CHAPTER-I

1.1. INTRODUCTION

Paper has always played an indispensable role in knitting humanity together. The rising developments in the communication technology may have shadowed its existence but has never threatened existence. The long practiced form of paper making - handmade paper is once again creating a niche for itself.

The predilection of mankind to express itself by drawing or scratching on any suitable plane led to the development of paper. Quasi-papers, such as papyrus, tapa or amatyl are known to have been in use long before the accredited date for the definite discovery of paper as defined by accepted standards\(^1\). These specify that it should be a mat of cellulose based, vegetable fiber separated by mechanical or chemical treatment, hydrated and refined by further mechanical treatment whilst suspended in water, deposited as a mat on a screen and finally removed form the screen by a felt, or blanket. By this definition the invention of paper is credited to a Chinese eunuch T’ sai Lun in 104 A.D\(^2\).

It was not until the 12\(^{th}\) century that paper reached Europe and it remained a handmade product, expensive and selectively used until the early 19\(^{th}\) century, when the Industrial Revolution influenced it by introducing mechanization. Increased demand created pressure to find cheaper and more plentiful fibers and processes for using wood were developed in the middle of the 19\(^{th}\) century. Since then the machine and pulping processes have been improved and paper has become the “throwaway” material now required in such quantity that it ranks fifth amongst the world’s requirements.
Table No 1.1

Per Capita Consumption of Paper

<table>
<thead>
<tr>
<th>S.No</th>
<th>Countries</th>
<th>Per capita consumption in Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>USA</td>
<td>308</td>
</tr>
<tr>
<td>2.</td>
<td>Japan</td>
<td>240</td>
</tr>
<tr>
<td>3</td>
<td>Western Europe</td>
<td>160</td>
</tr>
<tr>
<td>4.</td>
<td>India</td>
<td>5</td>
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</table>


The world average of per capita consumption of paper is 46 kg while that in India is a mere 5 kgs. Its uses have increased to include packing, as well as writing, printing and specific industrial purposes.

Machines have increased in width, speed and capacity and pulp mills correspondingly to the point that units capable of producing up to 1000 tonnes per day (T.P.D.) are now in operation. Sophistication has followed scale and quality of production to the extent that plant costs have multiplied at a rate greater than product cost³.

The cost per mill installation has reached the level where only government and multinational companies can afford modern, large-scale “economic” mills. The sophistication has brought the industry to the position where highly skilled technicians are required for machine or pulp mill control, operation and maintenance. Consumption of paper is unevenly spread amongst the population of the world, varying from 250 kg/capita/annum in affluent, developed societies to as low as 1.5 kg/capita/annum in third world underdeveloped areas. Table No. 1.1 presents the per capita consumption of paper in several countries regions of the world.
1.2 PAPER INDUSTRY IN INDIA

The first paper mill was set up in India more than 100 years ago. The industry operated under protective tariff since 1925. Attracted by high profits under the protective tariff umbrella, many new paper mills were set up. During the period of planned development, the paper industry made rapid progress, India’s forests providing abundant raw materials for its smooth working. The production rose from 3.5 lakh tonnes in 1960-61 to 36 lakh tonnes in 1999-2000. The production of newsprint rose from 0.9 lakh tonnes to 5.6 lakh tonnes between 1961 and 2000.

The paper industry represents an important segment of the Indian economy. The industry has witnessed a steady increase in installed capacity and production over the decades. The paper industry in India is primarily using non-conventional raw material, as 62 per cent of the market is catered to by paper products manufactured from raw materials like agro waste, agro residues and recycled paper. The demand is estimated to be around 54.80 lakh tonnes in 2005-06. The growth rate in the paper industry during 1999-2000 was 13.49 percent.

At present, there are about 515 paper mills (including mills producing newsprint) in the country with an annual installed capacity of about 49 lakh tonnes. Currently, the capacity utilization in the paper industry is about 70 per cent, as 184 paper mills, particularly small mills, are sick and are lying closed. Some incentives have been provided to the paper industry, particularly to those mills which are based on non-conventional raw material. Paper and paperboard manufactured out of more than 75 per cent non-conventional raw material have been exempted from payment of excise duty up to the first clearance of 3,500 mt. per annum. Imports of paper was 4.06 lakh tonnes in 1999-2000 and 2.71
lakh tonnes in 2000-2001. About 1,08,000 tonnes of paper have been exported in 2000-2001 mainly to neighbouring countries.

The production of paperboards during 198.1 was only 1.35 lakh tonnes. There has been continuous increase in the production of paper during the past five decades. The production crossed 34 lakh tonnes during the year 2000. The increase in percentage was 77.32 when compared to the year 1990.

