

PRINCIPLES AND RESULTS OF ENVIRONMENTAL SURVEILLANCE OF THE AUSTRIAN RESEARCH CENTER AT SEIBERSDORF WITHIN THE LAST TWENTY YEARS

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1. INTRODUCTION

The Research Center at Seibersdorf uses its 12 MW reactor for isotopes production, fuel testing and activation analysis and operates also several active laboratories, an accelerator, a waste managing department with an incineration plant and an intermediate store for low and medium active wastes.

On the area of the center also the Safeguards Analytical Laboratory of the IAEA was erected.

Our monitoring system has principally the following aims:

- to control the radioactivity which is emitted into air and waste water
- to ensure that governmental regulations are fulfilled
- to detect any changes of the environment by longterm emissions.

The monitoring of the center is performed by emission and immission measurements supported occasionally by research projects.

2. MONITORING DEVICES

2.1 Installations for controlling the emissions

The ASTRA reactor is the main emittent of shortlived radionuclides:

TABLE 1: Shortlived radionuclides emitted by the
ASTRA reactor

<u>Radionuclide</u>	<u>Activity per year</u>
Ar 41	200 ± 20 Ci
H 3	1 Ci
Fission gas	0,2 Ci
Aerosols, Rb 88, Cs 138	91 Ci
I 131	5.10 ⁻⁵ Ci

For monitoring the breathing air in the reactor hall it was therefore a counting unit in the off gas tunnel installed which has a detection limit of $3 \cdot 10^{-8} \text{Ci/m}^3$. Another unit with the same capacity is posted in the 25 m off gas tunnel.

For the determination of the aerosols, 100 m³ air are bypassed over a micropore filter. Activities up to $7 \cdot 10^{-14}$ Ci/m³ can be counted with a methane flow counter. I-131 is absorbed on charcoal and measured with a Ge(Li)-detector giving a detection limit of $3 \cdot 10^{-14}$ Ci/m³. The off gas tunnels of the hot cells and active laboratories are monitored by GM-counters with fixed alarm levels of 1000 c/min or 4000 c/min respectively. All air streams leaving outside of SAL are controlled very strictly for their alpha-, gamma- and beta-activity.

2.2 Permanent monitoring of the air

By a pumping station in the middle of the center daily 100 m³ air are sucked through a glasfibre filter and the alpha-, gamma- and beta-activity measured after 10 min, 3 hrs and 120 hrs after collection. If the 10 min value is higher than the normal scatter - the values will change with the meteorological conditions about a factor of 3 - this filter will be measured with a gammaspectrometer. The 120 hrs-values from the year 1978 differ e.g. from 0,034 to 0,152 pCi/m³. A second aerosol monitor is located on the roof of the institute for radiation protection. The collection and measurement are taken continuously with a filter band. The evaluation is made with plastic scintillators to alpha- and alpha+beta-activity. In the same place also the meteorological data are collected.

2.3 Controlling of water activity

In our center the following water systems exist:

- raining water:
it is drained into ground, but from the first water flowing down the pipe, a 2 litre sample is taken.
- wasting waters:
coming from basins, showers, kitchen and toilets; they are conducted directly to the biological purification plant.
- radioactive waters:
all waste waters coming from the active laboratories are led by a special piping directly to the decontamination plant.
High radioactive fluids are not allowed being poured in the sinks, but have to be brought in protected vessels to the plant.
- possible radioactive waters:
they are gathered in tanks, the activity is measured and either dispatched or led to the decontamination plant.

All cleaned sewage waters coming from the biological purification- or decontamination plant, are collected in a reservoir and pumped to a near river.

For monitoring, daily samples are gathered from pumping reservoir, the cooling pond and the reservoirs of the decontamination plant before releasing.

Weekly water from three wells in the center and a series of wells around the area, a sample of a near ditch and one of the drinking water is taken.

Also samples of the roof waters are measured every week if it is raining. The averaged activity is about 6 - 15 pCi/l. After a longer dryness the activity increases to about 100 pCi/l.

