

Treated Tracing Paper

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ABSTRACT

The paper presents the Developments in the field of paper conversion technology and reveals a wide scope for the development of speciality paper, especially the treated tracing paper. A process for making treated tracing paper using indigenous base paper and suitable surface sizing composition seems to be an innovative approach to meet the country's requirements. It has been found, from the laboratory study followed by pilot plant trial with a conventional coating machine, that it is feasible to manufacture treated tracing paper indigenously. The annual import of tracing paper is a heavy drain on our national exchequer. If tracing paper is produced indigenously, then lots of valuable foreign exchange can be saved.

One of the most essential item in any modern civilised society is 'Paper'. From time immemorial paper has provided man with a basic material for written communication, perhaps, because no other suitable material was available which could compete with paper for its cheapness. The rapid strides made in the field of science and technology has also made an impact on the paper industry. Today, paper is used not only as a suitable writing material but several varieties of paper catering to different specific requirements are in use all over the world.

In India, the pulp and paper industry has made significant studies and has secured an important place in the industrial structure of the country. Various qualities of paper and board are being manufactured in the country with the object of meeting the consumer's need, but this is mostly in the field of conventional paper rather than converted and speciality paper. Every year, India imports varieties of speciality paper and paper products incurring a huge expenditure which is inevitably a drain on the country's exchequer. Considering the present critical foreign exchange position, and with the view towards minimising large expendi-

ture on imported speciality paper, serious attempts have to be made for the rapid growth of converted paper industry in our country. Thus the paper converting industry has a vital role to play in the economy of the country.

The conversion of the paper has opened new horizons and has given scope for further development of the paper industry. Most of the papers, whether functional or decorative value, falls within the scope of conversion industry. The conversion of paper, generally consists of steps to modify its nature and functional qualities and to make it suitable for specific end-uses. The pace of development in speciality papers closely follows development in the field of paper conversion. One of the most important speciality paper is tracing paper. At present large quantity of tracing paper is imported annually to meet the internal demand of the country. This inevitably is a drain of foreign exchange. Thus development of tracing paper in the country has a very bright prospect. It is a highly specialised and consumable product.

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Tracing paper is defined as a paper with sufficient transparency to allow a design to be traced through and reproduced. Transparency is defined as being characteristics of a substance which permits parallel rays of light to pass through it without being scattered. In addition to good transparency the other requirements are good strength, and permanency, so that the tracing papers may be kept over long period without deterioration or much change in capacity. Resistance to erasure should also be satisfactory. The function of the paper when viewed by transmitted light should be uniform throughout and it should have ground glass appearance. An acceptable tracing paper is free from all defects which adversely effects its use.

It has been estimated that the demand for tracing paper will go up per annum since this paper is used in a large scale by architects, engineering organisations and design offices.

Types :

Tracing papers are generally divided into the broad categories :

1. Treated tracing papers
2. Natural tracing papers.

Classifications :

The major classification of these papers is as follows :

	Treated	Natural
Thin	— g.s.m. 50/55	g.s.m. 60/65
Medium	— g.s.m. 70/75	g.s.m. 70/75
Thick	— g.s.m. 85/90	g.s.m. 105/110

Treated Tracing Paper :

The manufacture of treated tracing paper is one of the major converting process of the paper industry. The manufacturing process is simple and less capital intensive. It is well suited to be undertaken on a small scale.

The base paper and surface sizing composition constitute the primary raw materials. The base paper employed for treated tracing paper should be strong, durable and properly bleached. It should also be flexible enough to ensure satisfactory folding properties. Its structure and formation is also very important because

the sheet showing an irregular formation does not absorb the surface sizing composition properly and evenly. It should also be smooth and free from dirt. There should not be any creases in the paper rolls, which should be properly and tightly wound to eliminate the possibilities of wastage. The thickness of the paper should be uniform and within the tolerance limits so as to obtain uniform impregnation of the sheet and prevent irregular tension during the drying operation. The grammage of the base paper used is 50 to 60 gms per square metre.