1.3 GROWTH OF PAPER INDUSTRIES IN INDIA

In terms of capacity, nearly 600000 T.P.A. will be contributed by the additional small mills already scheduled for commissioning but not yet so for a number of reasons discussed later. Production seldom reaches 65% of installed capacity. Even at such low efficiency, however, the greater majority of the mills are profitable.

Official forecasts, embodied in the two 5 year plans culminating in 1989, indicate growth averaging 7% per annum over all grades, and total consumption, including 800000 tonnes of newsprint, around 3,150,000 tonnes. At current rates of installation, controlled by government licensing, the small mills are likely to contribute up to 40% of the non-newsprint requirements and probably more if 7% proves to be a pessimistic growth forecast selling prices.

1.4 HISTORY OF THE HANDMADE PAPER INDUSTRY

The Handmade paper manufacturing is one of the traditional industries of the world as its invention dates back to 105 AD in China. However, Indians are credited with having used paper made from cellulose fibers even during the third century B.C. prior to this period. The leaves of palm trees were the medium of writing in India. Tapanis’ made from the barks of the trees that grew on the banks of the Nile river in Egypt was stated to have been the medium of communication in Egypt
1.5 PRODUCTION PROCESS OF HANDMADE PAPER INDUSTRY

It is of substantial significance to note that the machinery setup once in any unit can manufacture any variety of paper and board depending upon the raw materials used and of market taste.

1.5.1 Rag Sorting and Dusting

This is preliminary process which is carried out in order to remove unwanted contents like buttons, iron particles, dust, synthetic fibers etc. from the raw materials-rags or jute-hand picking is usually done by female workers. Then the cleaned rag is dusted on duster.

1.5.2 Rag Chopping

The cleaned rags are chopped into small pieces of 1” x 1 1/2” (small bits) in the machine named rag chopper. The machine is assembled of 3 revolving knives of hard steel plate 12” length - width 3” fitted to the central heavy cast iron (free from below hole roil), roll cut with 3 slits. Each knife is fitted to edge of each end counter sunk at an angle of 4” with a shaft of 2” dia. One stationery knife is fitted to the bed late with a sliding screw arrangement.

One feed roll of 12” wide and 3 1/2” dia with priory is attached to each side and adjustable screws run on rachet wheel attached to the driving pulley. Feeding platform and dis-charge chute regid MS angle iron frame, suitable to take the loan, two ball bearings for shaft, two cast iron pulleys 1!/2” dia - dace 1 1/2” (1 pulley v. belts twp belts, and one counter wt. Fly wheel) with proper wire mesh covering, speed of wheel be 40-45 r.p.m. of machine approx. 60 kg. Run with 2 H.P. motor capacity 400 kg. Per 8 hrs.
When the rag is chopped it is passed through duster to avoid dust from the rags. It is done manually by rubbing chopped rags on wire mesh, or by dusting machine.

1.5.3 Cooking (Digestion)

Well-sorted, chopped and dusted rag/jute, raw material has to be necessarily cooked before sending for pulping. Cooking liquor usually is caustic soda 1% to 3%. Generally for cooking process vomiting type of boiler is used which develops pressure of 10-15 lbs. Lt consists of : 1) Drum 4” dia x 6'/2” height with sides of the drum made of MLS plate of/2 the thickness, 2) Bottom plate 3/8” M.S. plate with flat bottom plate with pressure gauge and safety valve fitted to it, 3) Perforated bottom plate- suspended in the drum 011 the four steps of angle iron - 2” width welded to side wall inside 1'/2” from bottom plate and 4) Vomiting pipe and chimney, with capacity of 250 to 300 kg of rag bits of all kinds per charge of 600 kg. Wt. volume 2 cubic meter and with rustproof coating.

Cooking removes greese, dust and also bleaches the raw materials for further processes.

1.5.4 Pulping

This is done by Hollander Beater machine. In the Beater, pulping, Bleaching, washing of the pulp, dyeing, loading and sizing operations to the extent necessary depending upon the raw materials and end products are done. The puling operation takes 2-6 hrs. per charge, Usually 3 to 10 charges of pulp are taken in a beater.

1.5.5 The main parts of the Beater Machines (Size 30” x 36”0 are)

1. Roller 9with knives) 36” dia, 30” width, 2. Central shaft, 3. Cast iron pedestals with central level to hold the shaft, 4. Bed plate with knives, 5. Two ‘U’ shaped girders for pedestal channel, 6. Washing-drum of 30” & 36” dia with 40 mesh wire with angle iron stands, 7. Wooden hood to cover the roller, 8. Cement trough for beater to be constructed at
site as per design and 9. Cast iron V pulley for driving the beater. Machine should be sturdy and efficient in running and smooth in operation. Capacity should be such that 150 kg of rags can be beaten to make pulp in 6-7 hrs., 200kg of paper waste per charge in 3 hrs and 250 kg of straw bagasse etc. per charge in 2 1/2 hrs.

