

**Dr. J.C. Roberts** UMIST, Manchester, England

Prepared Contribution

One of our current interests is in the achievement of dry strength by means of wet-end addition.

The purpose of this contribution is to draw attention to the effect on sheet formation that the additions of dry strength agents, such as cationic starch, to the wet-end may produce.

For this work, we have used C<sup>14</sup> labelled cationic starch, the synthesis of which is shown in Figure 1.

When added to a fibre suspension in a sheet machine, the cationic starch does show a very high retention on fibres related to their degree of beating and the pH of the suspension as shown in Figure 2. Native starches, on the other hand, show very low retentions and are much less dependent on pH.

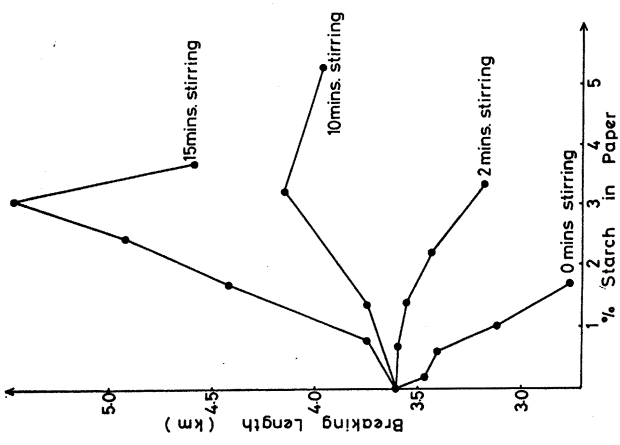
However, in normal sheetmaking, the introduction of cationic starch may cause quite severe changes in sheet formation which, of course, will be important in any subsequent measurement of physical properties such as tensile strength.

Figure 3 shows the breaking length obtained from hand sheets made from suspensions of fibres and cationic starch which had been pre-stirred for 0, 2, 10 and 15 minutes before being added to the sheet machine. It illustrates that the addition of cationic starch to the suspension may either increase or decrease the breaking length of the sheet depending on the degree of pre-stirring applied.

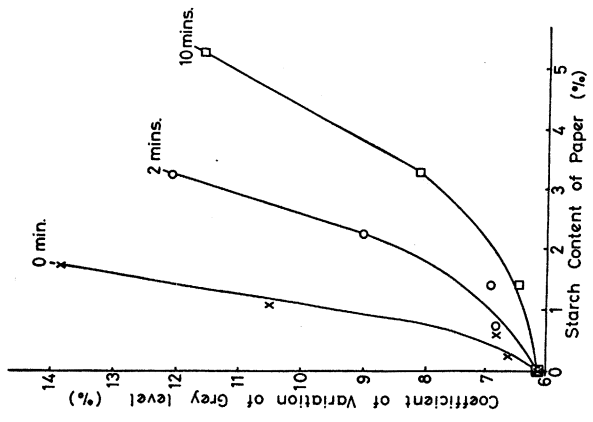
The effect of the addition of cationic starch on formation for three of the pre-stirring periods; 0, 2, and 10 minutes, is shown in Figure 4. Notice that, for the case of the suspension which had been pre-stirred for 10 minutes, the breaking length had increased while the formation had deteriorated with increasing levels of starch addition.

These results illustrate how important it is when analysing results of the effects of the addition of dry strength additives, to ensure that sheet formation remains constant.





**Fig 3—** The effect of retained Cationic Starch on the Tensile Strength of Hand-sheets prepared from an unbeaten Sulphate (pine) pulp under different stirring conditions (0.3% ~ 500 RPM)



**Fig 4—** The effect of Pre-stirring and Starch content on Formation