

Intermediate Technology of Indian Handmade Paper

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INTRODUCTION

Paper as we understand it today, has evolved through centuries. Though the invention is popularly attributed to China, there is material evidence to assume that it is quite likely that paper originated in India.⁽¹⁾

Systematic manufacture of paper on a substantial scale started around the third century B.C. in India. Till the middle of the nineteenth century, mostly paper was made throughout the world, by hand. Paper making technology continues to make progress commensurate with the advances in other fields. Yet the most modern paper leaves much to be desired. The Handmade Paper in India tries to remedy these shortcomings. This particular technology of Handmade Paper is therefore aptly called

"Intermediate Technology of Indian Handmade Paper".

In course of time the advanced countries found the mill made paper more profitable than the Handmade paper mainly from the manufacturing point of view. On the contrary certain countries, mainly India and Japan have continued the manufacture of Handmade Paper, even though many paper mills were operating. This could happen only because of the special qualities exclusively possessed by the Handmade Paper (Appendix A).

India manufactures special grades of paper for artists, for universities and share certificates with water mark, for documents, for greeting and invitation cards which require continued novelty. This continued novelty is possible because of Handmade Paper technique.

Japan continues to use the Handmade Paper technique for manufacturing special varieties of decorative papers for various purposes like

ceremonial decoration, paper for ladies and Children's dresses, lamp shades. Translucent paper for lamp shades, glass window panels with design papers are either single or duplex design paper. Paper with natural leaves and petals properly dried and then dyed with colour, interleaved between two thin sheets of semitransparent paper which is known as "sandwiched paper" used for glass windows and doors instead of cloth curtains. Silk thread paper, single and duplex, velvet paper are the other varieties of Japanese Handmade Papers. Some of these varieties are obtained by stencilled design; throwing compressed water fountain flow with particular angle from a jet of compressed air. Handmade Paper units in India have recently started manufacturing all these varieties.

PAPER IN GENERAL

Paper is basically a "mat" or a web formed by interlocking of fibres. To get paper, this mat is to be processed. The process is decided by the purpose for which the particular paper is to be used. Most of the paper used today for various purposes is millmade paper, because only automation can meet the huge demand economically.

As indicated earlier, the processes in mill, however sophisticated, leave the paper with certain drawbacks. Most of the millmade papers have certain defects which adversely affect its qualities like durability and strength which are very important in paper used for documents, certificates, registers and for such other purposes, where paper is required to be preserved over long periods of time without deterioration.

Above all, Handmade paper can render novelty in appearance even to each sheet, at no extra cost.

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This ever changing appearance also creates a sense of human touch, which has become a plus point leading to the greater demand, even though its cost is much higher as compared to that of the millmade paper.

Gradually due to various reasons the demand for paper went on increasing rapidly and at the same time the Fourdrinier Machine and Cylinder Mould Machine, came to be introduced in paper industry in 1804 and 1809 respectively.⁽²⁾ The process of automation was complete by 1821 when T.B. Crompton used steam dryers for drying paper. A stage came when automation thoroughly displaced the Handmade Paper technique practically all over the World except in India and Japan. During all those years, while Japan continued to develop Handmade paper for decorative purposes only. India concentrated on developing paper for a variety of uses. Consequently Japan gives the best decorative paper and India leads the trail in the Handmade Paper Industry.

COMPARISON OF HANDMADE PAPER WITH MILLMADE PAPER

Due to various advantages possessed by the Handmade paper, it continues to enjoy increasing popularity even in countries like U.S.A., Canada, which can produce best quality millmade paper. These countries therefore have started developing the Handmade Paper Industry. This fact is also supported by an article published in *Span "Return of Handmade Paper"*⁽³⁾. Appendix A gives detailed comparison of Handmade Paper with Millmade paper.

THE GLORIOUS PAST

As remarked earlier, the author believes that Indians knew the art of paper making as back as the third century B.C. It was spread through the Buddha monks, who travelled widely for the propagation of Buddhisam. Then it reached the Middle East by the eight century A.D. where the circumstances gradually increased the consumption of paper, and the art of paper making flourished.

