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The Effect of Histogram Class Interval on the Calculation of Mean Fibre Curvature and Standard Deviation of Fibre Curvature.

By

V.E. Fish

Australian Wool Testing Authority Ltd   PO Box 190, Guildford, NSW 2161, Australia

SUMMARY

Calculations have been made to show the effect of different class intervals of the frequency distribution histogram on the Mean Fibre Curvature (MFC) and the Standard Deviation of Fibre Curvature (SDFC).

Results show that there is very little impact on the MFC and SDFC between class intervals between 1 to 40 deg/mm in size. However, results have also shown a small impact on the MFC and SDFC at 120 deg/mm due to the asymmetrical nature of the FC distribution.

METHOD

Two wool samples with different Mean Fibre Curvature (MFC) were measured on OFDA. The Fibre Curvature data was captured and used to calculate frequency histograms. Data were grouped into bins encompassing class intervals of 1, 10, 20, 40, 80 and 120 deg/mm. Distribution statistics were calculated using the normal procedures for grouped data.

RESULTS AND DISCUSSION

Table 1 shows the calculated MFC and SDFC values for the two samples used in this exercise. The MFD and SDFC results are quoted to one decimal place to show the very small differences between the calculated values for each class interval. However, it is inappropriate for commercial work to quote MFC and SDFC to 3 significant figures (one decimal place), considering the variability of the measurement of Fibre Curvature (Fish et al., 1999).

Table 1: Mean Fibre Curvature (MFC) and Standard Deviation of Fibre Curvature (SDFC) Values calculated with differing Class Intervals

Class Interval (deg/mm)	Number of Intervals in 360 deg/mm	High MFC		Low MFC	
		MFC	SDFC	MFC	SDFC
1	360	99.4	69.9	74.8	51.5
10	36	98.9	69.9	74.3	51.5
20	18	99.1	69.7	74.6	51.7
40	9	99.8	70.0	75.4	51.5
80	4.5	101.3	70.2	78.3	51.8
120	3	104.7	70.9	82.2	49.2

The SDFC changes very little as the size of the class interval increases from 1 deg/mm to 80 deg/mm. However, from 40 deg/mm to 120 deg/mm MFC increases as the size of the class interval increases due to the asymmetrical distribution of the FC, demonstrated in Figures 1 and 3 for the samples investigated here.

Figure 1 and 3 show the Fibre Curvature distributions at class intervals of 1 deg/mm compared to Figures 2 and 4, which show the same data presented as class intervals of 40 deg/mm.
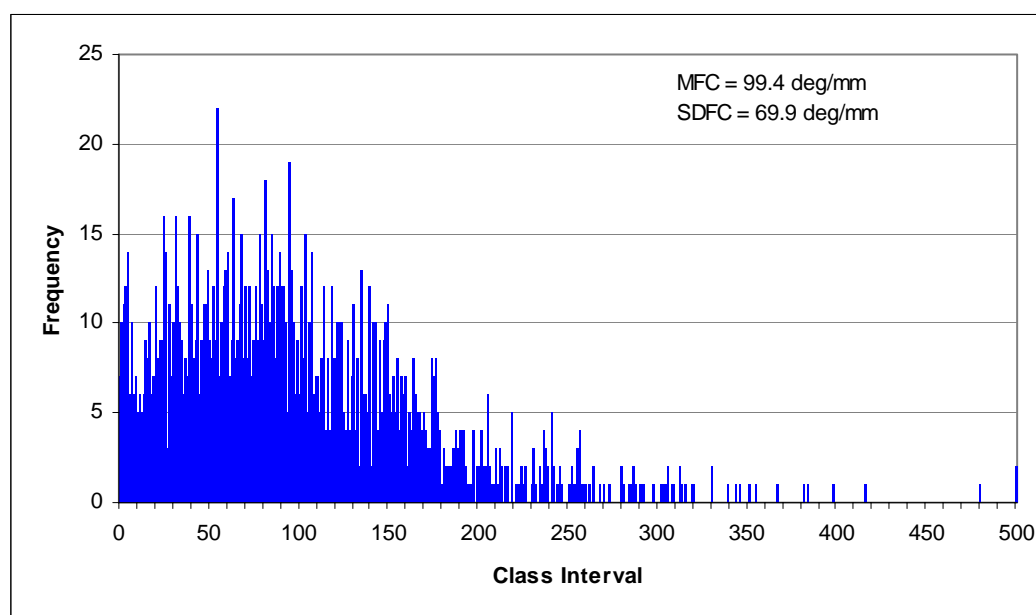

