Pergamyn or Greaseproof Paper

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Greaseproof or Pergamyn (as it is called in German) papers are still imported into our country. In the near future some of our Indian mills will be producing this variety, and my experience in West Germany in one of the reputed manufacturers of greaseproof papers (Aschaffenburger Zellstoff Werk) may be helpful. In this article I am giving in short, the important aspects of the manufacture of this quality of paper.

In Germany greaseproof paper is made from both bleached and unbleached sulphite pulp made by overhead or fractional cooking. Cuprammonium viscosity of unbleached stock is round 1,600 to 1,800 D.P. whilst for bleached stock it is 1,200 to 1,400 D.P. The bleach demand of the stock is kept round 10.5 to 11.5% in terms of active chlorine. Permanganate number of the stock is 25 to 27.

At the stock cleaning end extensive use is made of centricleaners. Special attention and treatment are needed for greaseproof beating and this operation should be carefully noted. Stock preparations are handled both in batch and continuous processes. In batch process, Hollander beaters of 1,000 kg. a.d. capacity with high backfull, and blunt tackle, are used. From the total number of beaters, 50% are with basalt lava roll and plates. Beaters are filled with 6 to 8% consistency and beating time is kept round 6 to 8 hours. Beaters are dumped at 75 to 80 S.R. and a further rise of 15 S.R. is achieved at the machine end when the stock is passed through sets of wide bar refiners or Strecker Feiner[1] situated in between the consistency regulator and machine mixing box.

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In the continuous process, Voith continuous beaters are widely used. This is a four unit multiroll beater (two rolls and plates are of basalt lava and the other two are with metal flybar and plates, plates being placed at an angle with the rolls so that a good volume of stock is allowed through the nip) and is generally operated at 3.5 to 4% consistency. From the beater, stock is passed through series of refiners and then to the dumping chest. From the dumping chest stock is pumped to a continuous proportioning and mixing box where the beater additives (alum, dyes, clay, size, etc.) are continuously mixed up and then the stock flows to the machine chest.

Now let us come back again to the batch process. As soon as the Hollander is filled in, the roll is put down sharp on the plate and is allowed to cut and disintegrate fibres. This removes the primary cell walls, then after a period of 30 minutes (in a beating period of 6 hours) the roll is lifted and allowed to run just touching the bed plate (giving a uniform brushing sound). This state of adjustment will continue for the next four and half hours, and then the roll is to be totally lifted up when there will be only whipping action. This is the last phase of greaseproof beating. The above treatment will give a long and very well hydrated stock which is essential for making good variety of greaseproof paper. We have to remember that this paper must possess the following physical properties: (a) Non-porosity, (b) good breaking length, (c) transparency, and (d) gloss.

As the first phase of treatment proceeds, the internal film structure is loosened and

the fibres swell rapidly to about twice the original diameter. Swollen hemicellulose on the surface of the fibres will take an active part in the formation of bonds between the fibres in the sheet. It acts as glue. The more the surface material is swollen and partly dissolved in water, the stronger are the surface tension forces when drying and also larger will be the areas of contact between the fibres leading to the formation of a strong (good breaking length) and even surfaced sheet which is a necessary condition for the final treatment of the paper, i.e., supercalendering. So this three-phase beating treatment, which gives first chopped and disintegrated, then swollen and partly hydrated and finally long and jelly like stock, is the most important phase in greaseproof manufacturing process.

Beater Additives

For time grade paper (a) no alum, (b) no sizing materials, and (c) no clay are used.

For cheap variety of greaseproof papers, certain amount of alum and clay are used.

(d) One litre of H.S.O. 98% commercial per 500 kg. a.d. pulp. The purpose of adding sulphuric acid at this stage is to impart certain degrading influence on the cellulose molecules, i.e. very long molecules are degraded into one of medium chain length, and the very short molecules are dissolved. This helps to increase the case of beating and a quick rise of schopper is obtained.

(e) 5 kg. of H.B.R. III or Tylose per 500 kg. of a.d. pulp. H.B.R. III or Tylose is the trade name of a compound called Sodium carboxymethyl-cellulose (manufactured by Kalle & Co. Wiesbaden-Bierrich| West Germany). This is added at the time of filling the beaters and helps to shorten beating time, expedite hydration, give extra bonding capacity to the fibres and improve the transparency of the paper.

