

# Safety Issues of Radon from the Processed Products Containing Natural Radionuclides

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## NORM Regulation in Korea

- ❖ **Establishment of NORM Regulation in Korea**
  - In South Korea in the 1990s and 2000s, pseudoscience that anions were good for health were in vogue.
  - In order to generate anion, some general processed products were manufactured using anion powder as a raw materials
  - Anion powder material was identified as monazite, which contained 1-15% ThO<sub>2</sub>.
  - It was reported that the use of some processed products, which were generally used for relatively long time such as thermal mats could result in excess of radiation dose limit to the public (2007).
- ❖ **Act on Protective Action Guidelines against Radiation in the Natural Environment**
  - Since 2012, in order to establish and implement a protection plan for NORM handling facilities and radiation that public in daily life can be exposed to, Korea has implemented the act on protective action guidelines against radiation in the natural environment.
  - NORM handlers : Registered with regulator (Table 1), Status survey of NORM handling facilities
  - Processed products containing NORM: Dose limit < 1 mSv/y
  - Recycled scrap handler: Install and operate radiation monitor
  - Air transportation operator: Evaluate radiation dose of crew members. Radiation dose < 6 mSv/y

Table. 1. Registration Levels for NORM Regulation in Korea

Sort	Definition		Registration levels	
	Bq/g	kBq	Bq/g	kBq
Raw materials	0.1 (U, Th) 1 (K-40)	100	1 (U, Th) 10 (K-40)	1,000 10,000
Residues	0.5 (U, Th) 5 (K-40)	-	1 (U, Th) 10 (K-40)	1,000 10,000

## Current Issue - Radon Mattress

- ❖ **A Big Issue about Radon Mattress**
  - High levels of radon were measured on the bed mattress. It was reported to media and became a big social issue (Fig. 2).
  - Concentrations of Rn-222 and Rn-220 measured on the mattresses were above 2,000 Bq/m<sup>3</sup>
  - It was known that anion powder has been used in the processed products and monazite has been used in some accessories used in domestic bed mattresses.
- ❖ **Public Exposure to Rn-220 from Processed Products**
  - Monazite contains high level of Th series, which has the potential to release Rn-220 and thus radiation exposure.
  - In general, Rn-220 was not considered important as a cause of radiation exposure due to its short half-life (55.6 seconds).
  - It has been confirmed that processed products that are used for a long time in close contact with a respirator such as bed mattress may cause internal exposure due to Rn-220 and have a significant effect on the radiation exposure of the general public.



Fig. 1. A Big Issue after TV Broadcasting in Korea

## Action to Processed Products

- ❖ **Recognition of the Use of NORM**
  - The manufacturers of the mattresses did not recognize that the anion powder used in the mattresses was monazite. Additionally, there was a lack of knowledge and information about monazite.
- ❖ **Assessment of Radiation Dose to the Public**
  - Radiation dose assessment based on measurement of Rn-222 and Rn-220 concentrations on the mattresses resulted on more than 1 mSv/year for some mattress models.
  - The radiation dose resulted from mostly inhalation of Rn-220 from monazite.
- ❖ **Collection of Processed Products**
  - The processed products exceeding 1 mSv/y have been disclosed by the vendor, recovered from consumers, and replaced with normal products in accordance with the administrative measures of the Nuclear Safety and Security Commission, a government agency.



Fig. 2. Collected mattresses in Korea

- ❖ **Investigation of Products Containing Monazite**
  - Rn-222 and Rn-220 concentrations were measured for the products imported by the general public from abroad (latex, pillows, etc.).
  - As a result, it was found that monazite was also used in some products.

## Reinforcement of Safety Management

- ❖ For the processed products and latex brought into Korea through overseas travel, the safety assessment is conducted through the radon measurement service provided by the Korea Institute of Nuclear Safety.
- ❖ If the processed products exceed the safety standards, the manufacturers or distributors shall collect and replaced the products by administrative measures.
- ❖ If the products purchased overseas exceeds the safety standard, the user should be advised how to stop using and deal with it.

