FROM THE CHAIRMAN’S DESK

It gives me great pleasure to extend my heartfelt greetings to the readers of the maiden issue of Raffia Times, an initiative taken by us to disseminate knowledge to the various stakeholders of plastic woven bags and the fabric industry, worldwide.

Since its inception, the Raffia industry has been soaring high, globally and has contributed significantly to the economic development of countries around the world. In fact, many challenges faced by the industry have been translated into great business opportunities, over the years. No wonder, in just a few decades the global Raffia industry has emerged as a USD 40 billion strong industry.

While our commitment to provide world-class capital equipment to the industry is of utmost importance, we would also like to create a knowledge pool to address the various issues faced by this industry.

I am hopeful that a lot of technocrats and policy makers will come forward to contribute to this noble endeavour in the coming days.

I wish all the members of the Raffia fraternity season’s greetings and a Happy New Year, full of hope and success.

Raj Kumar Lohia
Chairman- Lohia Corp Ltd.

BEST WISHES

Dear Raj Kumar Lohia ji,
My compliments to you and the Lohia Group for publishing a quarterly newsletter on the Raffia Industry. This will offer all stakeholders associated with the plastic woven sacks & fabric industry, a much-needed knowledge sharing platform, while simultaneously providing this vital segment of our economy, the attention it deserves. The Indian economy is set to become a USS 5 Trillion economy in the next five years, with manufacturing projects contributing USS 1.0 Trillion or 20% of our GDP. Raffia sector is sure to get a boost with Government of India’s resolve to spend over Rs.100 Lac Crores, over the next 5 years, on infrastructure alone.

Raffia sector is one of the key segments of the domestic polymer processing industry, consuming approximately 2 million metric tonnes per annum (MMTA) of the total domestic polyolefin consumption, which currently stands at 13.5 MMTA. It is imperative for the sector to provide high quality products, conforming to best-in-class (global) standards so that we may achieve our goal in enriching society through our expertise and developments across the polymer industry. While quality must stand uncompromised, it must also be cost effective to ensure continued growth of the sector. More importantly, I trust that this newsletter will address the need of the hour, ‘Sustainability’, and the issues that surround it, in detail. It is imperative that we, as front-runners and stakeholders of this industry, sensitize the supply chain and end-user on responsible and efficient ways of managing plastic waste. Keeping up with the reputation of the Lohia Group, I am fully aware that you will not spare any efforts to disseminate the latest achievements and innovations unfolding globally, across the Indian Raffia sector. I hope that you will strive to make this newsletter a sought-after publication for all stakeholders and budding entrepreneurs in the industry.

My best wishes to you, always!

Shri Nikhil Meswani
Executive Director - Reliance Industries Ltd., Mumbai

Dear Partners,
A chance to see an advertisement of Mr B.S.Kamath, made me curious about Plastic Woven Sack industry and it began my entry in this line. Subsequently as per our system and method of working Bajaj Plastics grew as the largest PWS Company in India with 2 units at Nagpur and Sausar (M.P). Unfortunately, although there was great love and affection for the PWS Industry but we had to get out of it, because of issues with our creditors.

Woven Sack Industry has a very bright future because the demand for packaging material is increasing year by year. I wish this Industry a great success and growth because there is no alternative to this packaging material in India and Worldwide. In India Jute is grown in Eastern region and is used as packaging material although it’s availability is limited and not much growth has taken place in last 20 years.

I congratulate Lohia Corp Ltd for bringing out a Newsletter for the benefit of Woven Sack Industry. My best wishes to Mr R.K.Lohia and his team for taking this assignment.

Shri Hargovind Bajaj
Chairman- Emeritus Bajaj Steel Industries Ltd., Nagpur
“The quest for knowledge never ends; it just leads to more curiosities that lead to a greater mind.” - Edmond Mbiaka

Prof Gulio Natta discovered that sterically ordered Polymeric chains of isotactic Polypropylene could be oriented in a linear direction. This characteristic with respect to annealing, temperature, stretch ratio and mode of extrusion led to the invention of Polyolefinic oriented structures commonly called Flat tapes to be woven onto a loom to create the “Plastic Woven Sack” which the Industry globally calls Raffia.

Estimated at 40 Billion USD, the global Raffia Industry has been growing at 5% CARG with an annual consumption of 16 million MTS of Polyolefinic Polymers. Keeping up with the global trend, India’s Raffia industry too has achieved phenomenal growth in the last two decades. Today, the industry consumes about 2 Million MTS of polymer and has achieved an impressive size of Rs 28000 crores, growing at the rate of almost 10% every year.

Growth in the Raffia industry is not just predictable but also desirable since it contributes to nearly the entire packaging solutions of bulk commodities like Cement, Fertilizer, Agricultural and Horticulture products, Chemicals, Polymers and building construction materials. No wonder, the growth in these industries is directly proportional to growth in the Raffia industry.

Geographically, the global Raffia Industry is segmented into five key regions - North and Latin America, Europe, Asia Pacific, Middle East and Africa. Both India and China have the capability and capacity to supply to the Middle East, Western Europe and Latin American countries. European companies operating in supply and logistics are heavily importing from the Asia Pacific region.

Growth in Raffia Industry can be attributed to a slew of breakthrough innovations in the last decade as also to remarkable upgradations in the quality of raw materials, additives and the processing machinery. From conventional single stage stretching systems in use for the last 3 decades with line speeds up to 450 MTM, the industry has now graduated to cutting-edge technology using double stretching processes with line speeds of 600 MTM and melt capacity of 900 kgs/hr with state-of-the-art pre stretching units, melt metering pumps, auto gauging dies and centralised PLC systems.

Similarly, new generation high-speed microprocessor based control system looms with 12 shuttles and 295 cm double flat working width have been made available. New generation machines like Valvomatic for automatic valve making at high speeds and precision and Blokomatic for conversion of PP woven fabric into Block Bottom valve bags without application of adhesives are being made available at affordable prices.

Today, sustainability is the key to ensuring the protection of environment and conservation of resources for mother earth. Needless to say, Raffia products are more sustainable in characteristics than traditional materials resulting in conservation of precious resources. Raffia products are unique that they can be used multiple times and are truly Reusable and Recyclable.