The surface sizing composition should be homogeneous and free from solid particles so as to give smooth finish on application to the base paper. It should readily impregnate the base paper and dry quickly, so that while unwinding a roll of treated paper the adjacent layers donot have the tendency to stick to each other.

Treated tracing paper is obtained by impregnating the base paper with a suitable surface sizing composition to render the product transparent and suitable for use with ink or pencil. Saturation of the paper is made with a substance having an index of refraction close to that of the cellulose so that the transparent sheet results. Treated papers are uniform, smooth and offer ideal surface for both pencil and ink work. This paper lies flat on the drawing board. The synthetic resin coating on both sides is moisture repellent and moth-proof. Therefore, treated tracing paper does not cockle, discolour or tear easily. It has got a very high degree of dimensional stability, flexibility, foldability, improved ink receptivity and resistance to erosion during handling. It has also excellent permanency to heat and is essentially non-yellowing when exposed to ultraviolet light sources.

Method of Impregnation :

This method is the simplest of all and widely employed for producing several varieties of speciality paper. The process of making treated tracing Paper essentially consists of preparing a suitable surface sizing composition, which has optimum solid content and viscosity, and then impregnating the required base paper with this composition. The impregnated paper is dried in the drying chamber to remove the excess solvent. The impregnated rolls are subsequently slit into proper sizes. Impregnation is done on the off-machine equipment. In order to have uniform distribution of the solution through the sheet, the base paper

is dipped into the solution and then passed between two rolls. The refractive index of the solution used for saturation is kept between 1.5 and 1.52.

Natural Tracing Paper :

Natural tracing paper is that which has been made transparent by highly beating the desired pulp and then super-calendering the sheet made out of it.

It is manufactured from a high grade strong bleached sulphite pulp and is given a long wet beating to produce the transparency and close formation.

Natural tracing papers are also sometimes treated to achieve greater transparency to ultraviolet light and to improve see-through for overlay tracing purposes. The increased transparency as a result of transparentizing treatment leads to faster speeds in the reproduction of engineering drawings and other subject matters.

Properties requirement :

There are different desired properties which are essential for standard tracing paper. All tracing paper, whether natural or treated, should be of uniform texture, with slightly grained surface. They should be free from defects like spots, wrinkles and pinholes which interfere with its intended use. The tracing paper should be suitable for pencil or ink lines, yielding solid lines without slipping, feathering, spreading or smudging. During normal use, surface cracks or abrasion should not be visible on the paper to the extent that cracks or abrasions can be seen on prints made therefrom.

Testing method :

To evaluate the finished product of both types of tracing paper, drafting test and ageing test are necessary to maintain an ISI specifications.

Drafting test :

The method of drafting test for both types of tracing paper is that lines are drawn on different portions of the samples with a2H black graphite lead pencil and erased with an eraser. The colour of the erased surface should not change neither there should be any perceptible linting of the paper. The surface of the tracing paper should withstand at least two or three erasures of lines drawn with a pencil without leaving any trace of mark

of sufficient intensity on reprint. Lines of varying widths drawn by black drawing ink should be made upon different portions of the samples and carefully inspected. There should be no appreciable spreading and feathering. The paper should also withstand at least two erasures of lines drawn by a drawing ink.

Ageing test :

The Standard procedure of ageing test of both types of tracing papers is that the paper is subjected to accelerated ageing by the heating in an oven at $105 \pm 2^\circ\text{C}$ for 72 hours, after which it should be tested for folding endurance. The paper should retain at least 50 percent of its original double fold.