(f) 200 grammes of Calgon per 500 kg. of a.d. pulp. Calgon is used to soften the water and is produced at Joh. Benckiser. Chemische Fabrik. Ludwigshafen, Rhein. From the dumping chest stock is pumped to machine chest and from there to the consistency regulator. The regulated stock then passes through sets of wide bar (6 mm.) high speed refiners or through the Strecker Feiners at minimum 3% consistency.

From the Feiners stock comes to the mixing box where it is diluted to 0.5 to 0.75% consistency ; from the mixing box measured stock flows to the machine head box via rotating type of centrifugal separator and strainers. Of late, strainers have been replaced by vertical screens or selectifiers.

At the paper machine the most interesting item that comes to our notice is the length of the wire. A machine at Redenfelden unit producing fine quality greaseproof paper has got the following wet and data: Machine speed 150 metre|min. width—2.5 metres substance run—45 to 55 gsm|sq. metre, its wire length is 32 metres.

Readers may make a comparison between this machine and a medium size newsprint machine, or with a kraft or cheap printing paper making machine. The question arises immediately, why such a long wire is used in a machine with such small width and low speed? This is due to the fact that here in this machine we are making a non-porous and well formed sheet from long and very wet stock ; water of hydration from long fibre needs a long time (hence long making length) to drain away. Obviously such fires take longer time to get themselves evenly interlocked on the wire.

There are suction couch, one rider roll over it, three sets of presses (no suction presses, but there are other greaseproof paper making machines where four to five sets of presses are found of which the first and the second presses are suction presses). The third press is a reversing one. In the first

and the second presses they use reverse broken twill weave of 600 grammes|sq. metre and in the third press, they use plain weave 700 grammes sq. metre wet felts.

The wire white water pH is kept round 6.5 to 6. There are certain types of greaseproof papers which are passed through the size press (at the drying process) in which case the back water pH should be kept round 4.5 to 5. In such special cases this is done by adding alum at the beaters.

For substance between 40 and 100 gms|sq.m. 65 to 70 mesh long, crimp or plain weave wire has been seen to be used.

The drying of greaseproof paper is very gradual as sudden rise to high temperature will cause dimensional unstability and formation of creases; secondly, it is to be remembered that the stock is highly hydrated and unsized.

Paper is reeled at 6 to 8% moisture content after passing through a set of calender (low pressure, 5 kg.|sq. Cm.).

All varieties of greaseproof paper are not supercalendered. High grade papers with various shades need high gloss and transparency; they are treated at the supercalenders. The calender rolls are made of chilled iron and paper. For paper rolls, filler material contains cotton as base fibre. Iron rolls are steam heated. Pressure on the bottom roll is 400 kg.|linear centimetre width. The intensity of the nip pressure is the element that governs properties like transparency and porosity whilst the element of slip motion between the hot and the filled rolls, governs gloss and smoothness of the said paper.

The main physical testing properties are :

(a) Tensile strength (breaking length) and stretch properties, (b) non-porosity.

A ready method of testing item (b) is: tear a piece of paper from the machine, light up a match stick and then hold the paper a few inches above the flame. The water of hydration in the fibres will evaporate and will try to escape. Now if the paper is porous, the water will escape, and if it is not, then there will be formation of bubbles and the surface concerned will bulge cut. This also proves that the fibres have interlocked very evenly on the long wire.

[1] Strecker Feiner: This is a type of refiner which works with very high consistency stock (3 to 6%) and is widely employed in fields of paper and pasteboard manufacture. Special features of this machine are that the machine and motor are directly connected by a highly flexible coupling. The rotating element is a rigid beater roll made of highly resistant, porous and tough basalt lava, with cut grooves. A stock feeder is located in the inlet casing, while the discharge casing contains a high consistency stock pump. The outer beating segments, which form an almost solid surface are incorporated into the stator, they are also made of basalt lava. The segments are hydraulically controlled and can be pressed on and lifted off radially.

The manufacturer of this machine is Dr. Otto C. Strecker K. G. Darmstadt P.O. Box 50|West Germany, Type FE II|I is the latest design, capacity—10 to 40 tons per day. Power requirements—approximately 110 to 35 H.P. (80 to 100 kW) revolution—950 r.p.m.