Abstract

Radon is a radioactive gas which occurs naturally as the decay product of radium and it can accumulate in buildings. For most people, the greatest exposure to radon occurs in the home. Because according to International Commission on Radiological Protection radon is a carcinogenic factor and is the most important cause of lung cancer after smoking, it is necessary to conduct researches to develop methods of radon diagnostics and reduction of its concentration.

From 1994 to 2002 the radon concentrations were measured in 55 buildings located in the Podlasie Voivodeship. The present experiment was conducted after about 20 years to updating researches.

The aim of this study was to estimate the changes of effective doses from inhaled radon which were received by inhabitants of modernized houses in Podlasie Voivodeship and to analyze the influence of the types of modernization used on the radon concentration inside the buildings. Study group contained 55 houses from which 46 were modernized and 9 did not undergo renovation. Residents from modernized buildings filled the questionnaires about renovation details. Radon concentration was measured using CR-39 detectors and the results were subjected to statistical analysis using STATISTICA 12.

Among whole study group the increase in radon concentration was observed in 62% of the buildings, the decrease in radon concentration in 22% of all houses and in 16% cases from study group this parameter has not changed. The influence of the age of buildings on the radon concentration inside the buildings was not noticed.

The statistically significant growth of the radon concentration was observed in houses in which the modernization as replacing windows or insulating the buildings was carried out. The highest increase of the radon concentration, average by 36 $Bq \cdot m^{-3}$, was noted in the case of the buildings with both types of modernization consisting exchange of windows and insulation. The decrease of radon concentration was observed in the houses where interior modernization was carried out or the roof was rebuilt. An average effective dose calculated for inhabitants of all modernized houses increased by 0,57 mSv and the determined increase in the risk of the lung cancer was about 0,37 %.

This study proposed the model to predict changes in the indoor radon concentration depending on type of modernization used. The best model prediction in group of modernized houses was obtained for average values of radon concentration. This study results indicated that different types of modernization have an influence on the radon concentration.