineers within India. India has a number of high quality R&D institutions, but the industry –institute interactions are low, thereby reducing the chances of creation of commercially viable technologies. Machine tools sector has a comparative disadvantage with respect to both product and process technologies. In the case of the Indian

machine tools manufacturers, the human resources devoted to design and engineering activity is about 20 to 50 per cent less than in other industrialized countries. Although Indian firms are capable of achieving high levels of precision, they are unable to produce high quality products due to lack of supporting process technologies such as precision measuring, material engineering and process control.

Firm level innovation is very low in India. Indian machine tools firms source technology, but very few of them improve upon it. The research spending as a percentage of sales amongst Indian firms are low when compared to the R&D spends of companies in Taiwan and Korea.

The major weaknesses are limited indigenous R&D capability and design innovation, low productivity, high capital investment requirement, process capabilities, finishing, safety features, costs, maintenance and operation, marketing and after sales service. Like the manufacturing sector in general, the machine tool industry also suffers from low volume production, high cost of finance and poor quality of power supply.

Technology Enhancements

The Indian Packaging industry has made efforts for up-gradation in design and productivity of machine tools in the last few years. The industry upgraded a large number of older designs or machine tools and evolves new machine designs to adapt to the specific requirements of the user sectors. In view of the growing demand of user sectors for high productivity machines, the percentage of CNC machines in the metal cutting sector has significantly improved.

The number of CNC machine tools produced has increased more than threefold in just two years. This reflects increased acceptance of CNC Technology by user’s especially small companies and greater price competitiveness of Indian CNC machine Tools. The most popular types of CNC machines produced are CNC lathes, Vertical and Horizontal Machining Centers, Wire Cut EDM, CNC External Grinders and Flexible CNC SPMs’.

Quality Move in Packaging Sector

Nearly 100 of the 400 organized sector companies are ISO 9000 certified. Many products (Over 50) are also 'CE' marked. Several machine tools are TPM Compliant (Total Productivity Maintenance), Indian machines now assure high CPK values, and some even guarantee uptime. Finish and Aesthetics have dramatically improved so also have fits and fittings, safety features and environment protection devices.

Technology Interventions

The industry has identified the following Key Factors of Success for making the industry technically competitive. These are:

1. Technology Up-gradation:

Current levels of domestic taxation are not conducive to investments. In order to encourage investments, upgrade technologies and thereby competitiveness of manufacturing industry by following mechanisms:

- a. Establish "Manufacturing Technology Up-gradation Fund" which can provide finance at reduced interest rates on long term basis

- b. Credit Linked 20% capital subsidy to SSI for the purchase of Upgraded Machines. Accelerated depreciation of equipments to encourage investments and continuously upgrade technology

2. Manufacturing Infrastructure:

For managing ten-fold growth, the packaging industry has to invest heavily in the industry. At the same time investments will have to be made in a manner that the manufacturing can remain competitive and meet global benchmarks of productivity.

- a. Encourage public private partnerships in establishing Packaging Parks at centers where clusters are active.

3. Promote Research Design & Development:

All exporting countries have well established research institutions that develop new technologies & help industry to productionize these technologies like- Germany, France, Switzerland etc. The industry is starved of technology development in the country and it requires priority attention of the government.

c. Encourage joint R & D projects resulting from Industry Institute interaction

d. Government Laboratories to focus on developing technologies that have impact on manufacturing and machine tool technologies

4. Availability of Qualified People:

The industry requires knowledge workers in the field and there is acute shortage of these people.

a. Packaging industry requires urgent focus on technology development. This requires post graduates and research scientists for designing new products as well as absorption of new technologies. More Engineering colleges need to be advised to offer graduate as well as post graduate courses on Packaging Technology.

b. To meet the demand of expert workmen Government ITIs must produce workmen having basic knowledge of mechatronics - Diploma in Mechatronics needs to be introduced at institutions offering diploma in engineering.

The Indian Packaging industry has poor technology competence due to the inward looking economic policies and dominance of public sector organizations. While this helped India initially in attaining self-sustenance, it also led to adoption of obsolete technologies in the developed countries and limited efforts to absorb and improve the imported technology. This is in contrast to the experience of Japan and Korea which developed significant scale and technology competence. Today India's competence is primarily in design and tooling industry due to availability of low-cost skilled manpower. Significant gaps exist in CNC controls, precision bearings and sensors.

This section highlights the technology initiatives required to enhance the technical competitiveness of Indian Packaging sector.

Develop and restructure technology infrastructure to support firms striving to improve their technological capabilities and competitiveness:

- Drive public R&D institutes and laboratories to become more demand -driven and service oriented, and make the resource allocation (government budgetary support) more performance driven. R&D institutes should acquire international accreditation for granting product certification in India and for providing, in competition with private consulting firms, effective technological extension services in order to help firms improve their manufacturing and design capabilities.

- Improve coordination among R&D programs through merger and consolidation of institutions that work in similar areas to create "Centres of Excellence". Institutionalize use of peer and technical panel reviews of public R&D proposals and programs to promote joint public/ private sector R&D activities for better monitoring and evaluation systems.

- Promote strong linkages between R&D institutes, universities, industrial extension agencies and manufacturing enterprises. Emphasize on international cooperation between R&D institutes and build linkages for technology development and technology transfer. Equip national institutes for providing contract R&D services to international players.

- Promote industry networks for a consortium approach to industry R&D activities and integrated development of new product designs and production processes, with the intensive involvement of and collaboration with suppliers.

Focus on selected manufacturing technologies and products

-Encourage firms, through the dissemination of relevant information, to acquire arms' length technology through technology licensing, technology transfer agreement, reverse engineering and adaptation to build their own capabilities - Establish Technology Trackers in leading

countries (Germany, Taiwan, Japan and USA) to track development of technology in key segments

- Encourage application of technologies (like business-to-business e-commerce, CRM, TPM, TQM etc.) at the enterprise level through rapid build-up of awareness of need, diagnosis of critical technological requirements, technology transfer management, and monitoring and forecasting of technology, as well as entrepreneurship development.

- Promote technology -based FDI partnerships between foreign and local enterprises especially in medium-scale SMEs with the view of developing India as global outsourcing and subcontracting base

- Establish entrepreneurship development programs at engineering and R&D institutes for goal directed promotion of business ideas - Maintain competitive pressures on the demand side by adopting a well-formulated competition policy and intellectual property protection regime. Promote application of environment-friendly and safety standards to upgrade the standardization level to global level and hence promote export competitiveness

Upgrade Technological capabilities of MSMEs

- Provide an effective outreach program to SMEs through designated public R&D institutes, starting with effective dissemination of information on standards to help SMEs improve technological capability

- Develop subcontracting and encourage integration of SMEs in the overall manufacturing sector, through vendor improvement and certification programs, as suppliers of raw materials, intermediate inputs and components

Provide fiscal benefits to manufacturing firms for R&D

- Provide tax exemption and other incentives for R&D and in-plant technical training by using any of the following instruments: tax credits for R&D expenses, and accelerated depreciation and reduced import duties for investments in R&D facilities

- Utilize Technology Development Fund (TDF) to finance indigenous R&D activities. Energize Technology Up-gradation Fund (TUF) by extending this grant to select non-textile industry and providing flexibility in its usage

Develop technical education and training facilities

- Revive interest for existing higher technical education towards core engineering stream by revising outdated curriculum, adopting interdisciplinary approach and increasing relevance to industrial application. Manufacturing industry should strive to attract and retain the best engineering talents.

- Encourage private sector to establish and operate demand-driven technical training centres through financial and other incentives, under carefully designed industry initiatives, supported and coordinated by government, for quality control and accreditation systems

Chapter 10

Packaging Industry: The Challenges and Opportunities

The large and growing middle class and the current low penetration of the organized retail sector are the catalysts for growth in this sector. With changing lifestyles the consumerist patterns are expected to change toward a greater emphasis on convenience, health and messaging. Organized retail will shift the trend from 'loose' items to branded packs on items like commodities, food grains, vegetable oil etc. At US\$ 9 worth, the per capita consumption package clearly shows the lack of packaging consumption currently by Indian consumers, even when compared to their Asian peers. With increased income levels, aspiration levels increase and will lend itself well to growth in packaged and processed foods which will lead to the increase in per-capita consumption levels.

Higher levels of disposable income will mean a higher growth of the impulse spending category which is packaging intensive. Further, increased spending from rural households will increase the shift from bulk packages to smaller packages due to lower purchasing power.

Also as companies try to differentiate in the face of increased competition, they are expected to focus on newer packaging design, materials and formats. Organized retail and liberalization have increased the competition in the industrial goods sector. Companies are slowly but steadily changing their packaging design even in industrial segments like paints, chemicals, lubricants etc. More than 78 percent of the total packaging market in India is contributed by rigid packaging while only the remaining comprises flexible packaging. This trend is similar to the global market where flexible packaging accounts for approximately 18 percent of the total packaging market.

