A study of Radon-Concentration Distribution in Buildings in Gyeong-ju

C. H. Park , S. Y. Jang , O. J. Jung, J. H. Moon
Dongguk University, 707 Seokjang-dong, Gyeong-ju, Gyeong-buk, Korea
**Corresponding author: chpark@dongguk.ac.kr*

1. Introduction

Radon(^{222}Rn) gas is the natural radiation generated by radioactive decay of uranium(^{238}U) nuclide. The radon which exists in ground flows into the inside by the atmospheric temperature, the differential-pressure or a gap of building underground and a ejection by a drywall with a phosphoric[1,2] In Korea, Korean Institute of Nuclear Safety had been studied about the inside-radon radioactivity investigation over the nation. In the area around the nuclear power plant, it is possible to exist both of a radioactivity nuclide and a natural. Therefore it is necessary to investigate the radon radioactivity in surrounding area of nuclear power plants. In this study, it is purpose to develop the method of establishing the on-line monitoring system to minimize the radiological effect due to radon gas, based on the real state of radon exposure in Gyeong-ju surrounding Nuclear Power Plant.

2. Methods and Results

2.1 *Positioning*

To measure a radon concentration distribution in building in Gyeong-ju, we selected the monitoring positioning at total of 23 points in the administrative districts, respectively, in Gyeong-ju. A radon monitoring was measured at town office for each administrative district.

Fig. 1. The detection positioning

2.2 *Detection*

We used continuous radon monitors (RAD7, DURRIDGE co.) to measure radon concentration distribution in buildings. The principle of detector is electrostatic collection of alpha-emitter with spectral analysis. It has fast low-level readings that it measures the EPA action level of 4pCi/L in 1 hour, with standard deviation of 10% [3,4]. Since the RAD7 has virtually no background. It is much more sensitive than other electronic detectors, easily measure down to 0.1pCi/L. It was analyzed pulse height spectrum of alpha distribution verifies radon/thoron, and also show the RAD7 is operating properly. Accurate determination of alpha particle energies produces a radon signature that allows discrimination of radon a thoron's alpha particles from those of other isotopes.

Using continuous radon monitors, we analyzed for more than 48 hours. After evaluation for measurement results, we decided the positioning regard to need re-measure for radon concentration distribution.

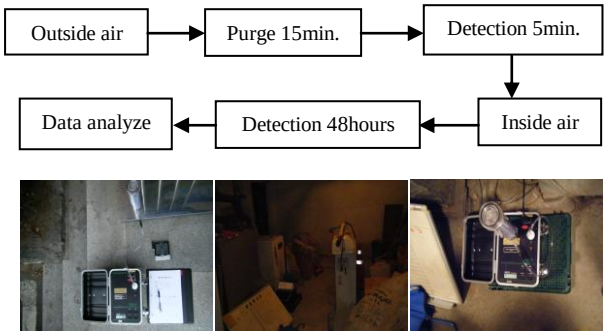

Fig. 2. Experimental procedure

The factor which can make a problem on the environmental in building be analyzed and applied to results. The factor is environmental conditions (temperature, humidity, spatial gamma-ray) as each positioning. All windows and gates was closed in the measurement positioning and the outside air be blocked off. The detector was located in more than 1m from all walls and in the 1.2-1.5m height by a base. After measuring the outside air first behind purging before measuring inside air, we measured continuously during 48 hours at positioning.

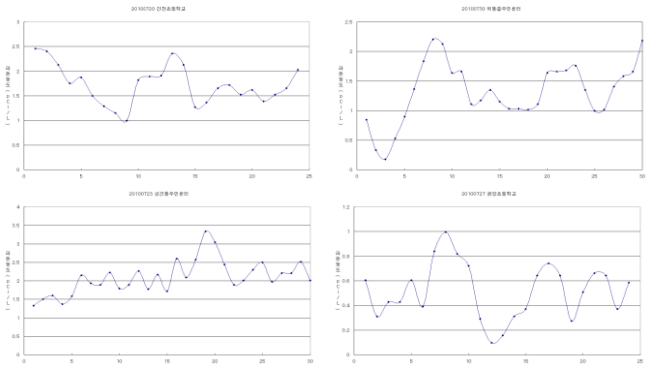

Fig. 3. Measurement data

Result of measurement, radon-concentration in buildings wasn't more than 4pCi/L that recommended standard. But the difference of data was founded as value that is caused by the environmental factor of each building. It'll be expected to analyze the relation to measured data in building a through a radon concentration distribution analysis of groundwater and soil in Gyeong-ju.

3. Conclusion

We developed the method of establishing the on-line monitoring system to minimize the radiological effect due to radon gas, based on the survey of the real state of radon exposure in Gyeong-ju surrounding Nuclear power plant. Survey results of radon concentration in Gyeong-ju would be used as a basic material to establish the management strategy for minimizing the radiological effect of local people.

REFERENCES

[1] B.W. Cho, I. H. Sung, S. Y. Cho and S. K. Park, A Preliminary Investigation of Radon Concentrations in Groundwater of South Korea, Korean Society of Soil and Groundwater Environment, Vol. 12, No. 5, pp. 98-104, 2007 .

[2] K. H. Moon, J. S. Kim, J. K. Ahn, H. C. Kim and H. Lee, Long-term Variation of Radon in Granitic Residual Soil at mt. Guemjeong in Busan, Korea, Journal of Petro. Soc. Korea, Vol. 18, No. 4, pp. 279-291, 2009.

[3] D. S. Park, W. S. Jung, B. C. Jung, Influence of Ventilation on the Subway Radon Level, The Korea Society for railway, Vol. 3, pp. 62-67, 2000.

[4] S. O. Kim, H. G. Kim, A Study on Harmful Radioactive Gas-Concentration in Soils, Taejeon City, Journal of the Korean Environmental Sciences Society, Vol. 6, No. 5, pp. 489-496, 1997.