

Process development in speciality paper field

SAIKIA C. N.* and CHALIHA B. P.*

SUMMARY

The paper industry occupies an unique position in the economy of the country. The country produces a large quantity of writing and printing papers and boards, along with a limited varieties of speciality paper and board. The production of different types of speciality coated, converted and functional papers is very limited though the demand for many of these papers is considerable. The present article discusses a few varieties of speciality papers like parchment paper, heat sensitive paper, direct copy paper, safety cheque paper etc, the indigenous technologies for which have now been developed.

INTRODUCTION

Paper plays an increasingly important role in modern society. It is an indispensable material for educational and cultural advancement of the people being the principal media of mass communication and expression. To-day paper serves many real needs of the society in various fields like sound recording and reprography, graphic arts and packaging, as rust preventers and quality preservers as resistant to oil, grease, fire, water insects, chemical and gases, as heat and photosensitive material, electrical conductor and insulator and also as clothing and housing media. These versatile uses of paper have been possible through the modification of the paper by various ways, such as by method of making the pulp, the treatment given to the pulp, the addition of fibrous and non-fibrous materials to the pulp or by application of coatings or films to the fibrous web etc.

The demand for pulp, paper board and allied products is increasing every year. However, the production of coated converted and other functional papers have not shown the desired growth rate. The reason for meagre production of the speciality papers may perhaps be that the knowhow for production of these different speciality papers was not available. Table-I gives the import figures of some paper products for the year 1980-81. All out efforts have to be made for the rapid growth of the speciality and converted paper industry. The manufacture

of different speciality paper and paper products to attain self sufficiency will also give us self reliance.

Speciality paper itself is a vast field. Only a few speciality papers having importance in the country and for some of which indigenous technologies have been developed, are discussed below.

PARCHMENT PAPER :

The grease resistance and high wet strength material formed by modification of a sheet of paper by means of sulphuric acid is called vegetable parchment. It is called parchment because it clearly resembles parchments made from hides of animals. By far the largest use for vegetable parchment is in the packaging of food products. It is used for the packaging of butter, lard, vegetable shortening, oleomargarine, fresh, frozen and treated meats, fish, poultry, cheese, icecream, canned meat and fish, as gaskets for milk and cream cans for milk bottle hoods. Since many food products combine problems of both moisture and grease, a paper with only wet strength or only grease resistance cannot give adequate package protection. Vegetable parchment combining high wet strength and grease resistance is the answer. There are many industrial uses for parchment, such as in the wood industry, in the spinning process, in the rubber industry as an

*Regional Research Laboratory, Jorhat-785006

TABLE—I
IMPORT OF DIFFERENT PAPER AND PAPER PRODUCTS DURING 1980-81

Article		April 1980 Quantity (kg.)	to March 1981 Value (Rs.)
1.	Art Paper	—	1321490
2.	Litho and Offset Paper	—	1658496
3.	Photobase Paper (uncoated)	—	139219
4.	Printing Paper	—	75353767
5.	Bank Bond and Cheque	—	41024
6.	Chromo and art paper	—	260708
7.	Other printing paper coated etc.	—	115874
8.	Genuine vegetable parchment paper	—	114708
9.	Glassine Paper	—	10950
10.	Other Parchment Greaseproof	—	29548
11.	Cable and Condenser Paper	—	281506
12.	Cartridge Paper	—	52098
13.	Filter Paper	—	758617
14.	Tissue Paper (total)	—	898424
15.	Electric Insulating press board	—	549403
16.	Matrix Board	—	171571
17.	Press Pahn and Insulation board	—	305856
18.	Tracing Paper	—	176279
19.	Building Board of paper or pulp (impregnated)	—	27340
20.	Chromoboard	—	36226
21.	Insulating Paper	—	2013633
22.	Raw base paper for sensitising coating	—	1510737
23.	Other coated Impregnated paper/paper board	—	5029938
24.	Converted paper/paper board	—	662586
25.	Coated paper with synthetic resins	—	211791
26.	Kraft paper, paper board in rolls, sheets	—	124988
27.	Kraft Paper board	—	606455
28.	Paper and paper board corrugated	—	34797
29.	Carbon and other copying and transfer paper	—	9797

interleaving sheets and in the steel industry as wrappers for metal parts. It is also popular as a tracing paper, greeting cards and as base stock in the duplicating field.

The production of parchment paper consists of first preparing the basic paper called 'waterleaf' from an unsized and unfilled stock. For many years rags constituted the principal raw material for the manufacture of parchment paper. This has largely been replaced by high alpha-pulps. Parchment paper is obtained from the unsized and unfilled sheet, having the requisite moisture content by treatment with concentrated sulphuric acid and then removing the excess acid by washing it with water and finally with dilute ammonia. The sheet is further treated with plasticizer and then dried and calendered. The waterleaf is kept in contact with concentrated sulphuric acid only for a few seconds, but during that time, it is believed that fibres of the paper are attacked by the acid, which forms a coating or film of gelatinous cellulose, covering the fibres and filling the pores of the sheet. This interlocks the fibres together and produces a paper with permanent high wet strength and grease resisting qualities.