Flexible packaging is however, the fastest-growing sector of India's packaging industry. The shift from traditional rigid packaging to flexible packaging mainly on account of its attractiveness, cost-effectiveness and strength is largely aided by increasing consumer demand for processed food (*Source: Paper, Film & Foil Convertors Association*).

Metal Packaging

Metal packaging is one of the fastest growing packaging categories in India driven largely by categories like aerosol packaging (deodorants, air fresheners, insect repellents etc.) and beverage cans (beer, soft drinks & health drinks). Increased income levels combined with high awareness driven by marketing by FMCG companies have led to growing aspirations amongst the middle class and lower income groups to adopt these new products. Further changing lifestyles and mindsets contribute to increased levels of spending by the higher income groups leading to increased demand for metal packaging.

Metal packaging has always been considered as a premium packaging type in India and products packaged in metal are seen as premium products that are expensive. Global advancements have made it possible to make metal packaging attractive with high quality printing and attractive shapes.

With the high growth in per capita income in metro areas and increasing number of working woman, the demand for metal packaging is growing, too. Metal food cans are able to keep food/beverages fresh for a longer time without refrigeration and this helped in its adoption in the Indian market. Demand for metal beverage cans have also grown due to changing lifestyles amongst Indian youth who are increasingly looking to adopt more functional pack solutions and are willing to pay more for it. Demand for metal aerosol cans, often higher margin products in the beauty and personal care industry, grew due to growing demand from brand owners. The major factors that are driving demand for metal packaging are growing per capita income, environment friendly packaging requirements, demand for premium packaging in products like beer, soft drinks etc. and changing lifestyles in urban India leading to growth of products like deodorants and air fresheners.

Rigid Plastic Packaging

Rigid plastics category includes products like tubes, cups, bottles, pots, cans and closures. Rigid packaging material finds usage in all packaging related applications and is fast replacing traditional packaging materials like metal cans, glass bottles, aluminum collapsible tubes and metal caps. In India this category is driven by the companies seeking lower cost of packaging, introduction of new products that fit this category, expanding middle class consumers shift from

'loose' products to packaged products, modern retail formats that increase value of product presentation and growing aspirations to consume better quality products.

Despite the increased focus on the environment, overall demand for rigid plastics remained strong in the Indian market. Rigid plastics were growing for all the packaged consumer goods categories due to its easy availability, user friendliness, adaptability and non breakability. Demand for PET bottles continued to grow for beverages (soft drinks) whereas HDPE bottles were growing fast for home care and personal and beauty care product categories. Newer rigid plastic packs such as thin-walled plastic containers were also growing due to growth in organized retailing chains and demand from newer food product categories. Growth in demand for thin-walled plastic containers were helping local suppliers and presenting newer opportunities in the packaging market in India.

Demand for these plastic containers can be to a large extent attributed to the growth in organized retailing with the increased penetration of freezers that allow consumers to view and select the products themselves; thus requiring effective packaging formats suitable to this requirement. The growth of 'take-away' & fast-food outlets has increased the demand for disposable cups, containers and plates which are primarily catered to by small and regional packaging suppliers as these can be made with small capital investments and are not regulated by packaging standard laws.

Flexible Packaging

Overall demand for flexible packaging was driven by the continued usage in existing categories and adoption into a wide range of new products like hot drinks, beauty and personal care products and home care products. Demand for flexible packaging in India is likely to remain strong, due to comparative lower cost of packaging and continuous innovation by leading players who are launching new materials and products for the industry.

Demand is likely to be further driven by smaller pack sizes, given the lower purchasing capacity in rural and semi-urban India. Indian companies have been highly innovative to reach this target market by launching products in extremely small size packs called "sachets" and "pillow packs" that contain a wide variety of products from personal care products like shampoos, tooth paste and face creams to chewing tobacco and related products. Also traditional segments like savory

snacks, biscuits and condiments are being launched in smaller packages to cater to the rural market.

Rural income growth coupled with high inflation during most of the year put the focus back on smaller packs being offered at lower price points. With income rising in rural areas, marketers also looked to tap this segment and increasingly came out with flexible packs that were meant for one-time consumption targeted at rural households. That trend was more relevant for personal care product categories such as shampoo, sun care, etc which continued to witness a large uptake of sachets in the Indian market. The higher inflation also forced the marketers to come out with smaller packs even in urban areas, as prices were rising for most of the commodities and people looked for products at lower price points.

As in other packaging segments, growth in this sector is expected to remain strong from traditional products and with new categories migrating from other expensive forms of packaging to flexible pouches. Some recent innovations in this category are the introduction of re-closable packs and packs that have a spout and screw cap; which can be used to package condiments, sauces, juices etc. and can also be made from aseptic packaging materials. These innovations could find increased application in other categories and may take more share from rigid plastics.

A new trend is the increasing usage of flexible films in beverage and water packaging. With innovative materials being used this category is likely to see a very high growth as companies start introducing individual portions of beverages in flexible packs. Amul and Mother Dairy have launched their buttermilk and ‘lassi’ beverages in such packs that need to be refrigerated but drastically reduce the transport and packaging costs.

A few challenges have also emerged that can impact the growth of this sector. Flexible plastics have always been regarded as a necessary evil in the environmental sense. Due to the poor recycling infrastructure and low weight of flexible films, this category of products is amongst the least recycled materials in India. It’s estimated that almost 80 percent of the material that is discarded after use finds its way to landfills and garbage dumps.

Citing the impact of flexible plastics on Indian cities and environment, the Supreme Court of India banned the usage of flexible plastics/sachets for tobacco products and the use of thin plastic carry bags in retail shops. The ban overnight was a big threat to survival of small local sachets/pouch suppliers as they did not have resources to come out with alternate solutions in the swiftly changed realities of the market. On the other hand, the bigger players took the benefit as they were quickly able to come out with different alternate solutions to flexible packs. The ban on sachets also pushed the cost of packaging up as alternate types of packs such as flexible aluminium paper were more costly and could not be adopted at a large scale for cheaper tobacco products. The ban also increased the focus on bigger pack sizes as marketers looked to optimise their size mix in order to reduce their overall packaging costs.

Glass Packaging

The primary driver of glass packaging in India remains the soft drinks and alcoholic beverages industry. Pharmaceutical applications of glass continue to reduce as the traditional glass packaged products continue to shift to rigid plastics. However, continued growth in demand is expected from alcoholic drink manufacturers, who prefer glass packaging, due to the premium image of glass packaging and better barrier properties compared to rigid plastics. Though some companies had tried introducing rigid plastic bottles and paper brick packaging for wines and beer, consumer adoption of these alternate packaging has been limited.

Returnable bottles are used only in soft drinks in India and continued to see a steady growth in demand as the rural and semi-urban market continues to expand. Due to higher state taxes in alcoholic drinks, such as wine, beer and spirits are likely to see a lower growth in the near term – however in the long term the upward growth trend remains strong which will keep the demand for glass packaging at current growth levels.

Glass packaging in India is highly fragmented with the presence of large number of localized players. Hindustan National Glass & Industries and Piramal Glass are some of the few integrated large players with presence across the country.

Liquid Cartons

Demand for liquid cartons has seen high growth in India driven by adoption across multiple new categories like oil, flavored milk, lassi, soya based drinks and some alcoholic beverages like wine and entry of new companies like Danone. Traditional categories like milk, juices and beverages also have seen a high growth in demand for this type of packaging. Further Indian consumers have high levels of awareness of the advantages of aseptic packaging due to a promotion run by the only company in this space, TetraPak. This category will continue to show the current high growth rates as demand is expected from newer product categories, increased penetration in rural and semi urban areas, increased levels of organized retailing and growing awareness among consumers.

The advantages of these products are that they do not require refrigeration to keep contents fresh as compared to competing products in this space like rigid plastic bottles. Hence this packaging type attracts food companies that have low shelf life and is itself a cheaper alternative to metal cans and easier to transport than glass bottles. Further the package can be attractively printed in comparison to glass bottles.

Demand grows for closures with functionality

The market showed a preference towards adopting functionality in their packs in order to provide customers with the most convenient usage and dispensation of the products. This helped the growth of closures that had functionality such as plastic dispensing closures as a replacement for the more standard plastic screw variety. The trend was particularly evident for home care packs where marketers were looking to provide customers with higher ease of use.

Chapter 11

Emerging Trends, Cost Effective Solutions and Reforms in Packaging

The Present chapter has discussed three aspects of present packaging industry. The issues covered in this chapter are as follows:

- **The emerging trends and cost effective solutions**
- **Reforms**
- **Government Regulations**

The packaging industry continues to evolve over the years. The trends are in constant fluctuation, and it has become easy to bring into being packaging designs that soon become obsolete or outdated. In order to keep up with the ever-changing packaging industry landscape, it is important to keep an eye on emerging trends. This awareness will help to strengthen opportunities for innovative designs.

