IAEA Naturally Occurring Radioactive Material (NORM) IX, 23-27 September 2019, Denver, Colorado, the United States of America

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The Implementation of NORM Regulation and Challenging in Korea

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2019.9.23

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Contents

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NORM Regulations in Korea

NORM Regulations in Korea

Structure of Korean law

4 phases

Act	• The act enacted by the national assembly
Enforcement Decree	• The sub-rules to enforce the act by the president
Enforcement Regulation	• The specific regulations of the Enforcement Decree by government
Notification	• The specific criteria and procedure by individual government department

NORM Regulations in Korea (Cont.)

Brief information of the NORM regulations

Title

- **Act on Protective Action Guidelines against Radiation in the Natural Environment**

Purpose

- To prescribe those matters concerning **safety management of radiation encountered in environments**
- **To protect the public health and the environment** and **improving quality** of life while contributing to public safety

Structure and other information

- 1 Act, 1 Enforcement Decree, 1 Enforcement Regulation, and 1 Notification
- Enacted in 2011, and implemented in 2012 by NSSC

NORM Regulations in Korea (Cont.)

Brief information of the NORM regulations (Cont.)

Scope

- **NORM : Raw materials, Residues, and Product**
- Cosmic radiations (flight exposure to air crew)
- **Terrestrial radiations (Gamma, Radon, Thoron)**
- Radioactive materials in the scrap metal

Meaning of NORMs in Korea regulation

- **Raw material:** A sort of **raw materials** which contain natural radionuclides
- **Residues:** **Byproducts and wastes** after processing raw materials and residues to produce the Product
- **The product:** **The processed products** made of raw materials and residues, so they might be contained natural radionuclides

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Implementation of NORM Regulations

Implementation of the NORM Regulations

Brief information of NORM regulations

Main contents of the regulations (by NSSC, since 2012)

- **Registration of NORM handlers**
- Carrying out **the field survey and analysis**
- Making the **comprehensive NORM DB** to store and analyze info.

  (**CISRAN**: **C**omprehensive **I**nformation **S**ystem on **RA**diation in the **N**atural environment)

Implementation of the NORM Regulations

Registration of NORM handlers

Registration levels

- Reference: IAEA RS-G-1.7, IAEA SRS-49
- **U-238 series, U-235 series, Th-232 series, and K-40**
- The handlers (operators) should be **registered** if they deal with raw materials and residues **over registration levels**.

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**

Implementation of NORM Regulations (Cont.)

Registration of NORM handlers (Cont.)

Current state of NORM registrations (`19.6)

- Types: **Raw materials** and **residues**
- Target: **Handers** who treat **materials above registration levels**
- **65 companies** have registered (`18.12)

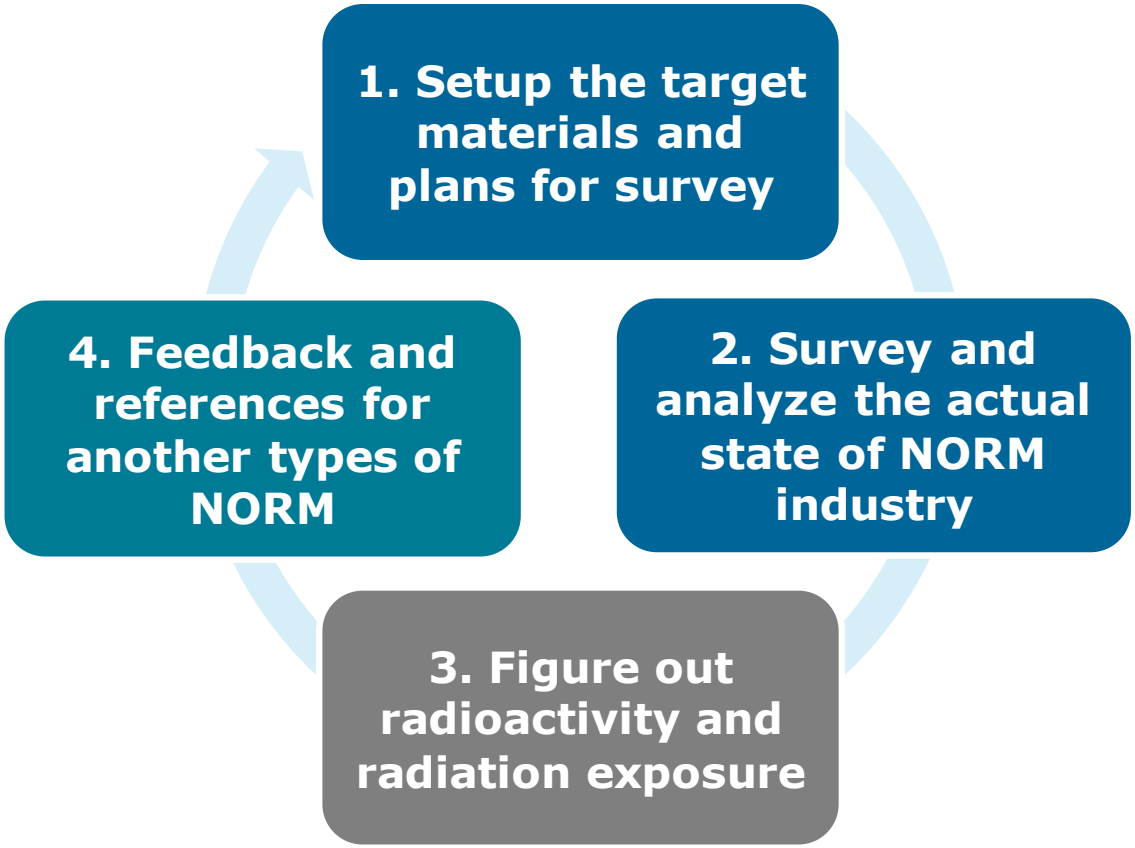
☞ **The production and distribution of the products** are not **required** for registration.