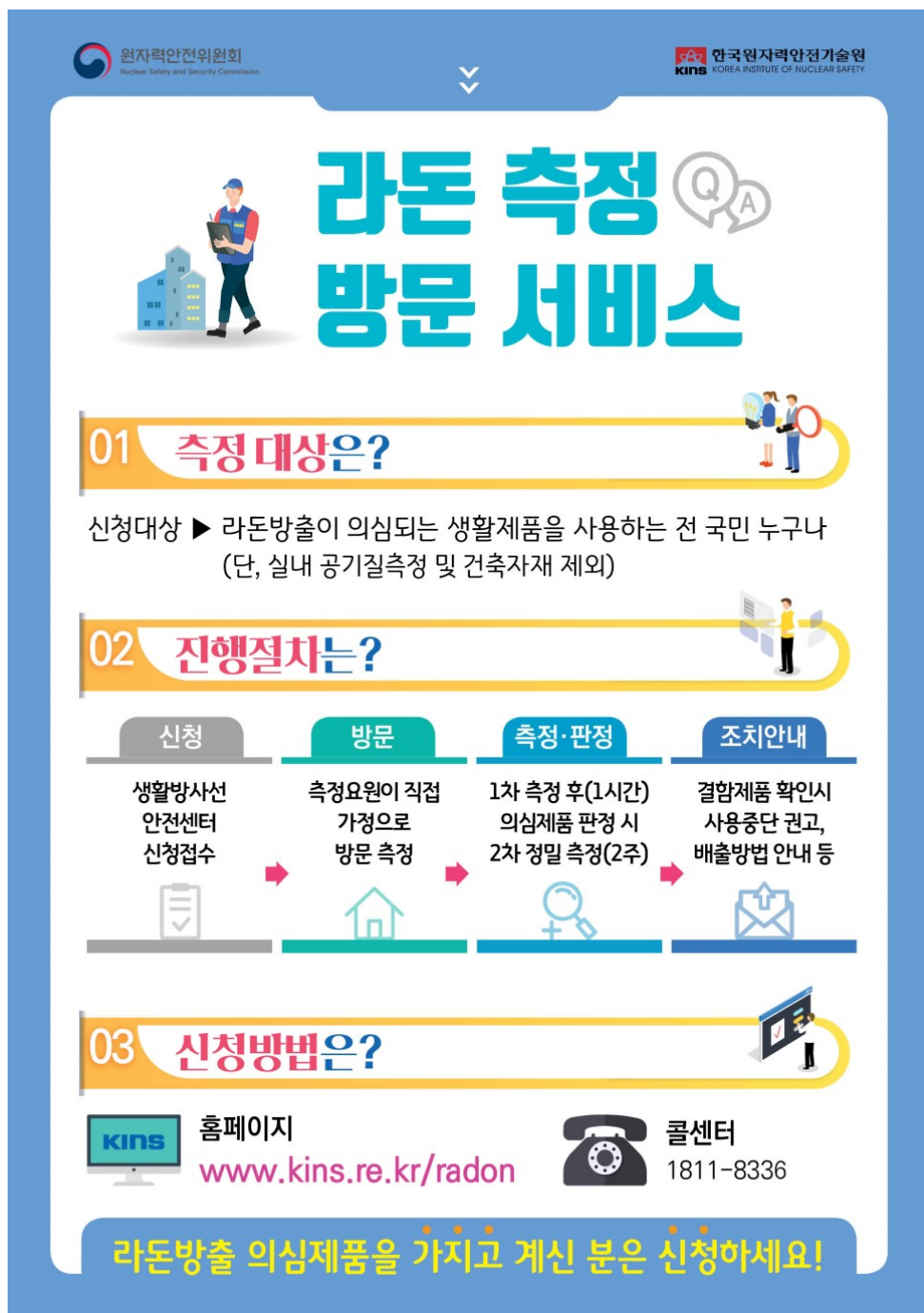


Fig. 3. Radon measurement visit service poster

## Conclusion

- ❖ Enforce regulations to prevent NORM materials from being used in close contact with the body, such as bed mattresses.
  - Expanded scope of regulation to register and manage processed product manufacturers and importers.
- ❖ Periodic inspections are carried out for companies handling NORM materials in consideration of their concentrations and annual usage.
- ❖ Prohibition of labeling and advertising as radiation ionization/excitation are beneficial to health for processed products.
- ❖ Continue to check and take measures by enforcing NORM-related regulations such as notification of processed products and manufacturer investigation.