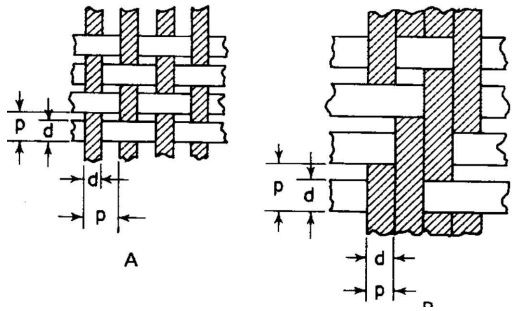
Lecture 20

Cover Factor
Theory and calculation of cover factor



The figure shows projected views of two woven cloths of different construction. At A the warp and the weft threads cover the area of the cloth only partially, but at B the cloth area is covered completely with no spaces left between the adjacent warp yarns, and it will be seen that the relative closeness of yarns in a woven cloth is dependent upon the ratio of yarn diameter, *d,* to yarn spacing, p. This ratio known as relative cover, can be defined as the proportion of a projected view of a given area of cloth which is covered by threads, and will have a scale from 0 to 1, although it may also be expressed as percentage cover with a scale from 0 to 100 per cent.

d/p = relative cover,

$(d \times 100)/p$ = percentage cover

It is preferable to express warp and weft relative cover separately, as the cumulative value of cloth cover does not indicate the comparative importance of each set of yarns which is essential for the determination of certain cloth characteristics.

From the relationship shown above it will be obvious that if $d = p$. the value of relative cover is one, and this is regarded as the theoretical maximum cover. In practice, however, this value can be exceeded considerably in any one direction, either through yarn distortion, or, by forcing the threads into different planes, especially if the relative cover of the opposite set of threads is reduced correspondingly.

The relative cover for one thread system can be calculated as follows by considering an area of 100 x 100mm:

Area per thread = $100 \times d$

Area covered by n threads of one system = $n \times 100 \times d$

Therefore, relative cover = $(n \times 100 \times d)/(100 \times 100) = (n \times d)/100$

Example: The cloth represented at A is specified as follows: Warp — 25 tex cotton, 267 ends/100 mm; weft—36 tex cotton, 334 picks/100 mm. Find the relative warp and weft cover. (Subscript 1 refers to warp, subscript 2 to weft.)

Warp relative cover $= (n_1 \times d_1)/100$

$= (267 \times \sqrt{(25)}/(26.7))/100$

$= 0.50$

Weft relative cover $= (n_2 \times d_2)/100$

$= (334 \times \sqrt{(36)}/(26.7))/100$

$= 0.75$

In most circumstances the cumulative value for cloth cover is of little use, but in some special cases, such as in considering air permeability, or porosity of cloths it may be of considerable interest, and should be specified. Simple addition of the relative warp and weft covers does not give the correct result because in this way the areas where one set of threads crosses the other are counted twice. These areas equal to

$$n_1 \times d_1 \times n_2 \times d_2, \text{ hence}$$

Relative cloth cover = (Relative warp cover + relative weft cover) - (Relative warp cover x relative welt cover)

Or (0.50 + 0.75) — (0.50 x 0.75) = 0.88

Expressed as a percentage it would indicate that 88 per cent of the total cloth surface was covered by yarn, with the remaining 12 per cent of the area consisting of open spaces. The calculations involving the degree of yarn cover in cloth can be simplified considerably if an index or cover factor is derived which will obviate the need for the cumbersome calculation of yarn diameter which is necessary to establish the relative cover value. This can be achieved in the following manner:

d mm = √N/ 26.7 (for yarns of specific volume 1.1 cm /g)
p mm = 100/n (where n is the number of threads per 100 mm)
d/p = relative cover and this has a value of 1.00 when d = p.
From the above the following relationship can be established:
d/p = √N/ 26.7 / (100/n) = n√N/ 2670

If the numerical factor is now eliminated a cover factor, *K,* can be expressed as: $K = n\sqrt{N}$ the value of K being 2670 when $d = p$. i.e. when the maximum theoretical cover value is reached. In this way a direct relationship is established between the cover factor. *K.* the number of threads per 100mm, and the tex yarn number, *N,* to the exclusion of yarn diameter calculation provided that only yarns of specific volume of 1.1 cm3/g are considered. It will be appreciated that for the relative cover of 0.50, K has the value of 1335 for relative cover of 0.33 it has the value of 890, and so on.