→ However, the registration will be required after July 16, 2019 because the **regulation enforcement** from **Radon mattress debacle**.

Implementation of NORM regulations (Cont.)

Field survey & analysis

Process of field survey and analysis



Implementation of NORM regulations (Cont.)

Field survey & analysis (Cont.)

Dosimetry method (external & internal exposures)

External dosimetry

- Measuring dose rate in workplace

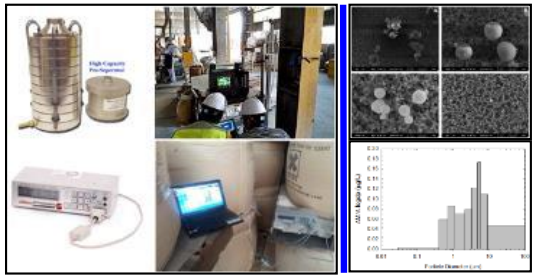

- Defining types of workers and work hour

Work place	Work hours (hour/day)	Work process
Raw material storage	4	- Raw material landing and rearrangement
	4	- Raw material transport
Mixing insertion hopper	3	- Raw material inserting
	3	- Mixed material pulverization
	1.5	- Mixed material producing
Molding area	5	- Product molding
	1.5	- Product pressurization
	1.5	- Mold separating
Fabricating area	7.5	- Product fabricating
	0.1	- Product transport

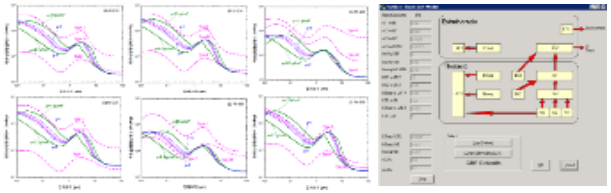
- Estimating external radiation exposure : **Dose rate X work time**

Internal dosimetry

- Measuring particles in workplace



- Developing DCF and estimating internal radiation exposure



Implementation of NORM regulations (Cont.)

Field survey & analysis (Cont.)

Current state of field surveys & analyses (Cont.)

- **104 NORM workplaces** were surveyed and analyzed (2013-2018).
- Occupational doses were **mostly external** and **under 1 mSv/y**.
- However, **few manufacturers of the products** were over 1 mSv/y.

Type	External dose (mSv/y)	Internal dose (mSv/y)	Total dose (mSv/y)
Raw material			
Zircon	0.188 (0.01-0.843)	0.017 (0-0.078)	0.203 (0.014-0.843)
Potassium compounds	0.180 (0-**1.13**)	0 (0-0.002)	0.180 (0-**1.125**)
Monazite	0.273 (0.007-**1.35**)	0.360 (0.01-0.763)	0.351 (0.007-**2.12**)
Bauxite	0.236 (0.123-0.364)	0.020 (0.014-0.032)	0.256 (0.155-0.379)
Etc.	0.123 (0-0.29)	0.001	0.123 (0-0.291)
Residues	0.038 (0.003-0.165)	0.002 (0-0.004)	0.025 (0-0.165)
Products	0.112 (0.043-0.180)	0.008 (0-0.015)	0.06 (0-0.18)

Implementation of NORM regulation (Cont.)

Comprehensive NORM DB (CISRAN)

Comprehensive supporting system for NORM regulation

For stakeholders & the Public

- Online registration
- Providing info.