This is very important machine is the industry. The motor required is capacity of 30 H.P slip ring type of 960 RPM. Thus ready pulp is discharged in a suspended pulp chest. In the beater consistency of pulp ranges from 2 to 3 per cent. The agitator mixes the pulp and does not allow the fibers to settle down in pulp chest to form clots. Now it is ready for lifting sheets.

1.5.6 Vat Machines

From pulp chests, the pulp is conveyed to pulp storage tanks in ‘Vat-section’. Vat machine is a paper lifting device, made up of wooden tank  V” angle iron frame. Size of the tank 42” x 56” (inside measurement), with false bottom resting frame. Inside the tank a fabrication of the angle iron 1 1/2” and 3/8” iron strips treadle is to be made to fix up the ‘Deckle’ box of the mould. The side ends are suspended by adjustable screws with 1/4” rod 6” long to a common 1” rod which lifts up and down with a common angle iron paddle.

1.5.7 Deckle & Mould

Deckle box is made to rest the mould inside. Bottom plank be 1/2" thick wooden plank. A complete bottom frame is made to fix this with 1/2” screw to the bottom frame. Similar wooden frame is made to cover the mould with side ‘hinges’ and is kept free to open the top frame to remove and insert the mould.
1.5.8 Mould

Paper lifting mesh - Teak wood frame of 1 1/2” brand and 1/2” thick wooden frame, on back side of it the ribbed fabrication of small wooden strips is fitted. Over this 7 mesh copper wire is stretched as supporting mesh. Last layer is covered with stretched copper or bronze wire of 40 mesh with two small wooden handles at each side 2 nos. each, vat size being 26” x 34”.

In order to make paper, Vat machine’s tub is filled with water where down the deckle mould 1 1/2” water rise occurs from mould to upward. In pulp storage tank the consistency is maintained at 1 to 0.50 per cent and the evaluated quantity of pulp is poured into the mesh when mould is dipped in water. The mass is stirred well by hand then gradually the mould is lifted up with the help of the paddle. The water gets stacked in the tank and the pulp settles on the mesh. This wet pulp sheet is taken out along with mould for couching on ‘Felt’. The operation is repeated. Each lifting gives one paper sheet. A vat man of expert caliber lifts 1000 thinner variety papers in 8 hrs. The weight of vat machine is generally of 125 kg. It should work smoothly without any strain, Vat machine - 4 nos.

1.5.9 Couching Table

This is a 42” x 36” wooden plank of 1/2” thick wood with angle iron frame of 1 1/2” height - 4 nos. This is for laying the wet sheets on the felts on this table and separate the wet pulp sheet from mould. A post of such sheets are piled up before it is taken to hydraulic/screw press for dewatering.

1.5.10 Dewatering Process

Before pressing, the post of wet papers contains 100% moisture. This water is removed by pressing in screw press. Simple central screw movement press plate of 36” x 42” M.S. 1/2 plate rigidly strengthened by top welded girders or a good cast iron ribbed plate. Central screw 4” dia 2
T.P.I. square with constant thrust bearing, side poles 4 nos. 5” dia M.S. rods, top wheel of 20” is operated by hand. Some times operated by screw bar too. The weight of such ideal machine is 2000 kg. Some times Hydraulic press is used. The water is removed upto 10-15 per cent only.

1.5.11 Separation of paper from felts

After required pressing, the couching table is taken out from press and paper sheet is separated from press and paper sheet is separated form the felts, and allowed for drying.

1.5.12 Drying Process

The drying of paper in hand made paper industry is a challenging task. Only sun drying and induces rope drying is used but during winter and rainy season when environment get humid, due to lack of heat prolonged energy the drying time of the sheets is finally retarding the production. Drying tunnels are being used in some of the industries in Maharashtra by utilizing steam but it is only on experimental basis and not economical. It is possible to design a drying system using some alternative energy resources viz. solar energy and bio mass energy.

Drying of hand made paper is an important activity of this Industry. The quality of paper wall depend on its drying at suitable temperature and environment. Sun drying in the open is a simple traditional method but the paper quality will be most of the time inferior in this method. If coal or electricity are used for the system it becomes costly for such small units from economical point of view.

