NUKLEONIKA 2001;46(4):147–149

Radiation monitoring network in Poland

**Dariusz Grabowski,
Walenty Kurowski,
Wojciech Muszynski,
Barbara Rubel,
Genowefa Smagala,
Justyna Swietochowska**

Abstract In Poland the radioactive contamination of the environment and food has been controlled since the early sixties by the Service for Measurements of Radioactive Contamination (SPSP). The Service comprises a network of measuring stations and the Centre of Radioactive Contamination Measurements (COPSP). Actually, there are 100 measurement stations. The main task of such station is systematic measurement of radioactivity level in samples of environment components and food. Nine stations of SPSP acting within meteorological stations, ten stations of low level air radioactivity measurements (Aerosols Sampling Stations ASS-500) and eleven permanent monitoring stations (PMS) form the radiation monitoring warning system in Poland.

Key words measurement stations • radiation monitoring • warning network

D. Grabowski, W. Kurowski, W. Muszynski✉, B. Rubel, G. Smagala, J. Swietochowska
Central Laboratory for Radiological Protection, Radioactive Contamination Department,
7, Konwaliowa Str., 03-194 Warsaw, Poland,
Tel.: +48 22/ 8110251, Fax: +48 22/ 8111616,
e-mail: spsp@clor.waw.pl

Received: 4 June 2001, Accepted: 30 August 2001

The Service for Measurements of Radioactive Contamination (SPSP)

The Service for Measurements of Radioactive Contamination (SPSP), supervised by the National Atomic Energy Agency (PAA), monitors since 1961 the radioactive contamination of environment and foodstuffs: air, fallout, atmospheric precipitation, soil, tap and surface water, sewage, grass, pasture, agricultural products and foodstuff. The Service comprises a network of measuring stations and the Centre of Radioactive Contamination Measurements (COPSP) [1], the duty of which is executed by the Central Laboratory for Radiological Protection (CLOR). This network consists of 100 stations; working within meteorological stations, stations for sanitary supervision, veterinary hygiene units, chemical agricultural stations, and water supply and sewage establishments (Fig. 1). The main task of this system is systematic measurements of radioactivity level in environmental and food samples using uniform methods of measurement. The kind of samples tested by each measurement station depends on the profile of activity of the institution to which that station belongs. For example, air aerosol samples, total fallout and atmospheric precipitation samples are collected and measured by the meteorological stations. Frequency of sampling depends on the actual radiological situation, kind of sample and on the seasons of the year. The sampling programme takes into consideration normal and accidental situations. There are selected permanent points for sampling of the environmental materials and food on the territory of Poland to be used for reference. In case of finding an increase of radioactivity the number of sampling points may be augmented.

All the SPSP stations are equipped with a standard measurement system SAPOS-90. It allows to measure gamma

Fig. 1. The Service stations.

Fig. 2. Radiation Monitoring Network System.

dose rate (with G-M counters) and beta or gamma activity with scintillation probes (a thin plastic scintillator or an NaI(Tl) detector). About 50 SPSP stations have gamma spectrometers with a scintillation or germanium detector. The Service stations can also measure the total beta activity, which cannot be used for dose estimations, but may be useful for the assessment of radioactive contamination level. Concentration of particular isotopes in samples are determined by radiochemical or spectrometric methods in some of the Service stations or in the COPSP. The SAPOS-90 can be used as a simple 3-channel analyser with the NaI(Tl) detector for quick measurements of ^{134}Cs, ^{137}Cs and ^{131}I radioactivity in the case of high contamination level. Activity of the stations is co-ordinated and supervised by the COPSP based at the Central Laboratory for Radiological Protection (CLOR).

All the results of measurements carried out in the SPSP stations are collected and analysed by the COPSP. The report "Radioactive Contamination of the Environment and Foodstuff in Poland" is published every year [2, 3].

The COPSP organises interlaboratory comparisons for the Service stations every year. The prepared reference material (e.g. milk powder) is checked by an HPGe gamma spectrometer. The COPSP calibration is checked by the international comparison exercises PROCORAD every year.

Additionally to the duties of the COPSP, the CLOR has the following research programmes connected with the analysis of radioactive contamination:

- High altitude monitoring. The samples of air aerosols are collected at six altitudes from 1 to 15 km by a jet plane [5];
- Surface water monitoring. Twice per year the surface water from the rivers Wisła and Odra and their tributaries and the water from lakes is sampled;
- Soil monitoring. Once per two years soil samples are collected from about 260 points all over the territory of Poland [4];
- Monitoring of radioactive substances in the Baltic Sea;
- Routine monitoring of air at near-ground level;
- Radon concentration in outdoors and indoors air.