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For the Regulators

- Supporting for field survey & analysis

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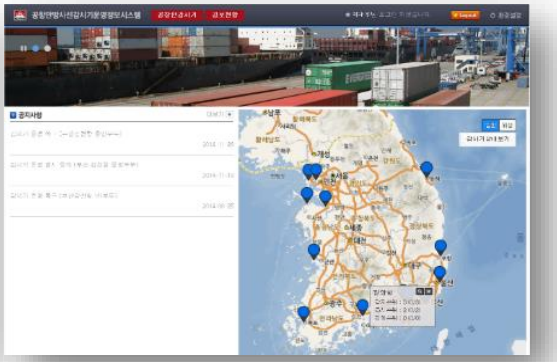
For Radiation Portal Monitor (RPM)

- Management of RPM operation



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NORM Issues in Korea

NORM Issues in Korea

Previous problems for the NORM regulations

Weak justification and optimization for NORM regulations

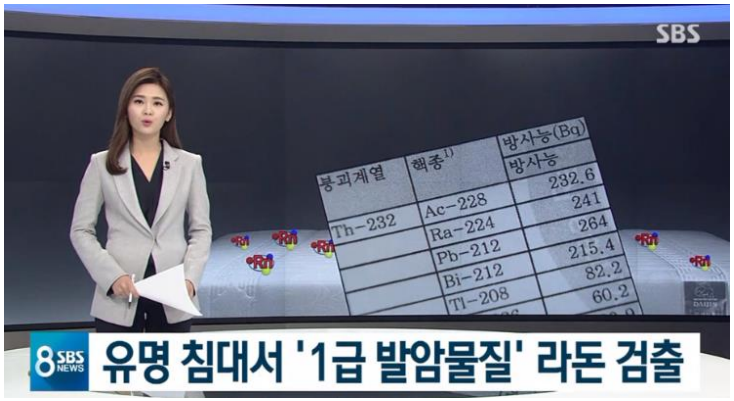
- Almost NORM workers exposure: around 1 mSv/y or less
  : **Weak justification**, however it could be justified to let **NORM workers know about their exposure for their health**
- Less risk comparing to other radiation facilities (NDT, NPP, etc.)
  : It makes **weak optimization** by selection and concentration principle
- **Who should be regulated?** (Stakeholders?, Actual NORM handlers?)

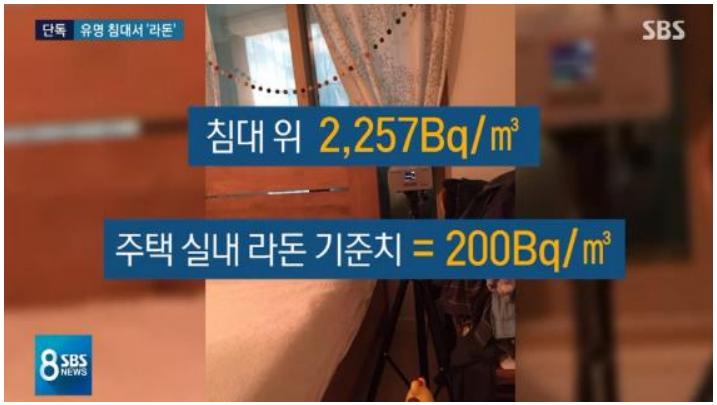
However, everything has been changed since the "Radon mattress" debacle happened.

NORM Issues in Korea (Cont.)

"Radon mattress" debacle

A big issue after TV broadcasting ('18.5.3)





NORM Issues in Korea (Cont.)

"Radon mattress" debacle (Cont.)

Current situation

- **29 types** of mattress were collected by the Act.
- **Over 70,000 mattresses** were collected.
- The maximum radiation dose for the mattress user is **13.7 mSv/y**.
  : Due to **thoron (Rn-220)** from **monazite**
- **New type of products** which emit thoron are being revealed (ongoing).
  : Other brand mattress, other type of products (latex, pillow, etc.)

NORM Issues in Korea (Cont.)

"Radon mattress" debacle (Cont.)

Why the manufacturer put monazite into the mattress?

- To make the products which emit **negative air ion (anion?)**
- Negative air ion is **well-known as good effects** for human health **without evidence**
- **The bunch of negative ion products** have been manufactured.
- A blanket was reported that the internal exposure was **64.1 mSv/y**.




Conclusion

Conclusion

- Korea has the individual act for NORM regulations.
- Korea has enacted the Act about NORM regulations and implemented with registration, the field survey & analysis, and comprehensive NORM DB.
- The implementation of NORM regulations showed the weak justification and optimization. However, necessity of NORM regulations rapidly increased because the usage of the negative air ion products (e.g. radon mattress).
- These day, negative air ion products still exist and are distributed. Therefore, investigation, examination, and enforcement are on going for the NORM regulations.

THANK YOU

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