At present there does not exist a single factory in India for production of parchment paper. The entire demand is met through import. There is a great scope for producing parchment paper as both raw materials and process know-how are indigenously available.

SAFETY CHEQUE PAPER :

Safety papers include a wide range of speciality papers like cheque, Bank note or currency note, counterfeit and lottery papers etc. These papers can be classified into two main types i.e. a paper where emphasis is placed on authentication and the other where it is on preventing alteration in writing. Safety cheque papers are made from any fibre as it is not designed usually for rough services or long life as currency papers. The writing or commonly used fountain pen ink on ordinary plain paper can easily be erased with chemical eradicators. To overcome this defect, safety cheque paper has been developed. The main requirement of this paper is to make forgery of writing on the paper i.e. of important documents, cheques etc. difficult, if not impossible.

The commonly available safety cheque paper is not able to leave visible tell-tale of the writing when eradicated with all types of available ink eradicators in the market. The chemical eradicators are grouped in five main heads as acidic, alkaline, oxidising agents, reducing agent and organic

solvents. Most of the commercially available safety cheque papers are sensitive to only first three types and not to reducing agents and organic solvents.

The security cheque paper currently used for making bank cheques etc. are reasonably sensitive to attempted eradication of conventional writing ink with acidic, alkaline and oxidising ink eradicators, but totally unsafe and insensitive if the eradication is attempted with reducing type of eradicators. The papers are also not sensitive to organic solvents. With the two drawbacks of the commercially available security papers in mind, improved type of safety cheque papers can be made which will have good demand in the country. The Regional Research Laboratory, Jorhat has developed process knowhow for manufacturing this type of paper.

ELECTRICAL INSULATING PAPER :

Paper is among the cheapest and best electrical insulating materials known. Most of the annual requirement of electrical insulating paper is met through import only. Therefore, there exists a very good scope for the development of these insulating papers.

These papers are usually produced from wood sulfate pulp, cotton rags, linen rags and other vegetable fibres. They are generally characterised as low-ash content, unfilled and unsized papers ranging in thickness from a fraction of a mil to several hundred mils and a cover a wide range of apparent density from 0.40 to 1.40 g/c.c. Electrical insulated paper divides itself into two branches. One dealing with properties of the impregnated paper and the other with the relation of the properties after impregnation. These papers must meet certain physical, chemical and electrical requirements. The most important physical properties are thickness, density, porosity, tensile strength and tearing strength and chemical properties are moisture content, acidity, presence of electrolyte and conducting particles. The important electrical properties are (i) high electric constant (specific Induction capacity) (ii) high dielectric strength (iii) low power factor (Dielectric loss) (iv) freedom from conducting particles.

Insulating paper are also made by impregnating base paper with paraffin, linseed oil, shellac, phenolic resin, chlorinated naphthalene and chlorinated diphenyls etc. The electrical properties of the impregnated paper cannot accurately be measured, because of the electrical properties of the paper itself and the impregnants.

HEAT SENSITIVE OR THERMOGRAPHIC PAPER :

Thermographic process broadly fall into two categories; viz. physical process and chemical process. In chemical process the image formation takes place due to the thermochemical reaction. In the direct or physical process, a coloured base paper is coated on one side with non-transparent fusible particles. When this coated paper together with the original is exposed to a radiant source, the coating corresponding the printed areas of the original melts and become transparent. Thus, the coloured base paper becomes visible and appears as a copy of the original.

The physical system of thermography is the easiest and cheapest and the paper also becomes pressure sensitive. This type of thermographic paper finds extensive use in all recording system. In a recording system, when the hot stylus passes over such a paper, the coating on paper sheets melts and the base sheet becomes visible at these points.

The Regional Research Laboratory, Jorhat has developed process knowhow for manufacturing heat and pressure sensitive papers used mainly for thermographic recording instruments and as ball bearing test charts. The Photograph-1 shows one of the products marketed by a manufacturing firm based on the knowhow developed at Regional Research Laboratory, Jorhat.

DIRECT COPY PAPER :

Introduction of computer in the business systems has led to the development of a variety of copying papers for use in multiple copying sets. The multiple forms industry designed special multiple parts form for use with mechanical computer printers. These forms usually were composed of carbon paper interleaved between sheets of paper. Because of the speed of computer printers, it was difficult to produce forms containing 8-12 parts. Special mechanical transfer type of papers, with improved manifold ability have been developed. These papers work on the principle of a dark layer on the back side of the sheet, transferring to a special receptor coating on the front side of the second sheet. The donor coating was so formulated that it would transfer more efficiently to the special receptor. Such formulations resulted in a paper that was much cleaner than carbon interleaved or carbonized bond.

Direct copy paper is a mechanical transfer type of paper, in which the coloured transfer material coated on the back or underside of the paper and it is arranged in the form of sets. In such a set,

except for the top sheet all other sheets are coated with a take up layer or receptor coating. Pressure from a ball point pen, type-keys releases the transfer coating from back to adhere on the receptor coating. Figure-1, shows a mechanical transfer and take up system of Direct Copy Papers.