The amount of water entering and leaving the drying media is measured as the percentage of water on the total wet weight Thus 65 per cent water entering the media means 65 kg of water and 35 kg. Of dry fiber for each 100 kg. Of wet paper. The entering water on this basis would be $65 + 35 = 1.857$. 
The leaving water is $5 + 95 = 0.053$. The evaporation per kg of dry fiber is $1.857 - 0.053 = 1.804$. Since there are 0.95 kg of dry fiber to 1 kg of dried paper the evaporation per kg of dried paper is: $1.804 \times 0.95 = 1.71$.

For a small scale HMP unit producing 120 kg fresh product of Manila cover 22” x 28” = 500.60 kg specification, the amount of heat energy required to dry the 120 kg F.P will be: $\sim 120 \times 1.71 = 205.2$ kg of water should be evaporated while drying.

As per hydrology science at 60° heat energy required to evaporate 1 kg of water - 563.2 Kcal, energy at natural condition, total energy required will be $= 563.2 \times 205.2 = 115,568.64$ Kcal / 8 hrs.

So a drying device can be developed by utilizing alternative energy resource to meet the above energy requirement i.e. a Bio gas plant of 9m$^3$ and a solar source of 10 M$^2$ which will give 1,45,470 Kcal/8 hrs. Based on the above theme, the proposed drying device is being experimented. Such of drying media will be quite feasible for plants 500 kg per day production.

1.5.13 Paper cleaning & sizing

When paper sheets got dried they are taken for cleaning. Females do it better then male workers and glue sizing is done, whenever required. The sizing is done to attain ink repellency of the paper and the process also gives tone to the paper. The sized sheets are pressed under screw press and allowed again for drying.

1.5.14 Calendering process

The basic function of calendaring is to reorient the surface fibers in the base sheets of paper or the coating applied to the surface of the paper by either compression friction or a combination of both. Calendar machine consists of 1) Calendar rolls (Bowls) - 2 nos., 2) Gear wheels, 2) non. Ped stalls, 3) Reduction gear wheel, 4) Driving V pulley, 5) Counter
weight Cover system, 6) Plant forms for paper post 2 nos., and 7) side pedestals -2 nos. This machine is use in making the sheet surface smooth as desired by the customer. The sheets are placed in between the zinc sheets and made in a post of 30-40 sheets and the post is passed in between the rollers. It operates to and for some time and imparts smoothness uniformity to the paper sheets.

1.5.15 Paper Cutting & Patching

The finished papers are cut to the required specific sizes in the paper cutting machine. The machine should be of 42” width (cutting) dia zonal cutting with a set of 2 knives to be operated both by hand or by 2 H.P. motor, and paper is paced to contain 500 sheets in each ream for the purpose of disposal.

1.5.16 Felt for Handmade Paper industry

The felts used in Handmade Paper Industry selectively or wollen, much thick and composed of pure wool and no vegetable Fibers since hand felting acts as a couch in addition to acting as a wet felt, it therefore, follows that it must be of close and very even texture.

1.5.17 Water marking of hand made sheets

The operation of water marking is best accomplished in hand made papers and it essentially become a part of the sheet forming operation. The watermark in paper is caused by wires of different gauges made in the forms of letters. Monograms are design and fastened to the wire covering of the moulds. As it lies on the mould the top surface of the wet pulp is flat, but the bottom surface is thinner where it touches the wires of the water nark. Thus remarks are ‘Sunk’ or raised. The ‘Sunk Mark’ makes that part of the sheet where the lettering or designs appear heavier than the remainder of the surface. While the ‘Raised Mark’ causes the pulp to lie thinner on the mould at that point and makes the water mark more transparent than the remainder of the sheets1.
1.6 HANDMADE PAPER PRODUCTS

Any industry of manufacturing nature will have to specify, first the entire product it is going to manufacture in the proposed unit. Accordingly the TNKVIB units, with an object to manufacture paper and boards that are badly in need of the state government were set up. The products under manufacture in TNKVIB departmental units are: 1) File boards, 2) Straw boards, 3) Impression papers, 4) Bond papers, 5) Kraft sheets 6) Card sheets of high-grade varieties.

For meeting the demands of the offices, stationery items such as envelopes, file covers, file pads, different varieties of files such as clip file, dock file, box file and so on, registers, pen cushion stands, zoo box, Photo albums, they are recently introduced carry bags manufacturing and the like varieties can also be manufactured and value addition to paper and boards can be ensured.

A few units were engaged in conversion activities as value addition on paper and boards. This value addition also enabled them to find immediate market for their product without and market gluts.

Conversion of file boards into file covers, combination of straw board/mill board with attractive marble sheets of bond papers and Lag flaps are in good demand to various departments of state and central.

