which the vapor pressure of the air being treated approaches that at the surface of the material depends upon the completeness of the contact. For this reason, actual moisture removing capacity is determined from performance curves of the several materials under practical conditions of temperature, concentration and contacting efficiency as shown in Figs. 7, 8 and 9. While these curves by no means explore all the performance possibilities, they may be considered to be representative of sound design

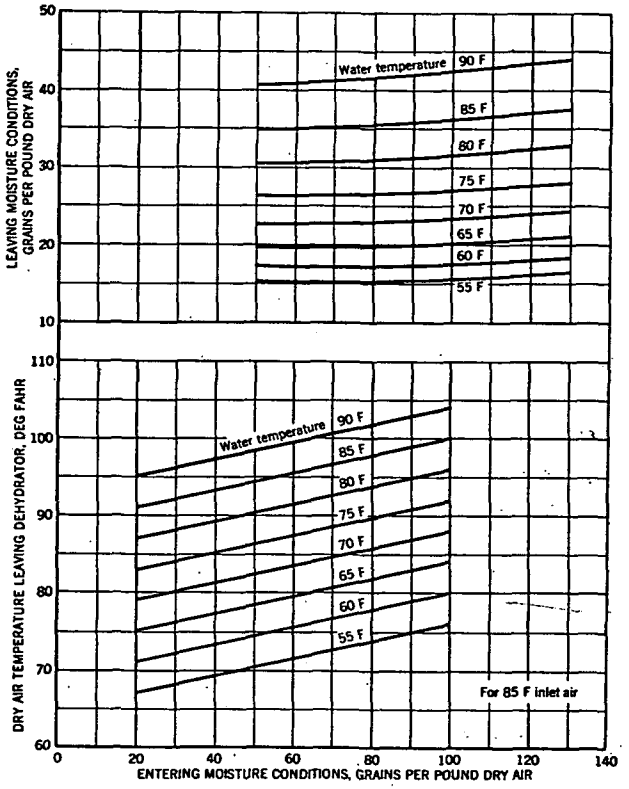


FIG. 9. LITHIUM CHLORIDE CONTACTOR PERFORMANCE DATA

and application practice. Representative data on heat input and water consumption are given in Table 4.

ECONOMICS OF DEHYDRATION

Almost all summer comfort air conditioning, as well as much industrial and commercial air conditioning, requires both of the functions of sensible and latent heat removal from air. Each of the methods of cooling and dehumidification has as its objective either the removal of sensible or latent heat, or both simultaneously. Choice of method and

medium therefore depends solely on whether (*a*) method and medium are physically able to accomplish the desired result with practical equipment, and (*b*) method and medium are justifiable economically.

Referring particularly to the problem of moisture removal, it may be stated that either dehumidification using chilled water, brine or direct expansion refrigerant, or dehydration using solid or liquid agents, is *equally practical* from the viewpoint of engineering performance for the vast majority of comfort and for a great many industrial applications;

TABLE 4. PERFORMANCE COEFFICIENTS AND WATER REQUIREMENTS OF SOLID AND LIQUID DEHYDRATION PROCESSES

Moisture Grains per Lb		Temperature Deg F		Thermal Performance Ratio[a]	Cooling Water Consumption[b]	
In	Out	In	Out		Temp. Deg F	Gpm per 1000 Btu per Hr of Latent Heat
Solid Adsorbent[c]						
130	65	85	138	0.39		
130	45	85	154	0.35		
65	30	85	118	0.28		
45	12	85	115	0.23		
Liquid Absorbent[d]						
130	65	85	99	0.45	85	0.23
130	45	85	101	0.45	85	0.44
130	45	85	87	0.41	60	0.26
65	30	85	83	0.41	60	0.64

[a] Thermal performance ratio is defined as latent heat removed from entering air divided by the heat input into the regenerator. Latent heat may be actually abstracted from system or converted to sensible heat, depending on process. No credit is given in the performance ratio for abstraction of sensible heat; where it occurs, it is considered a by-product effect. Values are approximate and, while they can be construed as typical, may vary considerably with design and economic application.

[b] Cooling water shown is that required solely to produce the latent heat removal. Additional water is required by both processes for reducing effluent temperatures below those listed. Gallons per minute shown are necessarily an economic approximation, weighing amount of surface against water consumption.

[c] Solid adsorbent based on the use of gas for activation.

[d] Liquid absorbent based on the use of steam at 12 lb per square inch gage for regeneration.

that is, their fields of application overlap. It cannot properly be stated that one method or material is superior *functionally* to another, since all have the same objective, and each is capable of attaining that objective.

For this reason, the choice of method and agent can normally be considered strictly on its economic merits. The choice of dehydration, mechanical refrigeration, natural cold water or ice, must be justified by the initial investment of available equipment, the availability and cost of prime energy sources, and the charges properly allocable to space occupied, labor of operation, maintenance, etc.

ECONOMIC COMPARISONS

It is evident that it is not possible to set forth definite rules governing the choice of dehydration equipment in preference to other methods of