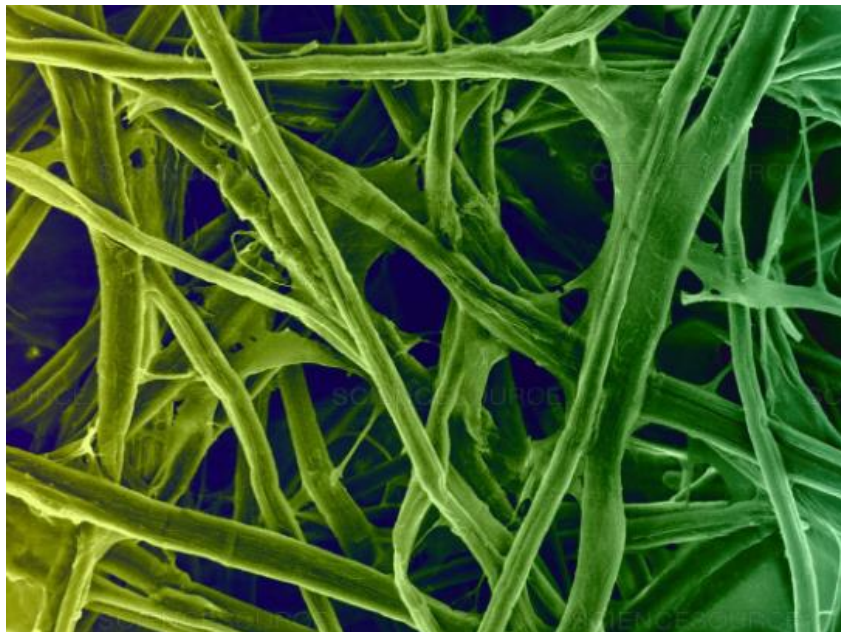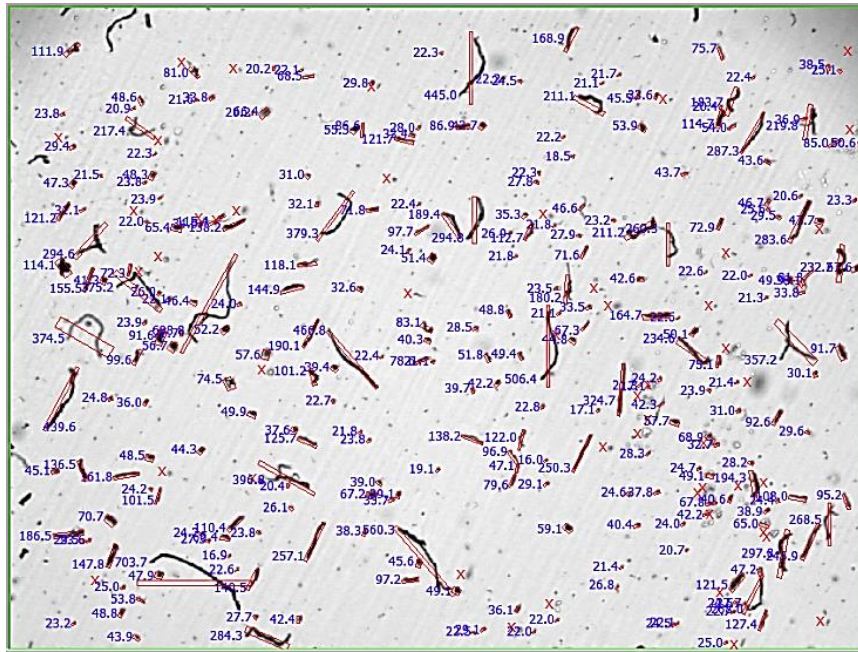# APPLICATION NOTE: AN-017

Particle Shape Analysis of Cellulose fibers

This study focuses on the characteristics of specific cellulose fibers deriving from natural sources. They are manufactured as thickening agents, which appear in several domestic consumer commodities, including cosmetics, shampoos, and many more. Length, breadth (thickness) and curl significantly influence the viscosity of the final commodity.
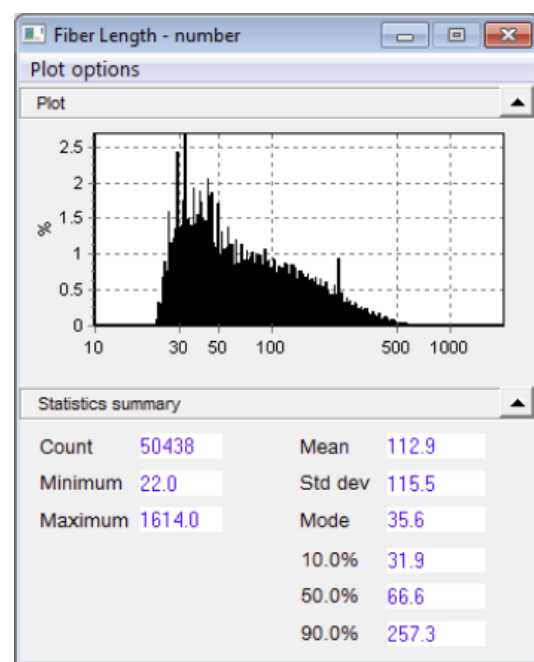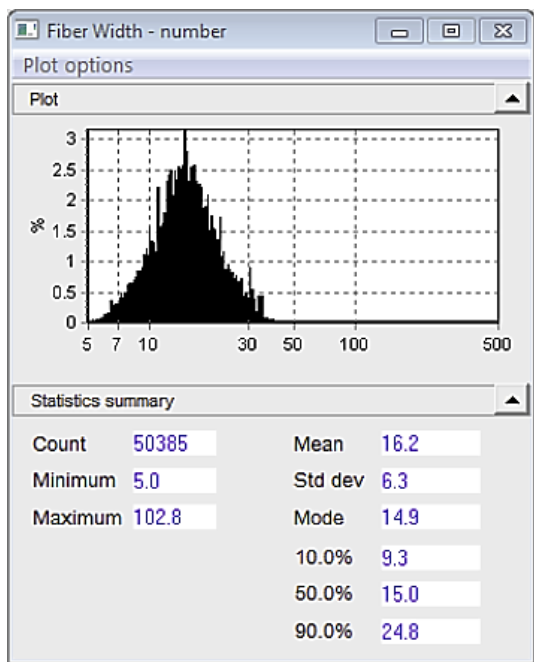