During the next three centuries popularity of paper wade great strides and settlements of families of Craftsmen specialised in the art of Handmade

Paper, started coming up in great numbers all over India. According to one estimate during the seven-teenth century the price of Handmade Paper manufactured annually at "Sialkot" (a town now in Pakistan) was around Rs. 90,000 (about U.S.A. \$ 1,80,000) of these days where 1200 Dhenkis (stampers) were in operation⁽⁴⁾. In 1800 Handmade Paper export of from the then Sind Province (Northern India) amounted Rs. 20,000/ in those days⁽⁵⁾.

THE DECLINE

The beginning of the twentieth century saw the decline of the Handmade Paper Industry in India and consequently throughout the World. A few paper mills were commissioned around 1880. The British Government started imports of paper and completely banned the use of Handmade Paper in all Government Officers. Under these severe blows one after the other, Handmade Paper Industry could hardly survive.

The Handmade Paper Units provided employment not only to one craftsmen themselves but to his whole familymen, women and children. The decline of the Handmade Paper Industry naturally ruined whole families of Handmade Paper craftsmen. This resulted in an irrecoverable loss, the very highly developed Handmade Paper technology was lost not only to India but also to the whole World. However, very few families in India, could continue making Handmade paper making. They could servive due to the constant, though limited, demand from businessmen, traders and money lenders. These communities insisted on the use of only the Handmade Paper for their accounts books, documents and other permanent records, because of the exceptional qualities of Handmade Paper compared to those of millmade paper.

The Arbic word for paper is **Kagaz** and **Kagazi** means the person who makes paper. Pura means a small locality. Localities at certain places by the name **Kagazi Pura** are the remnants of the erst-while settlements of the families of Handmade Paper Craftsmen.⁽⁶⁾

As the imports of paper became very irregular during the First and Second World Wars, more paper Mills had to be started in India. This situation

considerably worsened the prospects for the Handmade Paper.

THE REVIVAL

The situation started easing out in the wake of the "Swadeshi"* Movement. Soon after launching of the Swadeshi Movement, Mahatma Gandhi realised that the Movement would fail if it could not be supported by the manufacture of consumer articles in the country itself. He therefore initiated the formation of the All India Village Industries Association (AIVIA) in 1934. It brought together the traditional artisans in the villages and with their help, started manufacturing consumer goods including the Handmade Paper.

A variety of quality consumer goods from Britain were already available at cheaper prices in Indian markets. Compared with these imported goods the indigenous goods were very crude. Thus the efforts of AIVIA to give boost to the village arts and crafts could not bring the desired results. This situation made it very clear to the concerned persons that for the success of the Swadeshi Movement, it was imperative that Swadeshi goods ought to successfully compete with imported goods. It followed that the artisans and craftsmen required appropriate training. For this purpose AIVIA started in 1935 a training centre named Maganwadi ^{(x)(x)} at Wardha (Maharashtra) under the expert guidance of an eminent exponent of Gandhian Economics Shri. J.C. Kumarappa.

The training improved the quality of the various goods including the Handmade Paper, but only to a very small extent. Due to the atmosphere created by the Swadeshi Movement, people accepted such substandard goods and demand for them was

* Swadeshi Movement: Swadeshi means indigeneous goods. The main idea behind this movement was to urge all Indians to use only the goods made in the country, so that the traditional artisans living in villages, who had lost their means of livelihoods due to imported goods can be rehabilitated.

(x)(x) Maganwadi Renamed as Jamnalal Bajaj Research Institute Wardha, Maharashtra (India)

sufficient to keep their production just going on. However slight improvement in Handmade Paper was not enough to make it popular in the market.

Thus the Handmade paper faced a peculiarly difficult situation. Very good millmade paper, both imported and indigenous, was available in abundant quantities and that too at a low price. And even if the quality would have been satisfactory, the maximum production of all the Handmade Paper units in the country taken together, compared to the production of millmade paper, was too meager to meet the demand.

