

TABLE 2. REGAIN OF HYGROSCOPIC MATERIALS
Moisture Content Expressed in Percent of Dry Weight of the Substance at Various
Relative Humidities—Temperature, 75 F

CLASSIFI- CATION	MATERIAL	DESCRIPTION	RELATIVE HUMIDITY—PERCENT										AUTHOR- ITY
			10	20	30	40	50	60	70	80	90		
Natural Textile Fibers	Cotton	Sea island— roving	2.5	3.7	4.6	5.5	6.6	7.9	9.5	11.5	14.1	Hart- shorne Schloes- ing	
	Cotton	American— cloth	2.6	3.7	4.4	5.2	5.9	6.8	8.1	10.0	14.3		
	Cotton	Absorbent	4.8	9.0	12.5	15.7	18.5	20.8	22.8	24.3	25.8	Fuwa	
	Wool	Australian me- rino—skein	4.7	7.0	8.9	10.8	12.8	14.9	17.2	19.9	23.4	Hart- shorne Schloes- ing	
	Silk	Raw chevennes —skein	3.2	5.5	6.9	8.0	8.9	10.2	11.9	14.3	18.8	Atkinson	
	Linen	Table cloth	1.9	2.9	3.6	4.3	5.1	6.1	7.0	8.4	10.3	Sommer	
	Linen	Dry spun— yarn	3.6	5.4	6.5	7.3	8.1	8.9	9.8	11.2	13.8		
	Jute	Average of sev- eral grades	3.1	5.2	6.9	8.5	10.3	12.2	14.4	17.1	20.2	Storch	
Rayons	Hemp	Manila and sisal—rope	2.7	4.7	6.0	7.2	8.5	9.9	11.6	13.6	15.7	Fuwa	
	Viscose Nitro- cellulose	Average skein	4.0	5.7	6.8	7.9	9.2	10.8	12.4	14.2	16.0	Robert- son	
	Cuprammo- nium Cellulose Ace- tate		0.8	1.1	1.4	1.9	2.4	3.0	3.6	4.3	5.3	Robert- son	
Paper	M. F. News- print	Wood pulp— 24% ash	2.1	3.2	4.0	4.7	5.3	6.1	7.2	8.7	10.6	NBS	
	H. M. F. Writing	Wood pulp— 3% ash	3.0	4.2	5.2	6.2	7.2	8.3	9.9	11.9	14.2	NBS	
	White Bond	Rag—1% ash	2.4	3.7	4.7	5.5	6.5	7.5	8.8	10.8	13.2	NBS	
	Com. Ledger	75% rag—1% ash	3.2	4.2	5.0	5.6	6.2	6.9	8.1	10.3	13.9	NBS	
	Kraft Wrap- ping	Coniferous	3.2	4.6	5.7	6.6	7.6	8.9	10.5	12.6	14.9	NBS	
Misc. Organic Materials	Leather	Sole oak— tanned	5.0	8.5	11.2	13.6	16.0	18.3	20.6	24.0	29.2	Phelps	
	Catgut	Racquet strings	4.6	7.2	8.6	10.2	12.0	14.3	17.3	19.8	21.7	Fuwa	
	Glue	Hide	3.4	4.8	5.8	6.6	7.6	9.0	10.7	11.8	12.5	Fuwa	
	Rubber	Solid tires	0.11	0.21	0.32	0.44	0.54	0.66	0.76	0.88	0.99	Fuwa	
	Wood	Timber (average)	3.0	4.4	5.9	7.6	9.3	11.3	14.0	17.5	22.0	Forest P. Lab.	
	Soap	White	1.9	3.8	5.7	7.6	10.0	12.9	16.1	19.8	23.8	Fuwa	
Tobacco	Cigarette	5.4	8.6	11.0	13.3	16.0	19.5	23.0	27.5	33.5	Ford		
Food- stuffs	White Bread		0.5	1.7	3.1	4.5	6.2	8.5	11.1	14.5	19.0	Atkinson	
	Crackers		2.1	2.8	3.3	3.9	5.0	6.5	8.3	10.9	14.9	Atkinson	
	Macaroni		5.1	7.4	8.8	10.2	11.7	13.7	16.2	19.0	22.1	Atkinson	
	Flour		2.6	4.1	5.3	6.5	8.0	9.9	12.4	15.4	19.1	Bailey	
	Starch		2.2	3.8	5.2	6.4	7.4	8.3	9.2	10.6	12.7	Atkinson	
	Gelatin		0.7	1.6	2.8	3.8	4.9	6.1	7.6	9.3	11.4	Atkinson	
	Asbestos	Finely divided	0.16	0.24	0.26	0.32	0.41	0.51	0.62	0.73	0.84	Fuwa	
Misc. Inorganic Materials	Fiber		5.7	9.8	12.7	15.2	17.2	18.8	20.2	21.5	22.6	Fuwa	
	Silica Gel		0.20	0.40	0.61	0.81	1.03	1.24	1.46	1.67	1.89	Selvig	
	Domestic Coke		7.1	14.3	22.8	26.2	28.3	29.2	30.0	31.1	32.7	Fuwa	
	Activated Charcoal	Steam acti- vated	33.0	41.0	47.5	52.5	57.0	61.5	67.0	73.5	82.5	Mason	
	Sulfuric Acid	H ₂ SO ₄											