Further wells and surface waters in the environment are collected in half a monthly, monthly and three months cycle. The values differ from 0 to 99 pCi/l.

2.4 Controlling of the soil samples

Furthermore soil samples and vegetables are collected from six different points. The soil samples are taken from an area 10 x 10 cm and the depth of 5 to 10 cm. The grass is taken from 1 m². The values in 1978 were:

- Pu 239: grass <3 to 21 fCi/g ash.
 soil <3 to 12 fCi/g ash
- beta-activity: grass 72 to 284 pCi/g ash.

The samples are taken quarterly.

From five places from the river Leitha - above the mouth of the waste water pipe, 10 m, 100 m and 1000 m below and in the next village - various samples are taken: sand, mud, seaweeds and small crawl fishes. After preparation the activity is determined. The sensitivity of the measurement is good enough that ⁹⁰Sr and ²³⁹Pu can be determined in the size of the fallout concentrations. Half a year samples are collected from diverse parts of the purification plant and every year sand, fishes and biological material.

2.5 Installations for controlling the immissions

The measurement of the immissions are made in principle for preventive events, to realize the limits set up by the authorities and to verify the values which are calculated from the measurements of the emissions. The environmental surveillance to the gamma dose is made by TLD dosimeters. We use simultaneously card and bulb dosimeters which are housed in an Al-cylindre for protection against weather (1).

Dosimeters are placed in two about concentric circles around the center to superintend the environment independent from different emission parameters, the inner circle

in 30° and the outer in 90° steps. The change of the dosimeters and the evaluation is made monthly.

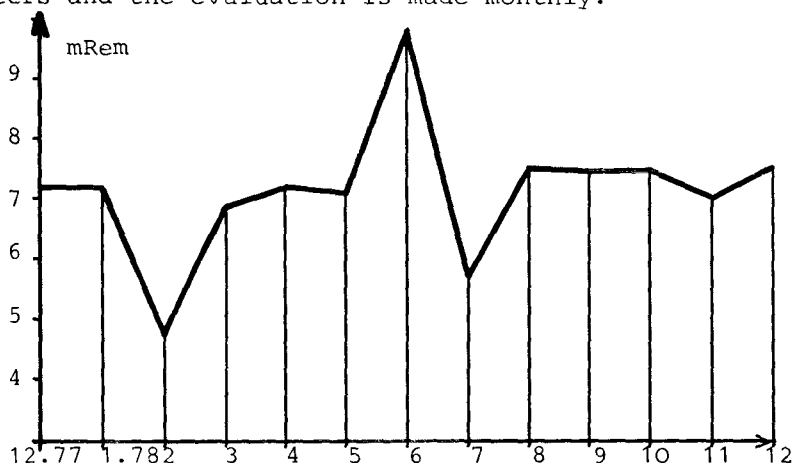


Fig.1 Fence-dose in the main-wind direction TLD

Additionally, the fence dose is measured with two integrating gamma radiation doserate monitors. One is situated in the main wind direction and the second in one of the surrounding villages. The detectors are sensitive GM-tubes equipped with a registering unit.

3. DISCUSSION

Since the center lies in an agricultural area, at first the main stress was led on the monitoring of water and also of air. The described system was extended by rings of TL-dosimeters and doserate meters and aerosol monitors. The described system was sufficient up to now in monitoring alpha-active laboratories and waste management. For comparison, in research work the Pu-fallout was determined all over Austria (2). For verification of the valid calculations for the spreading of activity in the air, a filter pump unit to collect 5000 m³/h on a charcoal filter is in construction.

4. LITERATURE

1. Duftschmid, K., Ch. Strachotinsky: SGAE Report No. 2543, ST 49-75.
2. Irlweck K., F. Steger: Proc. IVth Int. Congr. of Int. Rad. Prot. Assoc. Paris, 24-30 Apr. 1977, p. 853, Nr. 145.