

## FABRIC ANALYSIS.

### Conditioning Unscoured Material.

In some cases unscoured or dirty material has to be conditioned, and when besides ascertaining the percentage of moisture in the sample, we must also ascertain the percentage of yolk, dirt, gum and other foreign matter. The percentage of oil in tops, yarns, or fabrics is also often required to be known.

For this purpose a sample is carefully weighed, then thoroughly scoured with a neutral soap and water to which a little ammonia is added, dried, cleansed, and shaken to rid it of sand, lime, etc. It is then made absolutely dry in the conditioning oven, as previously explained, its weight again recorded, and subtracted from the first weight taken, the difference giving the amount of foreign matter, plus the moisture the sample contained.

### Silk Conditioning.

In conditioning of silk, besides ascertaining the percentage of moisture present it may be necessary to also obtain the percentage of gum or sericin before the true weight of the fibroin the silk contains can be given. This gum, which is the natural product of the silkworm, is poured by the latter on to the fibre during the spinning of its cocoon, and usually amounts to about 18 to 25 per cent., depending upon the kind of raw silk, China silk containing the most.

Thrown silk yarns are supplied either boiled-off (that is with all the gum removed) or as *gun-yarns*, in which case only a portion of the gum will have been removed, the proportion varying according to the purpose to which the yarn is to be put. Thus *souple* silk has only from 6 to 12 per cent. of the gum removed, whereas silk known as *ccru* has only as little as possible removed, consistent with the success of the bleaching of the material, say from 3 to 5 per cent.

SPUN SILK, which is made from the waste of raw silk, is supplied as *ordinary spun silk* in which the gum is all boiled out, or as *schappe* or *floss* silk in which the gum is retained.

The usual process of testing a silk sample as to moisture and boil-off consists of first weighing a sample on a pair of most delicate scales, then finding the absolute dry weight by placing it in the desiccating apparatus, which has been previously explained but smaller. The dry sample is then immersed twice in a bath of boiling soap suds,  $\frac{1}{4}$  lb. of silk soap being used to each pound of silk, for a half hour, after which the heat should be permitted to run down, the sample afterwards being washed in a current of cold water to remove the soap.

The sample is then conditioned a second time, and when then the difference between the absolute dry weights before and after boiling gives the amount of moisture and gum that was present, and from which the percentage of loss can be readily calculated.

### Count in Correct Condition.

The moisture in the air of the room at the time of this testing for the count of the yarn (or weight of fabric) "in correct condition", *i. e.*, *conditioning* as you technically call it, has no influence on the result of the test; that is to say, several tests might be carried out on the yarn under widely varying conditions with regard to moisture, and assuming there to be no natural variation in the count of the yarn, the "count in correct condition" would always be the same.

### Count in Condition Received.

On the other hand in the case of a test for "count in condition received" that is, count of yarn without correction for moisture, the result of the test will vary according to

- (1) the moisture in the sample, and
- (2) the atmospheric conditions prevailing at the time the test is made.

When a sample is tested in a damp state, the result will show the yarn to be coarser than is actually the case, whereas a test of yarn in a dry condition will give a result finer than the true count.

For the purpose of investigating the effect of variation in the amount of atmospheric moisture on the count of a yarn, a sample of a normal gray cotton yarn, after being accurately weighed, was placed in a cage specially designed so as to expose the sample as freely as possible to the atmosphere of the testing room, at the same time to afford

the maximum amount of protection from dust and dirt. The sample was weighed at frequent intervals during a period of about three months, and the weights recorded. Hygrometric readings were also taken during the same period, and the variation in the weight of the test portion of yarn was found to be generally coincident with the variation in the amount of atmospheric moisture. As was to be expected, however, there was a certain amount of *time lag* due to the condition of the test portion not coming immediately into equilibrium with the condition of the air.

At the end of the period during which the yarn was exposed, and after the final weighing, the sample was dried and the *absolute dry weight* ascertained. From this, the percentage of moisture in the yarn at the time of each preceding weighing was calculated, and the results showed the moisture to have varied approximately from 6 to 10 per cent.

Assuming the yarn to have been 40's, tests for count at different times during the period in question would have shown an approximately variation of from 39's to 41's. That is to say, if tested on the most humid day during the three months, the yarn would have been found to be 39's, whereas if the test had been made on the driest day, it would have shown the yarn to be 41's.

Although the true count of a yarn may be ascertained from a test of the material "in correct condition," tests of strength of yarn and cloth are commonly carried out on the material in its ordinary air-dry state. It is generally recognized by manufacturers that the strength of yarn and cloth varies to some extent according to the amount of moisture in the material, and in some works, strength tests are never made unless the samples have been previously exposed to the air in order that they may gain or lose moisture, and come to a supposed *natural* condition. No method of testing, however, has been generally adopted which obviates the discrepancies in the results of tests arising from variation in the amount of atmospheric moisture in materials at the time of testing. It has been stated that, in the case of flax canvas purchased by some foreign governments, it is stipulated that before testing for strength, the material shall be subjected to a certain temperature for a stated time. Objections may be raised to this procedure, however, since it is possible that physical changes may be brought about by the heat used in drying, and, on cooling, the material may not be in its natural condition.

With a view to determining the effect of atmospheric moisture on the strength of cloth, a series of tests have been carried out some time ago by the Manchester Testing House on wool, cotton, and linen cloths, and the results obtained show that the degree of strength possessed by these materials depends to a considerable extent upon the conditions of the atmosphere to which the cloth is exposed prior to testing.

Having regard to the variation in strength usually found from place to place in a piece, it was necessary for the purpose of this investigation that special precautions should be taken so as to reduce to a minimum any natural variation in strength existing from one test portion to another. The cloth was tested in the direction of the warp only, in order that the strength of the test pieces would not be influenced by the accidental presence of mixed filling yarn, or by variation in the number of picks per inch due to irregular beating-up in weaving a piece of cloth, measuring several yards in length was cut into six strips in the direction of the warp. Each strip was of such length as to provide about thirty test pieces, which could be cut off as required. The strips were numbered before being divided, so that the exact position in the cloth of any particular test portion could (if desired) be ascertained after the tests had been made.

The strips were so prepared that each had the same number of threads in its width, and they were then exposed in the testing room, the necessary sized test piece being cut from each of the six strips, and the remaining portions left exposed to the air for subsequent tests whenever the moisture conditions of the air showed a change from those prevailing at the time of the previous test. The tests were not made at strictly regular intervals, but only after the hygrometer readings showed a change to have taken place in the relative humidity of the air.

A serge of the type used for military uniforms was selected to represent the wool cloth, while an ordinary gray cotton drill and a flax canvas were chosen as typical of the cotton and linen cloths which are frequently brought to a specification strength.

Comparison of the highest and lowest results obtained in each of the series of tests show that, when tested in their assumed *normal* air-dry condition, the average strength of the materials varied to the extent of 14 per cent. in the wool cloth, 12 per cent. in the cotton cloth, and 18 per cent. in the flax canvas.