The economic downturn of the past few years has altered behavior and driven many consumers to seek more value, while being more conservative with their spending. As a result, researchers have identified a number of key trends in buyer behaviors. In response to consumer's desire for high quality packaging for private-label products, many companies have opted for optimum packaging machinery.

There is also a consistent sentiment amongst consumers that packaging remains excessive for products. Downsizing and minimizing the materials and weight of packaging will continue to become more prevalent as this can help in reducing costs and make the product more attractive for environmentally conscious consumers. Cuts are being made in many facets of the packaging industry including the reduced costs through automation and technology and the elimination of under-performing lines and products.

Sustainability and eco friendly packaging is also a major shift in the industry. Minimization of energy and expanding use of recycled materials will certainly be a pair of key initiatives as packaging companies and brand owners work hard to meet and exceed consumer expectations. Climate change issues is also one of the factor dramatically affect sustainability packaging decisions.

In a cost-sensitive market such as India, the pressure is higher than other countries to reduce packaging costs. While the demand for more sophisticated packaging is on the rise in India, with it comes additional pressures on cost for packaging suppliers. With a shifting socio-economic landscape, a move towards the consumption of more processed foods has resulted in a doubling of the growth of the food processing sector to 13.7 per cent in the past four years. There is also growing consumer awareness and government focus on going green.

The government has taken steps to promote recycling under the National Action Plan on Climate Change. Studies indicate that sustainable packaging is likely to see its greatest growth in the Asia Pacific region owing largely to the size of the food and beverage market in the region, driven in large part by India, China and Indonesia.

Among several emerging trends that are taking shape, the following technologies are the most widely recognized.

- Cut Costs: Packaging Is Expensive
- Focus on retaining freshness for longer period/waste reduction
- Shift in demand from rigid (metal / glass) to flexible (Plastic / paper / laminated) packaging
- Green packaging -both recycle and reuse
- Eco-friendly packaging
- Sustainability- Small Steps but a long way to go
- Light-weighting of packaging
- Anti-counterfeiting Technology into Packaging
- Technology that help in reducing Logistics Costs
- Innovation in shape/design
- Consumer Awareness and Education
- Reforms: Creating a Conducive Environment for Packaging Industry’s Growth and
- Key Regulatory Developments and the Impact

THE EMERGING TRENDS AND COST EFFECTIVE SOLUTIONS

Cost Cutting: Packaging Is Expensive

Packaging being a critical component of cost for producers of manufactured goods, suppliers of packaging are under constant pressure to innovate to bring down overall costs. The current emphasis is on reduction of secondary packaging, light-weighting of material, through design innovations that allow for ease of shipping of larger quantities at the same costs as well as through durable and re-sealable materials. The suppliers are also expected to reduce the quantum of energy consumed in production of the packaging, and use automation during production to reduce labor costs and increase efficiency.

Worldwide, government reforms are pushing hard on industries to reduce cost by reducing packaging weight, Europe offers saving on packaging tax as a reward. Internationally recognized specifications, rules and requirements for the proper packaging of goods moving by motor carriers, the National Motor Freight Classification regulations to control freight cost are mandatory for all LTL shipments in USA. Even in India, medical device manufacturers have to comply by regulations of ISO 11607 and design methods of cost cutting.

The challenge for packaging companies is to ensure that quality and product safety/integrity is not compromised while bringing down costs, as the resultant waste would push costs up in the overall scheme of things. Since packaging is also a carrier of the brand for the company, the lower costs cannot reduce appeal to the consumer which would in turn have an adverse affect on sales.

Recent trends show many technical innovations to cut down the cost of packaging without compromising the performance. Reduction of cost while dealing with packaging for the hygiene sector is very challenging due to specific requirements on hygiene, safety and efficiency. Use of resins has provided an edge in this regard by finding their applications for peelable sealants. One of the biggest breakthroughs in this domain was introduction of Surlyn by DuPont which allows multiple adaptations to reduce cost. Smooth and peelable seals such as Flexform P use Surlyn for sealed packing for food and pharma products. New package designs such as DuPont's Ostasis

reinforced pouch has provided a cost effective solution for requirement of sturdy packs in medical domain. These pouches have provided an alternative to high cost puncture resistant films. Also, they help avoid cost related to repeated distribution testing. Creating pre-formed boxes has helped reduce labor cost that is needed to assemble the packaging, while pre printing boxes reduces printing costs. Automation and the use of robotics has also helped in process improvements, increased production efficiency and reduced wastage during production.

Another interesting technology gaining popularity in developing low cost packaging is co-extrusion technology to form multilayered plastic films having high performance for food and specialty packaging. Recent advances in this area have been to produce ultra clear films such as ShieLLD QE, NPB and NCB films by Amcor. This technique eliminates the use of laminations, reduces thickness of packs and at the same time provides puncture, abrasion and crack resistant packages.

Besides the direct impact on production costs, innovation on cost cutting also impacts attendant costs on logistics/transportation/storage. Pepperidge Farm Deli Flats new packaging reduces the quantum of material used by 65 percent enabling 25 percent more packages to be shipped in the same space as the original packaging, bringing down costs further.

Focus on Retaining Freshness for Longer Period and Reduce Wastage

For the food and pharmaceutical sectors, ensuring freshness of products (in shape, form, color, and nutritional benefit), increasing shelf life and reducing waste are critical requirements. While there have been moves to use vacuum packaging, modified atmosphere packaging, controlled atmosphere packaging and skin packaging to wrap food products, the world is now adopting active packaging and smart packaging.

While active packaging plays a key role in retaining freshness through absorbing excess moisture or being antimicrobial for instance, smart packaging can track quantities of carbon dioxide and offer indicators on product quality. Smart/intelligent and active packaging is already in use in the pharma and food sectors for the role they play in informing the consumer of product freshness and in promoting a longer shelf life. Others may even be a core product feature as in the case of

ScentSational Technologies' Aroma Waters where fruit scents are infused into bottled water via the bottle cap. In addition, there have been advancements with the emergence of transparent, evaporated and light-blocking films as well as nanocomposites. The FDA in the USA has begun to monitor this evolving area closely and has issued draft guidelines on the use of nanotechnology particles in packaging. Companies will be required to first prove the safety of the material before they can go into production.

Modified Atmospheric Packaging (MAP) is said to have great potential to increase the shelf life of a number of perishable products including dairy, meat (both cooked as well as raw) fruit and vegetables. Because these foods get spoiled due to the development of oxidative rancidity and or the growth of micro-organisms, MAP packaging holds great promise.

Shift in demand from rigid (metal/glass) to flexible (plastic/paper/laminated) packaging

Expected shift from bulk purchases to smaller consumer packs and focus on higher levels of processing and quality amongst the urban consumers will be the key drivers to higher packaging material consumption in India. Rural income growth and rising inflation has also caused a shift towards smaller pack sizes, in flexible packaging. As such, the growth in sachet usage for personal care continues while the growth in demand for flexible packaging in foods is likely to be driven by rural demand for packaged foods like biscuits and snacks.

Flexible packaging can consist of either monolayer or multilayer films of plastics. The multilayered laminated sheets of plastics mainly include polyethylene, polypropylene, polyethylene terephthalate (PET) and polyvinyl chloride (PVC), along with metal foils, paper and cloth separately or together depending upon the end application. Flexible packaging has the advantage of protecting the product from adulteration, pilferage, moisture etc. and hence prevents wastage and damage. They also have the advantage of convenience of handling and disposal along with saved costs in transportation and storage - taking up less shelf space. Flexible packaging is unique in terms of aroma retention, sealing the product from heat, good barrier properties against moisture and grease, along with good tensile strength.

Plastics can now also be used to play an active role in maintaining or even enhancing the quality of packaged food. Antioxidant additives can be dispersed within a plastic packaging material or

the plastic can be made inherently oxygen absorbing by incorporating oxygen absorbing monomers into the polymer structure during polymerisation. Other types of smart plastics can keep fruits, flowers and vegetables fresh by absorbing compounds such as ammonia, ethylene and hydrogen sulphide that form inside the package.

‘Green’ Packaging (both Recycle and Reuse)

While recycling has been the mantra that both governments and manufacturers are learning to live by, reusability is an area where the packaging sector has much to offer by way of innovation. With the introduction of landfill taxation, stringent rules on waste management and landfills, the reduction of waste is a focus area for most countries –developed and developing. There is an urgent need to find ways to cut waste at the production stage, in materials and also to find ways to increase reusability of both the finished products and the raw materials that go into the creation of them.