THE PIONEERING INSTITUTE AND MEN BEHIND IT

It will be interesting to review the work put in by the Handmade Paper Research Centre* Pune which saved the Handmade Paper Industry from a catastrophe around 1939 described before.

The Handmade paper Research (HMPCR) saw it clearly that the only way out would be to develop sophisticated varieties, which only Handmade Paper technique could produce; and for that purpose the Handmade Paper Units in India and the Handmade Paper section at Maganwadi ought to leave their old traditional methods of manufacturing writing and printing paper.

This necessiated the introduction of machines, equipment, improved technique and chemicals, introduction of modern machinery and use of mechanical and electrical power in Handmade paper section at Maganwadi, Wardha could be at variance with the set established there. As such it was considered advisable to undertake this experimental development at some place other than Maganwadi.

The Provincial Congress Government at Bombay acceded to the request by AIVIA to establish the new unit at Pune in 1939. This work was completed by July, 1940 and the "Handmade Paper Research Centre" inaugurated by Pandit Jawaharlal Nehru on 1st August, 1940.

This event turned a new page in the history of

* Handmade paper research centre renamed in 1962 as Handmade Paper Institute (HMPI)

the Handmade paper Industry in India under the able guidance of devoted experts Shri. K.B. Joshi to begin with and later Shri. G.H. Gondhalekar and Shri. K.J. Soman Handmade Paper Research Centre/ Institute made on outstanding progress through pioneering research and it enjoys the privilege of leading the development of Handmade Paper Industry in the country. Its original contribution is so valuable that the technique is known today as the **"Intermediate Technology of Indian Handmade Paper"**. It will be seen that this work of HMPRC in adopting certain techniques then prevalent abroad and modifying them to suit Indian conditions, was not only original and valuable but also pioneering.

At this juncture it would be in the fitness of things to refer to, in a little detail to certain individuals who have richly contributed to these developments, at least in respect of the work conducted at HMPRC/HMPI Pune.

This is not to underestimate in any way the valuable work done before 1939 by Shri. Satish Chandra Dasgupta in Bengal, others in other regions and also the contributions after 1939 made by others.⁽⁷⁾

SHRI KRISHNAJI BAPUJI JOSHI

The name of Shri. K.B. Joshi, stands out as the torch bearer who blazed the trail of this pioneering work of the HMPRC. Shri Joshi a devoted follower of Mahatma Gandhi, was a chemist in an Oil Mill at Navsari, Gujarat while working as Oil Chemist, he happened to develop keen interest in Handmade Paper. In course of time he was successful in producing quality paper from cotton linters, which was a by product of the oil industry. A specimen of this paper was displayed in the exhibition held on the occasion of the Faizpur Session of the Indian National Congress in 1936 Mahatma Gandhi took no time to visualise its immense potentialities He therefore induced Joshi to continue his work on the development this type of paper at Maganwadi.

In due course, Joshi succeeded in using different indigenous materials for making various grades of Handmade Paper. He also successfully introduced modifications in different machines and equipments being used at **Maganwadi**.

Simultaneously Joshi had also to take up the challenging task of developing sophisticated grades of Handmade Paper as a solution to the crisis referred to earlier. To begin with, Joshi had to concentrate on the development of very high grade drawing paper. The paper, was most on par with "Whatman Drawing Paper" then being imported in India (Whatman is the best quality Handmade Paper and millmade paper manufacturing in England)

Mahatma Gandhi on a point of principle was opposed to the use of mechanical power in any village industry. But Joshi, on the basis of positive results of his work, could convince Mahatma Gandhi that partial mechanisation in Handmade Paper Industry was absolutely necessary, especially for better quality and uniformity. Therefore Mahatma Gandhi conceded the use of power on an experimental basis for production of quality paper, particularly for the Beater and Calender Machine. He nevertheless desired to explore the possibility of utilising bullock power that was easily available in every village, instead of electrical power, which had not reached even to big towns then-Seeing the success of these experiments Mahatma Gandhi approved the use of electricity also in the Handmade Paper Industry.