The Raffia industry is fully committed to quality and adheres to all national and international standards of excellence. The industry works very closely with regulatory bodies and contributes in formulating, upgradation and adaptation of industry standards on a regular basis.

With our constant endeavour to disseminate knowledge for growth and development, Lohia Corp Ltd has now decided to bring out a Quarterly Newsletter, specific to the Raffia industry. The prime objective of the newsletter is to share knowledge with all stakeholders associated with the Plastic Woven Sacks and FIBC industry. The targeted audience/ readers for this Newsletter will be raw material and additive manufacturers, Raffia processors across the globe, machinery and accessory manufacturers, end users like Cement and Fertilizer manufacturers, food grains suppliers, sugar industry, manufacturers of similar products, regulatory bodies, Government agencies, policy makers and many others.

This is our maiden attempt to bring the worldwide Raffia community under one umbrella and we seek your blessings in making this project a success. We hope you will enjoy the content and provide us with your valued feedback as well as cooperation in the coming months and years.

Regards
Dr. U. K. Saroop
Vice President- Product and Business Development
Lohia Corp Limited, Kanpur, India
RAFFIA - THE INDUSTRY THAT TREADS THE PP DEMAND GROWTH IN INDIA

History: The idea to produce flat tape yarns or fibrous products via the film is quite old. The first known efforts were made in the early 1930s. Jacque and his co-workers at the I.G. Farbenindustrie AG applied in 1936, for their first patent to produce oriented tapes from polymer films, using films of polyvinyl chloride and of polystyrene in 1936. However, when in the early 1950’s the polyolefins, namely high-density polyethylene (HDPE) and polypropylene (PP), came into commercial reality, the situation changed completely. These polymers, being relatively inexpensive and having good stretch ability and orientation ability, produced tapes with high strength. This gave the impetus for development of methods to commercially produce flat tape yarns and fibrillated fibres from PP/HDPE polymers, culminating into commercial production of plastic woven sacks (PWS) in early 1960’s to contain, carry, store and protect bulk commodity goods.

Present status of flat tape yarn industry

The flat tape manufacturing process is based on high throughput rates, high efficiency and is low manpower intensive compared to jute industry and not vulnerable from seasonal effects unlike jute. These advantages have benefitted propagation of various flat tape yarn products, mainly woven sacks in a short period of time.

Several applications were developed in last 5 decades and the application portfolio enlarged encompassing from traditional woven sacks to Flexible Intermediate Bulk Containers (FIBCs) and technical fabrics such as geotextiles. Today, India stands as the second largest producer of woven sacks and largest exporter of Flexible Intermediate bulk Containers (FIBCs).

Globally, the production of flat tape yarn woven fabrics is around 16.1 mMTA and it has grown at 4.8% CAGR over for the last 5 years.

The largest end-use market is represented by woven sacks for bulk packaging of cement, fertilizers, food grains, sugar, agricultural produce, animal feed, fodder, chemicals, petrochemicals, sand, minerals and ores, flour, seeds, nuts, and many more products of mass consumption. Other growing applications of flat tape yarn woven fabrics are Flexible Intermediate Bulk Containers (FIBCs), open mesh leno and raschel bags for packaging of agricultural produce, shade net fabrics, wrapping fabrics, tarpaulins, geotextiles, geomembranes, webbings, lifting slings, ropes, twines, stitching threads, etc.

In India, the flat tape yarn woven sack industry is popularly known as the ‘Raffia’ industry. The industry is more than 50 years old. Prior to the plastic woven sacks, majority of the packaging was done in jute sacks till early 1970s. The shortage of jute sacks, during the Bangladesh war in 1970s demanded alternates for bulk packaging, which resulted into the in rapid development of plastic woven sack industry. Furthermore, the prolonged jute strike in the 1980’s, triggered the mass use of PWS in the bulk packaging sector. Today, PP sacks enjoy a good market share in India and is likely to continue to do so as such in the coming years.

The Indian Raffia industry has a nationwide spread, with more than 1270 units in small and medium scale enterprises. With an investment of ~ INR 28,000 crores, it employs about 13 lac workers, with installed processing capacity of 2800 KTA, gross annual turnover of INR 30,000 crores and enjoys the reputation of making an important economic contribution to the country’s growth.

Recently, the growing awareness on sustainability and environment protection has also resulted in a need for reusable and recyclable packaging sacks of high quality and performance.
Domestic Raffia industry – Sector wise Outlook

The PP/HDPE Raffia industry is generally classified into the following main categories, depending on package type and end-use function as:
1. Woven sacks for packaging of cement, fertilizer, food grains, sugar, polymers, chemicals
2. Flexible Intermediate Bulk Containers (FIBCs) or Big Bags
3. Tarpaulins
4. Wrapping fabrics
5. Other applications

Raffia sector is one of the key segments of the domestic polymer processing industry, contributing to growth of consumption of commodity polymers like Polypropylene Homopolymer (PP) and High-Density Polyethylene (HDPE). The domestic Raffia industry roughly contributes 15% of the domestic polyolefin consumption of around 13.5m MT. Polypropylene contributing more than 82% of the total Raffia sector consumption.

Another significant segment in the Indian Raffia market is Fertilizer packaging which consumes around 275 KT of polymer with 14% share of the Raffia consumption. This Raffia segment is expected to register a growth of around 6% for next 5 years. Laminated HDPE bags are predominantly used for packing fertilizers owing to better outdoor stability of HDPE than polypropylene. With easy availability of UV stabilizers and suitable master batches at lower cost, recently, PP made inroads into this sector and its share is growing as faster production rates are possible for PP woven sack manufacturing.

In India, there are about 55 fertilizer units producing Urea, DAP, Complex and Ammonium Sulphate fertilizers. The total production of Urea fertilizer is ~ 240 mMT and DAP and Complex fertilizers is ~ 130 mMT, besides this India also imports sizable quantity of fertilizers. Considering local production and import, requiring 275 KTA of PP/HDPE sacks currently valued at INR 3600 crores. Urea is predominantly packed in HDPE sacks, whereas, DAP and NPK fertilizers are preferably packed in PP sacks.