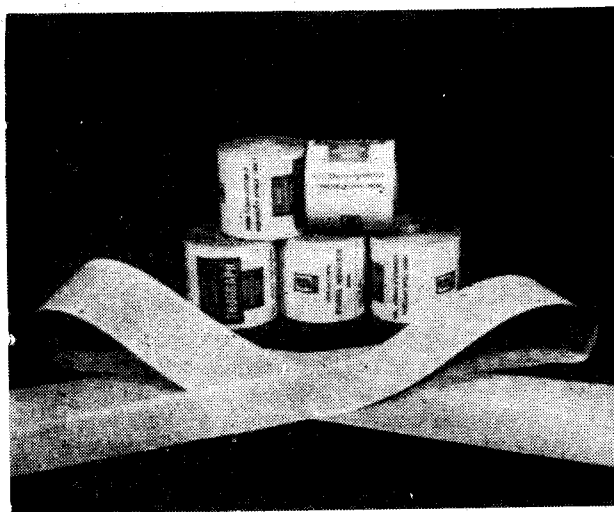


Fig. 1—Heat sensitive Paper for use in ECG Machine Produced by FRL Knowhow.

The Direct Copy Papers can be used for variety of purpose such as for multiply telex rolls, computer listing papers, specialised crush printed multipart sets, as continuous stationery, for airline

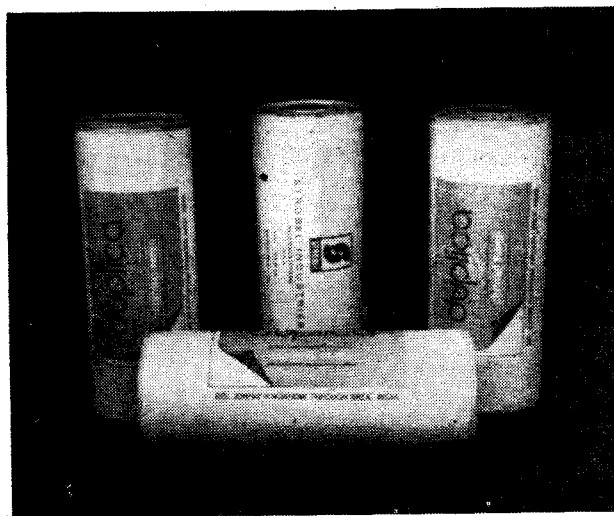


Fig. 2—Teleprinter Rolls of Direct Copy Paper Produced by FRL Knowhow.

tickets and various government and private business forms. Equipments like electrical typewriters, electrical typewriters with memory banks, telex machines and computer systems etc. use the direct copying papers.

The process developed by Regional Research Laboratory, Jorhat for manufacturing Direct Copy Papers has been taken up for commercial production by a few companies in the country. The product is now available in the market and used for mainly for making Photograph-1, computer stationeries, credit cards of a few nationalised banks, multipart business forms etc. Photograph-2, shows the teleprinter rolls made out of Direct Copy paper by one of the licensee of the process.

CARBONLESS COPY PAPER :

A rapidly expanding speciality paper is the chemical transfer type of carbonless copy paper. The carbonless copy papers are designed to eliminate the carbon interleaver used with conventional uncoated paper in multipart forms. The carbon paper have got several limitations in use due to its functional and aesthetic shortcomings. Carbon paper causes soiling and also it is difficult to get clear copies and many times texts get smudged quite easily under the effect of friction. In a carbonless copy system, the insertion of the carbon paper between the sheets for making plurality of copies is avoided as the sheets carry a colourless marking layer on the rear face of it and the front face is coated with an inorganic substance adapted to form a coloured mark, when localized pressure is applied either by a ball point pen, pencil or by striking with the keys of a typewriter. In many of the modern business machines like electronic data processing equipments and computers, teletype and

adding machines etc. carbon paper cannot suitably be used. The carbonless copy paper overcomes all these disadvantages. It works on the principle of release and reaction of chemicals on surface of the paper under pressure of handwriting, typewriter or keys of an electronic printer.

The main advantages of the chemical carbonless copy paper are :

- i) It gives sharp and clear copies as the number of sheets is reduced by elimination of carbon inserts.
- ii) No possibility of soiling hands or other objects as the colour reaction takes when chemical reactants are in direct contact with one another.
- iii) Saves time and effort required in the disposal of carbon inserts in automatic machines.
- iv) Can be reclaimed.
- v) Better cost/performance ratio.

The Regional Research Laboratory, Jorhat has developed a process for the manufacture of chemical carbonless copy paper. The process in nutshell consists of micro-encapsulation of colourless dye derivatives and then coating the same on one side of the paper to obtain the donor surface while the receptor surface of the paper is coated with a clay like material with an adhesive. The process is now being commercially utilised.

ACKNOWLEDGEMENT

The authors are highly thankful to Dr. J.N. Baruah, Director, Regional Research Laboratory, Jorhat, for his kind permission to publish this paper.