Reusability of Packaging

The CUBE (Packaging System) by Smart Packaging Systems is a multi-dimensional packaging solution that is ready to ship, display-ready and ready to sell, besides being reusable. The usage of this patented system eliminates the need for corrugated material, reduces quantity of shrink wrap needed and allows for easy display. The material used in its production is 100 percent paperboard lamination and uses recycled fibers as well as new fibres. The system also meets the norms set by Walmart under their ISTA Testing directive.

Eagle Flexible Packaging’s compostable, renewable pet food pouches developed in partnership with pet food manufacturer Steve’s Real Food is one such innovation. A ZIPPAK Press-to-Close system means that consumers can open and then re-seal the pouch. UK based retailer, Tesco introduced the Reseal-it packaging system for its strawberry packs, developed by Macfarlane Labels and Sampak. This system creates packs that are resealable as well as being tamper-proof. The Zipbox from T.H.E.M. overcomes some of the issues with traditional reusable zip pouches – its rectangular shape allows from better stacking in transit and in stores, while retaining the ability to be reusable.

Reusability of Raw Materials

Ciclo Verde Taeq is a closed-loop system that makes use of recycled materials to manufacture high-value products. Under this system, recyclable materials from the packaging after usage are collected at Grupo Pão de Açúcar stores, from where the materials are given to a group of low income families in Brazil who then sort the material and sell it to Papyrus. Papyrus is a paperboard manufacturer that in turn supplies raw materials made from their own recycled cellulosic material to Taeq, thus closing the loop. As per estimates, over 600 tons of cellulosic material had gone through the recycling system and been fed back into production of new packaging.

Eco-Friendly Packaging

Consumers are highly sensitive to sustainability issues and perceived over packaging, prompting major retailers like Tesco and Walmart to gear up their supply chains and production lines to be eco-friendly and 'green'. A report by The Freedonia Group estimates that "the world demand for green packaging is projected to rise 5.7 percent per year to US\$212 billion in 2015."

The challenge for packaging companies is to find a middle path that balances the various dimensions of being eco-friendly. Biodegradable packaging, optimal sizes that reduce transport volumes, and packaging that does not consume huge quantities of energy in its production are multiple goals that need to be balanced. The Danish EPA quotes an instance of cat food in plastic jars that lowered emissions from transportation because of the lower space occupied by these jars compared to traditional cans. However, biodegradability was an issue. Nonetheless, the emergence of eco-friendly focused packaging companies is another trend.

Certain classes of packaging are an obvious choice, such as corrugated boards – materials that are biodegradable and have a low carbon footprint. Consequently, several companies are investing in this material, through M&A by acquiring companies with production capabilities in this area or by broadening their own product range through addition of new capacities. One such innovation in corrugated boards is Interstate Container's GREENCOAT wax-replacement corrugated boxes are completely recyclable and repulpable with the added advantage of offering potential cost savings over wax boxes.

National Flexible’s Chalk-based film for thermoforming is being hailed as an eco friendly alternative to oil polymer based films, and can be laminate replacement for flow-wrap, form-fill-seal or thermoform applications.

Eagle Flexible Packaging’s pet food pack uses water based printing inks that are more environmentally friendly than solvent based inks. ThermoPod that produces cold chain packaging now offers biodegradable/recyclable temperature-controlled shipping containers. FreshCase, an innovation primarily for retaining freshness of the food, results in less landfill waste and reduced consumption of packaging materials.

As an alternative to metallized films, foil laminated papers and foil, which are not always easy to recycle, compostable metallized packaging has entered the market. Vacumet Corp. launched 100-percent compostable metallized papers. AirOPack is another patented technology to dispense fluids and creams using a patented pressure control device that makes use of air instead of conventional hydrocarbon chemical propellants.

Large food and beverage companies too are making the shift to eco-friendly packaging - Coca Cola has a vision to sell all beverages in sustainable packaging by 2020, starting with the recyclable PET plastic bottle launched in 2009; Heinz has followed suit with a similar initiative for their 20 oz bottles of ketchup; UK based Innocent Ltd., uses a 100 percent RPET bottle for its refrigerated smoothies; GlaxoSmithKline, Brentford, UK, uses RPET bottle for its Ribena fruit drinks. As is the case with reusable packaging, Eco-friendly packaging initiatives need to be backed by the industry and owners of the brands. Walmart’s Packaging Scorecard lists the 7 Rs of sustainable packaging - Remove, Reduce, Reuse, Recycle, Renew, Revenue, and Read; a clear signal to their global suppliers to get with the eco-friendly program. The Walmart Sustainable Packaging Value Network brought together representatives from the global packaging industry, government, NGOs, academia and industry.

Sustainability – Small Steps but a Long way to Go

Global developments in some areas of sustainability and recycling, such as green plastics are yet to enter the Indian market, an opportunity that some are likely to seize in the coming years.

Packaging design as an area also lacks the due focus it deserves, according to some industry experts. An ASSOCHAM study on Domestic Green Packaging notes that while the packaging industry is growing at about 20 percent, the sustainable packaging segment is outpacing it, at 25 percent.

Food manufacturers like Dairy & Food player Mother Dairy have introduced reusable and recyclable packaging, the Thermoformed Tray, the use of refill packs for packaging shampoos, hand wash and other personal care products has been championed by FMCG majors like Unilever. Hindustan Unilever as part of Project Galvanise replaced the previous three-piece plastic closure of Ponds Talcum Powder with a two-piece rotating cap. The new packaging reduced polymer material by 640 tons, and eliminated 200 tons of PVC shrink sleeve while also helping them garner an additional market share of 9 percent.

Energy Conservation

Energy conservation has an attendant benefit of helping cut costs for the packaging sector and has resulted in innovations in some feeder industries as well. Schneider Packaging Equipment Co’s Sustainability Measurement Option, allows tracking of energy consumption and equipment performance which means companies can now track their carbon footprint more precisely.

Replacing virgin content with recycled material helps reduce energy consumption besides waste reduction. Interestingly, the current demand for recycled materials outpaces the supply of it, thus limiting the extent to which substitution can be done – until such time as more closed loop systems like Ciclo Verde Taaq or recycling efforts in general scale up from the consumer side.

REFORMS: Creating a Conducive Environment for Packaging Industry’s Growth?

The reforms reboot, announced by the government in September 2012, has raised the expectations of the industry. The easing up of norms for multi-brand retail FDI promises to open up a whole new demand for packaging as multinational players enter the Indian market.

While the entry of multinational supermarket chains is imminent, the existing food and beverage manufacturers are expanding their portfolio of products with custom-made for India SKUs as well as new categories that have not been available in the Indian market until now. For instance, Field Fresh Foods, Del Monte’s JV with Bharti has recently added fruit based snacks as a new category in the Indian market. As the uptake of such packaged health foods rises, so will the

demand for packaging for this segment. India’s current share of the health food market in packaged food is not yet as high as global levels, promising much room for growth.

Meanwhile, limited progress on technical innovation for certain India specific categories of foods, like Indian sweetmeats or ‘mithai’ with a long shelf life, has held back bigger players from foraying into their production. As packaging research in the area evolves, so too will the product lines and in turn the demand for packaging in some new segments.

Light-weighting of Packaging

Environmental legislation requires manufacturers to reduce the quantity of packaging through use of reduced quantities of material and light weighting. Light weight corrugated containerboard is a significant development in paper and board packaging. Europe has seen a high uptake of this new material, while in North America the trend is slower. Overall however, the average weight of packaging is expected to go up as regions like China that have become increasingly large users of packaging, tend to still use heavier weight packaging.

Light weighting trend is an outcome of the focus on sustainability and a need to reduce costs and material and energy usage. Light weighting of packaging directly impacts shipping costs which are critical for certain sectors such as beverages. As such, companies like Coca Cola are constantly innovating on their packaging to create lightweight and more sustainable packaging - in 2010 they saved US\$90 million by reducing packaging waste. Recycling body WRAP is working with international wine sector players to promote the development of lightweight glass containers that can reduce waste. Swedish company Ecolean says that their packages weigh about 50-60 percent less than a regular liquid food cartons and bottles, the plastic in a 1 litre Ecolean Air package is said to weigh just 10 grams.

Weight Watchers Smart Ones Environmentally Friendly Trays are CPET microwavable trays for frozen foods, that reduce weight by 15 percent and plastic consumed by 40 percent. Nestlé scientists have developed PLOC (Packaging Low Weight Ovoid Container), a onepiece packaging concept. This led to the development of special light weight pouches for Nestlé

Chilled Dairy products. As per Nestlé estimates, “the new pouches weigh less than half of regular pouches, and being made of PET they can be recycled.”

Anti-counterfeiting Technology into Packaging

A powerful tool against counterfeiting, track and trace elements have come into focus to prevent rampant counterfeiting, particularly in sensitive sectors such as pharmaceuticals. European borders have seen a sharp rise in the number of confiscated counterfeit medicines in recent times, prompting the need for such tracking systems.

