

L'UMIDIFICAZIONE DEI MATERIALI E NEI PROCESSI PRODUTTIVI

I nostri sistemi rappresentano la soluzione più efficiente per mantenere il corretto livello di umidità dei materiali e nei processi produttivi. Livelli di umidità differenti consentono l'adeguata idratazione dei materiali igroscopici. Il livello di idratazione varia largamente da un materiale all'altro. La tabella sottostante elenca i più comuni materiali igroscopici che richiedono livelli di umidità relativa (RH) specifici per evitare disidratazione, deteriorazione e/o problemi di produzione.

HUMIDIFICATION OF MATERIALS AND PROCESSES

Our systems are the most efficient solution to keep the right humidity levels of materials and of processes. Different levels of relative humidity provides adequate moisture content in all hygroscopic materials. Moisture content requirements vary greatly from one material to the next. This table shows typical hygroscopic materials which require specific RH levels to avoid moisture loss and materials deterioration and/or production problems.

Recommended Relative Humidities											
PROCESS OR PRODUCT	°C	°F	% RH	PROCESS OR PRODUCT	°C	°F	% RH	PROCESS OR PRODUCT	°C	°F	% RH
Residences	21-22	70-72	30	<i>Switchgear:</i>				Tea			
Libraries & Museums				Fuse & cutout assembly	23	73	50	Packaging	18	65	65
Archival	13-18	55-65	35	Capacitor winding	23	73	50	Tobacco			
Art storage	16-22	60-72	50	Paper Storage	23	73	50	Cigar & cigarette making	21-24	70-75	55-65
Stuffed fur animals	40-50	40-50	50	Conductor wrapping with yarn	24	75	65-70	Softening	32	90	85-88
Communication Centers				Lightning arrester assembly	20	68	20-40	Stemming & stripping	24-29	75-85	70-75
Telephone Terminals	22-26	72-78	40-50	Thermal circuit breakers				Packing & shipping	23-24	73-75	65
Radio & TV studios	23-26	74-78	30-40	assembly & test	24	75	30-60	Filler tobacco casing			
General Commercial & Public Buildings				High-voltage transformer repair	26	79	55	& conditioning	24	75	75
	21-23	70-74	20-30	<i>Water wheel generators:</i>				Filter tobacco storage			
(including cafeterias, restaurants, airport terminals, office buildings & bowling centers)				Thrust runner lapping	21	70	30-50	& preparation	25	77	70
Hospitals & Health Facilities				<i>Rectifiers:</i>				Wrapper tobacco storage			
General clinical areas	22	72	30-60	Processing selenium & copper oxide plates	23	73	30-40	& conditioning	24	75	75
<i>Surgical area</i>				Fur				Pharmaceuticals			
Operating rooms	20-24	68-76	50-60	Storage	4-10	40-50	55-65	Powder storage (prior to mfg)*	*	*	*
Recovery rooms	24	75	50-60	Gum				Manufactured powder storage			
<i>Obstetrical</i>				Manufacturing	25	77	33	& packing areas	24	75	35
Full-term nursery	24	75	30-60	Rolling	20	68	63	Milling room	24	75	35