Use of the new cloth cuttings (rags) from tailoring shops, in place of waste paper, was another idea successfully implemented by Joshi. This new raw material gave a paper far superior to any other paper made earlier in India.

Even though the cloth cuttings were new, the presence in them of sizing materials, traces of oil, grease etc. and the stiffness of rags would have rendered pulping difficult Joshi therefore introduced the process of "Digestion" (boiling with caustic soda) to remove all these impurities. Simultaneously Joshi substituted the pressure digesters used in paper mills by the "Vommiting Type Digester" developed by him specially for the Handmade Paper.

The Hollander Beater used in mills was not suitable for the Handmade Paper Industry. Joshi modified it to suit the handmade paper requirements by combining into one, the separate units of breaker and beater.

Another original contribution to Joshi's credit is

the innovation in the paper lifting process. Paper lifting on wooden vats in standing position, sheet formation with the help of wire mesh mould and separation of the sheet from the mould termed as "couching" on cotton felt.

Those days wet paper was being pressed with the help of huge stones. This crude method resulted in defects like uneven distribution of water content, ununiform shrinkage, lack of smoothness and reduced strength. Joshi substituted a simple hand operated screw press, which removed some of the defects of the old method.

Formerly the paper sheets were burnished (rubbed) manually with smooth agate stones, to make the paper smooth. It was badly necessary to substantially increase the smoothness. Here also one sees the originality of Joshi. According to his new process the sheet of paper placed between two galvanised sheets, is passed through two heavy rollers. This machine known as the "CALENDER MACHINE" was operated by electrical power.

All these innovations, though very important, would not have given the expected quality to the Handmade Paper necessary for success in its tough competition with millmade paper both indigenous and imported.

For raising the quality of the Handmade Paper to the level of the best imported Handmade Paper, further sophistication was necessary. Joshi accepted this challenge also and registered one more success using animal glue and alum for external size. All these devices enabled indigenous papers to successfully compete with imported ones. The fact that his superiority of Handmade paper continues even today, speaks eloquently of the yeomen services rendered by Joshi to the cause of Handmade paper. Deckle edge drawing paper, deckle edge writing paper, bond paper for writing, printing paper and filter papers of different kinds are among the varieties of paper specially developed by Joshi.

The fact that all these innovations of Joshi are being used even today, of course with certain modifications, prove his originality and the significance of his pioneering contribution.

SHRI GAJANAN HARI GONDHALEKAR

Another person who is instrumental to the de-

velopment of Handmade Paper Industry is Shri. G.H. Gondhalekar. He came in contact with Shri. Joshi by chance. Gondhalekar soon realised that he can fulfill his burning desire to contribute his mite to the Freedom Struggle and to the cause of the Nation by working with Joshi, hence he started working with Joshi and joined HMPCR in 1941.

Gondhalekar's vital contribution to the HMPCR's process has two sides: Research and Training. Gondhalekar very effectively and satisfactorily translated Joshi's ideas into practice and developed full length programmes for training of workers, supervisors, managers and teachers coming from all parts of our country. Many of these trained personnel started their own units and partly reduced the shortage of paper caused by the Second World War.

The HMPCR was temporarily suspended as many of its personnel were actively involved in the Freedom Struggle in 1942. The work was resumed on the 16th August, 1946 with Joshi as Consultant and Gondhalekar as Manager.

The first challenge Gondhalekar had to face was to give HMPCR a sound financial base. He met this challenge squarely by manufacturing and selling to sugar mills large quantities of filter paper of all specifications; so also Artist's Drawing paper, Bond paper, writing and coloured printing paper and water mark certificate.

By increasing the size of the beater troughs Gondhalekar reduced the variations in inequality of papers, at the same time greatly increasing the production.

Use of levers for the Poona Vat and Uni Vat resulted in faster lifting of the sheets, reducing the hardship of the labourers and also augmenting production.

Addition of a capstan to the screw press reduced the drying period while increasing the dimensional stability of paper.