Bosch Packaging developed a Track and Trace system for pharmaceutical companies, where a unique identifying code is printed on each product post packaging, so each item is traceable through the supply chain. Bosch Packaging say on their website that, “The CPS printer and camera module is designed to minimize impact on overall production output. It maintains a consistently high Overall Equipment Effectiveness (OEE) as it is designed to minimize impact on overall production output, and the solution can be perfectly integrated into the overall system, which results in unrivaled print quality and reliability but still maintains speed and the flexibility to handle different product formats.”

The Mettler Toledo PCE (Pharmacontrol Electronic GmbH) Datamatrix Station DMS XMV Marking and Verification system is another such complete serialization solution that also offers a lot of flexibility. Also in use are holograms, color-shifting inks and covert markings.

Technology that help in reducing Logistics Costs

Well designed packaging can increase the quantity of products that can be shipped per truck, eliminate void and reduce transport costs overall, plus reduce emissions from transport. In terms of storage as well, the space needed to stock goods significantly reduces.

Minimizing or modifying tertiary packaging while retaining modularity is critical in reducing transport costs. One way this is achieved is by replacement of one-time-use cardboard boxes in tertiary packaging with reusable containers. Ice cream manufacturer Weis, in Australia, did away with secondary packaging by making the inner wrapper the primary packing. In addition, film

thickness was also reduced, as per reports from The Australian Packaging Covenant. Capilano Honey substituted round glass jars with PET and pail packs to improve space utilization in cartons.

Innovation in shape/design

Cube shaped containers are gaining popularity for their ease of stacking in transit and warehouses, and also for the minimizing/eliminating void. The STI Group's cube-shaped corrugated package for detergent is supplied flat instead of as a round container drum, thereby reducing the volume of packaging to be transported and stored by 80 percent. When empty, Swedish company Ecolean's packages lie flat like an envelope occupying very little space, and reducing transport and storage costs.

Consumer Awareness and Education

Consumer awareness and education is a challenge that will need to be met for the drive towards reusable packaging to be truly successful in India. Hindustan Unilever's Go Recycle campaign that was run with Bharti Walmart India was a first of its kind effort to get customers into the habit of recycling and reducing packaging waste. Under the scheme, consumers were offered discounts against future purchases in exchange for returning used/empty plastic bottles and pouches to Bharti stores across Delhi.

GOVERNMENT REGULATIONS

KEY REGULATORY DEVELOPMENTS AND THEIR IMPACT

New Packaging Norms on Standard Pack Sizes

After some delays in implementation due to opposition from the sector, the new norms on packaging set by the Consumer Affairs Ministry in India come into effect on 1st November 2012. As per this, players will have to mandatorily pack items in standard sizes only, taking away the leeway to tweak weight to accommodate rising raw material costs, without impacting prices for the consumer. Small pack sizes, vital as recruiter packs for new consumers, are exempt from the new rules.

Food Safety and Standards (Packaging and Labeling) Regulations, 2011

The Food Safety and Standards Authority of India proposed to make Food Safety and Standards Regulations in 2011 and came out with its guidelines regarding the same. The regulation provides clearly defined labeling requirements for all the foods packaged in India. It gives clear guidelines on labeling a packaged food, covering things like date of manufacture and best used by, date of packaging, not for infants, etc. The law also covers the general requirements for packaging a food product and gives clear legal guidelines regarding this. To meet new food packaging industry norms, Indian companies will need to look at technological innovation, to meet higher quality standards. While it was earlier required only to meet certain technical guidelines on material usage, the process of packaging was not under the scanner, as it will now be. This may be a challenge at first for smaller players who might need to upgrade their processes and infrastructure to meet the newer, more stringent norms of standardization. Players who are able to rise to the challenge, have a lot to gain as this presents an opportunity to improve India's footing in the global market as well, on the perception front, as this marks a shift to quality management from quality control.

Ban on usage of flexible plastics for tobacco products / Ban on Gutkha / Chewing tobacco

In February 2011, the Supreme Court of India banned the usage of flexible plastics for tobacco products. This notification is aimed at clearing the impact that these millions of smaller sachet packs were having on the overall environment and also the cities' ecological systems. This has highly impacted the consumption of packaging material by this sector. Consumption of Polyester Films in Pan Masala and Gutkha accounts for around 30-35 percent of the domestic demand, thus severely impacting players for whom this was a core business.

Environmental Issues Impact on Plastic Materials

The Indian packaging industry accounts for more than 50 percent of the plastics produced in the country. Due to the growth in packaged goods consumption, the Indian packaging industry has been under the lens of environmental agencies and regulators. This has resulted in increased legislation and regulations to minimize the environmental impact of packaging materials. Packaging industries in the flexible and rigid plastics are being targeted by the regulators as in the regulator's view, these are seen to have maximum impact on the environment.

Chapter 12

Conclusion and Corrective Measures

The present has described the concluding remarks and suggested corrective measures for improving the condition of the Packaging Industry in India.

Conclusion

The Indian packaging industry is a significant contributor to various industries, including food and beverages, pharmaceuticals and personal care products. In fact, a broad sector-wise break-up of the industries it contributes to is as follows – processed foods accounts for 48 per cent; personal care products 27 per cent, pharmaceuticals 6 per cent, and others 19 per cent.

The packaging machinery manufacturers and packaging material producers are integrating their efforts to meet the future needs of the rapidly developing domestic and export markets. Imports of packaging machinery to India are currently estimated at approximately \$172 million (Euro 139 million). The major equipment suppliers to the Indian market include Germany with a 42% share, Italy 20% share, the US 10%, Switzerland 8% and others including Taiwan form the remaining 20%. In 2010, export of German machinery in food processing and packaging sector increased by around 22% to attain a value of Euro 69 million.

Demand for packaging is expected to go up in next four to five years and infrastructure will remain a main challenge for the industry in India. If it is adequately taken care of, it will be of great help for the industry. Government should help us in building good infrastructure that will help the industry to grow.

Technology Trend
Fastest Growing and dominant segment is Flexible Packaging
Fastest Growing material is Plastics
Moderate growth material is Paper
Low Growth segment is Glass and Metal

Specific High Growth Areas are:

- Stand-up Pouches- highest growth
- High barrier Flexibles
- Plastic Containers- especially High Barrier & PET
- Labels and Shrink- Sleeves
- Poly-Lactide Resins- Bio-degradable
- Extreme concern on Tamper-Proofing, anti-counterfeiting and Brand security
- Demand for much better graphics

High Export Opportunities

To sum up, it can be stated that the future of the Indian packaging industry is very good if opportunities can be capitalized upon with suitable investments in capabilities. The growth of the domestic market will be good and drive growth in requirements; export potential is also substantial if properly addressed. If organized retail takes off as expected, growth opportunities are substantial, and enormous potential exists in converting wastages of food into productive output.

Thus, the Indian Packaging Industry needs to be ready to work on these points to meet global and domestic competition. The industry is also facing the challenges due to lack of regulatory clarity in packaging, consumer awareness towards sustainable packaging and stress towards green packaging materials.

According to Thomas Schneider, president, World Packaging Organisation, the Indian packaging industry will see a substantial growth in coming years. The increasing awareness regarding clean water, safe food and pharmaceuticals will drive this growth. The challenges that the industry is facing today are lack of regulatory clarity in packaging; consumer awareness towards sustainable packaging, and stress on green packaging materials.

The packaging industry should seize the opportunity to offer eco-friendly and innovative packaging solutions. The packaging industry has to put its act together to offer packaging

solutions with WTO standard compliance, eco-friendly materials, high lifecycle cost and waste management, cost effectiveness, innovation and consumer convenience.

Recommendations / Corrective Measures

The corrective measures / recommendations for the packaging industry have been divided in sections. The details of the same are highlighted below:

A. Special Support for Packaging Sector

It has been observed, during the study and discussed with different industry representatives; MSME sector is lacking with updated technologies, non availability of proper resources, R & D activities etc to face market and quality challenges.

- I. Capital investment subsidy may be designed to the development of infrastructure, latest machineries, technology upgrade, R & D activities etc. The subsidy may encourage new investment as well as an enabling environment for development of MSME industries. Subsidy may cover machineries for production, process control, quality assurance, research, innovation, automation, raw material import.
- II. Interest Subsidy also may be given to meet expenses for the development and improvement of market share of MSME sector, for modernization of existing unit by investing a certain percentage of fixed capital investment to upgrade technology by the way adopting new technology/production process and or improving quality of products. Interest subsidy may be given more to micro enterprises to small and medium enterprises.
- III. Comprehensive Insurance subsidy may also be given to industrial units with a view to accelerating packaging industries under MSME. The subsidy may be given in particular time duration of the scheme to an eligible industrial unit for a period of particular years from date of commencement of commercial production.
- IV. Special subsidy may be given for developing Information Technology (IT) systems and Statistical Process Control (SPC) system to enhancement of system and capacity building. This to be done because most of global companies in retail sector outsourcing packaging to domestic MSME packagers.

