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OFFICE FOR EMERGENCY MANAGEMENT
NATIONAL DEFENSE RESEARCH COMMITTEE
OF THE

Calvin

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OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

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July 3, 1942

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Professor C. C. Furnas
National Defense Research Committee
1530 P Street NW
Washington, D. C.

BEST COPY AVAILABLE

Dear Prof. Furnas:

Several deterioration tests are now in progress and the results on six of the units have progressed far enough such that the results should be of some value. In the six units five operated with absorption at 80 lbs./sq. in. ga., the cycle was essentially the same as employed in the previous activity tests, involves an absorption period of 5-1/2 minutes, followed by a 1/4-minute purging period and then a 5-1/2 minute desorption period. A cooling period of 2 minutes is employed before absorption is again initiated. The exit air rate in all cases was 3 CFM. In these five units at 80 lbs./sq. in. ga. three were operated with air that had been dried with silica gel, and the only difference in these units was the type of absorbent used. In one case the material was 10 to 20 mesh "high-high" material produced by the Rumford Chemical Co. In the other two units the material was of Rumford origin but which we had pressed ourselves, in one case to 5,000 lbs./sq. in. and the other case to 20,000 lbs./sq. in. All three of these units are deteriorating at essentially the same rates as shown in the attached figure.

In this figure the per cent of the original saturation is plotted as a function of the number of cycles. The 20,000 lb. material started at a lower initial capacity than the other two units, but the percentage deterioration appears to be about the same. Another unit was operated in the same manner with the 5,000 lb. material but with a desorption pressure of 20 lbs./sq. in. You will note that it is deteriorating almost twice as rapidly as the units operating at atmospheric pressure. Another unit employing the 5,000 lb. material was operated on wet air at 80 lbs./sq. in. ga.

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Presumably, this air was saturated due to the fact that water collects in the separator after the compressors. This unit is showing a much higher rate of deterioration and the experimental values appear to be much more erratic. These erratic results may be due to the fact that this unit has developed a very high pressure drop. In all of the other four units with dry air at 80 lbs., the pressure drops have continued at a rather low value (with "high-high" apparently the least), but the unit operating on the wet air has developed such a high pressure drop that it is no longer possible to obtain the desired flow rate. In other words, 80 lb. pressure will not force 3 cu. ft. of air per hour through the unit. This high pressure drop may account for the more rapid loss in activity due to the fact that saturation may not be complete. We are planning to check the saturation capacity of all of these absorbents when they are removed from the units in order to be certain that the apparent deterioration is not due to caking or channeling. It appears that wet air causes the absorbent material to disintegrate and pack in the half-inch tubes.

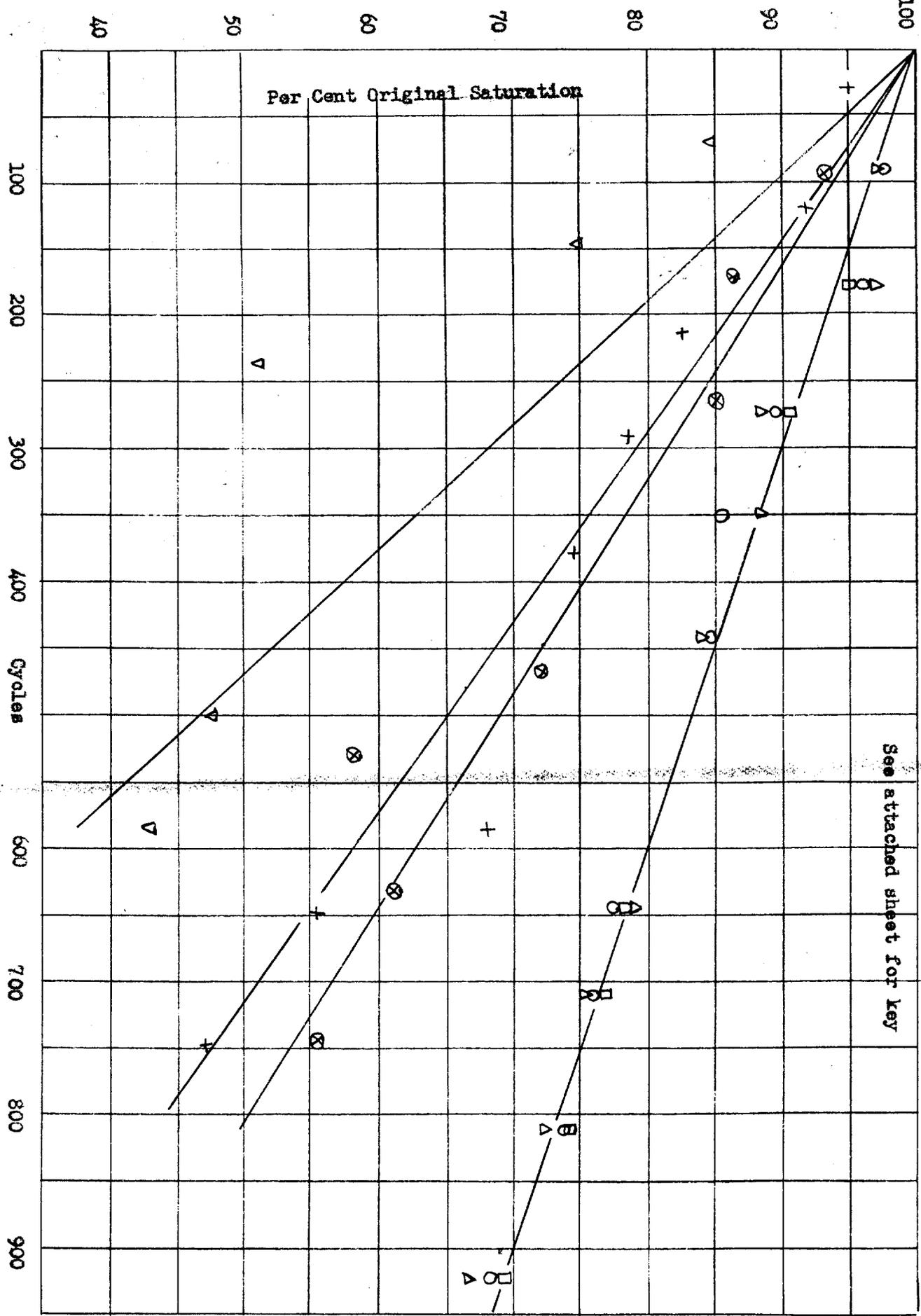
One unit has been operating with dry air at 250 lbs./sq. in. ga. with other conditions the same as the 80 lb. units. This unit shows a deterioration of about 10 per cent per 100 cycles and has developed a very high pressure drop. The results of this unit are more or less in line with our previous experiments.

A number of other units are now in operation involving regeneration temperatures of 35°C., regeneration under vacuum, CO₂ removal with soda lime, absorption at 40 lbs./sq. in. ga., different rates of air flow, etc. Results on these units should be available next week.

Yours very truly,

rl
cc: E. P. Stevenson
G. A. Roberts, Jr.
D. B. Curll, Jr.

E. R. Gilliland



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Legend

	Absorption Pressure Lb./sq. In. Ga.	Air	Comments
▽	250	Dry	-----
+	80	Wet	-----
○	80	Dry	20 lbs./sq. in. ga. desorption
○	80	Dry	5,000 lbs./sq.in. absorbent
◇	80	Dry	Rumford "High-high"
△	80	Dry	20,000 lbs./sq. in. absorbent