THE IMPACT OF AN ABANDONED URANIUM MINE TO THE OUTDOOR AND IDOOR RADON CONCENTRATION, REMEDIATION POSSIBILITIES

Theses of Ph.D. dissertation

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Veszprém, 2006

INTRODUCTION

I investigated the impact of an abandoned uranium mine to the outdoor and indoor radon concentration, where and what degree of the radon concentration increased, and remediation techniques to decrease high indoor radon level.

I present the health risk of the tailings ponds, the possible mitigation and evaluate the existing results.

Furthermore, I measured the indoor and outdoor radon concentration in the houses and the places located near the former uranium mining area, to reveal relationships between uranium mine cavities and the surface radon concentration.

I studied experimentally the remediation possibilities of high indoor radon concentration in the houses, originating from cracks and mining cavities.

NEW RESULTS, THESES

1 Aanalyzing of the remediation of the tailings ponds we can determine, that the inactive layer put on the surface tailings ponds, gives a suitable protection for the biosphere. The progress of remediation process reduces the population radiation exposure as well. Before remediation work I measured 1,06 mSv/year excess effective dose to the people in Pellérd village. This value decreased to 0,25 mSv/year after remediate No 2 tailings pond. At the same period the workers effective dose can reach the value of 0,9 mSv/month. This impact due to the remediation works on the tailings pond No 1.

2 I observed radionuclide migration only in close vicinity of tailings ponds. At larger distance, I couldn't indicate any migration of radionuclides.

3 The first 1200 m section of Northern mining tunnel has a radiological effect on the village (Kővágószőlős) population located above that Northern mining tunnel. This part of Northern mining tunnel characterized by many cracks and mining cavities. This effect resulted the enrichment of indoor radon level in houses of Kővágószőlős. The most extreme effect appears on the place where the fault are crossing. In that locations people could suffer more than 10 mSv/year effective dose from indoor radon.

4 The indoor radon concentration in houses of Kővágószőlős depends on the location related to the mining tunnel. Within 100 m distance from Northern mining tunnel the average indoor radon concentration is 660 Bq/m^3, between distances of 100-200 m this average concentration decreased to the 420 Bq/m^3 value, while in the houses of more than 200 m distance this value reduced to the 279 Bq/m^3 average concentration. Shifting the belts to the Eastern direction by 50 m, the radon concentration increased further.

5 The increased indoor radon concentration in the houses of village Kővágószőlős depends on two effects. One effect is the high radon concentration flowing up from the Northern mining tunnel, and the second effect is the presence of cracks and cavities located close to the surface.

6 The high radon concentration in the office building originates from and correlated with radon concentration which we measured in the mining shaft No 1. This effect is important for the calculation of mitigation efficiency.

7 Trying a variety of mitigation techniques above the former uranium mining cavities, the suction of radon sump produced the best results. However, the radon well as mitigation method also gave satisfactory results, if the depth of well exceeded 2 m.

PUBLICATION RELATED TO THE THESES

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