varnish from within. This produces a surface free from bubbles and a homogeneous film throughout. Desirable temperatures for *drying* varnish vary with the type. A relative humidity of 65 percent is beneficial.

Control of Rate of Biochemical Reactions

In the field of biochemical control, industrial air conditioning has been applied to many different and well-known products. All problems involving fermentation are classed under this heading. As biochemistry is a subdivision of chemistry, subject to the same laws, the rate of reaction may be controlled by temperature. An example of this is the dough room of the modern bakery. Yeast develops best at a temperature of 80 F. A relative humidity of 70 percent is maintained to hold the surface of the dough open to allow the carbon dioxide gases formed by the fermentation to pass through and produce a loaf of bread, when baked, of even, fine texture without large voids.

The curing of fruits, such as bananas and lemons, also comes under this classification. Bananas require a cycle of temperatures and relative humidities for ripening. The starches in the pulp of the fruit must be changed and the skin cured and colored, after which the fruit is cooled to maintain as low a rate of metabolism as possible. Ideal storage conditions range between 56 and 60 F, with about 85 percent relative humidity, and ventilation at the rate of three or four air changes per hour.

The curing of lemons is an entirely different problem. Bananas are cured for a quick market, while lemons are held for a future market. The process, therefore, varies in the temperature used. Temperatures from 54 to 59 F have been found to be best suited for this process. A high relative humidity of 84 to 88 percent is necessary to hold shrinkage to a minimum and, at the same time, develop the rind so it will be sufficiently tough to permit handling.

Tobacco from the field to the finished cigar, cigarette, plug or pipe tobacco, offers another interesting example of what may be done by industrial air conditioning in the control of color, texture and flavor. In the processing of tobacco, control of moisture regain, and of chemical and biochemical reactions, is involved, and only through close atmospheric control can the best quality of leaf be developed.

Control of Rate of Crystallization

The rate of cooling of a saturated solution determines the size of the crystals formed. Both dry- and wet-bulb temperatures are of importance, as the one controls the rate of cooling, while the other, through evaporation, changes the density of the solution.

In the coating pans for pills, gum, and nuts, a heavy sugar solution is added to the tumbling mass. As the water evaporates, each separate piece is covered with crystals of sugar. A smooth, opaque coating is only accomplished by blowing into the kettle the proper amount of air at the right dry- and wet-bulb temperatures. If the cooling and drying are too slow, the coating will be rough and semi-translucent, and the appearance unsightly; if too fast, the coating will chip through to the interior. Only by balancing temperature, relative humidity, and volume of air to the sugar solution, can the proper rate be obtained and a perfect coating assured.

Control of Temperature for Close Machining Tolerances

Where tolerances must be held within 2 or 3 ten-thousandths of an inch, as in the manufacture of precision instruments, tools, and high quality