B. Technology Up-gradation:

- I. Encourage public private partnerships in establishing Packaging Parks at places where clusters are active.
- II. Drive public R&D institutes and laboratories to become more demand -driven and service oriented, and make the resource allocation (government budgetary support) more performance driven. R&D institutes should acquire international accreditation for granting product certification in India and for providing, in competition with private consulting firms, effective technological extension services in order to help firms improve their manufacturing and design capabilities.
- III. Encourage Industries (both organized and unorganized), through the dissemination of relevant information, to acquire arms' length technology through technology licensing, technology transfer agreement, reverse engineering and adaptation to build their own capabilities - Establish Technology Trackers in leading countries (Germany, Taiwan, Japan and USA) to track development of technology in key segments.

C. Quality improvement and Technology Up-gradation related recommendations

- I. Facilitation of technology transfer: Government may facilitate providing exposure and opportunities for the Indian manufacturers to establish tie-ups with players of the packaging, organized industry, international players so as to get access to contemporary technologies so that Indian manufacturer can produce good, high-end, packaging material in reasonable price which will attract more customers. Participation in delegations, industry specific fairs and events at national and international level needs to be stepped up substantially.
- II. Quality Certification assistance: The Ministry of MSME, Government of India has a scheme whereby it reimburses the ISO 9001/14001/HACCP certification expenses to the tune of 75% or Rs 75000/- whichever is less through the respective Directorate of MSME- DIs. The study observed a significant percentage of manufacturing units have not yet made ISO certification of their products. The Government may conduct campaigns / workshops/ awareness programmes to ensure all MSME Packaging Industries go for ISO certification.

- III. While the Ministry of Food Processing Industry is entrusted with the responsibility of ensuring quality standards in processing, it has no power to ensure that the raw material procured meets the required quality standard. Take, for instance, the case of processing milk. The Ministry can ensure quality standards in the processing stage but has no power to ensure that the milk is collected in a hygienic manner. Inter-linkages across different sectors/industries are generally not reflected in the regulations for these sectors. There are no packaging specifications to ensure that the packaging material used is environment-friendly, nor has any attempt been made to ensure that packaging standards are set to take into account different retail formats. Products have been taken off the shelves after they were found to be contaminated due to inappropriate packaging. It is important that the packaging standards for processed food are suitable for India's climatic condition.
- IV. Establish training Centres for skill up-gradation: Availability of skilled and un-skilled manpower is observed as a major short-coming in the sector. Rising labour costs and standard of living is affecting the sector as un-skilled manpower is less interested to work in the sector. The manufacturers could not pay high wages due to high production costs. Secondly, in order to have adequate number of skilled manpower, the government may consider offering training and certification courses to bring-in skilled labour force to the cycle industry.
- V. Setting up of Task Force: The Task force should be set up for benchmarking of technology in terms of machinery, country and makers. There should be a planned long-term roadmap with commitment on milestones from the Government.

D. Market Promotion

- I. The government may consider to develop a Packaging cell or appoint consultants to help MSME entrepreneurs in understanding global marketing trends, best available cost benefit materials, facilities available for up-gradation of technology, receiving data on buyers and suppliers, environmental and health related issues and Intellectual Property Right (IPR) related issues etc.
- II. Marketing is a strategic tool for business development and it very is crucial for the growth and survival of Micro, Small & Medium Enterprises (MSME). Marketing is the

most important factor for the success of any enterprise. Large enterprises/industries have enough resources meet expenses and having good hiring capacity of manpower to take care of marketing activities of their products and services. MSME sector does not have these resources at their level and therefore they need institutional support for providing these inputs in the area of marketing specially. Ministry of Micro, Small & Medium Enterprises, through National Small Industries Corporation (NSIC), may be given special attention to the packaging sector through marketing assistance scheme.

- III. Create a directory: Directory of MSME Packaging Industries (Product-wise). Government may take initiative to create a data base of each and every industry category wise as well as sector wise so that the Government has a clear picture of the actual industrial scenario and efficiently monitor the growth of the MSME Packaging industry. The data will enable them for better administration and forming better growth policies. This may also result in business growth and market expansion as it will provide them exposure to organized sector, other industries, market, as well as customers.

E. Export promotion related recommendations

- I. Specific measures may be designed by the government to promote export by MSMEs. The government may consider providing duty free while importing goods for the industry, operation and maintenance facilities, exemption in Sales Tax and Service Tax and Single window clearance for Central and State level approvals.
- II. Exposure visits: Government must give a fillip to organizing exposure visits of Indian MSME Packaging manufacturers to different countries and market so that they may get a chance to understand the latest technology and trends in the international market.
- III. Step up participation in international fairs: There should be a significant stepping-up of Indian bicycle and bicycle parts manufacturers participating in International bicycle fairs in order to obtain foreign OEM orders and learn technologies from other countries. The participation in these international events will enable manufacturers to understand the R & D capabilities of key players, stimulate their own innovation aspirations and think in a

modern and creative way so that they can apply these various new idea in their own business and accordingly upgrade their industry.

F. Tax relief to develop innovative packaging

- I. Import duty on packaging machinery is required to be relaxed by the Government. At the same time, import duty on finished packaging materials needs to be reduced. This will help in developing newer and innovative packaging material for end users. It will also help in developing initial market for new technologies and concepts. As observed, aseptic packaging machineries are not manufactured in India and thus, are imported. Since aseptic filling machines are not being manufactured in India, the government should not charge countervailing duty (CVD) on such machines.
- II. Central Excise tax on packaging equipment and food processing equipment may be further reduced to promote innovation in food processing and packaging equipment, thus increasing processing efficiency.
- III. The government may consider abolition of excise duty on the packaging materials. This will enable more items to be packed in modern packing mediums.
- IV. The Government may consider giving Tax Holiday to the Packaging Industry to boost Research and development activities. Extending benefits to the packaging industry would greatly help in increasing the R&D activities in the packaging industry.

G. Packaging Norms:

- I. With changing packaging formats, regulations and norms are also witnessing modifications. Recent case is "new packaging norms for FMCG products" of the Ministry of Consumer Affairs, Government of India that says "FMCG companies cannot sell 19 product categories in current unconventional arbitrary pack sizes like 65, 73, 85, 92, 175, 425 (grams/milliliter, whichever is applicable). Instead, all such products will have to be sold in standard pack sizes like 25, 50, 100 and multiple of 100 units (g/ml)." The stringent measures have affected the health of the MSMEs. Extension for

implementation of package standardization norms may be considered and measures may be initiated to protect the interests of the MSME industries suffering the most.

K. Creation of World Class Infrastructure

- I. The study reveals for creating enabling environment, it is important to focus on creating world-class centre of excellence with sustained commitment. For example, premium institutes in the country should be given more thrust and developed into centers with world-class facilities. Developing close international relationship with worldwide packaging fraternity is need of the hour to encourage technology transfer.
- II. Making India a focal point for contemporary developments for technology and engineering in the field of packaging the promotion of investments, both foreign & domestic and simplification of procedures should be considered with utmost care. The recent growth trends indicate many global packaging bigwigs and Indian companies are setting up new plants or acquiring plants from abroad. The standards, rules and regulations governing packaging materials need to be reviewed frequently in line with new developments.
- III. The Packaging Institutes currently imparting training programmes should take the responsibility to complement the shortcomings of the Indian MSME sector as far as qualitative requirements, knowledge base, inputs on issues like production, improvement in supplies and developing new lines are concerned.

L. Promotion of Education, Training and Awareness

- I. The packaging industry has a task to satisfy 300 million understanding buyers today to 600 million buyers in the near future, and the story will continue. Even on an average consumption, the growth potential in India is a minimum of 700 percent-7 times, which is a potential for the packaging industry. Demands will be dynamics- concepts need to be alive and moving. The requirement will be technology, process and human resources.
- II. The subject of packaging education today has thus assumed a special significance and has opened up opportunities in several areas. The relevance of packaging education has gradually and steadily increased. The need is remove the myth and make packaging the

frontline subject in industry and academics. It is in the context that training and education in the field of packaging has become vital in spreading the message of awareness or the need, the contribution of the package as a value-added factor.