Test results :

- | | | |
|---|---|--------------|
| (1) Grammage, gm/m ² | : | 55 |
| (2) Folding Endurance | : | |
| Double fold | | |
| (a) Machine Direction | : | 278 |
| (b) Cross Direction | : | 182 |
| (3) Opacity percent | : | 2.56 |
| (4) Change in folding endurance opacity after accelerated ageing by heating in an air oven at $150 \pm 2^\circ\text{C}$ for 72 hrs. | : | |
| (a) Folding endurance | : | |
| Double fold, percent of original value | : | |
| (i) Machine Direction | : | 123 |
| (ii) Cross Direction | : | 87 |
| (b) Percent increase in opacity from the original value | : | 1.6 |
| (5) Drafting Test | : | Satisfactory |

Development :

Regional Research Laboratory, Jorhat, has developed a suitable coating composition for making treated tracing paper from indigenously available raw materials and chemicals. The process has been developed on a laboratory scale and has also been tried in Pilot plant (10 lit/batch) level. The plant trial was found to be successful in a coating machine plant (22" width). The plant trials confirm the laboratory

result that the treated tracing paper can be made by using right type of surface sizing composition and base paper. The paper produced during plant trials has shown satisfactory physical strength properties. To evaluate the samples made during laboratory scale investigation and pilot Plant study, drafting test, ageing test and other necessary tests have been carried out and they conform to the ISI specification (IS : 8431-1977).

Process Manufacture :

The process essentially consists of preparing a coating composition and then applying this coating composition on the surface of a specially made paper.

Process Details :

The different steps of the process are ;

1. Preparation of polystyrene solution.
2. Preparation of coating composition.
3. Application of the coating composition on the surface of the paper.
4. Drying of the coated sheet.

Preparation of polystyrene solution :

In case of first experiment, 10 parts of polystyrene is soaked in 100 parts of xylene in a metallic or a glass container for eight hours. The container should be covered properly to avoid the loss of solvent. The mixture is then stirred till the polystyrene completely goes into solution.

In case of second experiment, 50 parts of polystyrene is soaked in 1000 parts of xylene in metallic or a glass container for eight hours.

In case of third experiments 240 parts of polystyrene is soaked in 1.2 parts of xylene in a metallic or a glass container for eight hours.

Preparation of coating composition :

Experiment No. 1 :

Xylene	:	100 parts
Polystyrene	:	10 parts
Dibutyl pthalate	:	2 parts
Butyl Acetate	:	2 parts

Experiment No. 2

Polystyrene	:	50 parts
Xylene	:	1000 parts
Acetone	:	100 parts
Dibutyl Pthalate	:	10 parts
Butyl Acetate	:	10 parts

Experiment No. 3 :

Polystyrene	:	240 parts
Xylene	:	1.2 parts
Acetone	:	120 parts
Dibutyl Pthalate	:	22 parts
Butyl Acetate	:	22 parts

Prepared ten percent polystyrene solution (preparation of polystyrene solution as mentioned before) is taken in a metallic or glass beaker to which 10 parts of dibutyl pthalate and 10 parts of Butyl Acetate are mixed one after another (2-3 minutes interval) and mixed thoroughly by a stirrer for 25 to 30 minutes. The mixture is ready for applying on the base paper.

In case of second experiment, prepared 5% polystyrene solution (Preparation of polystyrene solution as mentioned before) is taken in a metallic or glass beaker to which 100 parts of Acetone, 10 parts of dibutyl pthalate and 10 parts of Butyl Acetate are mixed one after another (2-3 minutes interval) and mixed thoroughly by a stirrer for 25 to 30 minutes. The mixture is ready for applying on the base paper.

In case of third experiment, prepared 20% polystyrene solution (preparation of polystyrene solution as mentioned before) is taken in a metallic or glass beaker to which 120 parts of Acetone, 22 parts of dibutyl pthalate and 22 parts of Butyl Acetate are mixed one after another (2-3 minutes interval) and mixed thoroughly by a stirrer for 25 to 30 minutes. The mixture is ready for applying on the base paper.

Conclusion :

In a nutshell, the article has presented a detailed study of treated tracing paper and its various prospects in the Indian Paper Industry. A broad outline has been drawn of tracing paper with special emphasis on treated tracing paper, which is a relatively unknown field in the paper converting industry of our country.

With the availability of indigenous raw materials and chemicals, and in the context of the present economic set up of the country, there is a vast scope of producing treated tracing paper in the country. A close analysis of the present market trend will show that this product has a very bright future in the domestic market.

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