1.7 HANDMADE PAPER INDUSTRY IN INDIA

The handmade paper industry which flourished in India during the Moghul period gradually declined with the establishment of paper mills during the 18th and 19th centuries. Nevertheless, it is noteworthy that the art of handmade paper making was revised under the inspiration of Mahatma Gandhi, the father of the Nation, during the Freedom movement. And with the financial and technological assistance extended
by the Khadi and V.I. Commission during the last four decades, the
industry has not only survived in India but made its impact felt in
developed countries by exporting drawing paper and other exclusive
items for the past two decades.

Table No. 1.2 presents the targets proposed in the Ninth Plan of the
Government of India for the development of the industry.

Table No. 1.2
IX Five Year Plan Target of HMP Industry

<table>
<thead>
<tr>
<th>Particulars</th>
<th>No.of Units</th>
<th>Production Qty.in Tonnes</th>
<th>Value of production Rs.</th>
<th>Sales Qty.in Tonnes</th>
<th>Value of Sales in Rs.</th>
<th>Employment in Nos.</th>
<th>Earnings Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1997-98</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>Existing units</td>
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<td>4570.00</td>
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<td><strong>1998-99</strong></td>
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<tr>
<td>Existing units</td>
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<td><strong>1999-2000</strong></td>
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<td></td>
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<tr>
<td>Existing units</td>
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<td>4926.00</td>
<td>19107</td>
<td>6329.20</td>
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<td>20094</td>
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</tr>
<tr>
<td>Existing units</td>
<td></td>
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<td>5131.00</td>
<td>19927</td>
<td>6575.20</td>
<td>20094</td>
<td>1535.85</td>
</tr>
</tbody>
</table>

Today the handmade paper industry is one of the important industries under the Khadi and Village Industries sector, with 340 working handmade paper units spread over the length and breath of the country, producing around Rs.100 millions worth of paper, providing full time employment to around 6,500 persons in the rural areas. In contrast, there is a sharp decline of the industry in Europe and Japan on account of exorbitant labour costs.

Table No-1.3

Performance of Hand Made Paper Industry in India

(Rs in lakhs)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Working units</th>
<th>Value of Production in Rs</th>
<th>Value of Sales in Rs</th>
<th>Employment in thousands</th>
<th>Wages in Rs</th>
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<tbody>
<tr>
<td>1</td>
<td>1991-92</td>
<td>344</td>
<td>1210.39</td>
<td>1238.52</td>
<td>7.00</td>
<td>T36.8¹</td>
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<tr>
<td>2</td>
<td>1992-93</td>
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<td>1532.12</td>
<td>1604.91</td>
<td>7.50</td>
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<td>3</td>
<td>1993-94</td>
<td>1246</td>
<td>2213.92</td>
<td>2401.83</td>
<td>10.00</td>
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<td>4</td>
<td>1994-95</td>
<td>1911</td>
<td>3027.45</td>
<td>3325.88</td>
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<td>5</td>
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<td>3872.75</td>
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<tr>
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<td>7</td>
<td>1997-98</td>
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<td>9</td>
<td>1999-2000</td>
<td>2883</td>
<td>7000.32</td>
<td>8500.50</td>
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<tr>
<td>10</td>
<td>2000-2001</td>
<td>2519</td>
<td>12100.89</td>
<td>14200.36</td>
<td>25.00</td>
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</table>


The performance of Indian handmade paper is presented in Table 1;3. Paper conversion units were also included from the year 1993-94. Female employment is about 35% of the total employment. In the year 2000-01, production of handmade paper and related products increased
by above 72.85% and sales recorded spectacular growth of 67%. This was due to ban on plastic products and increased awareness on environ friendly products and scope for rural entrepreneurship. These initiatives helped to generate more employment and increased wage earnings. The performance of the Industry is bound to increases, as more and more literate masses are being attracted towards Handmade Paper and coming forward to establish/ deal in Handmade Paper.

1.8 IMPORTANCE OF HANDMADE PAPER INDUSTRY

The handmade paper industry in the small scale sector is now growing fast. Paper now plays an important role in our day to clay life and we are unable to pass a single day without the using paper in one form or other. Due to very rapid industrialization on a global scale, the big paper mills have over-shadowed the handmade paper industry which is truly eco-friendly. However, in India, the handmade paper industry under the KV1 sector has been substantially developed whereby traditional kagazies, arts and crafts are preserved. What is more, a variety of handmade papers are manufactured by using non-woody raw materials. Though it is environment attuned and has unparalleled durability and texture exclusiveness, handmade paper does not find a proper place in the global market due to its inadequate exposure in the international market. It is also a fact that it has tremendous export potential. The demand for handmade paper in European countries as well as in developing countries is growing more and more.