- III. Being industry-oriented, it has enlarged employment potential, scope for entrepreneurship either for expansion or diversification and equally importantly new entrepreneurship opportunities. These opportunities are available at different levels. A basic in-depth technological exposure with practical industry orientation is the best means to lay the right foundation to build up personnel who would satisfy core need. A wide gap is observed in the field of Packaging education which may work as a hindrance in attracting more into the field of packaging. At this juncture, there is a need for a three-pronged strategy: a. upgrade the skill of existing personnel-at all levels through human resource development programmes, b. creates and develop fresh technocrats at all levels and c. establish Vocational Institutes for Packaging Industry.

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ANNEXURE 1 - LIST OF INDUSTRIES VISITED BY CMSD TEAM

SL.NO	NAME OF INDUSTRIES	TYPE OF INDUSTRY	STATE
1	STAR BIOTECH	PHARMACEUTICAL	HIMACHAL PRADESH
2	UNICHEM	PHARMACEUTICAL	HIMACHAL PRADESH
3	SURYA PHARMACEUTICALS	PHARMACEUTICAL	HIMACHAL PRADESH
4	BRD MEDILABS	PHARMACEUTICAL	HIMACHAL PRADESH
5	MISSION LABS	PHARMACEUTICAL	HIMACHAL PRADESH
6	POLO PHARMA	PHARMACEUTICAL	HIMACHAL PRADESH
7	LANCER PHARMACEUTICALS	PHARMACEUTICAL	HIMACHAL PRADESH
8	LIFE CARE REMEDUES	PHARMACEUTICAL	HIMACHAL PRADESH
9	BIOGENETICS PVT LTD	PHARMACEUTICAL	HIMACHAL PRADESH
10	UNIX BIOTECH	PHARMACEUTICAL	HIMACHAL PRADESH
11	MEDICEF PHARMA	PHARMACEUTICAL	HIMACHAL PRADESH
12	ALLIONCE INC	PHARMACEUTICAL	HIMACHAL PRADESH
13	AGER VET	PHARMACEUTICAL	HIMACHAL PRADESH
14	DIPESH CHANDEL RADICO REMEDIES	PHARMACEUTICAL	HIMACHAL PRADESH
15	INDOCO REMEDIES LTD	PHARMACEUTICAL	HIMACHAL PRADESH
16	INDIA CRTLES	PHARMACEUTICAL	HIMACHAL PRADESH
17	KREEN FIBRES PVT LTD	FOOD	GUJARAT
18	GAYATRI DAIRY PRODUCTS PVT LTD	FOOD	GUJARAT
19	M/S KRINY BISCUITS & CHEMICAL INDUSTRIES LTD	FOOD	GUJARAT
20	SHRI GANESH GRUN UDHYOG UTTARASANDA	FOOD	GUJARAT
21	RUTU AGRO FOOD COLD STORAGE NADIAD	FOOD	GUJARAT
22	PASAND PAPAD UTTARASANDA	FOOD	GUJARAT
23	REAL BAKERS ANAND	FOOD	GUJARAT
24	CHHAJED FOODS PVT LTD	FOOD	GUJARAT
25	ANAND FOOD & DAIRY PRODUCTS	FOOD	GUJARAT
26	SHIV DUGDHALAYA	FOOD	GUJARAT
27	SAYONA GRAH UDHYOG	FOOD	GUJARAT
28	AMBICA NUTRITION PVT LTD	FOOD	GUJARAT
29	UTTAM DAIRY PRODUCTS	FOOD	GUJARAT

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30	PATSON FOODS PVT LTD	FOOD	GUJARAT
31	JAIN DAIRY	FOOD	GUJARAT
32	JAYDEEP COTTON FIBRE PVT LTD	FOOD	GUJARAT
33	FLOUSHISH PURE FOOD PVT LTD	FOOD	GUJARAT
34	SHREE ADDITIVES LTD	FOOD	GUJARAT
35	JAYSHANKAR SNACKS & CONFECTIONERS PVT LTD	FOOD	GUJARAT
36	SHRI SADASHIV BAKERY	FOOD	GUJARAT
37	MANORAMA DAIRY & FOODS PVT LTD	FOOD	GUJARAT
38	GANDHI AGRO SEEDS	FOOD	GUJARAT
39	KWALITY MAKERS SNACKS PVT LTD	FOOD	GUJARAT
40	NAVRATAN GARLIC PICKLE	FOOD	GUJARAT
41	VIDHYA DAIRY	FOOD	GUJARAT
42	HARI OM ENGINEERING WORKS	MATERIAL PACKAGING	GUJARAT
43	MEHTA INDUSTRIES	MATERIAL PACKAGING	HARYANA
44	FLAOUR & FRAGRANCE INDIA PVT LTD	COSMETIC	HARYANA
45	SARASWATI PRINTERS	MATERIAL PACKAGING	DELHI
46	DEEPAK PRINTERS	MATERIAL PACKAGING	DELHI
47	SEWARA ORGANIC	FOOD	DELHI
48	INDIA CRAFTS	MATERIAL PACKAGING	DELHI
49	YAMATO SCALE INDIA PVT LTD	MATERIAL	DELHI
50	COCOON EXPORTS	MATERIAL	DELHI
51	DUTTA PRESS	MATERIAL	DELHI
52	TECHNO PLASTICS & ENGINEERING WORKS	MATERIAL	DELHI
53	MIELE FASHION HOUSE	MATERIAL	DELHI
54	ORIENT FASHION EXPORTS	MATERIAL	DELHI
55	UNICO RETAIL	FOOD	DELHI
56	SAIVANA EXPORTS	MATERIAL	DELHI
57	RADIO EXPORTS	MATERIAL	DELHI
58	SUMIT ENTERPRISE	FOOD	UTTAR PRADESH
59	GUPTA & SONS	MATERIAL	UTTAR PRADESH
60	HARIOM ENGINEERINGS WORKS	MATERIAL	KARNATAKA
61	CRESCENT PACKAGING	FOOD	KARNATAKA

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62	KULUVA PACKAGING	FOOD	KARNATAKA
63	AFNOSH PACKAGING INDUSTRIES	FOOD	KARNATAKA
64	PATIL INDUSTRIES	MATERIAL	KARNATAKA
65	SRI KOLLAPURI AMMA ENTERPRISES	FOOD	KARNATAKA
66	SUHAS PACKAGING PVT LTD	FOOD	KARNATAKA
67	SURYODAYA PACKAGING INDUSTRIES	MATERIAL	KARNATAKA
68	BANKIN PUNCH SYSTEMS	MATERIAL	KARNATAKA
69	MICRO PRINT & PACK	FOOD	KARNATAKA
70	SHIVANAGERE PACKAGING INDUSTRIES	PHARMA	KARNATAKA
71	ORKAY INSTANT FOODS PVT LTD	FOOD	KARNATAKA
72	KAUSHIK PRODUCTS	MATERIAL	KARNATAKA
73	GEETANJALI POLYMARS	FOOD	KARNATAKA
74	STANDARD CARTONS	MATERIAL	KARNATAKA
75	SUNPACK SYSTEM	MATERIAL	KARNATAKA
76	OMEGA SCIENTIFIC INSTRUMENTS PVT LTD	PHARMA	KARNATAKA
77	ANU POLYMERS	MATERIAL	KARNATAKA
78	CORINTHIA PACKAGING	FOOD	KARNATAKA
79	SAI KRIPA INSULATIONS PVT LTD	FOOD	KARNATAKA
80	J.B. ENTERPRISES	MATERIAL	KARNATAKA
81	SRI VINAYAKA PACKS	FOOD	KARNATAKA
82	VAISHNAVI PACKAGING INDUSTRIES	MATERIAL	KARNATAKA
83	JHARNA TEA CO.	FOOD	WEST BENGAL
84	NEW SINGHA JEWELLERY ENTERPRISES	COSMETICS	WEST BENGAL
85	SANANDA JEWELLERY & SONS	COSMETICS	WEST BENGAL
86	ROMA PACKAGERS	COSMETICS	WEST BENGAL
87	M/S SINGHA JEWELLERY DESIGNERS	COSMETICS	WEST BENGAL
88	CAVINKARE PVT. LTD.	COSMETICS	WEST BENGAL
89	DEBNAT TOILETRY ENTERPRISES	MATERIAL	WEST BENGAL
90	SANDHYA TOILETRY ENTERPRISES	COSMETICS & MATERIAL	WEST BENGAL
91	SARBARI SARI KUTHI ENTERPRISES	MATERIAL	WEST BENGAL
92	FULIA NUTAN SARI ENTERPRISES	MATERIAL	WEST BENGAL
93	BANGALA TAMTUJA MANUFACTURERS	MATERIAL	WEST BENGAL

