Evaluation of seashore salinity measurement period

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1. Introduction

A nationwide inspection of the seashore salinity has been performed in Korea during 3 years from 2003 to 2006. The measurement of the airborne chlorides was conducted regularly every month. Such measurement period corresponds to the salinity measurement period prescribed by ISO(International Standardization Organization)[1], JIS(Japanese Industrial Standards)[2] and KS(Korean industrial Standard).

Even if the national inspection finished in 2006, the salinity is depending significantly on environmental factors, which requires continuous update of the field data. Accordingly, representative areas reflecting the salinity characteristics of each coastal regions were selected to monitor the salinity trends. However, difficulties were encountered in acquiring measurement data since each of the sites all over the country had to be visited every month.

Therefore, the field test period was adjusted to every 2 or 3 months instead of once a month during 1 year since July of 2005 and evaluation of the validity of such measurement period was verified in order to measure more efficiently the accumulated quantities of airborne chlorides.

2. Summary of the experiment

The major factors of the experiment are summarized in Table 1. Targeting the extension of the measurement period to maximum 3 months, comparison was done with periods of 1 and 2 months. In addition, the difference between the chloride sampling obtained through the method applying the former dry gauze and the method using wet gauze has also been examined. Moreover, the possibility to increase the performance of airborne chloride sampling by adjusting the shape or thickness of the sampling plate has also been investigated.

The method using dry gauze that was formerly applied in Korea adopts the K3-type device illustrated in Fig. 1.[3] The K3-type salinity sampling device presents an opening of 10cm×10cm with two measuring plates of 10cm×12cm installed inside a box and an isolating membrane disposed at a height of 2 cm at the bottom. The K3-type sampling device has been improved by adopting wet gauze known to be the advantage of the "wet-candle method" prescribed in the ISO regulations, this improved K3h type device is pictured in Fig. 3. The improvement was achieved by installing a water tank and a wick resembling the wet-candle method at the bottom of the K3-type sampling device so as to transform the dry gauze onto a wet gauze. This allows the former K3-type dry gauze sampling device to maintain its measuring performance up to 3 months. The experiment related to the above mentioned measurement periods compared the data obtained through 10 airborne chloride sampling devices installed at 3 spots in the area of Gochang in the western coastal region of Korea. The experiment was conducted during 1 year until June of 2006.

Table 1 Major experimental variables

Item	Major variables
Measurement period	1 month, 2 months, 3 months
Measurement device	Dry gauze type, Wet gauze type
Sampling plate	Number of sampling plates and layers

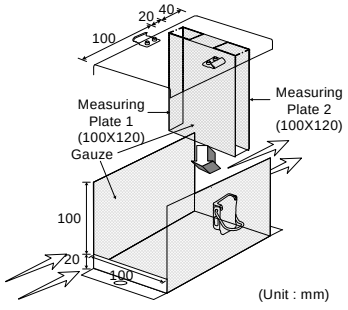

Fig. 1 K3 type device

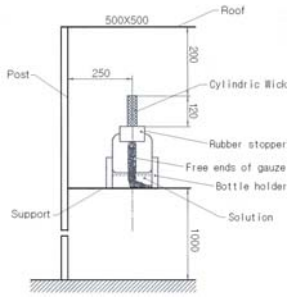

Fig. 2 ISO type (Wet-candle)

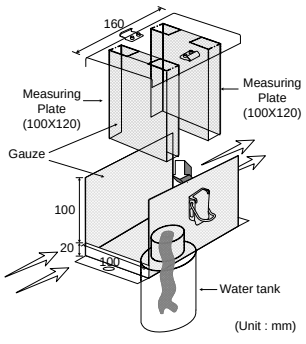

Fig. 3 K3h type device

Fig. 4 Field test

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3. Experimental results

The comparison of the measuring performances of the dry and wet type devices in Figs. 5 and 6 reveals that cumulated measurements at 2 and 3 months using the dry type produce values reaching respectively 80% and 77% of the values obtained by adding monthly measurements. This means that, after 1 month, the gauze sampling salinity in the dry type device is hardening by loosing gradually its inherent flexibility. Accordingly, it appears that the former dry-type sampling device is likely to lose its performance for longer measurement periods.