Another important segment for Raffia is the packaging of food grains, sugar and agriculture product packaging. This sector is presently coming under JPMA act and has seen relatively higher growth in last decade, solely due to the end-use advantages of PP/HDPE woven sacks, easy availability, lower cost versus jute sacks. This Raffia packaging segment consumes around 229 KT of polymer with 14% share. India is one of the largest producers of commodities like food grains, sugar, fruits, vegetables and tea. With varied crop pattern, localized production of commodities, safe and hygienic storage, transportation and distribution and protection against wastage, packaging becomes of utmost importance. Huge losses have been observed in agriculture produce in India. Wastage varies from 5 to 35% depending on nature of crops.

Open mesh leno sacks are widely used for packing of various agricultural products such as onions, potato, garlic, carrot, ginger, orange, pineapple other fruits and vegetables. Leno bags being permeable allow the air to pass through the sack which help to...
keep the product fresh. With their low weights and cost-effective nature, leno bags provide a superior packaging alternative to other materials.

**Flexible Intermediate Bulk Containers (FIBCs)** is another important segment of Raffia sector and consumes around 420 KT of polymer with 21% share. FIBCs, also called as Big bags, are the large size, box shape bags fabricated from thick and UV stabilized, coated or uncoated Raffia fabrics, with integrated lifting devices for bag handling. FIBCs are one of the most cost effective and ideal types of packaging for shipping and storing dry bulk products. FIBCs are available for powdered and granular materials like chemicals, petrochemicals, minerals, building materials, fertilizers, foods grains, etc.

India is the largest exporter of FIBCs to the global market, with major supplies to North America, Europe and Australia. In 1998, India’s export was around 8% of the global FIBC consumption of 567 KTA. The domestic FIBC industry has recorded an admirable growth in the last two decades and the present export share is around 30% of the global FIBC consumption of 1240 KTA. The major factors contributing to this growth are the local availability of raw materials including speciality high tenacity grades, efficient machinery with latest technology, skilled manpower specially for the FIBC fabrication process, stringent quality norms and, the long reputation of supply of high quality FIBCs to the global market.

Advantages of FIBCs:
- Low cost of material handling from the manufacturer to the end user, inclusive of wastage of material
- Easy filling and discharge of material from bag
- Saving in loading/unloading time due to ease of handling
- Possibility of automation to reduce manpower
- Low weight packing for transport
- Built in safety factor of at least 5:1 on nominal load
- Transportation of empty FIBCs is cheap and space saving
- No requirements of handling pallets when compared to small sacks – self supporting
- Moisture sensitive material can be stored and transported using inner liners made of barrier films
- Eco-friendly, since product is recyclable

**Polymer packaging sacks** is yet another segment of domestic Raffia industry which is growing at fast pace and the present consumption of this segment is 82 KT of polypropylene resin. Recently, all domestic polymer producers have voluntarily started procurement of ISI marked, BIS (Bureau of Indian Standards) compliant packaging sacks to ensure high level of bag quality and consistent end-use performance.

**Geosynthetics** segment which includes geotextiles, geomembranes and other geo-engineering products, is a relatively new entrant in Raffia industry. Polypropylene woven geotextiles of various types such as tape-by-tape, tape-by-multifilament yarn and tape-by-monofilament are extensively used for soil embankments and soil erosion control in construction of irrigation works, roads, railways, ports, mines, buildings and more. Having the functions of reinforcement, filtration, drainage and layer separation, PP woven geotextile is one of the most popular and fast-growing segments. Polypropylene is the predominantly used raw material for production of geotextiles and the present consumption is 35 KT.

Geomembranes represent the other largest group of geosynthetics. Geomembranes are relatively thin, impervious sheets of PP or HDPE woven fabrics and multiple laminated on both sides, used primarily for waterproofing, separation and linings of liquid/solids storage facilities. This includes all types of landfills, surface impoundments, roads, railways, canals, reservoirs, pond lining in aquaculture and agriculture and other containment facilities. Geomembranes produced from Raffia fabrics provide higher strength, longer service life, most economical and effective method of storing water. Although, this segment is in nascent stage, in recent years has shown rapid growth and popularity, particularly in pond lining sector.

Other growing applications of Raffia are packaging sacks for animal feed, fodder, chemicals, sand, minerals, flour, seeds, nuts, and many more products of mass consumption. Raffia tape yarns also find there use in wrapping fabrics, tarpaulins, raschel knit shade net fabrics, webbings, lifting slings, ropes, twines, stitching threads, etc.

Concluding remarks

Today, the domestic Raffia industry has truly come of age. We are self-sufficient in raw materials, have energy efficient machinery, cost-effective processing technology and skilled manpower essential for sustainable growth. Many of the large-scale processors has already developed overseas network for export of raffia products and more and more processors need to explore the possibilities for export of woven fabric, sacks, BOPP film laminated sacks, wrapping fabrics, FIBCs and some speciality products like ground covers, lumber covers, waterproof roofing fabrics, shade nets, geotextiles, pond liners, carpet backing fabrics, artificial grass, etc.

The expected future growth in infrastructural projects and investment in real estate projects may facilitate increased consumption of cement thereby demand generation of plastics woven sacks for packaging of cement. With strong support from government for increase in agriculture yield, the future remains bright with prospects in fertilizer, food grain, horticulture packaging and shade nets. In addition, polymer packaging, FIBCs for bulk packaging and allied products like tarpaulins, wrapping fabrics, ground cover fabrics, ropes, twines, etc will add to the demand prospects of woven sack or Raffia products.

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I would like to congratulate LohiaCorp in its effort to bring out a quarterly publication on the Raffia Industry. The theme is topical and of wide relevance to society, which is becoming increasingly conscious of environmental matters and sustainability. I am sure that the insights provided in the publication would be relevant across industries. I extend our best wishes for the success of the initiative.

