

ENVIRONMENTAL MONITORING AT CNEN/SÃO PAULO

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ABSTRACT

In order to evaluate the radiological impact due to the operation of the nuclear facilities available at CNEN/São Paulo an environmental monitoring program is carried out. This program was established in order to assure that under normal operation conditions the radioactive effluents generated will not give rise to radiation exposures of members of the public in excess of those stipulated by competent authorities. The program comprises a continuous monitoring of all the radioactive liquid and gaseous effluents generated at CNEN/São Paulo, and the measurement of the artificial and natural radionuclide concentration in aquatic, terrestrial and atmospheric samples in the surrounding of the nuclear facilities. Besides, external gamma radiation background in the environment is measured by using thermoluminescent dosimeters.

INTRODUCTION

The normal operation of any establishment dealing with radioactive materials inevitably involves the production of radioactive waste products. Complete removal of radioactivity from effluents discharged to the environment is practically impossible to achieve so that these effluents will always contain some amount, however small, of radioactive waste material.

The design of a nuclear establishment must ensure that under normal operating conditions, any waste discharged from it will not give rise to radiation exposures of members of the public in excess of those stipulated by competent authorities. The regulations governing the discharge of radioactive waste usually require that measurements be made during the course of the normal operation of an establishment in order to demonstrate that radiation does remain below the stipulated levels. These measurements may take the form of an environmental monitoring programme which primary objective is to perform a radiological control.

The present paper is mainly concerned with the activities carried out by the Environmental Monitoring Division (EMD) which is responsible for this radiological control. These activities comprise :

- a continuous monitoring of all the radioactive liquid and gaseous effluents generated at CNEN/São Paulo
- the measurement of the artificial and natural radionuclide concentration in environmental samples in the surrounding of the nuclear facilities available , as well as of the external gamma radiation background.

CONTROL OF THE RADIOACTIVE EFFLUENTS GENERATED AT CNEN/SP

The EMD must control the release of radioactive material into the environment and demonstrate that it is within the authorized discharge limits, according with the Brazilian legislation. The effluent monitoring systems are intended to measure radioactivity in airborne and liquid effluents before discharge to the environment in order to evaluate the source term. Of course the nature and amount of the radionuclide to be

detected depends upon the nuclear facility available.

The nuclear facilities in operation at CNEN/SP , presently, are as follows :

Research reactor

Uranium and thorium handling facilities

Radioisotopes production

Particle accelerator

Radiochemical facilities

Treatment and storage facilities for radioactive wastes

The modes of discharge in these groups are very similar. In almost all such facilities airborne effluents are discharged through one or more stacks, and liquid effluents are generally stored in appropriate tanks and after radiometrical analysis are released to the sewage system.

The rates of discharge may vary. Airborne effluents are , for the most part, discharged continuously. The liquid effluents, on the other hand, are almost always discharged descontinuously, on a batch basis.

The most important radionuclides in airborne effluents from research reactors are the noble gases and radioiodines with, in addition, some fission and activation products in particulate form. The use of special filters drastically reduces this discharge to the atmosphere although small quantities of radioactivity may still be released. The radioisotope production facility also presents radioiodine in its normal airborne effluents but here too the emission is substantially reduced by using special filters. The liquid discharges from research reactors are generally very small and contain some fission and activation products such as cobalt, strontium , caesium and iodine isotopes. Finally the liquid effluents from radiochemical facilities and from uranium and thorium handling facilities may contain almost all the types of nuclides handled with ratios that cannot be foreseen. The particle accelerator and the treatment of radioactive waste do not normally produce significant amounts of airborne and liquid effluents.

ENVIRONMENTAL MONITORING PROGRAM AT CNEN/SP

Since the objective of the Environmental Monitoring Program is to ensure that acceptable doses are not exceeded, it follows that the most profitable measurements are those which can be made on the materials which provide a direct source of exposure, whether air, water, food or some other material. In certain cases, however, measurements on materials, which do not constitute a direct source of exposure to man but which are good indicators of environmental contamination, can be used to evaluate the trend of this contamination.

The Environmental Monitoring Program was established in order to cover an area of 7 Km around the nuclear installation. In formulating the program, account was taken of the principal radionuclides likely to be emitted. Two important pathways for human radiation exposure were identified : the river water → fish → human food chain and the direct radiation exposure paths by radionuclide deposition. After consideration of these pathways and of the preliminary site data (predominant wind direction , population distribution and so on) the media to be monitored in addition to sampling and measurement locations and the frequencies of monitoring were specified.