Radiation Monitoring Warning Network

A sub-system of the SPSP forms the Radiation Monitoring Warning Network based on: the Service stations acting within meteorological stations, Aerosols Sampling Stations (ASS-500) and Permanent Monitoring Stations (PMS) (Fig. 2).

The meteorological alarm stations are carrying out on-line measurements of gamma dose rate by FHZ 601A Intelligent Probe with a proportional counter. Besides, the aerosol monitor FHT 59 (with a glass filter strip and an Si detector) serves for monitoring of concentrations of aerosol alpha- and beta radioactivity in air. The total beta activity and the artificial and natural alpha activity are measured simultaneously, the artificial beta activity is being calculated.

The Computer Measuring Network Program analyses the results as they come, calculates the mean values of every hour and compares them with the alarm threshold. Then, the results of gamma dose rate, concentrations of natural and artificial alpha and artificial beta activity of the air are sent to the COPSP by dedicated meteorological communication line, once a day in normal situations and every hour in emergency situations.

Ten Aerosol Sampling Stations (ASS-500), constructed by the CLOR, collect air aerosols on a filter in weekly cycles. The volume of air passed through the filter (50,000–80,000

m^3) enables, using an HPGe gamma spectrometer, the determination of natural and artificial radionuclide activities at concentrations as low as 0.5 μBq m^{-3}. The scintillation probe located above the filter may detect I-131 and Cs-137 activity on the filter. In the case of an increased radioactivity level the frequency of sampling is augmented.

Eleven permanent monitoring stations, Danish construction, owned by the National Atomic Energy Agency and managed by the CLOR, measure on-line gamma dose rate by the probe with a G-M counter. A spectrometer with a large NaI(Tl) detector analyses on-line the spectrum of gamma radioactivity in the vicinity of the station. All the results from the radiation monitoring warning network are collected and analysed by the CLOR.

Conclusions

The monitoring network in normal situations should:
- carry out measurements of radionuclide concentrations in environmental samples and in foodstuff in a limited number of points, with limited frequency,
- observe long-term changes of radioactive contamination level,
- assess the degree of radiation hazard of population.

During emergency situations the monitoring network of radioactive contamination should fulfil the following tasks:
- to identify an increase of radioactive contamination level immediately,
- to give an alarm as quickly as possible,
- to modulate the frequency of sampling and measurements needed for rapid estimation of actual radiological hazard.

The long-lasting activity of the SPSP provides information about the radiological situation in Poland: background radiation, global fallout and nuclear accidents. The Polish radioactive monitoring network fulfils all tasks in normal and emergency situations.

The Chernobyl accident was a serious test for the radiation monitoring system. The SPSP station at Mikołajki, in northeastern part of Poland, recorded an increase of the total beta activity of the air aerosols and the gamma dose rate at 7 a.m., on 28 April 1986. The station transmitted immediately the exceptional readings to the COPSP. The COPSP alarmed the competent authorities and initiated the emergency operation in the other stations of the Service. On the basis of the early data collected in the SPSP stations, the COPSP was able to estimate the radiological situation of Poland at that time and to advise the Government an adequate counteraction.

References

1. Grabowski D, Kurowski W (1990) The system for measurements of radioactive contamination of environment and food in Poland. Report CLOR No 121/D. Central Laboratory for Radiological Protection, Warsaw
2. Grabowski D, Kurowski W, Muszynski W, Rubel B, Smagala G, Swietochowska J (1999) Radioactive contamination of environment and food in Poland in 1998. Report CLOR No 139. Central Laboratory for Radiological Protection, Warsaw (in Polish)
3. Grabowski D, Kurowski W, Muszynski W, Rubel B, Smagala G, Swietochowska J (2000) Radioactive contamination of environment and food in Poland in 1999. Report CLOR No 140. Central Laboratory for Radiological Protection, Warsaw (in Polish)
4. Jagielak J, Biernacka M, Henschke J, Sosinska A (1998) Radiation atlas of Poland 1997. Central Laboratory for Radiological Protection, Warsaw
5. Kownacka L, Borkowski JL (1996) Changes in the vertical distribution of fission products over Poland during the period 1973–1994. Acta Geophysica Polonica 44:43–59