DETERMINATION OF WOOL FINENESS BY LANAMETER TYPE 2-12-1/b

By

J. Horváth

Research Engineer at the Hungarian Textile Research Institute

Wool lots of varied qualities are processed by the woolens industry. One of the most important quality characteristics of wool is the fibre average fineness.

In practice, determination of the fineness takes place by subjective, and objective methods, respectively. With the development of modern measuring technique, classifying methods based on uncertain subjective judgements, are increasingly being replaced by objective instrumental tests. Measuring methods based on diverse principles, can be used for the determination of wool fineness.

The methods used for determination of wool fineness can be divided into two groups. The direct methods are the micrometer procedures, while the gravimetric and the airflow fineness tests form the indirect methods. The most widely used of the micrometer methods is the Lanameter wool fineness measuring.

Determination of wool fibre fineness by use of optical appliances was first carried out by Daubenton, Ploncquet and Volklaender in the 18th century. The microscopes and methods employed were primitive. Magnification was appr. 15× and the number of fibres examined in one specimen, was 5—10. Since that time optical instruments have undergone considerable developments. The optical and instrument manufacturers developed a special microscope under the name of LANAMETER, for the measuring of wool fineness. Development has not slowed down and is now directed principally towards measuring accuracy and ease of manipulation. In addition, however, endeavours are being made to render the Lanameter suitable for general microscopic testing purposes besides standard wool fineness testing. Thus for example, multi-magnification is now provided in place of the single magnification and micro-photographic equipment is attached to the instrument. A dark room is no longer required for tests carried out with modern Lanameters and the measurements can be made in laboratory premises with normal illumination.

The continually developing Hungarian instrument manufacturing industry has produced definite results most recently, in developing the Lanameter into a universal projection microscope. Four Lanameter types are produced, viz. with magnification powers of 75, 250, 500 and 750×. Magnification change-over is simple, a screw knob is turned. The lowest magnification stage (75 power) is used mainly for individual fibre counting tests, e. g. when it is necessary to know the number of fibres in the bundle, for gravimetric fineness testing. The 250 power magnification is used for other fibre fineness testing. The 500 power magnification is used internationally as the magnification degree for fibre diameter measuring. With the more powerful 750× magnification, microscopic tests of this magnification degree can be conducted continuously with a minimum of fatigue to the laboratory assistant using the instrument. Micro-photography can be carried out with the apparatus, without using a camera.

The principal advantage of the apparatus, however, is the built-in registering appliance. With the aid of this, the operator can register the fibre diameter values measured with an easily handled mechanism. Registering is carried out by grouping by fineness according to the diameter values of the individual fibres. The frequency values of the fibre fineness can be registered by these means. In the interests of quick work and accuracy of records, two persons were required hitherto for carrying out this type of measuring, one who conducted the measuring, while the other recorded the results.

The frequency recording equipment now renders one of the operators redundant and thus the work entailed by fineness testing becomes less exacting in labour requirements. Apart from this, however, the instruments differ in other respects also from those used hitherto, although the differences are not of significance with regard to the measuring technical viewpoint. We refrain from dealing in detail with these differences and mention only that the mm division scale for reading the fibre diameter is not marked into the ground glass of the picture screen but is projected thereon by means of an optical auxiliary appliance. This greatly facilitates ease of handling as the picture screen is placed in a light well and direct placing of the scale onto the fibre axis would not be possible during the measuring test.

The essential feature of micrometric determination of fineness is that a 0.8 mm section of the fibre bundle representing the wool lot, is cut out by means of a Hardy microtome, and the short fibre clippings are bedded in cedar oil on the object plate, and in this manner placed onto the Lanameter stage. The diameters of the fibres projected onto the picture screen are measured by means of the mm division scale likewise projected onto the screen, with a magnification of 500 power. This method can be applied equally for testing of fibres taken from fatty washed wool, yarns and combed laps.

The preparation can be moved on the Lanameter stage in two directions perpendicular to each other. Care must be taken during the course of the test, to measure the fibres of the preparation indiscriminately, without selection. It is of equal importance that the fibres be measured once only. To ensure this, the adapter holding the object plate is moved in stages of 0.5 mm. In view of the fact that a 0.5 mm movement of the preparation magnified 500 fold, represents a screen movement of 25 cm, the appearance on the screen of fresh fibres is always assured. Movement, respectively measuring, is commenced at the upper left corner of the preparation under the covering plate and advanced to the right as far as the edge of the covering plate. The preparation is then moved backwards, similarly 0,5 mm, in a direction perpendicular to the former movement. Measuring is then continued with movement to the left. In other words, the readings are taken at stages of 0.5 mm meander-line wise continuously, until the required measuring data has been obtained.

Measuring is carried out in the centre part of the screen as defined by a 100 mm diameter circle, by placing the mm division scale perpendicularly to the fibre axis and moving the preparation to a position where one contour of the fibre being measured, coincides with a scale division. The width (breadth) of the fibre can then be read in mm-s.

Adjustment of sharpness is correct when the fibre is bordered by a black line, with no external white line. During the course of measuring — i. e. determination of the distance between the two contours of the fibre correctly adjusted for sharpness — it will be experienced that the fibre thickness seldom registers accurately with the multiple of an integer scale division. It will generally be found that if one edge of the fibre is accurately adjusted to register with a division line of the scale, the other edge of the fibre will fall between two of the scale divisions. It is therefore necessary to proceed according to a determined system in recording the results. During the course of the measuring tests fibres, one edge of which lies between two scale divisions, should be recorded on the measuring sheet under the lower scale value, and marked as "n" mm. For the later evaluation calculations, the readings of the total "n" values should be taken as n + 0.5 mm. Fibres will be found, however, whose diameters are an integer, "n" mm. These fibres are also entered with the values corresponding to the "n" group, making a note of their number, e. g. by placing a dot between the respective groups. For calculation purposes, one half of these fibres are placed in the n + 0.5 mm group and one half in the (n — 1) + 0.5 mm group. For this purpose the number of non-integer mm diameter fibres belonging to the "n" group, are registered on the lanameter frequency recorder, while the number of integer "n" values found in the same group and later to be distributed, are registered on the other. Simultaneously with these values, the apparatus records the number of fibres registered, respectively measured.

Literature

1. V. Dischka: Textile raw materialsme, chanical technological testing and classifying methods.
2. Gy. Kerekes: Determination of wool average fineness, according to the International Wool Association specifications. 1942.
3. P. Keresztúri: Fineness determination of 100 wool specimens, by empirical, microscopic and weighing methods, 1930.

Manufacturers: **Precision Mechanical and Medical Appliances Manufacturing Small Industries Co-operative Society**

Designers: **Joseph Horváth, Engineer, Textile Research Institute, and John Pölössy, Engineer, Optical Research Institute**

Exporters: **METRIMPEX, Budapest 62. P. O. B. 202.**

A kiadásért felel az Akadémiai Kiadó igazgatója Műszaki felelős: Farkas Sándor
A kézirat nyomdába érkezett: 1958. XII. 30. — Terjedelem: 10 (A/5) ív 104 ábra

Akadémiai Nyomda Budapest, V. Gerlóczy u. — 47721/59 — Felelős vezető: Bernát György