Special care nursery	24-27	75-80	30-60	Stripping	22	72	53	Tablet compressing	24	75	35
Industrial Hygroscopic Materials				Breaking	23	73	47	Tablet coating room	24	75	35
Abrasive				Wrapping	23	73	58	Effervescent tablets & powders	24	75	20
Manufacture	26	79	50	Leather				Hypodermic tablets	24	75	30
Ceramics				Drying	20-52	68-125	75	Colloids	24	75	30-50
Refractory	43-66	110-150	50-90	Storage, winter room temp.	10-16	50-60	40-60	Cough drops	24	75	40
Molding Room	27	80	60-70	Lenses (Optical)				Glandular products	24	75	5-10
Clay Storage	16-27	60-80	35-65	Fusing	24	75	45	Ampoule manufacturing	24	75	35-50
Decalcomania production	24-27	75-80	48	Grinding	27	80	80	Gelatin capsules	24	75	35
Decorating Room	24-27	75-80	48	Matches				Capsule storage	24	75	35
Cereal				Manufacture	22-23	72-73	50	Microanalysis	24	75	50
Packaging	24-27	75-80	45-50	Drying	21-24	70-75	60	Biological manufacturing	24	75	35
Distilling				Storage	16-17	60-63	50	Liver extracts	24	75	35
<i>Storage</i>				Mushrooms				Serums	24	75	50
Grain	-14	6	35-40	Spawn added	16-22	60-72	**	Animal rooms	24-27	75-80	50
Liquid Yeast	0-1	32-33		Growing period	10-16	50-60	80	Small animal rooms	24-26	75-78	50
General manufacturing	16-24	60-75	45-60	Storage	0-2	32-35	80-85				
Aging	18-22	65-72	50-60	Paint Application				Photographic Processing			
Electrical Products				Oils, paints: Paint Spraying	16-32	60-90	80	<i>Photo Studio</i>			
<i>Electronics & X-ray:</i>				Plastics Manufacturing areas:				Dressing room	22-23	72-74	40-50
Coil & transformer winding	22	72	15	Thermosetting molding				Studio (camera room)	22-23	72-74	40-50
Semi conductor assembly	20	68	40-50	compounds	27	80	25-30	Film darkroom	21-22	70-72	45-55
<i>Electrical instruments:</i>				Cellophane wrapping	24-27	75-80	45-65	Print darkroom	21-22	70-72	45-55
Manufacture & laboratory	21	70	50-55	Plywood				Drying room	21-22	90-100	35-45
Thermostat assembly				Hot pressing (resin)	32	90	60	Finishing room	32-38	72-75	40-55
& calibration	24	75	50-55	Cold pressing	32	90	15-25	<i>Storage room</i>			
Humidistat assembly				Rubber-Dipped Goods				b/w film & paper	22-24	72-75	40-60
& calibration	24	75	50-55	Cementing	27	80	25-30*	color film & paper	4-10	40-50	40-50
<i>Small mechanisms:</i>				Dipping surgical articles	24-27	75-80	25-30*	Motion picture studio	22	72	40-55
Close tolerance assembly	22	72	40-45	Storage prior to manufacture	16-24	60-75	40-50*	Static Electricity Control			
Meter assembly & test	24	75	60-63	Laboratory (ASTM Standard)	23	73.4	50*	Textiles, paper, explosive control			> 55
								Clean Rooms & Spaces			45
				* Dew point of air must be below evaporation temperature of solvent				Data Processing	22	72	45-50
				** Nearly saturated				Paper Processing			
								Finishing area	21-24	70-75	40-45
								Test laboratory	23	73	50

