CHAPTER 5

DISCUSSION

At first, attention should be paid to change the orientation of fibres on the fourdrinier wire, because this factor seems to be the most influential factor on the ratio. If the fibres are orientated more in the cross machine direction, the cross direction breaking length should increase while the machine direction breaking length decreases, therefore, the ratio of tensile strengths decreases according to Page's theory. For this purpose, the jet velocity is altered by changing stock level in the head box while the wire velocity is held constant at 1450 feet per minute corresponding to theoretical head of 108 inches of mercury. Refer to result 1 and graph 1 (in appendix A), when the head box level is lower than theoretical head the ratio is reduced from 3.1 to 3.0 which is nearly constant and the tensile breaking lengths are nearly equal. When the head box level is raised higher than theoretical head the ratio increases from 3.1 to 3.3 while the tensile breaking lengths decrease in both directions. The results indicate that the variation of jet velocity has little effect on the orientation of fibres on wire. It is suggested that paper machine should operate with actual head less than the theoretical head by from 0 to 10%. In this way there is a relative motion between the wire and the slurry which helps to make a better-formed sheet by shearing the flocs at the instant of deposition.

Next, the attention is paid upon the reduction of the weak zones of the tissue paper in the cross machine direction. For this purpose, freeness and consistency have been varied. The result 2 and graph 2 (in appendix A) indicate that as Canadian Standard Freeness is reduced from 450 to 350 CSF., both machine and cross machine tensile breaking lengths of the tissue paper increase and the ratio reduces gradually. For freeness lower than 350 CSF., the machine and cross machine tensile breaking lengths are still increased but the ratio is nearly constant. This result can be explained that as the fibres are beaten with greater force, the freeness of stock decreases, the surface and flexibility of the fibres increase and a greater degree of bonding take place when dried. The ratio reduces due to greater percetage of bonding increases in cross machine direction than in machine direction, and as the freeness is lower than 350 CSF., percentages increase in bonding are nearly equal in both directions. For the type of furnish in result 2, the operating freeness under 350 CSF. will not help in reducing the ratio but will increse the cost of manufacturing due to higher power supply to motor, the lower freeness also causes the water to drain slower from the wire due to stock's characteristic. It is also recommended that the manufacturer should predetermine the type of furnish, so that a suitable freeness can be choosen. It can be concluded that the degree of freeness of stock has little influence upon the variation of the ratio of tensile strengths. So the alternative left in order to reduce the weak zones is to re-

duce the consistency of stock in the head box. Refer to result 3 and graph 3 (in appendix A), as the consistency decreases the ratio decreases rapidly, the machine direction breaking length decreases and the cross machine breaking length increases. It shows that more fibres are orientated in the cross direction and also the lower consistency reduces flocculation and forms a better even formation. This consistency figure can be taken to guide the manufacturer in improving the ratio of the tensile strengths. Result 4(a) and 4(b) (in appendix A) also show that the ratio is affected by quality of furnishes used in the production line. The fibres which have good tensile strengths give a good tensile strength tissue paper and also reduce the ratio of the tensile strengths but it has a limitation on production cost.