Air Moistening in Woolen and Silk Mills

By Robert Dantzer

All textile fibers present a large area to the air and are hygroscopic, that is to say, they possess the property of absorbing moisture from the surrounding air until they reach a state of equilibrium. It is easy to understand that this equilibrium is a function of two variables: (a) relative humidity; (b) temperature of the air. It follows that the estimate of the weight of a mass of fibers is susceptible to error, the weight varying under the influence of atmospheric conditions. In commercial transactions the process known as conditioning is used to correct in a certain degree the influence of humidity on the weight of textile materials. According to M. Chevreul, wool is more hygroscopic than is other textile materials. He found that 100 parts by weight of bone dry wool when exposed to a saturated atmosphere at 65° F. weighed as follows at the end of several days:

Merino wool in the grease	182.40
Merino wool desuinted	139.71
Merino wool scoured	138.14
Merino wool in spun yarn	134.57
Merino wool in unfinished cloth	132.75

At the Bureau Militaire de Conditionnement at Vienne, M. Girard experimenting with wool at a temperature of 70° in saturated atmosphere, reach the following results, which vary slightly from those given by Chevreul:

Patagonia wool in the grease	180.7
Cape wool scoured	136.8
Wool cloth sky blue	138.5

The influence of humidity is greater on raw wool, that is to say, when loaded with grease and saline matter soluble in water.

According to Otto Willkomm heat and humidity causes a swelling of the fibers which increase in volume and length. He also found that animal filaments, silk and wool, stretch more than those of vegetable origin. While the humidification of cotton results in greater cohesion of the short fibers and it seems probable that the humidity in wool disintegrates the scales of the fiber, which explains the decrease in strength, while the elasticity is increased. Heat and moisture facilitate the straightening of the fibers by increasing the flexibility and elasticity, making it easier for the fibers to slip on each other; the reduction in the strength of the fibers being largely offset by the advantages realized.

Under the influence of a relative humidity of 70 to 80 per cent. wool fibers are more lustrous, nearer round and more elastic. If, however, the humidity is increased all these qualities disappear. From this we can conclude that there is a degree of relative humidity that is favorable to the working of each kind of textile material. This question as affecting cotton has been studied by Willkomm, Baker, Muller and others.

In working animal fibers the relative humidity of the air facilitates the dispersion of static electricity which may be generated and of which the intensity increases with the dryness of the air. As is well known, the filaments charged with the same kind of electricity tend to repeal each other and to separate, causing rough and twitty yarn. The air being a better conductor when charged with humidity tends to prevent the accumulations of electricity and protects the fibers by re-establishing electrical equilibrium. Otto Willkomm has determined at what relative humidity the air becomes a good conductor for neutralizing the disturbance of electrical equilibrium. In making his experiments he used an electroscope from which he found that the discharge decreased progressively but slowly up to a relative humidity of 68 per cent. Above 68 per cent. the period of the discharge decreased very rapidly, and above 70 per cent. the discharge of electricity no longer had an injurious effect on the work. From this it was concluded that for the purpose of preventing static electricity the relative humidity should be 70 per cent. in the work rooms. Spennrath described a method for determining whether the relative humidity of a working room was sufficient for neutralizing electricity. A piece of paper having been coated with resinous paste is dried and then subjected to friction in the room to be tested. The friction electrified the paper which is then placed against a wall. If it sticks to the wall the air is too dry. If, on the contrary, it falls to the floor, the relative humidity is sufficient.

Furthermore, the researches by MM. Szilard & Strohl have revealed methods by which static electricity in fibers can be neutralized without humidification.

Humidity in Working Worsted.

Carding. Humidification is required as soon as the carding process begins. The double cards in general use are equipped with a burring apparatus at the feed end. In order to facilitate the removal of the burrs, the wool should be dry, but for the carding process which follows immediately the wool should be moist in order to prevent the material from winding around the doffer. As these ideal conditions are impossible of attainment the practice is to have the wool carry a slight amount of moisture. The card rooms should be kept at a temperature of about 72° and a relative humidity of 75 to 80 per cent.

Combing. The temperature of combing rooms should be kept at 72° to 77° for the expansion of the machine parts may cause bad work. A relative humidity of 75 to 80 per cent. gives the best results.

Drawing and Spinning. In the drawing room the temperature should not fall below 72° with a relative humidity of 75 per cent. When the yarn is spun on frames the temperature should be from 72° to 75° and the relative humidity 75 to 80 per cent. As these spinning machines generate more heat than the self-acting mules it is necessary to supply more moisture to the room. In mule spinning rooms the temperature should be at least 75° and the relative humidity from 80 to 90 per cent., the latter varying in proportion to the fineness of the yarn spun.

Humidity in Woolen, Carding and Spinning.

As the result of the oil applied to the wool the fibers become very flexible providing the oiling solution is sufficiently fluid. The required fluidity is obtained at a temperature of 72° in card rooms and 75° in spinning rooms. The relative humidity should be at least 60 per cent. in the card room and 70 per cent. in the spinning room.

Humidity in Silk Mills.

Silk is dielectric which makes it a good insulating material for electricity. Its high degree of porosity enables it easily to absorb vapors and gases. In the raw silk preparatory operations the relative humidity of the work rooms should be 70 per cent. and the temperature 64°, the heat softening the silk gum. The rooms in silk throwing mills should be kept at a temperature of 72° with a relative humidity of 85 per cent. These atmospheric conditions are

adapted for doubling organzine, grenadine and silk twine, while for doubling tram and twisted silk a relative humidity of 65 per cent. is sufficient.