MFC = 99.4 deg/mm
SDFC = 69.9 deg/mm

Figure 1: Asymmetrical distribution of the Fibre Curvature Histogram for High MFC sample (Class Intervals of 1 deg/mm).

MFC = 99.8 deg/mm
SDFC = 70.0 deg/mm

Figure 2: Asymmetrical distribution of the Fibre Curvature Histogram for High MFC sample (Class Intervals of 40 deg/mm).
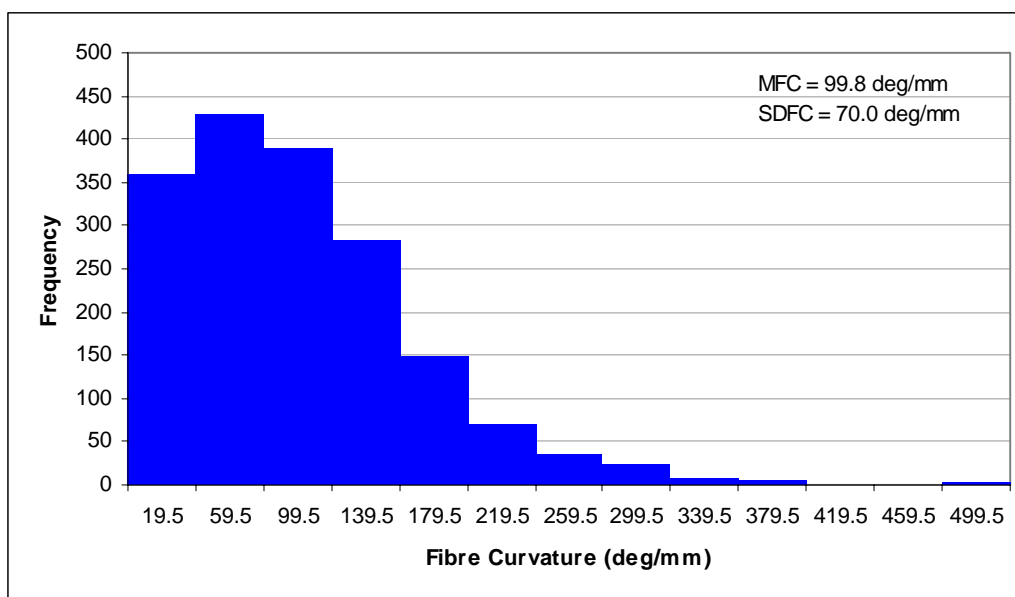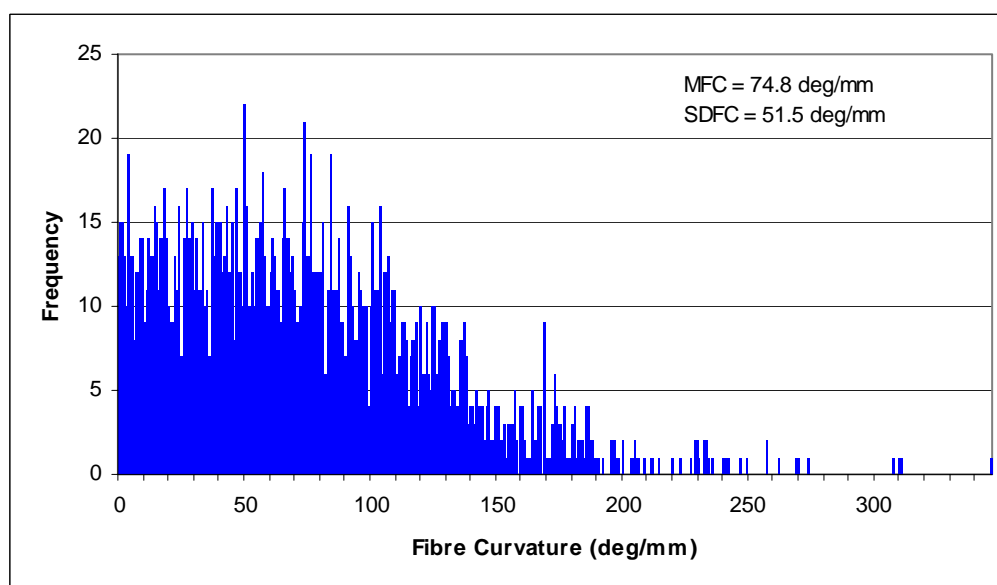
MFC = 74.8 deg/mm
SDFC = 51.5 deg/mm