This improved press together with the use of a special felt made possible the production of a particular type of grain termed as natural grain or rough finish, indispensable to the artists. This innovation opened up a large export market too.

The "Lever and Weight Arrangement" on the Calender Machine enabled the operator to adjust the pressure between the rollers to give desired degree of glazing, simultaneously increasing the production. The calender machine was so modified further that automatic to and fro movement of the sheet was possible. This effected considerable saving in man hours.

Gondhalekar, inspite of his innuerable commitments, was keen on updating his knowledge. With this view he underwent training at the Forest Research Centre, Dehradun, India, for six months in 1949. On his return, on the basis of his studies at FRI, he established a well equipped laboratory including imported Paper Testing Machines. This laboratory was amongst the best in the country.

The HMPCR/HMPI boast of a library which has a very wide ranging collection of books, periodicals and journals on various aspects of paper making. It has been found very useful by experts all over the country. This again reflects the versatality with which Gondhalekar strived for the upliftment of the Handmade Paper Industry.

In 1960, Gondhalekar was appointed as Director of Handmade Paper Industry, Khadi & Village Industries Commission, Bombay By virtue of this position he had also to shoulder the responsibility of developing the Handmade Paper Centres in the country.

On the basis of the paper submitted by Gondhalekar he was invited to participate in "The Conference on Pulp And Paper Development in Asia and Far East" jointly sponsored by United Nations Economics Commission for Asia and Far East and the Food and Agriculture Organisation, held in Tokyo in October, 1960.

All these years Japan also had been working on the improvement of the Decorative Paper. Gondhalekar was not blind to this, and was planning a visit to Japan. Gondhalekar took the opportunity of the Conference to visit Japan and study Decorative Paper Industry there.

With the help of the knowledge gained in Japan, Gondhalekar improved the working of HMPCR's Decorative paper section. The 21 varieties devel-

oped by Gondhalekar immediately on return from Japan with local raw materials were on par with the original japanese varieties themselves. These were greatly appreciated by the Consul of Japan in Bombay at the Exhibition held at HMPCR in 1961

SHRI KESHAV JAGANNATH SOMAN

Behind all these achievements by Gondhalekar was the personality of Shri. K.J. Soman. Gondhalekar was able to devote fully to his stupendous task because Soman ably looked after all the other departments. Administration, Production, Sales, Publicity and above all Labour.

As in charge of Administration and Labour Soman very skill. fully steered the HMPCR clear of all difficulties. He also took all the trouble to secure orders from various parts of the country; these included requirements of paper of all universities in India for their certificates, various types of paper required in laboratories and institutions including the Botanical Survey of India, National Chemical Laboratory, Ammunition Factories, Government offices, letter head paper for Chief Ministers of States and Prime Minister of India. To meet this voluminous and varied demand Soman had to co-ordinate the production of the different Handmade Paper Units. He was also successful in securing export orders for HMPCR/HMPI quality drawing paper.

Soman right from school days was involved in various activities of his father, who was a devoted social worker. Naturally after graduation, Soman was in search of some field which would help him to satisfy his urge for social work. He joined the HMPCR as Assistant Manager Production in 1947. This job fulfilled his urge.

In this capacity he succeeded in procuring orders from various prestigious buyers like Associated Cement Company, Vakil & Sons, Chimanlal Paper Company, Vikas International. But the requirements comprised paper of such types as were never made in India before. Consequently Soman faced a host of problems concerning all the spheres of the Handmade Paper Industry. With his exceptional qualities he was able to meet this challenge successfully.

• Gondhalekar's joining as Director of the HMPI, KVIC, Bombay Soman took over simultaneously as

Director, HMPCR and director, Handmade Paper Industry of Maharashtra State Khadi & Village Industries Board (MSK & V.I. BOARD) the MSK & V.I. BOARD under a scheme of providing jobs through Handmade Paper Units throughout Maharashtra, had financed about 25 units of four types; School units, Home Units, Production Units of Small, Medium and Big capacity. Soman brought them to the level of quality production.