Special care is necessary in handling silk, owing to the ease with which the silk fibers are electrified. Simply rubbing the silk fibers against each other generates positive electricity when the rubbing motion is lengthways of the fiber, while negative electricity is generated when the motion is crossways. Owing to the dielectric property of silk this textile material is neutralized with great electricity, the fibers repelling each other and the material forming into a quantity of kinks and snarls which cause imperfections and waste. To reduce this difficulty it is the practice to leave about 5 per cent. of silk gum on the fiber. The silk gum becomes electrified more slowly than the silk, but the silk yarn thus produced is not so brilliant and loses weight during the dyeing process.

Humidity for Schappe Manufacturing.

The working of silk waste likewise calls for a definite degree of relative humidity and of temperature. In the combing rooms the temperature should be 72° with a relative humidity of 70 per cent., while for carding a relative humidity of 65 per cent. is sufficient. In the spinning room the temperature is usually 72° with a relative humidity of 65 per cent. for filling yarn and 70 per cent. for warp yarn.

Humidity in Weaving.

Humidification of the air is frequently dispensed with in woolen and silk weave rooms because, as we have seen, it causes a decrease in the strength of the yarn. Nevertheless, the constant friction to which the yarn is subjected develops static electricity which interferes with the work. For this reason a constant temperature of 64° and a relative humidity from 70 to 75 per cent. are recommended for wool and silk weave rooms.

Removing Electricity from Textile Fibers.

From what has been said it is clear that the humidification of work rooms is intended to facilitate the passage of the electricity which is generated during the process of the manufacture. Attempts have been made to remove static electricity from textile fibers by means of an electric current passed across the machines by insulated conductors, the current being generated either by a coil or an electric generator. The danger of receiving a shock by getting in contact with the conductors, and the difficulty of assuring an exact neutralization without producing a reverse current have caused these methods to be abandoned.

After being subjected to a mill test the electrical method of neutralizing fibers high frequency and high tension currents, as proposed by MM. Paillet, Ducretet and Roger, received the commendation of the Academy of Sciences. Another method proposed by MM. Szilard and Strohl was also commended by the Academy. It consisted in applying a special solution which did not affect the properties of the fiber. In certain cases the press rolls of the preparatory machines were subjected to a special treatment which was varied to suit leather and parchment rolls for the spinning of wool, and rubber rolls for the spinning of waste silk. Good results were obtained with these processes under conditions that would otherwise have been considered very bad for working the material.

Neutralization of textile materials and textile machines improves the working conditions by preventing all tendency of the fibers to stick together, reducing the amount of waste made and making it possible to increase the speed of the machine.

CLOTH ROOM REPORT.

The form shown this month is used for reporting daily the cloth delivered to the cloth room from weave room, also the goods inspected and baled. It is suited for the requirements of a small mill and gives the manager a statement every morning as to the work done in the cloth department

CLOTH ROOM DAILY REPORT

March 5 19

		Rate	Amount	CLOTH RECEIVED FROM WEAVE ROOM						
1	FOREMAN	55		Cuts	Pounds	Style	Construction	Width	Received Wt.	Ac. Wt. Unfinished
1	STITCHER BOY	20		276	3461	C	48x48	40	4.	4.02
2.	INSPECTORS	35								
1	PRESS MAN	30								
1	Holder	30								
				TOTALS						

RECORD OF CLOTH INSPECTED AND BALED

No. Bales	Style	Construction	Width	Received Wt.	Act. Wt. Finished	Yards Baled	Pounds Baled	Grade	Per Cent Seconds
12.	C	48x48	40	4.	4.02			C	

35 LBS. RAGS
15 LBS. SWEEPS
10 HOURS RUN

the previous day. The hours run and the amount of rags and sweepings are also reported on the same blank.

THIRD INTERNATIONAL COTTON CONFERENCE.

Nearly one hundred English and Continental cotton spinners and manufacturers arrived in New York on Sept. 23 en route to the Third International Cotton Conference, which opens in New Orleans on Oct. 13. The European delegation was headed by Sir Herbert Dixon, chairman of the Fine Cotton Spinners' and Doublers' Association, which operates about 7,000,000 spindles. The secretary of the delegation is Frank Nasmith, editor of the Textile Recorder, and in the party is Arno S. Pearse, secretary of the International Cotton Federation. There are in the delegation representatives of the cotton trade of England, France, Belgium, Switzerland. After visiting Boston and a number of mills and machine shops in New England the visitors will proceed to New Orleans where an elaborate program has been arranged for the Conference.

WOOL BY MOTOR.

The suggestion that motor vehicles should be employed to facilitate the delivery of wool from London to Bradford (180 miles as the crow flies) has at length borne fruit. It occurred to the Ministry of Munitions that as certain motor wagons were going to Yorkshire, about 60 in all, it would be folly to allow them to travel empty, which was quite a good idea, and accordingly they were laden with bales, and some 160 tons of wool were thereby conveyed from London docks to Bradford warehouses.

PAPER CLOTH IN SPAIN.

The British Vice-Consul at Granada, Spain, states that a local firm has erected a factory in which it is intended to manufacture thread from paper and to weave cloth from it for the packing of their products. The necessary raw material is obtained from eucalyptus wood, of which tree the company has a large plantation. The process of its manufacture is described as follows:—From wood paste paper is made which is cut in long narrow ribbon-like strips. These are wound on reels and are placed in a spinning frame the spindles of which make 5,000 to 6,000 revolutions per minute. In this process the twisted paper forms a tube of little strength. It is now soaked in a special glue which becomes insoluble when exposed to hot air, and considerably increases the strength of the yarn. The thread is then stretched to obtain the necessary firmness, but is too coarse to be woven into a substitute for either linen or cotton cloth.—Textile Mercury.