Abstracted from ASHRAE Systems and Applications Handbook.



L'UMIDIFICAZIONE NELLO STOCCAGGIO DI FRUTTA E VERDURA

Dal momento della raccolta e durante l'intero periodo di stoccaggio, frutta e verdura sono soggetti a respirazione e traspirazione che ne riducono il contenuto di nutrienti e acqua. Intervenendo per ridurre questi due processi naturali, ne risulterà un tempo di conservazione più lungo, riducendo in modo sostanziale il calo naturale. Per questa ragione, frutta e verdura devono essere trattati e trasportati il più presto possibile nelle migliori condizioni di stoccaggio (mantenendo temperatura e umidità relativa ottimali, secondo le varie specie).

HUMIDITY AND STORAGE OF HORTICULTURAL CROPS

From the time of harvest and during all the period of their storage vegetables are subject to respiration and transpiration and this is on account of their reserve substances and water content. The more the intensity of these two natural processes are reduced, the longer sound storage time will be and the more losses will be reduced. For this reason, vegetables have to be handled and transported as soon as possible in the best storage conditions (optimal temperature and air relative humidity for the given species).

Recommended Temperature and Relative Humidity for Fruits and Vegetable Crops											
Product	Temperature		Relative Humidity (%)	Product	Temperature		Relative Humidity (%)	Product	Temperature		Relative Humidity (%)
	°C	°F			°C	°F			°C	°F	
Amaranth	0-2	32-36	95-100	Corn, sweet	0	32	95-98	Oranges, Fla. & Texas	0-1	32-34	85-90
Anise	0-2	32-36	90-95	Cranberries	2-4	36-40	90-95	Papayas	7-13	45-55	85-90
Apples	-1-4	30-40	90-95	Cucumbers	10-13	50-55	95	Passionfruit	7-10	45-50	85-90
Apricots	-0.5-0	31-32	90-95	Currants	-0.5-0	31-32	90-95	Parsley	0	32	95-100
Artichokes, globe	0	32	95-100	Custard apples	5-7	41-45	85-90	Parsnips	0	32	95-100
Asian pear	1	34	90-95	Daikon	0-1	32-34	95-100	Peaches	-0.5-0	31-32	90-95
Asparagus	0-2	32-35	95-100	Dates	-18 or 0	0 or 32	75	Pears	-1.5 to -0.5	29-31	90-95
Atemoya	13	55	85-90	Dewberries	-0.5-0	31-32	90-95	Peas, green	0	32	95-98
Avocados, Fuerte, Hass	7	45	85-90	Durian	4-6	39-42	85-90	Peas, southern	+5	40-41	95
Avocados, Lula, Booth-1	4	40	90-95	Eggplants	12	54	90-95	Pepino	4	40	85-90
Avocados, Fuchs, Pollock	13	55	85-90	Elderberries	-0.5-0	31-32	90-95	Peppers, Chili (dry)	0-10	32-50	60-70
Babaco	7	45	85-90	Endive and escarole	0	32	95-100	Peppers, sweet	7-13	45-55	90-95
Bananas, green	13-14	56-58	90-95	Feijoa	5-10	41-50	90	Persimmons, Japanese	-1	30	90
Barbados cherry	0	32	85-90	Figs fresh	-0.5-0	31-32	85-90	Pineapples	7-13	45-55	85-90
Bean sprouts	0	32	95-100	Garlic	0	32	65-70	Plantain	13-14	55-58	90-95
Beans, dry	4-10	40-50	40-50	Ginger root	13	55	65	Plums and prunes	-0.5-0	31-32	90-95
Beans, green or snap	4-7	40-45	95	Gooseberries	-0.5-0	31-32	90-95	Pomegranates	5	41	90-95
Beans, lima, in pods	5-6	41-43	95	Granadilla	10	50	85-90	Potatoes, early crop	10-16	50-60	90-95
Beets, bunched	0	32	98-100	Grapefruit, Calif. & Ariz.	14-15	58-60	85-90	Potatoes, late crop	4.5-13	40-55	90-95
Beets, topped	0	32	98-100	Grapefruit, Fla. & Texas	10-15	50-60	85-90	Pummelo	7-9	45-48	85-90