Figure 3: Asymmetrical distribution of the Fibre Curvature Histogram for Low MFC sample (Class Intervals of 1deg/mm).
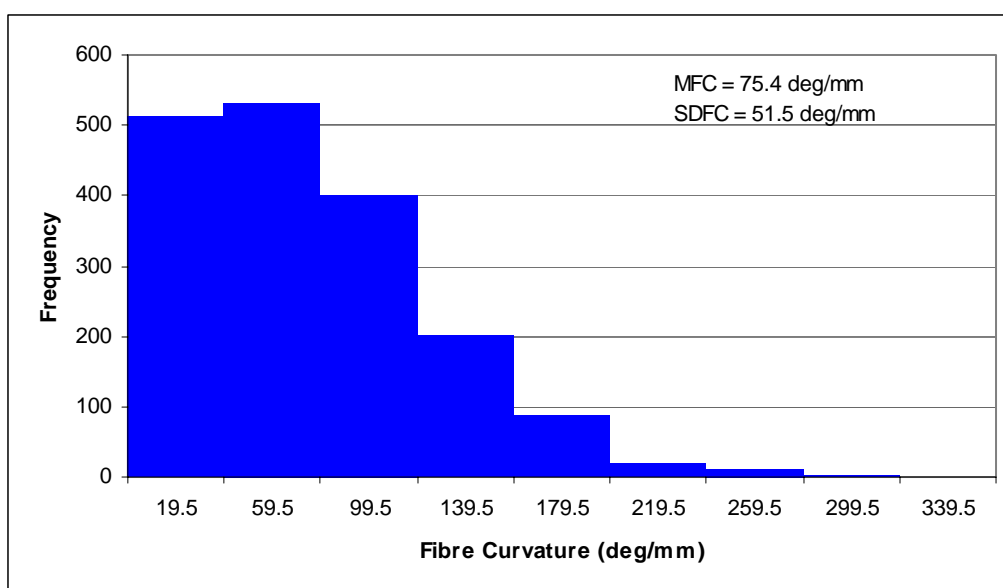
Figure 4: Asymmetrical distribution of the Fibre Curvature Histogram for
Low MFC sample (Class Intervals of 40 deg/mm).

CONCLUSION

Changing the size of Fibre Curvature class interval has little impact on the SDFC over the range of values investigated. The trends in Table 1 show that there is little, if anything, to be gained by collecting Fibre Curvature data in class intervals smaller than 40 deg/mm. However, intervals larger than 40 deg/mm will result in a slight increase in the Mean Fibre Curvature because of the asymmetrical nature of the Fibre Curvature distribution. Even up to intervals of 120 deg/mm there is a relatively small impact on MFC (~5 deg/mm), and a lesser impact on SDFC (~1 deg/mm).

REFERENCES

Fish, V.E., Mahar, T.J., and Crook, B.J. (1999) *Fibre Curvature Morphometry and Measurement.* IWTO T&S Committee, Nice, Report CTF 01.