One tonne of traditional Indian handmade paper, produced from cotton rag waste, will require an estimated 277 eucalyptus or 462 bamboo trees if produced as conventional mill made paper. Though it is surprising, but it is true.
The handmade paper industry with minimum effluent discharge and small size units allows a large canvas for mill location taking advantage of several options such as proximity to consumers or export centers, easy accessibility for transport of supplies and products to various consumer centers, as well as a large employment potential. As the Indian economy is a rural economy, this production system will not only stop the wealth drain from rural to urban areas but also establish a strong base for rural development.

The industry provides the surest, quickest, least expensive and most effective means of resolving the shortage of paper. The handmade paper industry depends upon indigenous source of raw materials which is utilized to the maximum extent possible, it puts to use fiber materials such as waste paper, hosiery cuttings, press cuttings, tailor cuttings, old gunny bags, jute waste etc. These materials are easily available and can be put to economic use.

It utilizes agricultural residues. Most developing countries depend upon agriculture as the backbone of their economics. Agricultural residues such as paddy and wheat straw etc. are most productive. They are obtainable in such large quantities as to make a very significant contribution to the increasing paper demand. But in reality only a small amount of these residues are utilized as manure, fodder, source of fuel etc.

It provides consumers with a variety of paper products such as documents and books which can be preserved for many years etc. which is an important aspect. It causes little pollution as compared to big mills. By virtue of using waste paper and other fibrous materials, it does not contribute to the problem of environmental deterioration such as deforestation, pollution etc.
1.9 SCOPE OF HANDMADE PAPER INDUSTRY

The future of the paper industry is bright considering the present demand and supply. The gap between demand and supply is widening day by day. It is expected to rise to Rs.50.70 lakhs by the year 2015-16 from a low of Rs. 16.92 lakhs in the year 2000-01. With the rise in popularity the use of handmade paper has not just been restricted to printing and writing. Modern creative minds have taken paper beyond its conventional form to greener areas.

Currently 30% of the paper is being consumed for special grade paper and board (Drawing paper, Bond paper, water mark certificate paper for exclusive stationary issue from banks and leaf fibers for archives and conversation). Industrial paper consumes around 5%. Quality board for packing consumes 15% of boards. Others uses combine to consume around 25% of the total handmade paper produced.

General character and formation as shown by the look, due to the method of forming the fibers into a web by hand, which allows them to be evenly distributed in all directions of the sheet instead of mostly in one direction, as on the paper machine.

Handmade paper has a higher average strength than ordinary paper. Only the highest grades of rags are, as a rule, used in the manufacture, and they are strongly dub-sized and well matured. A very high degree of permanence and durability are other very important features. These qualities arise from the fact that a high grade cellulose fiber is used which requires very little chemical processing and consequently the fibers undergo a minimum of degradation.
1.10 USES AND APPLICATION OF HANDMADE PAPER

Handmade paper is made from a choice of raw materials. In England and other foreign countries fine grades of linen and cotton rags are used for high class paper. Linen rags are not available in India in large quantities. Hence cotton and hemp wastes and to a certain extent linseed fiber if it could be obtained clean are most useful for such purposes.

The raw material does not receive any harsh chemical treatment, in boiling and bleaching so that the quality of the cellulose does not deteriorate. The beating is carefully regulated so as not to injure the fiber. Unlike in the machine made paper, the fibers in the handmade paper are well felted or malted together as the wet material receives shakes from all directions at the hands of the vat man. The sheet dries in its natural state as against the artificial means employed for drying machine made paper. In modern practice, handmade paper is sized with glue or gelatin.

All these produce special qualities in handmade paper. It is used where strength, durability and endurance are required. Such uses to which machine-made paper is put are currency or bank notes as they have to undergo considerable handling every day while in the circulation, printing valuable books, ledger and account books, as the books are required to last long and stand rough and hard handling, filter paper for chemical analysis.

“Grain and fine texture” together with strength and durability are required in drawing papers as it is used by artists and architects in water colour printing. Drawing paper is required to stand the stretch over the board. So also the paper must stand the colour wastes at the hands of the artists. Legal documents, bills, share certificates, bonds etc. must stand hard wear and tear and should not deteriorate for a considerable time. Photograph and picture mount, carry bags and Vellum papers also require strength and durability.
Note paper, and envelopes as high class stationery, wedding Christinas and Pongal greetings cards, fine etchings, engravings, presentation of addresses etc., also require such special paper.

1.11 MARKETING POTENTIAL OF HANDMADE PAPER

The Indian handmade paper industry produces a host of varieties of paper by mainly recycling the waste materials such as cotton rags (in the form of tailor cuttings) and small quantities of waste paper. Agro fibres like jute, straw and banana fibre are also used to blend with the primary fibres for mottling effect etc. This aspect, with its co-friendly nature, earns for an added advantage in the world market.

