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# Fundamental Principles of Fibre Fineness Measurement

## Part 11

### Sedimentometry



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## SEDIMENTOMETRY

### Principle

Sedimentometry is the measurement of rates of settlement of particles or fibres in a fluid, where the differential settling of the particles or fibres is a function of their dimensional characteristics. Sedimentation of particles in a fluid is described by their Stokes Diameter  $d_s$ .

$$d_s = \sqrt{\frac{\mu h t}{(\rho_p - \rho_l) g}} \quad 1$$

where:

$\mu$  = the dynamic viscosity of the fluid

$h$  = height fallen in time  $t$

$\rho_p$  = density of the particles

$\rho_l$  = density of the liquid

and  $g$  = acceleration due to gravity

### Development

Le Compte (1948) described a method where fibres were cut into uniform lengths (not exceeding 200 micrometres), suspended in a liquid and allowed to settle. Four deposits of fibres were removed at spaced intervals and weighed, thus determining the proportions of four grades of fineness in the samples.

The author described the cutter and sedimentation apparatus and reported that the method could deal with 100,000 to 200,000 fibres at a time and was rapid and objective.

Uno, Shiomi and Yanagawa (1966) devised an apparatus for measuring fibre fineness by horizontal airflow. A mass of cotton fibres was separated into single fibres in an opening box. The opened cotton was fed through a guide tube in the measuring chamber carried by a horizontal air current and progressively deposited on a board. The distribution of fibre along the board was related to fineness. A theoretical model based on the assumed Stokes diameters was evaluated and found to give good agreement with practice. The authors claimed the method compared favourably with the Micronaire.

Onions and Townhill (1968) described a method based on Photo-extinction Sedimentometry. The cut fibres were dispersed in a liquid and the settling rate monitored by turbidimetric measurements over a period of time. The instrument was calibrated by constructing extinction curves for the IWTO tops. The time at which 50% extinction occurred for each of the tops was determined and used as the criterion for defining the mean diameter of the calibration top. Using this parameter the calibration curve was constructed. Various suspension media, fibre lengths and sample concentrations were investigated. The author claimed a precision of +/- 0.5 micrometres was achieved, using 100% xylene as the suspension medium.



*A powder sedimentometer used for determining particle size distributions in fine powders.*



## **Technical Issues**

This technique has never been seriously developed for testing wool. Consequently very little is known about the technical issues associated with the method.

## **Bibliography**

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