Analytical Considerations in the Assessment of Workplaces Exposed to NORM

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1. Abstract

The current situation in Austria with regard to the evaluation of exposure of workers to NORM and radon is described. Some examples of research projects on this subject and implications for the analytical strategy for assessment of workplaces are given.

2. Introduction

The current legal situation in Austria is based on the Austrian Radiation Protection Act [1], which implements the Council Directive 96/29/EURATOM [2].

Protection from natural radiation sources is defined in part IIIb of the Austria Radiation Protection Act. In article 36d, a dose limit of according to Article 9 of the Council Directive 96/29/EURATOM [2] is imposed for work where increased exposition to ^{222}Rn, Uranium, Thorium and their daughter nuclides or exposition to cosmic radiation is possible. The types of work activity where an increased exposition of workers is possible, has to be defined by the Austrian legislation. This will be done in the Radiation Protection Ordinance.

For the companies working in this field, it will then be obligatory to evaluate the potential exposure of workers and to report the results of this survey to the competent authorities.

Therefore, methods for assessment of exposure to NORM have to be defined in accordance with international and Austrian regulations.

3. Current situation in Austria

A systematic nation-wide survey of radon concentrations in indoor air of Austrian dwellings has been conducted on initiative of the Austrian Ministry of Health and Consumer Protection from 1995 to 1999. From the measurement results, a map of radon potential for Austrian standard dwellings was constructed [3], from which areas with elevated risk of high radon concentration in indoor air can be easily identified. A project on radon mitigation methods for dwellings has been carried out in selected

Marilee Williams, Editor
Proceedings of the 9th EAN ALARA Workshop
18-21 October 2005
Augsburg, Germany

dwellings in Upper Austria [4]. The information obtained in these surveys will also simplify the investigation for work places with enhanced radon concentrations due to the geological location.
Possible work activities with enhanced radon exposure in Austria include mining activities, tunnelling, touristic exhibition mines and caves, thermal spas and waterworks. Although a systematic survey on the radon exposure in fields of activity with possible enhanced radon exposure is not available, studies on single working activities exist. For instance, elevated radon concentrations have been investigated in an underground gallery used for medical treatment [5], [6].

Potential NORM exposure in Austria can be found in e.g. rare earth industry, oil and natural gas industry and the use of Thorium in industrial processes, e.g TIG welding. Also in the case of NORM, a systematic survey of the industrial sectors, where increased exposure can be expected, is not available. In a current project of the ARC Seibersdorf research with the Austrian social insurance for occupational risks, the exposure of workers using thoriated electrodes for tungsten inert gas welding is investigated. Similar studies have shown that considerable exposition of welders from TIG welding and electrode sharpening can occur [7 – 10]. In the current study, the measurement strategy is based on stationary and personal air samplers for evaluation of the intake during welding. Additionally, urine and feces excretion samples of exposed workers are analysed for thorium. The composition of the welding fumes is investigated by cascade impactor measurements.

4. Analytical strategy for assessment of workplaces exposed to NORM

Requirements and methods for incorporation monitoring of workers have been defined in Austrian national standardisation. In the three parts of the Austrian standard ÖNORM S 5220 [11–13], the necessity and frequency of monitoring, the requirements for the monitoring laboratories and the methods for dose assessment are described in accordance with Austrian legislation.

Additionally, a working group has started recently to prepare a national norm for dose assessment for work with natural radioactive materials. In this project, measurement techniques and dose assessment methods will be defined with special emphasis on the exposure of workplaces by NORM and radon.

An area of concern, where investigations will be necessary, is the handling of raw materials and intermediate products in industrial processes where increased levels of NORM are possible. Industrial processing often disturbs the secular equilibrium in the uranium and thorium decay chains as accumulation of certain members of the natural decay chains can occur during chemical processes [14], making the verification of the equilibrium conditions necessary. As incorporation in these cases usually can be expected to occur by inhalation, a survey to assess the incorporation risk should include measurement of air contamination by stationary and personal air samplers. Additional analysis of the materials used for production and the intermediate products handled by the workers can then be used to establish which parts of the natural decay chains can be assumed to be in equilibrium. For determination of the exposure the time the worker spends at the workplace has also to be taken into account.

5. Conclusions

Some industrial sectors in Austria can be identified, where an increased exposition of workers to NORM and radon is possible. The specific types of work activity, which are affected, have to be defined by the Austrian legislation.

For the definition of monitoring methods and dose assessment in accordance with EC and national legislation, the Austrian standard ÖNORM S 5220 can be applied.

For determination of the exposure of workers to NORM and radon, single studies on this topic exist in Austria, although further work will be necessary.

6. Acknowledgements

The author wishes to express his thanks to W. Aspek from the Austrian social insurance for occupational risks for helpful discussions on this topic.

7. References

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