Belgian endive	2-3	36-38	95-98	Grapes, Vinifera	-1 to -0.5	30-31	90-95	Pumpkins	10-13	50-55	50-70
Bitter melon	12-13	53-55	85-90	Grapes, American	-0.5-0	31-32	85	Quinces	-0.5-0	31-32	90
Black sapote	13-15	55-60	85-90	Greens, leafy	0	32	95-100	Raddichio	0-1	32-34	95-100
Blackberries	-0.5-0	31-32	90-95	Guavas	5-10	41-50	90	Radishes, spring	0	32	95-100
Blood orange	4-7	40-44	90-95	Haricot vert	4-7	40-45	95	Radishes, winter	0	32	95-100
Blueberries	-0.5-0	31-32	90-95	Horseradish	-1-0	30-32	98-100	Rambutan	12	54	90-95
Bok choy	0	32	95-100	Jaboticaba	13-15	55-60	90-95	Raspberries	-0.5-0	31-32	90-95
Boniato	13-15	55-60	85-90	Jackfruit	13	55	85-90	Rhubarb	0	32	95-100
Breadfruit	13-15	55-60	85-90	Jaffa orange	8-10	46-50	85-90	Rutabagas	0	32	98-100
Broccoli	0	32	95-100	Japanese eggplant	8-12	46-54	90-95	Salsify	0	32	95-98
Brussels sprouts	0	32	95-100	Jerusalem Artichoke	-0.5-0	31-32	90-95	Santol	7-9	45-48	85-90
Cabbage, early	0	32	98-100	Jicama	13-18	55-65	65-70	Sapodilla	16-20	60-68	85-90
Cabbage, late	0	32	98-100	Kale	0	32	95-100	Scorzonera	0-1	32-34	95-98
Cactus Leaves	24	36-40	90-95	Kiwano	10-15	50-60	90	Seedless cucumbers	10-13	50-55	85-90
Cactus Pear	24	36-40	90-95	Kiwifruit	0	32	90-95	Snow peas	0-1	32-34	90-95
Caimito	3	38	90	Kohlrabi	0	32	98-100	Soursop	13	55	85-90
Calabaza	10-13	50-55	50-70	Kumquats	4	40	90-95	Spinach	0	32	95-100
Calamondin	9-10	48-50	90	Langsat	11-14	52-58	85-90	Squashes, summer	5-10	41-50	95
Canistel	13-15	55-60	85-90	Leeks	0	32	95-100	Squashes, winter	10	50	50-70
Cantaloups (3/4-slip)	2-5	36-41	95	Lemons	10-13	50-55	85-90	Strawberries	0	32	90-95
Cantaloups (full-slip)	0-2	32-36	95	Lettuce	0	32	98-100	Sugar apples	7	45	85-90
Carambola	9-10	48-50	85-90	Limes	9-10	48-50	85-90	Sweetpotatoes	13-15	55-60	85-90
Carrots, bunched	0	32	95-100	Lo bok	0-1.5	32-35	95-100	Tamarillos	3-4	37-40	85-95
Carrots, mature	0	32	98-100	Loganberries	-0.5-0	31-32	90-95	Tamarinds	7	45	90-95
Carrots, immature	0	32	98-100	Longan	1.5	35	90-95	Tangerines, mandarins	4	40	90-95
Cashew apple	0-2	32-36	85-90	Loquats	0	32	90	Taro root	7-10	45-50	85-90
Cauliflower	0	32	95-98	Lychees	1.5	35	90-95	Tomatillos	13-15	55-60	85-90
Celery	0	32	97-99	Malanga	7	45	70-80	Tomatoes, mature-green	18-22	65-72	90-95
Celery	0	32	98-100	Mamey	13-15	55-60	90-95	Tomatoes, firm-ripe	13-15	55-60	90-95
Chard	0	32	95-100	Mangoes	13	55	85-90	Turnips	0	32	95
Chayote squash	7	45	85-90	Mangosteen	13	55	85-90	Turnip greens	0	32	95-100
Cherimoya	13	55	90-95	Melons:	7-10	45-50	90-95	Ugli fruit	4	40	90-95
Cherries, sour	0	32	90-95	Mushrooms	0	32	95	Waterchestnuts	0-2	32-36	98-100
Cherries, sweet	-1 to -0.5	30-31	90-95	Nectarines	-0.5-0	31-32	90-95	Watercress	0	32	95-100
Chinese broccoli	0	32	95-100	Okra	7-10	45-50	90-95	Watermelons	10-15	50-60	90
Chinese cabbage	0	32	95-100	Olives, fresh	5-10	41-50	85-90	White sapote	19-21	67-70	85-90
Chinese long bean	4-7	40-45	90-95	Onions, green	0	32	95-100	White asparagus	0-2	32-36	95-100
Clementine	4	40	90-95	Onions, dry	0	32	65-70	Winged bean	10	50	90
Coconuts	0-1.5	32-35	80-85	Onion sets	0	32	65-70	Yams	16	61	70-80
Collards	0	32	95-100	Oranges, Calif. & Ariz.	3-9	38-48	85-90	Yucca root	0-5	32-41	85-90

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