Table 2 Types of sampling plates used for the experiment

Name	type	Numbers of measuring plate	Numbers of layer for 1 measuring plate
No.1 "2 2"	Wet	2	2 layers
No.2 "1111"	Wet	4	1 layer
No.3 "1221"	Wet	4	1 layer and 2 layers
No.4 "111111"	Wet	6	1 layer
Dry type	Dry	2	2 layers

However, the improved wet-type sampling device is seen to provide cumulated measurements at 2 and 3 months reaching respectively 106% and 104% of the values obtained by adding monthly measurements. This implies no problem will occur even for measurement period extended up to 3 months. Accordingly, measurements are currently conducted for measurement period of 3 months.

In addition, the comparison of the sampling performances according to the number of plates and number of layers plotted in Figs. 7 and 8 shows that No.2 “1111”, corresponding to 4 one-layer sampling plates, is exhibiting the most remarkable measuring performances. This reveals that excessively thick gauze used as sampling plate or excessive number of plates may degrade the sampling performance by impeding the inflow and outflow of sea winds flowing through the sampling device.

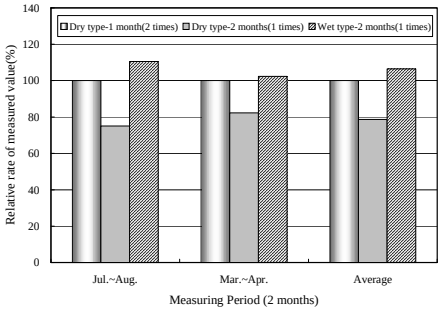

Fig. 5 Performance between dry and wet type devices (2 months)

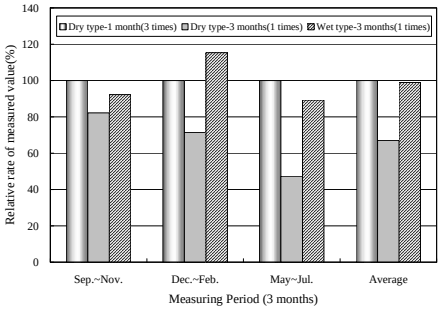

Fig. 6 Performance between dry and wet type devices (3 months)

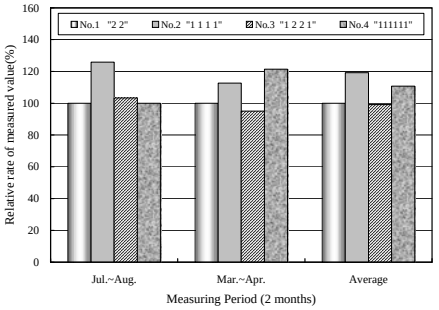

Fig. 7 Performance to numbers and types of layers on measuring plate (2 months)

4. Conclusions

Even if the K3-type salinity measurement device using dry gauze formerly applied in Korea performs efficiently measurement of salinity for periods of 1 month, this device appears to be inadequate in measuring the quantities cumulated during 2 or 3 months.

Besides, the improved K3h-type device adopting wet gauze provides measurements of the salinity cumulated during 2 and 3 months corresponding respectively to 106% and 104% of the salinity obtained by adding the values measured monthly. This reveals that no problem will occur even if the measurement period is extended up to 3 months.

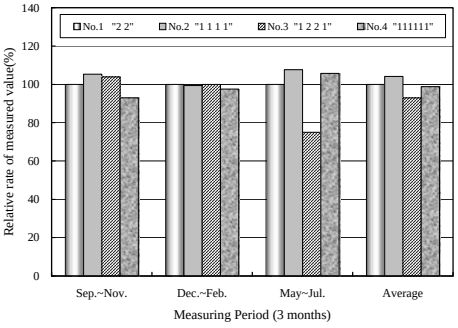

Fig. 8 Performance to numbers and types of layers on measuring plate (3 months)

On the other hand, experiments performed for diverse number of improved plates and layers revealed that the adoption of 4 one-layer sampling plates is exhibiting the most remarkable measuring performances.

References

1. ISO 9225, International Standard, "Corrosion of metals and alloy - Corrosivity of atmospheres - Measurement of pollution", 1992.
2. JIS Z 2382, Japanese Industrial Standard, "Determination of pollution for evaluation of corrosivity of atmospheres", 1998.
3. J.S. Lee, W.S. Choi, J.H. Lee, H.Y. Moon, "Evaluation of seashore salinity measurement period", precedings of 60th JSCE Annual Meeting, 5-188, 2005. 9