Aparna Dutt Sharma
Secretary General,
Cement Manufacturers Association
POLYMERIC MONOFILAMENTS: STRUCTURE PROPERTY AND PERFORMANCE RELATION

Introduction to Monofilaments:
The great advantages of chemistry at the beginning of twentieth century have contributed to the development of the commercial manufacture of artificial fibres. The era began after 1939, which witnessed the development of manufacturing processes for synthetic fibres (i.e. Polyester, Nylon, Polypropylene, etc.). Nowadays these substances are truly indispensable to mankind, being essential to clothing, shelter, transportation, space science, communication, etc., and as well as to the convenience of modern living.

Monofilament yarns are simply single filament of synthetic polymer that are strong enough to be useful without being further twisted or mixed with other filaments.

It is important to produce monofilament yarn to fulfil or as per the final needs of the end user. Though the Consumer is not interested with its chemical or mechanical structure but will be looking forward to its durability, adequate dimensional stability, suitability of running on their machines and finally the comfort in the end product but it is very important for the manufacturer to have a good understanding of how yarn structure controls its properties so that orientation and properties can be engineered accordingly. The choice of the raw material coupled with optimisation of processing parameters on sophisticated State-of-the-art machines are key to achieving the properties and scope for finding varied applications.

Types of Monofilament yarns:
There are broadly two categories of Polymeric Monofilaments based on their manufacturing pattern as under
- Technical Monofilament yarn produced on spools finds mainly applications in Industrial filtrations, Automotive Industry, Zippers, Air Conditioning filters, Carpets, Spacer fabrics, Sewing threads, Embroidery work, High end fishing nets, Paper machine clothing, Geotextiles, Fencings, Agricultural, Ropes, Tennis strings, etc.
- Technical Monofilament yarns produced in the form of hanks mainly known as bristles which are used for all kind of brushes like Industrial Brushes, Household application brushes, Oral care brushes, Vacuum cleaner brushes, Latex products- cleaning and polishing brushes, Shaving brushes, Cosmetic brushes, Electronic appliance brushes, paint brushes, etc.

Production of Polymeric Monofilaments:
Synthetic monofilament yarns are produced by extrusion process. Monofilaments are of different diameters, different profiles and are produced with different polymers depending upon the application.

Normal process involves the following set up:
Raw material and additives are dried to remove the moisture present in the material and are dried to an extent of 30 to 300 ppm of moisture. In certain polymers, we would need to reduce moisture to an extent of 30 ppm before extrusion and in some cases, we would need 300 ppm. The dried Raw material is fed to 4 to 5 zone Extruder where the raw material is converted into the molten form and all the previous history is destroyed. This molten mass is then spun through well-made spinnerets having requisite number of holes and diameters in order to produce required monofilaments and the melt is pushed in it with the help of metered gear pumps which control the delivery with highest accuracy. These as spun filaments are then quenched in the water so that molten form is converted back into the solid form with the round or any other shape as required. As-spun Monofilaments are mechanically stretched 3 to 6 times in the first draw stage using hot water as the medium. Water temperature is maintained above the glass transition of the polymer followed by second stage
drawing in hot air and is stretched 1.3 to 1.6 times more. Here the temperature is maintained as per the final application of the product. In the last stage of the process the stretched material is stabilized by annealing the material at desired temperatures and by overfeeding the material enabling us to remove the maximum strain present in the material. Once we are able to orient and stabilize the material as required and as per the application is wound on the winder either on spools or in the form of hanks after applying the necessary amount of the spin finish. The use of spin finish is to make the material anti-stat and does not create any static charges when used at the customer end and also unwind very easily when put on the creel.

**Technical Specifications of Monofilaments**

Synthetic monofilaments are produced for various end applications as mentioned above and as per its application each type of monofilament will have its technical specification. In the Table no. 1, we have shown the specification in which most of the monofilament applications are covered except for the Paper Machine Clothing application where mostly Polyester Monofilaments are used having good resistance to Hydrolysis.

<table>
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<th>Unit</th>
<th>PET</th>
<th>PBT</th>
<th>PA6</th>
<th>PA66</th>
<th>PA612</th>
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<td>Tenacity</td>
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<td>3.0-8.0</td>
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<td>3.0-6.0</td>
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<td>0.5-6.0</td>
<td>0.5-6.0</td>
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<td>Thermal Shrinkage</td>
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<tr>
<td>Bend Recovery Wet</td>
<td>%</td>
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<td>88-93</td>
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<td>88-93</td>
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**The following figures provide the mechanical property relation of various Polymeric Monofilaments**

Stress- strain curve of monofilament having diameter - 0.20/0.30/0.40mm PET/PP/PBT/PA6

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**Differential scanning calorimetry (DSC) OF PA6/PET/PP Monofilaments**

Typical DSC of PA6/PET/PBT

**First heating**

**Second heating**

**Cooling curve**

**Table 1**

**Typical Properties of Various Types of Monofilaments**
Different types of Polymeric Monofilaments and their Specific End Applications

A. Polypropylene
- Geotextiles
- Filtration
- Horticulture
- Road Sweeping
- Door packing strip Brushes
- Air Condition Filters
- Agriculture
- Industrial Brushes
- Floor Cleaning
- Escalators

B. Polyesters
- Filtration
- Zipper
- Embroidery
- Textile Machinery brushes
- spacer Fabrics
- Braids
- Tapes
- Cleaning Brushes
- Paper Machine Clothing
- Brooms

C. Nylon 6
- Tyre Reinforcement
- Fishing nets
- Special Fish Catch nets
- Industrial Brushes
- Sewing
- Filtration Fabric
- Fishing Lines
- Shaving Brushes
- Embroidery
- Screen Printing
Olefinic polymers comprising Polypropylene and High Density Polyethylene are very widely used both in commodity and specialty applications. Market demand globally is very high in comparison to other extrudable polymers. Globally PP and PE polymers are widely accepted polymers for below mentioned applications due to their inherent properties. All the products are produced with the addition of UV stabilizers to have a good life of the products in the mainly in outdoor applications. We feel globally monthly demand of these polymers for monofilaments should be more than 10000 – 15000 MT per month.

**Poly Olefinic Monofilaments for diverse end applications**

Olefinic polymers comprising Polypropylene and High Density Polyethylene are very widely used both in commodity and specialty applications. Market demand globally is very high in comparison to other extrudable polymers. Globally PP and PE polymers are widely accepted polymers for below mentioned applications due to their inherent properties. All the products are produced with the addition of UV stabilizers to have a good life of the products in the mainly in outdoor applications. We feel globally monthly demand of these polymers for monofilaments should be more than 10000 – 15000 MT per month.