1.12 EXPORT PERFORMANCE OF HANDMADE PAPER INDUSTRY IN INDIA

Identification of export potential and establishment of an export cell by the State Government to serve as an information center for export are urgent needs. Training in all aspects of export is to be arranged and provided. Visits of experts to the identified units are essential for promoting export activities. Such units are to be liberally financed and supported by the KVIC in all their export marketing efforts. Such potential units are also to be linked with the Tourism Development Corporation for their publicity. Aggressive publicity and advertisement aboard is to be done by setting up at least a few contact points with showrooms in the US and Europe, preferably in New York, Paris and London. This will enable foreign customers to have direct contact and interaction with such showrooms. Exchange programmes for the people coming from abroad and going abroad from the industry are to be encouraged. Awards may also be given to excelling quality units for their performance.
The Kumarappa National Handmade Paper Institute specializes in export promotion: It arranges international market survey by international consultants, awareness about Indian handmade paper and paper products abroad through international marketing consultants, awareness about the Indian handmade paper and industry in developed countries by market study teams, exposure to the industry by participation in international fairs at New York, Singapore and London and awareness about Indian handmade paper through technical study teams.

Table -1.4

EXPORT PERFORMANCE OF HANDMADE PAPER INDUSTRIES IN INDIA

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Value (Rs.in crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1993-94</td>
<td>6.00</td>
</tr>
<tr>
<td>2</td>
<td>1994-95</td>
<td>8.00</td>
</tr>
<tr>
<td>3</td>
<td>1995-96</td>
<td>10.00</td>
</tr>
<tr>
<td>4</td>
<td>1997-98</td>
<td>21.00</td>
</tr>
<tr>
<td>5</td>
<td>1998-99</td>
<td>50.00</td>
</tr>
<tr>
<td>6</td>
<td>1999-2000</td>
<td>55.00</td>
</tr>
<tr>
<td>7</td>
<td>2000-2001</td>
<td>63.00</td>
</tr>
</tbody>
</table>


1.13 MAJOR BUYER COUNTRIES

The demand for handmade paper is increasing in the international market. The major buyer countries are USA, Germany, U.K., Italy, France, Sweden, Australia, Singapore, Hong Kong and Japan.

There is a growing demand for various qualities of handmade papers in developed countries, particularly because it is an environment friendly product. The country is exporting handmade paper
worth Rs.21 crores which is expected to increase substantially. The industry has to gear up its activities in maintaining quality, timely supply, economy and tapping unexplored markets as there exists tremendous potential for handmade paper export. India is the leading country in the world in the field of hand made paper production. It produces about 17000 tonnes various grade of handmade paper per annum. The handmade paper industry, being a village industry, is located in rural areas and provides employment to more than 15000 rural people masses from the poorer sections of the society. It is not only producing econ-friendly paper and saving forests for maintaining clean environment but also serves the nation in its own humble way. There are about 339 units working all over the country. A major portion of their products is exported, which earns a sizable amount of foreign exchange. Some of the units are lacking in technical expertise, entrepreneurial or managerial skill and in many other fields. The KVIC is well equipped to cater to the needs of these units. The Maximum advantage should be taken of this to maintain our prestigious position in the handmade paper market. Kumarappa National Handmade Paper Institute plays a leading role in sending the message to each state to develop clusters of handmade paper units and help them in exporting their products. Tamil Nadu handmade paper units should avail of this facility for their betterment.

The type of handmade papers which are in general demand in foreign markets are given below:

Water colour drawing paper, Bond paper, Decorative and fancy paper, Perfume boxes and carry bags, Unsized mottled art paper, Gift wrapping paper, Marble paper and blended fiber paper, Invitation cards, Greeting cards, Hotel menu cards, Stationary items like pads, envelops, price tags, diary, note books, table cover, wall posters.
The Indian handmade paper industry produces a host of varieties of paper by mainly recycling the waste materials such as cotton rags (in the form of tailor cuttings and hosiery cuttings) and small quantities of waste paper. Agro fibers like jute, straw and banana are also used to blend with the primary fibers for mottling effect etc. This aspect with its eco-friendly nature earns for it an added advantage in the world market.

The role of non-resident Indians, Particularly women groups and students both in India and abroad will be quite significant. They must be involved in all important programmes for sustainable and balanced growth of the industry. The role of Indian Embassies, UNICEF, ILO and various other international bodies must be examined in detail. The price of the paper should be based on the buying capacity which will differ from place to place.

The Indian perspective of handmade paper, in particular recycling, must be highlighted. For this its long-term sustainable aspects need to be studied and linked up. There appears to be a number of explanations for the affirmative response to a range of Indian paper. In particular the “mood” of the American market is at a perfect stage to appreciate the aesthetic aspects of Indian handmade paper for several reasons.