To avoid any overlapping in production, Soman allotted the production of a particular variety of Handmade paper to a particular unit. This also enabled the units to specialise themselves in respective varieties. Soman also saw that this production was properly marketed, even overseas.

By 1970, the Central Government and the State Governments together launched a programme for helping the educated unemployed to start their own small scale, industry. Among such entrepreneurs many opted for Handmade Paper Industry. Soman has lion's share in over all success of these units.

Before he retired in 1975, Soman has contributed in three directions Mechanical, Technical and Training.

RAG CHOPPER:- The hand operated knife for rag cutting was replaced by an electrically operated Rag Chopper. This substantial increase enabled the Institute to cope with the large demands.

RAG DUSTER:- The manual rag dusting on Screen could not remove totally the dust and small fibres from the rags. This process was substituted by electrically operated Rag Duster Machine. As these rags are totally free from dust and small fibres, the paper has improved uniformity and also increased strength.

BIGSIZE BEATER MACHINE:- Introduction of larger size beaters made large quantities of uniform paper possible.

DRYING CHAMBER:- Use of ceiling fan and exhaust fans together with electrical heaters in the drying chamber made drying faster; it also facilitated production in the rainy season and winter.

Soman also developed paper of different colours required for invitation cards, greeting cards, covers, drawing paper with different finishes like linen, stripe,

burlap, mat. He also produced various grades of filter paper, leather board and papers for various stationery articles file, envelopes, letter pads, library cards, albums.

During this period, on behalf of the Institute, Soman worked as Consultant to different paper mills also, for developing various grades of their paper.

Before taking a look at the future, it will be appropriate to mention the following.

While HMPCR/HMPI was busy carrying on its mission, Handmade Paper Units in other parts of India were also working for the progress of Handmade Paper. Most of the work force at various levels in these units came from the trainees of the HMPCR/HMPI. These personnel also made original contribution to the various aspects of Handmade Paper.

Many of HMPCR/HMPI trainees are working at various levels even in paper mills.

Some trainees of the HMPCR/HMPI are at present successfully occupying responsible posts in paper mills abroad also.

Trainees from countries like Sri Lanka, Burma, Tanzania have started Handmade Paper production in those countries.

All the contribution of HMPCR/HMPI is given in a chart form in Appendix B.

THE FUTURE

Although the contribution of the Institute and that of the men behind it to the progress of the Handmade Paper has unequalled in the history of Handmade Paper, there is still enormous scope for further developments not only in India but in other countries also.

The supply of Handmade Paper is far short of the demand which continues to rise day by day.

Certain special varieties of paper are still required to be imported. If appropriate varieties of paper are manufactured of the expected standard, they will save foreign exchange. Also, if production is suitably increased, large amount of foreign ex-

APPENDIX B.

Name of country	88-89	89-90 (in thousands)	90-91	91-92	92-93	93-94	94-95 upto 30.9.94
U.K.	86.00	99.70	165.05	541.51	952.69	502.40	557.35
Austria	9.98	13.50	--	--	12.53	101.09	--
Canada	11.4 11.47	--	--	--	--	--	--
Germany	--	1.95	30.83	125.15	322.92	114.02	489.47
Holland	--	13.00	47.99	11.34	--	--	--
U.S.A.	--	13.50	--	--	57.56	16.24	--
Sweden	--	16.00	396.91	368.91	963.82	948.18	352.65
Netherland.	--	--	--	21.22	--	--	--
Nepal	--	--	--	8.85	5.60	7.24	--
Denmark	--	--	--	--	--	69.64	49.73
Belgium	--	--	--	--	--	3.07	42.50
Paris	--	--	--	--	--	17.35	--
Australia	--	--	--	--	--	--	26.04
Total	107.45	157.65	1140.79	1076.99	2315.13	1779.37	2828.51 upto Feb. 95

change can be earned. Moreover, this will create a large employment potential which is so very badly needed in the present conditions.

One thing, however, must be mentioned in this context. In the development of small undertakings like Handmade Paper Units, there are bound to be ups and downs. However, if the foundation is sound, difficulties can be overcome and the progress continued unbridled.

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