**Major Applications:**

- Agriculture nets
- Mosquito & Fishing Nets.
- Window frames –Replacement for Extruded nets and Steel mesh
- Vegetable packing’s –Mainly Onions
- Concrete Reinforcement
- Road laying–Geotextiles
- Air Condition filters
- Artificial hair

**Conclusion:**

- Polymeric Monofilaments are versatile materials finding diverse end applications
- Choice of Polymer and processability is key to achieve desired properties
- Markets are growing globally and innovations in material and machines is very important.
PLASTIC WOVEN SACKS: STANDARDS & REGULATIONS

HDPE/PP woven sacks are included in Packtech sector of technical textiles that include various packaging materials used for industrial packing like cement, pesticides, polymer, fertilizers, etc. and for packaging food grains, sugar, salt and flour.

The present market size for HDPE/PP woven sack industry is about 20,000 crores with a contribution of 2000 crores in the export basket. HDPE/PP woven sack industry provides employment to about 9 lakh workers. The segment has witnessed a growth of 14% during the last five years mainly due to inflationary rise of materials and export oriented growth in the key areas of the industry.

Standards for HDPE/PP woven bags at National Level are being formulated by the Textile Materials made from Polyolefins (Excluding Cordage) Sectional Committee, TXD 23 under the Textile Division Council of the Bureau of Indian Standards. In the last 5 years, most of the standards under the domain of TXD have been revised to include the important requirement of ash content and to update the various other performance requirements. Important standards on PP block bottom sack for packaging cement and PP non woven sacks for packaging bulk commodities have been published/finalized. The details of the important standards published by TXD 23 are provided as below:

Shri J. K. Gupta
Scientist-D (Textiles)
Member Secretary, TXD 23
Bureau of Indian Standards, New Delhi
The world market for Raffia is increasing constantly, especially for Raffia tapes to produce super sacks to store and transfer goods all over the world. The main concern of any Raffia producer and consumer is that the content of the super sack will not be harmed. Though the super sacks are basic and simple “containers” their content’s value can reach thousands of dollars.

Ultraviolet (UV) light has the biggest affect on the longevity of these super sacks; thus, UV stabilizers are the most important additive in the production of these tapes. UV light makes up approximately 4% of sunlight, but because of its high energy it is the main and root cause of the polymer’s degradation. During the processing of polypropylene (PP), unstable species (hydroperoxides) and radicals can form. When they are exposed to sunlight these impurities will start the photo-oxidation of the PP. The effect will be apparent by loss of mechanical properties at the surface of the PP.

The most commonly used additives are from the HALS (Hindered Amine Light Stabilizer) family. HALS are chemical species containing an amine functional group that protects polymers from photo-oxidation and thermal degradation (long term heat stability). Unlike common misconceptions these species do not absorb the UV light, but scavenge radicals in a continuous cyclic process. The mechanism in which the HALS protect the polymers is very complex but can be simplified by the Danisov cycle, as follows:

Today there are many commercially available grades of HALS, each one having different advantages and disadvantages. There are a number of aspects that need to be considered when choosing a UV stability package. The UV masterbatch (MB) can cause water to be carried on the film during processing, this phenomenon is referred to as “water carry over (WCO).” WCO can decrease production speed and decrease the film’s initial mechanical properties. In some cases, the UV stability package needs to be replaced to solve this problem.

The chosen HALS should be compatible with the polymer, as using the wrong HALS can cause die build up at the extruder die and insufficient protection of the polymer from UV light. For some applications, food contact approval is required but not all HALS comply with this regulation.

Nano-fillers are used as a compromise to reduce the cost of the UV MB but not dramatically affect the performance of the UV. The competition in today’s market forces the Raffia producers to find cost effective solutions. As a result, Raffia producers are in a constant search for UV MB’s that offer improved performance at lower cost.
Packaging is both a symbol of society’s consumption habits and a reflection of its progress. The user expects the packaging to have better strength and easier handling, lighter, more aesthetic and safer from the point of view of hygiene. The manufacturer undertakes research and development to meet these demands and to offer high quality product. In addition to its standard attributes, today’s packaging must also contribute to protecting the environment and certainly must not damage it besides being friendly to human health. Today when there is a difference of opinion about merits of using different packaging materials and their environmental credentials, an ecological assessment as well as study of the effects on human health is necessary. In view of this, a study on Life Cycle Analysis (LCA) of bulk packaging materials (jute sacks, PP-HDPE woven sacks and paper sacks) was undertaken with a capacity of 50 kg or below (Figure 1).

SUSTAINABILITY OF PLASTICS WOVEN SACKS—LIFE CYCLE APPROACH

For over three decades, Tosaf has been developing and manufacturing high quality additives, compounds and color master batches for the plastics industry. With the aim of providing for our customers’ every need, we have continuously grown and developed our offering, production capacity and global reach, becoming a truly close-to-the-market, global organization.

With a deep-rooted belief that we must be at the cutting edge of each of the industries we serve, the experts at Tosaf work with various educational institutions, gaining inspiration and giving of their experience.

Tosaf CEO Amos Megides established the company in Israel in 1986, and still stands at its head, leading and inspiring his team to always uphold the following three pillars:

- **Service**: Doing our homework, learning each client’s industry, processes, technology and needs, as well as having sales people and warehouses on the ground, ready to deliver anywhere, anytime.
- **Quality**: Investing in the latest machinery and technologies to ensure the highest standards, we also continuously learn, and look towards the future needs of each of the industries we serve.
- **Innovation**: Over 60 qualified professionals working together to develop unique and specific solutions to the complex challenges and ever-changing market demands faced by our clients.
Life Cycle analysis using “Cradle to Grave” approach is the only way to assess and compare the benefits for bulk packaging material by identifying inputs and outputs in the different phases of the life cycle assessment involves two stages: The first stage consists an accounting process that produces an inventory of all inputs and outputs in terms of energy, material and emission in the life cycle of a product or package; and the second stage involves evaluation of the effects of this inventory on the environment. The basis of this study has been considered as one million ton (1 Mt) of bulk commodities in keeping with the view of the consumption in order of magnitude.

