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Prof M.L. Miller Miami University, Oxford, Ohio

Prepared Contribution

We have been preparing lumen loaded fibres at Miami University, (1), by loading a Southern pine kraft pulp separately with titanium dioxide and clay..

Our preparation procedure is shown in Figure 1. To maximise the quantity of PEI retention aid in the lumen, we operate at high pH initially and then reduce it after stirring to cationize the PEI.

The characteristics of the pigment used are very important. For a given volume of pigment in the lumen, there would be almost twice as much titanium dioxide as clay because the specific gravity of titanium dioxide is about double that of clay. Therefore, we can achieve levels of about 20% TiO_2 and about 12% clay in the lumen of a Southern pine.

Electron micrographs have revealed that the pit openings of lumen loaded fibre are filled with pigment and also show the placement of the pigment particles within the lumen of the fibre.

Figure 2 shows the effect of loading level on strength. The loss of strength with lumen loaded fibre is essentially proportional to the reduction in fibre content in the sheets.

Lumen loaded fibres provide for better stiffness due both to the better fibre/fibre bonding and to the lower degree of fibre collapse. These same factors may possibly also account for the better tear strength of sheets made from lumen loaded fibres.

Figure 3 illustrates the effect of lumen loading on opacity. Our results, in contrast with Dr. Scallan's, show a slightly poorer opacity, for a given loading level, with lumen loaded fibres. This may be due to the over-flocculation of the pigment particles by the retention aid we use in our lumen loading procedure. We also obtained a slight reduction in brightness with the lumen loaded paper.

The advantages of lumen loaded fibres are summarised in Figure 4.

1. DISPERSE FIBERS IN WATER
2. ADD PIGMENT SLURRY TO FIBER
3. AGITATE 20 MIN. IN TAPPI DISINTEGRATOR
4. ADJUST pH TO 11.0
5. ADD 2% PEI
6. SLOW STIRRING FOR 60 MIN.
7. ADJUST pH TO 6.0
8. WASH IN BAUER-McNETT CLASSIFIER TO REMOVE EXTERNAL PIGMENT

Fig 1—Preparation Procedure for Lumen Loaded Fibres

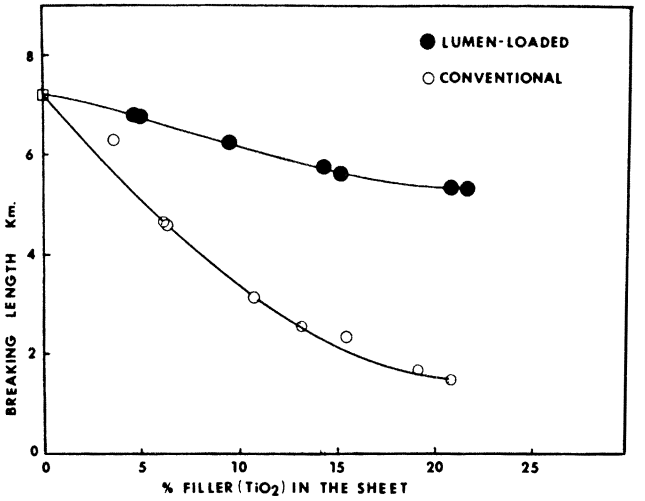

Fig 2—Relationship between Breaking Length and Filler Content for Lumen Loaded and Conventionally Loaded Sheets

Further work needs to be carried out to look at other pigments, to assess the sizing demand of lumen loaded papers and their printability. The effects of lumen loaded fibres on formation requires study as does the possible benefits to be gained from adding pigment in the usual way to already lumen loaded fibre suspensions. The recycling aspects of these fibres also requires study.

References

1 Miller, M.L. and Paliwal, D.C., Journ. of Pulp and Paper Science, Vol 11, No. 3, May (1985).

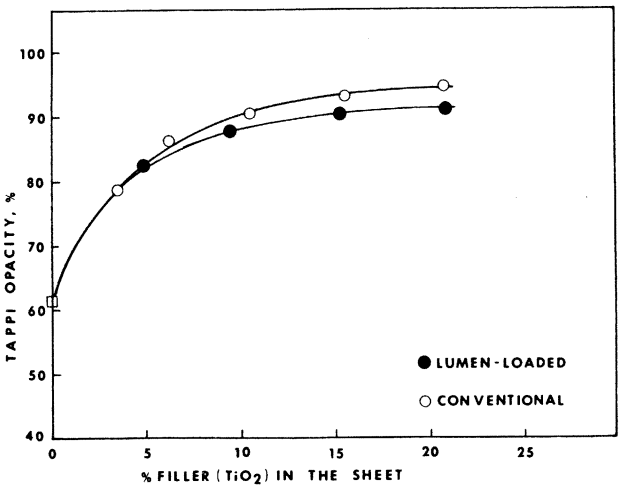

Fig 3—Relationship between TAPPI Opacity and Filler Content for Lumen Loaded and Conventionally Loaded Sheets

1. HIGH RETENTION OF FILLER DURING PAPERMAKING
2. HIGH PAPER STRENGTH
3. HIGH PAPER STIFFNESS
4. CLEANER WHITE WATER - REDUCTION IN EFFLUENT LOAD
5. FASTER DRAINAGE AT PAPER MACHINE
6. REDUCED WIRE AND FELT PLUGGING
7. REDUCED FILLER DUSTING
8. REDUCED TWO SIDEDNESS OF PAPER
9. REDUCED SIZE DEMAND OF THE STOCK

Fig 4—Advantages of Lumen Loaded Fibres