Contributions to the studies of psychrometer Covering.

(The Second note.)

By T. Okada.

1. Introduction:— A few years ago Professor A. Tanakadate found that Japanese paper called "Yoshinogami" is a best material for psychrometer covering. By a series of experiments I have shown that a paper-covered wet bulb gives always a greater psychrometer difference than that covered with muslin or silk in all the temperatures above and below the freezing point. But my experiments have been conducted with wet bulbs set in an ordinary thermometer screen. It remains therefore to experiment with a ventilating psychrometer.

In a course of my recent hygrometric studies I had an opportunity to make this experiment with Assmann's aspirations-psychrometer. The following lines contain a short account of my experiments.

2. The experiments with a paper covered wet bulb with a ventilation device:— The Assmann psychrometer used in this experiment was No. 44 constructed by Fuess and Company.

The thermometers have been carefully compared with the standard instrument of the Central Meteorological Observatory, Tokio.

The following corrections are to be applied:—

Thermometer	10°	11°	12°
No. 433	-0.12	-0.11	-0.10
No. 434	-0.07	-0.07	-0.06

I have covered the bulb of the thermometer No. 433 with the Japanese paper, (Yoshinogami). In covering the bulb I have first dipped the bulb for a moment into water so as to get the bulb wholly wet

1) For the first note see T. Okada: Jour. of Met. Societ. of Japan April, 1906. pg. 10

with water in order that the paper will easily adhere the bulb. I have tied the neck of the paper covered bulb and the end of the cover itself by a cotton string.

The thermometer No. 434 has been covered with a piece of muslin, which was supplied by Fues and Co.

In a place shaded from the direct sunshine I have taken the simultaneous observations of both wet bulbs in an ordinary way.

According to Prof. A. Sprung the vapour tension is to be computed by the following formula:—

$$f=f'-0.25(t-t')\frac{P}{755}$$

where t and t' are the readings of the dry and wet bulbs, f' is the max. tension of vapour at the temperature t , and p the pressure.

$$\text{We have} \quad df=0.25 \times \frac{P}{755} dt'$$

therefore an error of 1° in the indication of the wet bulb will cause an increase of about 0.2mm in the calculated vapour tension.

The following table contains the readings of both wet bulbs and differences of calculated vapour tension.

Table I. Differences of readings of
wet bulbs covered with paper and muslin

No.	$t'm$	$t'p$	$t'm-t'p$	df
1	10.33	10.28	+ 0.05	+ 0.01
2	9.74	9.68	+ 0.06	+ 0.02
3	10.35	10.30	+ 0.05	+ 0.01
4	10.13	10.06	+ 0.07	+ 0.02
5	10.91	10.38	+ 0.03	+ 0.01
6	10.93	10.89	+ 0.04	+ 0.01
7	11.73	11.70	+ 0.03	+ 0.01
8	11.73	11.70	+ 0.03	+ 0.01
9	11.13	11.09	+ 0.04	+ 0.01

10	11.53	11.49	+ 0.04	+ 0.01
11	12.14	12.10	+ 0.04	+ 0.01
12	11.43	11.40	+ 0.03	+ 0.01
13	12.54	12.50	+ 0.04	+ 0.01
14	12.14	12.10	+ 0.04	+ 0.01

From the above table we see that in Assmann's ventilating psychrometer the paper-covered wet bulb gives always a greater psychrometric differences than the muslin wet bulb as in an ordinary thermometer screen. This shows that the paper covering gives a better result in case of the aspirating psychrometer, and the Japanese paper may, at least, replace muslin as the psychrometer covering.

Comparing the figures in the above table with corresponding values in table I of my previous paper we see that the difference of both bulbs is smaller in Assmann's ventilation psychrometer than in an ordinary screen. This accords with the result obtained by Dr. O. Edelmann in his psychrometric studies. As he remarks, the active ventilation will lessen the difference in the psychrometer readings arising from the difference of covering materials.

In concluding this short note I take opportunity to make a slight modification of a statement in my previous paper. In the first paragraph of that paper I had described a manipulation in covering the bulb with Japanese paper which I thought a best one. Later experiences have however shown that a paper string used instead of ordinary wicks or of cotton strings often get cut by strong winds or gales. Hence the manipulation described in my previous paper may be used in a place with moderate air currents. It may be best used in a room of building, or as such. In a locality where gales are frequent we may better employ two paper strings twisted together or ordinary

wick and cotton strings, the method of covering the bulb with the paper being the same as in the manipulation described in the present note.

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