To perform LCA of any product, the whole life cycle starting from its birth to death or in other words, from “cradle to grave” are to be taken into consideration. Life cycle of bulk packaging materials are divided into four phases: (I) Raw materials manufacture (II) Production of sacks (III) Usage (packaging and Transportation) (IV) Waste management. Each phase has been evaluated taking in consideration energy and water requirement for the operation and emissions of harmful chemicals and gases, during the same. Other effects as a result of these processes on the environment, such as depletion of natural resources, greenhouse effect etc. are also evaluated. A typical flow chart of product life cycle is shown in Figure 2.

The study discloses that for producing packaging with PP-HDPE woven sacks for one million tonne of bulk commodities, the raw material required is only 2310 tonne. But the same quantity of packaging with jute and paper requires 12290 tonne of jute and 7200 tonne of paper. This is almost six times more consumption of raw material in case of paper compared to PP-HDPE.

Another major resource utilization is demonstrated in terms of consumption of water. Manufacture of jute and paper sacks involves significantly higher consumption of water about 22,000 lakh litre/Mt of packed product in case of jute sacks production and about 18,000 lakhs litre/Mt of packed product in case of paper bag production. This is about ten and seven times higher for jute and paper respectively, compared to the water consumption in case of PP-HDPE woven sack per Mt of packed product.

Furthermore, production of both jute and paper sacks require utilization of chemicals to the tune of 258 tonne/Mt of packed product (for jute) and 4647 tonne/Mt of packed product (for paper) whereas almost negligible quantity of chemicals of this nature is required for production of PP-HDPE woven sacks (0.014 tonne/Mt of packed product). The energy requirement and more particularly, the health hazards associated with the packaging materials should be taken into consideration for comparison of bulk packaging purposes.

![Figure 2: Various Phases of Life Cycle Analysis](image-url)
More importantly, attention has been given to two end-of-life cases i.e., 100 per cent incineration (waste to energy) and/or 100 per cent recycling with energy recovery/saving. According to this phase, energy recovery due to incineration is about 95,000 GJ for PP-HDPE woven sacks used for packaging one MT of bulk commodities as compared to about 170,000 GJ in case of paper sacks used for packaging one MT of bulk commodities. Similarly, energy savings due to recycling is found to be around 47,000 GJ for PP-HDPE woven sacks used for packaging one MT, while it is only 32,000 GJ for paper sacks, used for packaging same quantity of bulk commodities. It should also be noted that in case of recycling of plastics the waste enters into a new life and if the waste management technique is taken into consideration, the life cycle analysis of plastics can be termed as Cradle-to-Cradle approach instead of Cradle-to-Grave. In this phase, very insignificant or almost no energy is recovered for waste jute sacks.

PP-HDPE woven sacks on the other hand are produced from raw materials which are chemically inert and also inert to metabolic processes. PP used for the manufacture of PP Woven Sacks meets the requirement stipulated in IS 10910 on “Specification of Polypropylene and its co-polymers for safe use in contact with foodstuff, pharmaceuticals and drinking water”. Furthermore, additives incorporated in polypropylene conform to the positive list of constituents as prescribed in IS-10909. The grade and additives incorporated in PP also comply with the FDA: CFR Title 21, 177.1520, olefin polymers. Likewise, HDPE used for the manufacture of HDPE Woven Sacks meets the requirement stipulated in IS 10146 on “Specification of Polyethylene for safe use in contact with foodstuff, pharmaceuticals and drinking water”. Furthermore, additives incorporated in HDPE conform to the positive list of constituents as prescribed in IS-10141. The grade and additives incorporated in HDPE also comply with FDA: CFR Title 21, 177.1520, olefin polymers. PP-HDPE woven sacks for packing bulk commodities are produced from PP-HDPE the same raw materials which are widely accepted and used for extremely critical and life saving medical applications for humans, besides items of daily human consumption, all over the world.

![Table 1: Life cycle data for packaging of one million tonne of bulk commodities](image)

<table>
<thead>
<tr>
<th>Material Required (tonnes)</th>
<th>Jute 12290</th>
<th>PP-HDPE 2310</th>
<th>Paper 7200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I (Production of Raw Materials)</td>
<td>153.6</td>
<td>12.0</td>
<td>258.5</td>
</tr>
<tr>
<td>Phase II (Production of Sacks)</td>
<td>179.4</td>
<td>9.7</td>
<td>Negligible</td>
</tr>
<tr>
<td>Total</td>
<td>333.0</td>
<td>21.7</td>
<td>258.5</td>
</tr>
</tbody>
</table>
PP-HDPE based bulk packaging is a vehicle for sustainable development and is fully renewable and amenable to recycling. After all, these polymers perform dutifully and effectively the role of a carrier from the doors of the producer to that of the consumer.

<table>
<thead>
<tr>
<th>Phase III Usage</th>
<th>Jute</th>
<th>PP-HDPE</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Transportation per 100 km distance, 9 tonne truckload and 3.05 km/l fuel consumption)</td>
<td>Excess Fuel (thousand litres)</td>
<td>Excess Energy (GJ)</td>
<td>Excess Fuel (thousand litres)</td>
</tr>
<tr>
<td></td>
<td>36.3</td>
<td>2035.9</td>
<td>Taken as basis (Zero Consumption)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase IV Waste Management</th>
<th>Jute</th>
<th>PP-HDPE</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling (Energy saving thousand GJ)</td>
<td>-</td>
<td>46.75</td>
<td>32.26</td>
</tr>
<tr>
<td>Incineration (Energy recovery thousand GJ)</td>
<td>-</td>
<td>95.31</td>
<td>169.11</td>
</tr>
</tbody>
</table>

**Outcome**

Though plastics like PP-HDPE are relatively newcomers, the use of it in packaging of bulk commodities adheres to the basic tenets of sustainable development more than in case of materials like jute and paper, if one considers the consumption of energy, emission of gases and the use of chemicals. An analysis of the comparable life cycle with jute and paper clearly indicates that plastics are economically affordable, socially acceptable and environmentally effective. Health hazards for workers in jute and paper are very high while those employed in plastics are almost free from such health hazards. Another revelation in the study results in discovering the effects of the weight of the jute and paper vis-a-vis PP-HDPE woven sacks on the overall loss to environment through transport of commodities (Figure 3). Managing waste helps to produce more from fewer resources, while generating less pollution and waste. The measures to reduce the amount of solid waste as industrial, commercial, or domestic, in essence, are improvements in efficiency. Jute and paper as bulk packaging material because more stress on waste management than PP-HDPE woven sacks. The residual plastics at less than 10 percent by weight of municipal solid waste can provide 20 percent of the fuel value for a local Waste to Energy plant.