1.14 **KVIC’S NATIONAL PROGRAMME ON HANDMADE PAPER**

The programme is of 3 years’ duration. It envisages setting up 460 new units , providing direct employment to 26,000 rural people, of whom over 10,000 will be women. The indirect employment created will be another 10,000. The existing installed capacity of 438 units is 12,356 tonnes of paper and board, which, at the end of the programme, will increase to 56,000 tonnes. To provide technical and marketing support to existing and new units, it is proposed to set up 20 service centers and 45
extension wings of Kumarappa National Handmade Paper Institute, a unit at Jaipur besides a professional marketing organization.

115 TAMIL NADU KHADI AND VILLAGE INDUSTRIES BOARD, CHENNAI

Established on the first of April in 1960, the Tamil Nadu and Village Industries Board, Chennai promotes, formulates, finances and implements the Khadi and Village Industries schemes. The basic objectives are to provide employment in rural areas and to augment the daily income of the rural poor and at the same time introduce modern tools and techniques at the grass root level to upgrade the skill of traditional artisans.

The handmade paper industry in Tamil Nadu has been controlled by three operational sources namely, the Tamil Nadu Khadi and Village Industries Board, registered institutions controlled by Tamil Nadu Khadi and Village Industries Board, Co-operative Societies and other registered institutions and charitable trusts and private units. The Tamil Nadu Khadi and Village Industries Board and other institutions produce different varieties of paper. The Tamil Nadu State Khadi and Village Industries Board get assistance from the Khadi and Village Industries Commission as well as from the State Governments. Finding allocations under different social development programs, the handmade paper industry could give sustainable employment opportunity to rural masses at their door steps. Wealth is created from waste and requires very little capital investment compared to large paper mills where the disposal of effluents is a problem. Catering to the requirement of the different Government departments, the Tamil Nadu Khadi and Village Industries Board units produce mostly impression paper, bond paper, blotting paper, card files, card boards, straw boards, envelopes, carry bags, letter head pads whereas most of the private units are concentrating on production of industrial
utility papers like packing covers, writing papers, greeting cards, festival cards etc.

Table No - 1.5

Performance of Hand Made Paper Industry in Tamil Nadu

(Rs in lakhs)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Value of Production in Rs (3)</th>
<th>Value of Sales in Rs (4)</th>
<th>Employment in thousands (5)</th>
<th>Earnings in Rs (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1991-92</td>
<td>15.61</td>
<td>16.01</td>
<td>120</td>
<td>7.07</td>
</tr>
<tr>
<td>3</td>
<td>1993-94</td>
<td>20.01</td>
<td>15.88</td>
<td>119</td>
<td>4.6</td>
</tr>
<tr>
<td>4</td>
<td>1994-95</td>
<td>19.49</td>
<td>25.43</td>
<td>109</td>
<td>6.72</td>
</tr>
<tr>
<td>5</td>
<td>1995-96</td>
<td>22.67</td>
<td>18.99</td>
<td>107</td>
<td>5.05</td>
</tr>
<tr>
<td>6</td>
<td>1996-97</td>
<td>15.93</td>
<td>21.32</td>
<td>100</td>
<td>4.73</td>
</tr>
<tr>
<td>7</td>
<td>1997-98</td>
<td>25.04</td>
<td>22.99</td>
<td>101</td>
<td>6.23</td>
</tr>
<tr>
<td>8</td>
<td>1998-99</td>
<td>31.80</td>
<td>21.24</td>
<td>100</td>
<td>14.74</td>
</tr>
<tr>
<td>9</td>
<td>1999-2000</td>
<td>55.20</td>
<td>24.72</td>
<td>108</td>
<td>35.92</td>
</tr>
<tr>
<td>10</td>
<td>2000-2001</td>
<td>53.65</td>
<td>24.47</td>
<td>100</td>
<td>12.54</td>
</tr>
</tbody>
</table>

Source: Computed by the researcher from the Annual Audited Report of TNKVIB Handmade Paper Units.

As per Table 1.3, performance of handmade paper industries under the purview of Khadi and Village Industries Commission has shown continuous improvement in production, sales, employment and earnings in the span of ten years. In the case of Tamil Nadu, as per Table 1.5 from 1990-91 onwards there was a continuous decline in production, sales, employment and earnings affecting the prospects of this industry. Hence the researcher undertook the present research work to analyse the reasons for declining trends in the major parameters. This would also help the study units to revise their operational strategic and plan for better prospects.
REFERENCES

1. GODE P.K., “Migration of Paper from China to India”, Himalayan publishing House, New Delhi, 1944, P.216.


