

# Mineral waters and TENORM

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# Radiation Protection Legislation in Slovenia

- **Ionising Radiation Protection and Nuclear Safety Act (Uradni list RS, št. 67/02, 102/04, 60/11)**
- **Article 45**
  - **systematic surveillance of living and working environment**
- **Article 46**
  - **measures to reduce the exposure of workers and members of the public**

# Radiation Protection Legislation in Slovenia

- **Decree on activities involving radiation - UV1 (Uradni list RS št. 48/04)**
- Art. 3,
  - ...if specific activity of radionuclide do not overestimate exempted level (Table 1)...
  - ... if prior evaluation of the radiological risk to exposed population shows dose less than 0.010 mSv/year

# Radiation Protection Legislation in Slovenia

- **Decree on dose limits, radioactive contamination and intervention levels - UV2 (Uradni list RS št. 49/04)**
- **Art. 10.**
  - Effective dose for population should not overestimate 1 mSv/year

# Radiation Protection Legislation in Slovenia

- **Rules on the requirements and methodology of dose assessment for the radiation protection of the population and exposed workers – SV5 (Uradni list RS št. 115/03)**
- **Art. 9.**
  - Effective dose for population should not overestimate 1 mSv/year
- - dose assessment required

# Mineral waters and TENORM introduction

- activity concentration of natural radionuclides like  $^{226}\text{Ra}$ ,  $^{228}\text{Ra}$  and  $^{228}\text{Th}$  in some mineral waters can reach  $600 \text{ Bq/m}^3$
- For reducing activity concentrations zeolite filters have been used

# Mineral waters and TENORM introduction

- Filtering system cleaned by 20 m<sup>3</sup> fresh water each day
- Filtering system periodically overheated on 80 °C

# Mineral waters and TENORM sampling and measurements

- Sampling of zeolite filter on three different time periods (starting, before cleaning, after heating)
- Measurements of samples on high purity Ge detector



# Mineral waters and TENORM sampling and measurements

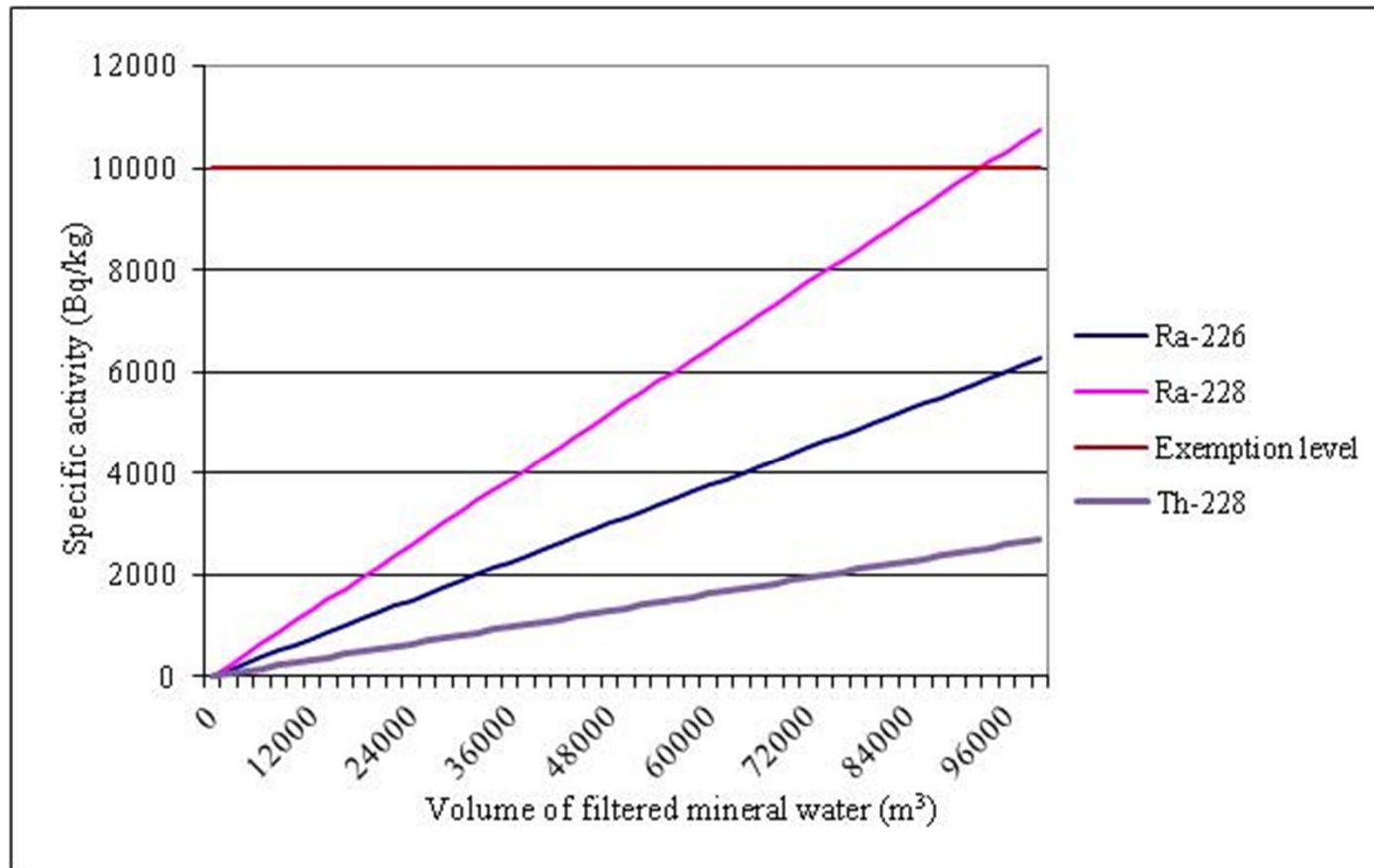
- Table 1. Specific activity of radionuclides in zeolite filter

Sample code	RV3051007	RV3041007	RV3031007	Exemption
Sampling	23.10.2007	23.10.2007	23.10.2007	levels*
Measuring	5.11.2007	5.11.2007	5.11.2007	Bq/kg
	Specific activity ( Bq / kg )			Exemption levels
Radionuclide	1. sampling	2. sampling	3. sampling	(Bq/kg)
<sup>226</sup> Ra	1003,8 ± 23,0	1327,0 ± 21,3	1067,8 ± 39,6	10000
<sup>228</sup> Ra	1525,2 ± 37,1	2083,0 ± 35,9	1638,8 ± 51,9	10000
<sup>228</sup> Th	155,9 ± 6,8	295,7 ± 7,8	159,5 ± 17,7	10000
* Decree on activities involving radiation				

# Mineral waters and TENORM sampling and measurements

- higher specific activities of natural radionuclides after the second sampling
- after the filter overheating (third sampling) specific activities reduced to the initial value

# Mineral waters and TENORM conclusions



# Mineral waters and TENORM conclusions

- Exemption level for  $^{228}\text{Ra}$  reached after 100000 m<sup>3</sup> of mineral water filtered
- Filtering system has to be overheated on 80 °C after 50000 m<sup>3</sup> of mineral water (company)
- There is no problem with enhanced natural radioactivity and TENORM
- Zeolite filter can deposit without restrictions