**Figure 3: Excess energy required during transportation in jute and paper sacks as compared with PP-HDPE woven sacks for total (350 Mt) and 1Mt of bulk commodities.**
TECHNICAL TRAINING & RESEARCH CENTRE – TTRC
(A DIVISION OF LOHIA CORP LTD.)

Globally the FIRST TRAINING CUM RESEARCH Institute FOR RAFFIA INDUSTRY

TECHNICAL TRAINING & RESEARCH CENTRE (TTRC) was established by LOHIA CORP LTD at Kanpur, India in 2012 as an independent division of the group, with objectives blended with CSR commitment to impart skills to unemployed youth for employment generation as well as to support the growing Raffia industries by providing skilled & trained manpower. The objectives of TTRC have been drawn up in line with the vision of Mr. Raj Kumar Lohia, Chairman, Lohia Group to create a Training Institution for the Raffia industry which should cater to the training needs of Plastics woven sack sector, globally.

Since its operation in 2012, TTRC has emerged as the global destination for training requirements in all disciplines of Raffia industry from Operator level program to Executive & Entrepreneur development programs with a systematic approach to create pool of trained & knowledge based manpower for Raffia or Plastics woven sack Industries. Perhaps, globally TTRC is the first-of-its-kind Technical Training & Research Centre, dedicated for Woven sack industry. TTRC campus at Kanpur, India is spread across 10 acre land with residential facilities within the campus & state-of-art infrastructure including Lab & Workshop, equipped with Tape plant, Looms, BCS, Valvomatic, Multifilament yarn extrusion, etc. Over the years, TTRC has trained over 2300 operators & supervisors.

TTRC has been engaged by Woven sack companies from Kenya, Uganda, Bhutan, Bangladesh, Egypt, Qatar, Mauritania, Madagascar, South Africa, Vietnam, etc. as the Training partner for training of manpower for skill & knowledge enhancement, leading to productivity & quality improvement in their operations. USP of TTRC programs is customization as per the requirement of Industries. Also, TTRC is conducting Executive training programs for Plastics raw material manufacturers exclusively on Tape processing & on process optimization.

Lohia’s TTRC has coordinated with Textile sector skill council under the aegis of NSDC in creating Raffia sector Qualification packs (QPs)- Circular Loom Operator (Shuttle Type), Tape plant Operator and Tape Winder which have been approved by NSQC, body to recognize skill qualifications in India under MSDE, Govt of India. Any Raffia industry can take advantage of these QPs under textile sector, can avail benefits under Apprentice scheme as these skill courses related to Loom operator, tape plant operator & winder operator have now been formalized under Governmental Skill India program. Also, if any Raffia industry wishes to get their operators certified, it can be done through Recognition of Prior Learning (RPL) initiative of Govt of India. TTRC can very well assist Raffia industry for RPL related requirements.

TTRC has got NABL accreditation for its Laboratory for testing of Plastics Woven bags as per BIS specifications. The scope of NABL accreditation includes UV resistance testing through accelerated weathering test.
Overview

Raffia Industry started in India in early 1980’s and has been on a growth trajectory especially in the last two decades. Government of India encouraged Plastic woven sacks Industry after the severe shortage of Jute, which was a traditional packaging material. Furthermore, due to the Jute Industry strike in mid-eighties, Raffia Industry got a boost. This industry in India is mostly in Small and Medium Enterprise (SME) and has made an important contribution in India’s Economic Growth. Raffia products provide total solution to packaging of bulk commodities e.g. cement, fertilizer, sugar, food-grains, polymers, as also production of tarpaulin.

Its growth also has been commensurate with the growth in production of these commodities. With an installed capacity of 3.0 Million Tons per annum comprising 1350 units, spread across the country, the industry has an investment of Rs. 30,000 Crores (USD 4.3 Billion). The present production estimated at 2.2 Million Tonnes per annum, Raffia Industry in India employs around 1.4 Million workers across the country. This Industry is represented by AIFTMA (National Association of PP/HDPE Woven Sacks Industry) and Indian Flexible Intermediate Containers Association (IFIBCA)

Challenges

Raffia Industry in India, growing at about 10% CAGR, catering to most of the bulk packaging applications, had many ups and downs. Despite being a sunrise Industry, there have been many challenges faced by the Raffia Industry.

• JPMA Jute Packing Material Act (JPMA) 1987 applicable for food grains which mandatorily have to be packed in Jute Bags. Imposition of JPMA order in 1987, was almost like a bolt from blue and the industry was at loss. However, the industry had seen an opportunity under the adverse condition and it made the industry looking outwards. Thus, the Raffia sector made a good beginning in exports of PP Woven bags to Europe under compulsion, competing with strong and well established suppliers from China & other South East Asian countries. Eventually, some of these units also had started going up the value chain and commenced exports of FIBC (Jumbo bag) to Europe competing with Turkey who were much ahead, compared to other exporting countries.

• Anti-Dumping Duty: In mid of 90’s, imposition of Anti-dumping duty by EU on imports of PP Woven bags from India brought another jolt to the industry. However, the industry once again did innovation by starting exports of woven bags to EU under re-export market for packing of sugar, fertilizers, etc. wherein anti-dumping duty was not applicable and also started exporting woven bags to Russia, Africa, Middle East and South American countries.

• Multi-Fiber Arrangement: Due to quota system under Multi-Fiber Arrangement, exports of Indian made Woven Sack, Woven Fabric & FIBC was not allowed in USA market till end of 1999, due to quota regime. However, after abolition of Multi-Fiber Arrangement, exports of FIBC, small Woven Sacks, and Speciality Fabric, made a beginning in the year 2000.