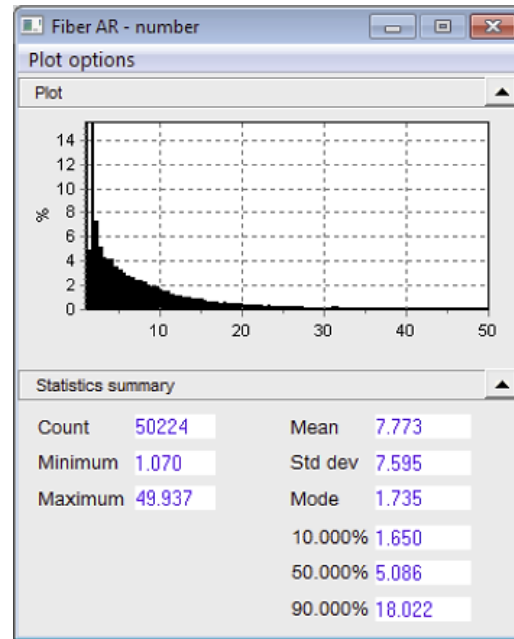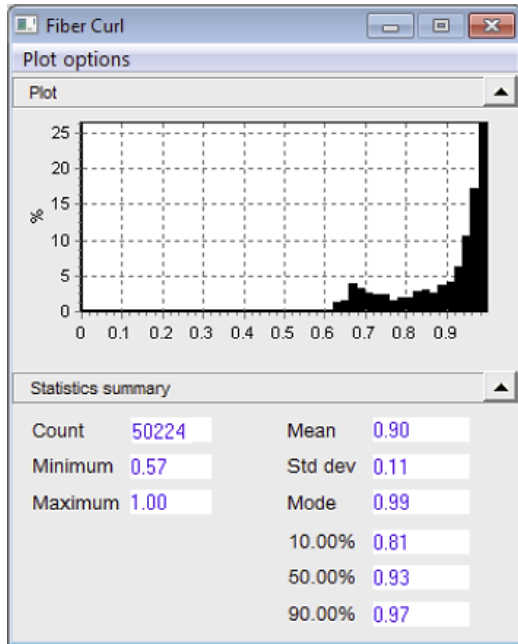|	Measure	Range of acceptance
Applicable Measures	Fiber Width	5 – 500 microns
	Fiber Length	10 – 1000 microns
	Fiber Aspect Ratio	1.0 – 50.0
	Fiber Curl	0 – 1.00

Notes

Fibers of this category are first suspended in propanol, which prevents rapid dissolution, and are subsequently intermixed thoroughly. As longer fibers typically arrange themselves according to the orientation of flow, the examination of lengths with greater extension than the width of the flow cell is possible. The above image from the Pi Sentinel PRO exhibits Fiber Length values. The fiber shape model aligns the long, narrow fibers and records **Length**, **Width**, and **Aspect ratio** of the aligned rectangle.

Fiber Width displays symmetry around the average (16 microns). **Fiber Length** displays an acute increase and subsequently a straight decrease to 500 microns. This decrease is nearly linear (on the log scale). Fiber length distributions do not usually adhere to the typical particle size distribution shapes.

Fiber Width - number				
Count	50385	Mean	16.2	
Minimum	5.0	Std dev	6.3	
Maximum	102.8	Mode	14.9	
		10.0%	9.3	
		50.0%	15.0	
		90.0%	24.8	

Fiber Length - number				
Count	50438	Mean	112.9	
Minimum	22.0	Std dev	115.5	
Maximum	1614.0	Mode	35.6	
		10.0%	31.9	
		50.0%	66.6	
		90.0%	257.3	

Fiber Curl is an index of straightness, represented in numerical terms. 1.0 represents perfect straightness, while lower values correspond to a more curled shape. Aspect ratio (Fiber AR), the proportion of length to width, displays an average value of 7.7. The largest aspect ratio observed was around 50.

Fiber Curl		Fiber AR - number	
Count	50224	Count	50224
Mean	0.90	Mean	7.773
Minimum	0.57	Minimum	1.070
Std dev	0.11	Std dev	7.595
Maximum	1.00	Maximum	49.937
Mode	0.99	Mode	1.735
10.00%	0.81	10.000%	1.650
50.00%	0.93	50.000%	5.086
90.00%	0.97	90.000%	18.022

End of NOTE