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94	THE NEW TANTUGA OF BENGAL	MATERIAL	WEST BENGAL
95	SHYAMA MA TOILETRY ENTERPRISES	COSMETICS & MATERIAL	WEST BENGAL
96	M/S KOLKATA ENAMEL	COSMETICS	WEST BENGAL
97	GANESH TEA & CO.	FOOD	WEST BENGAL
98	MAA LAXMI TEA MANUFACTURERS	FOOD	WEST BENGAL
99	SWASTIK INDUSTRIES	COSMETICS	WEST BENGAL
100	AFF AROMATICS PVT. LTD.	COSMETICS	WEST BENGAL
101	MAUICK TEA PACKAGING INDUSTRY	FOOD	WEST BENGAL
102	NIDHI COSMETICS PVT. LTD.	COSMETICS	WEST BENGAL

ANNEXURE 2 -QUESTIONNAIRE

Block 1: Descriptive identification/Profiling of the sample enterprise					
S.No.	Item	Descriptive Entry			
1.1	Name & Address of the Enterprise				
			State		
1.2	Name of the Respondent (with Designation)		1.3	Email id and website URL:	
1.4	Phone No. with STD code		1.5	Mobile No.	
1.6	Type of Enterprise(for answering this definitely refer the code sheet on the last page of this questionnaire)				
1.7	Year of establishment (multiple cells for multiple units)				
1.8	Number of Employees	Male	Female	Total	
1.9	Are a member of any Association of Packaging Units (Yes 1, No 2). Which association? Since which year?				
1.10	Source of packaging material – Agency Code: Public-1, Private-2, Cooperative-3, Others (specify)-9				

Block 2: Particulars of operations of the enterprise					
2.1	Type of Packaging				
2.1 a	Whether all the stages of packaging are done under one roof (yes-1, no-2)				
2.2	Products for which packaging is done and type of packaging (product-wise)	Name of Products		Type of packaging	
		1.			
		2.			
		3.			
2.3	Kind of packaging done (product-wise)	Name of Products		Kind of packaging	
		1.			
		2.			
		3.			
2.4	Enterprise type (Code) (Based on value of plant & machinery as on date)	1.Micro Enterprise (up to Rs. 25 lakh)			1
		2.Small Enterprise(>Rs. 25 lakh and up to Rs. 5 crore)			2
		3.Medium Enterprise (>Rs. 5 crore and up to Rs. 10 crore)			3
		4.Others			4
2.4 (a)	Type of ownership	a) Proprietary	1	e) Private Limited Company	4
		b) Partnership	2	f) Public Limited Company	5
		c) Cooperative	3	g) Others	6

2.5	Number of packaging units of enterprise and their	Sl. No.	Location
		1.	

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	locations (Only applicable for those having multiple units)	2.				
		3.				
2.6	Is your enterprise certified/compliant with (ISO 9001:2008 standards/ISI/BSI/FCAAI/ US FDA norms/ BRC/IOP Global standard for Packaging and packaging Materials-Issue 4/ Europe commission of law requirements/Code for good manufacturing practice for flexible and fibre based packaging for food in Europe/etc.) (If Yes 1, If No 2- if yes mention the compliances and certificates)	Certificates and version/year	2.6 a In case there is another certification			
2.7	Are you registered with NSIC (Yes 1, No 2) If yes then specify					
2.8	Investment in Plant and Machinery (Book value) (Rs. in lakh)					
2.9	Annual Turnover for the last three years 2010-11, 2011-12, 2012-13 (Rs. in lakh)5	2010-11	2011-12	2012-13		
2.10	Average Annual Production (in Quantity per unit)- Installed capacity (I), utilized capacity (U)	Insta				
		Utiliz				
2.11	Average cost of production per unit	Product			Cost (INR)	
		1.				
		2.				
		3.				
		4.				
5.						
2.12	What is the economics of your business) –					
	<ul style="list-style-type: none"> • How profitable is it? • What is your business model? <ul style="list-style-type: none"> ○ Integrated product and packaging unit? ○ Distributed packaging? ○ Franchised? ○ Outsourced? 					
	Please mark the problems that you face and give a brief description:					
	2.12.1	Less profit margin				
	2.12.2	Irregular order by the client				
2.12.3	Irregular Payment					
2.12.4	Other (Specify)					

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2.13	Major Machinery & Equipments installed (Maximum 3 in value terms)	Indigenous		Imported	
		1.		1	
		2.		2	
		3.		3	
2.14	In case you have installed imported equipment/machinery- Your reasons for installing imported equipment (in detail)				
2.15	Packaging material used				
	Indigenous			Imported	
	1		1		
	2		2		
	3		3		
4		4			
2.16	In case you use imported material- Your reasons for using imported material (in detail)				
2.17	Did the unit have ever become sick? (yes - 1, no-2)				
2.18	Did you avail of any facilities from the Government for supporting your unit/for nursing it back to health? Supporting scheme, subsidy, tech support (Code: yes - 1, no - 2) (If Yes from which Bank/financial Institution)				
2.19	Have you got any support scheme and/or subsidy for starting the unit- name the ministry/agency and the scheme (Code: yes - 1, no - 2) if yes what				
2.20	Which are the clusters and manufacturing hubs of packaging industry in your line of activity i.e. food, pharma, etc.?				

Block 3: Questions on packaging by the Unit		
3.1	Source of packaging material – Location Code: within town-1, within state-2, outside state-3, imported-4, others (specify)-9.	
3.2	State the problems faced by the unit – Multiple Codes	
	01 Loan (Bank/Financial Institution) 02 Highly inadequate credit flow 03 Procurement quality packaging materials 04 Storage of Product & packaging material 05 High cost of packaging materials	06 Irregular power supply 07 Lack of skilled labour 08 Obsolete machinery 09 Lack of marketing, distribution & branding 10 Lack of training facility 11 Others (specify)

Block 4: Technology used in packaging by the Unit						
Sl.	Item	Description				
4.1	Which type(s) of packaging do you do? (Mention Capacity also)					
4.2	Which technology do you use in packaging					
4.3	What is the payload of the machine (s)					
4.4	Output obtained by you by using the current process and current technology					
4.5	Are you Aware about the Modern/ New/ Alternate technology? If yes please mention the name and describe it					
4.5a	If you are aware , please mention your reasons for not adopting it in your unit					
4.6	What is your perception/ Opinion about demand of the technology and process					
4.7	What is the payload of the Alternate machine					
4.8	Output of the process by the Alternate technology					
4.9	How will you obtain this technology? Are you aware of the sources?					
4.10	Quality Difference b/w your and alternate technology (Compare Alternate with yours)	Poor	Bad	Same	Better	Good
4.11	Price Difference b/w your and alternate technology (Compare Alternate with yours)	Low	Same	Affordabl e	Very High	Unaffordable
4.12	Is the alternate packaging technology cost effective?	Poor	Bad	Same	Better	Good
4.13	What is the status of manpower (skill Labour) in the field (Available/ Unavailable) If unavailable how to obtain it. Whether skill upgradation of workers is reqd? What kind of training will be required for using new technology?					
4.14	Are you aware about the training programs about the packing industries? If yes State your opinions about these					

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4.15	Whether packaging technological up gradation is required in your line (if yes why?)	
4.16	Do you find the role of exhibitions and trade fairs useful with respect to packaging in your line? If yes? How do they help?	
4.17	Suggestion(s) for possible remedial measures for overcome the technology gap in packaging techniques	
4.18	What according to you is the current role of packaging industry associations, forums, government organizations, institutes, etc.	
4.19	What according to you are the factors affecting growth of packaging industry	
4.20	What are your suggestion(s) for possible remedial measures for taking corrective action?	

Block 5: Field Particulars												
Name of the Investigator												
Date of field survey									2	0	1	3
Comments of the Investigator Plant:												
Comments on the Technology (Modern/Obsolete):												
Comments on the process & Quality:												

Codes:

Serial No.1.6: Type of Enterprise (Code): Enterprise exclusively engaged in packaging of product(s): 1, Enterprise engaged in production of product(s) and packaging of its product(s): 2, Enterprise engaged in production of product(s) and packaging of its product(s); and also engaged with some other activities: 3, Enterprise engaged in packaging of product(s) and also engaged with some other activities: 4, Enterprise engaged in manufacturing of packaging material(s): 5, Enterprise engaged in activities other than packaging of product(s): 6, others 99.

Serial No. 2.1: Type of packaging (code): Paper and board: 01, Plastics: 02, Laminates (plastic and papers): 03, Thermocol: 04, Metal-Aluminium: 05, Metal-Glass: 06, Metal-Tinplate: 07, Metal-others 08, Mixed 09, others 99.

Serial No. 2.3: kind of packaging (code): **Rigid packaging**-metal containers: 11, glass bottles: 12, plastics: 13, wooden containers: 14, others 19; **Flexible packaging**-standup pouches: 21, milk pouches and bags: 22, laminated tubes: 23, squeezable bottles: 24, medicine bottles: 25, foam packaging: 26, food containers: 27, others (specify): 29; other packaging- caps and closures: 31, Labels: 32, secondary packaging: 33, **Others** 99.