• Extended Producers Responsibility/ Single Use Plastic- Government of India’s recent intention to restrict/ ban single use plastic, has again brought some uncertainty amongst Raffia processors. Fortunately, as plastic woven sacks/ Raffia products are designed to be used for multiple times, the current challenge can be an opportunity for the Raffia Industry. Incidentally Raffia products are fully reusable & recyclable.

Opportunities- Overseas Market:

• It is heartening to note that today in the Global Market of Raffia industry, comprising PP Woven Fabric/ Bags, Specialty Fabric and FIBC, India has achieved enviable status of being the largest exporter with highest market share in Europe and USA which is no mean achievement.

• Though India achieved top exporter status for FIBC in Europe more than a decade, they could achieve top exporter status in USA in 2016, despite late entry in beginning of year 2000. India is holding No.1 position in exporting FIBC to Europe with 60 % share in 2018 with commendable 24% growth over 2017.

In 2018, India continued to be the top exporter of FIBC to USA with 49% share and a significant growth of 17% over 2017.

• No doubt, cut throat competition amongst Indian producers is a matter of concern and this is an issue to be addressed by the industry itself.

Ujjal De
Director, Sales & Marketing
Lohia Corp Ltd, Kanpur, India
· At the same time, India has insignificant market share in exports of FIBC to Japan and Korean markets and Indian producers so far, could not make a break into this market which can be achieved by formulating and adopting right marketing strategy by choosing a right partner in respective countries and producing bags which meets typical requirement of these markets. US-China Trade war also has opened up new opportunity for Indian exporter to USA market.

· Recent success of Raffia industry in Speciality Fabric like Geo-textile, Ground Cover, Lumber Wrap, Ago-fabric and Roof underlays for USA market is a commendable achievement.

· Indigenous availability of high quality Polypropylene under Advance License, a unique scheme, prevailing in India and the ‘state of the art’ capital equipment like High productivity Tapelines, Looms, Conversion Lines, Recycling machines, etc. at affordable prices and finally Entrepreneurship of Indian processors, having excellent managerial capability and availability of skilled manpower, brought the success of Indian Raffia industry in Global market.

High Growth of Indian Demand:

Pond Lining: Interestingly, innovative development of Pond Liner in which Maharashtra has taken a lead is likely to change water problem for farming community. Pond Lining business has huge potential to grow in arid and semi-arid states like Rajasthan, Karnataka, Andhra Pradesh, Telangana and Odisha.

Another innovative idea of developing collapsible pipe for water distribution is likely to have far reaching consequences.

Cement: As per India Brand Equity Foundation (IBEF), cement production in India during 2018 is 460 million tonnes per year (MTPA) which accounts for more than 8% of the global installed capacity. The demand of cement industry is expected to achieve 550-600 million tonnes per annum constantly by 2025 because of expansion in housing, commercial and industrial construction.

Fertilizer: As per IMARC, Indian fertilizer market was worth Rs. 5.44 Lac Crores (USD 78 Billion) in 2018. It is expected to reach Rs. 11.12 Lac Crores (USD 158 Billion) by 2024, growing at a CAGR of 12.3% during 2019-2024.

Sugar: Brazil has recently reduced production of Sugar, by corresponding increase in ethanol output and in the process, India has become the largest producer of sugar in the world. This opens up good opportunity for growth from this sector.

Food grain: As per 2nd advance estimate of agriculture department, India’s overall food-grain production is likely to be 281 Million Tonnes in 2018-19. Due to high production of food-grain & constraint in availability of raw jute, PP Woven Bags for food packaging is likely to grow.

FIBC growth in Indian domestic market: As labour cost is going up in India, there is a possibility of shifting small bag packing, suitable for manual handling towards more mechanized packaging, requiring FIBC usage, which is prevailing in developed countries.

Considering expectation of high growth in Domestic market for packaging in various applications and India’s strong presence of export of FIBC in US and Europe market as also export of small bag and fabric, Raffia industry is likely to show sturdy growth in coming years.

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valvomatic

INTELLIGENT VALVE BAG MAKING MACHINE FOR THE INTELLIGENT RACE.

Synonymous to robust engineering, innovation and precision, Lohia Corp presents valvomatic, a one-of-a-kind valve bag making machine that performs multiple operations in a single automated set-up. Apart from ensuring precision, flexibility and ease of operation for highly automated facilities, for packaging of powdery materials, valvomatic also comes across as a saving champ, as it brings down manpower requirement, increases production and requires a much smaller production area. All the makeings of an intelligent choice. Isn’t it!

Why is valvomatic the intelligent choice for valve-type bag producers?

World’s only machine that enables cutting, bottom folding & stitching, valve forming and subsequently top folding & stitching in a single automated set-up.

Can valvomatic make bags as per specific requirements?

Yes, each and every bag is of the specified dimension and can be calibrated to make bags which are compatible with the world’s leading bagging, weighing and packaging systems like Haver and Boecker, Behn and Bates, Payper, Paglierani, etc.

How many bags can the machine produce per day?

Upto 35-40,000 valve bags per day, which are perfect in terms of dimensional consistency and accuracy.

What do I save, if I buy valvomatic?

It reduces cost of production, wastage of material and chances of spillage.

Any added advantages?

Less sewing margin allows a saving of around 30mm of fabric per bag. This results in saving 1200 meter of fabric per day which can further be used to make 1330 bags.
EMPOWERING THE INDIAN RAFFIA INDUSTRY DELIVER BETTER.

Presenting blokomatic - Valve Bottoner

blokomatic offers reliable and efficient solutions for producing block bottom valve bags, specially for cement and dry granular/powdered material packaging. Made from coated polypropylene woven fabric, these bags deliver enhanced strength and tear resistance compared to conventional bags.

Applications
Cement • Building Materials • Dry Granular Materials • Chemicals/Petro-chemicals • Food/Animal Feed & More

Easy Filling • Moisture Resistance • Dust Free • Strong and Durable • Higher Brand Visibility • Fully Recyclable

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