RADIATION PROTECTION AT A RADWASTE TREATMENT AND STORAGE FACILITY IN THE NETHERLANDS

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1 INTRODUCTION

Since 1984 the radioactive waste produced in the Netherlands is managed by COVRA, the Central Organisation for Radioactive Waste. This dedicated organisation has been set up as a joint venture between the three major radwaste producers in the country and the government.
All kinds of radwaste (LLW, ILW and HLW) that will be generated in the next 100 years will be treated and stored in an above ground facility.
At this moment COVRA's activities are collection, treatment and storage of LLW and ILW. The conditioned HLW is expected to arrive in the year 2001.
The treatment and storage facility for LLW and ILW is located in the south-west corner of the Netherlands near the town of Vlissingen (Flushing).
The construction of a storage building for HLW in Vlissingen will start in 1997.
The methods of radwaste treatment are chemical cleaning by means of a precipitation technique of liquids, incineration of organic liquids, supercompaction of solids, reducing large items and conditioning treated radwaste by cementation.
At this moment, in the storage facility there are approximately 20,000 drums of conditioned LLW stored with a total volume of 7500 m^3 and a total activity of 0,5 PBq. This waste has been collected in the period 1982 - 1995.
The new facility is in operation since 1992.
Radiation protection during 1992 - 1995 is quantified by monitoring the radiation during treatment and storage, dosimetry of the work preformed by radwaste workers and measuring radiation levels at the fence of the facility.
In the facility near Vlissingen there are some 45 employees working of which 30 are radiological worker.

1.1 Producers of radwaste

In the Netherlands the radwaste producers are research institutes, hospitals, ore-processing and manufacturing industry, and nuclear facilities (two nuclear power plants and two nuclear research reactors).
The annual amount of LLW produced by the users of radioactive materials in research, medicine and industry equals roughly the amount of ILW produced by the nuclear facilities. This amount is after treatment, conditioning and packaging some 500 m^3.

1.2 Radwaste management organisation and facilities

In general terms the task of COVRA is to manage all Dutch radwaste, in order to protect man and the environment against the hazardous effect that could be caused by this radwaste. This means more specifically:

- collection and shipment of radwaste
- treatment and conditioning of radwaste
- storage of all kinds and categories of conditioned radwaste
- conventional and radiological protection

- monitoring the radwaste before treatment
- monitoring the radwaste after conditioning
- monitoring the environmental impact of treatment and storage

2 ACCOUNTANCY OF RADWASTE TREATMENT AND RADIOLOGICAL ASPECTS

Before shipment an administrative and radiological control of the radwaste is preformed by radiation protection monitors (RPM's) of the Health Physics department of COVRA. These measurements are executed to check if there is compliance with COVRA's standards of LLW and ILW.
After shipment there is an extra administrative and radiological check of the radwaste at the receptionbay of COVRA and after agreement the radwaste is transported into a bufferstorageroom in the treatment building.
During treatment and storage of the radwaste there is a daily and a weekly program of monitoring preformed by the RPM's. They measure the doserate and the level of contamination in the treatment- and storage buildings.
The results of these measurements should be in accordance with the radiological zone classification of IAEA.
The emission of aerosols and gasses (α, ß, γ, SO_2, NO_2 and CO) in the ventilation air is accounted for by sampling and analyzing airfilters from the ventilation systems and the ventilation stack.
The emission of radioactivity in the wastewater is accounted for by analyzing the radionuclides and the emission of chemical substances (heavy metals, MAC, EOX and COD) in the treated wastewater.
The limits of emission in air per year permitted by the Dutch authorities are for α-emitting nuclids: $2.5*10^4$ Bq, for ß/γ-emitting nuclids: $2.5*10^{10}$ Bq, non-ionising gasses SO_2: 40 mg/Nm^3, NO_x: 70 mg/Nm^3 and CO: 50 mg/Nm^3.
The limits of emission in water per year permitted by the Dutch authorities are for α-emitting nuclids: $1.5*10^7$ Bq, for ß/γ-emitting nuclids: 10^{11} Bq, non-ionising heavy metals: 0,5 mg/l, MAC: 0,5 mg/l, EOX: 0,1 mg/l and COD: 1100 mg/l.
These limits were during the years 1992 - 1995 never exceeded.
The doserates at the fence of the COVRA-facility are monitored. These measurements are used for the accountancy of the dose caused by COVRA's activities. The contribution to the doses at the fence of the facility (figure 1) was in **1992** ; 0,01 μSv, in **1993** ; 6 μSv, in **1994** ; 8 μSv and in **1995** 6 μSv (**1991** is used as a referencepoint).
The radiological protection of the workers, contractors and visitors of the treatment and storage facility at COVRA are monitored by electronical dosimeters. The doses of the workers of COVRA are also monitored by thermoluminescence dosimeters (TLD). These TLD's are once a month controlled by an Approved Dosemetry Service and the results are reported back to COVRA and the results are also stored in a centralized databank system (NDRIS).
The collective doses of the radiological workers of COVRA in 1992 was 10,5 manmSv (32 man), in 1993 it was 7 manmSv, in 1994 it was 7 manmSv and in 1995 it was 16 manmSv (figure 2).
The collective doses of contractors in 1992 was 4,6 manmSv (3 man) and in 1993 it was 0,7 manmSv (3 man). COVRA made no use of contractors in the

period 1994 and 1995.
During the period 1993 - 1995 approximately 2000 people visited the facility and during those visits a personaldose of 6 μSv was never exceeded (mostly however 1 - 2 μSv).
The radiation protection during collection and transportation of radwaste from the producers is preformed by RPM's of the Health Physics department.
The operators are accompanied by a RPM during treatment and storage of radwaste. The RPM preforms the radiological measurements of the radwaste and is responsible for the radiation protection.
Persons leaving the controlled zone are controlled on α/β contamination and on γ contamination.
A reading device for the electronical dosemeters gives the person a read-out of his personal dose collected during that day.
Twice a year the workers in the controlled zone of COVRA are informed by the radiation protection officer (RPO) of their personal dose .
The RPO is mandated by the license holder COVRA and is responsible for the radiation protection at COVRA.

Figure 1

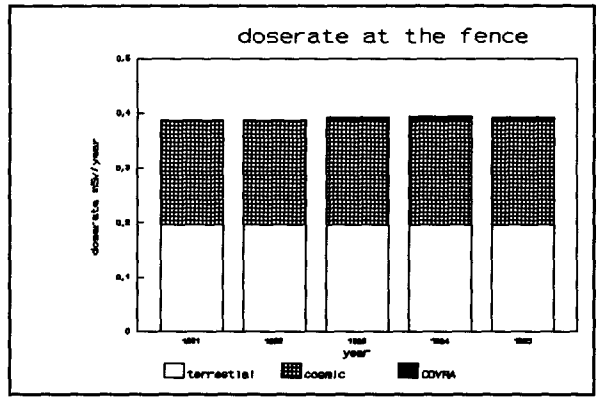

Figure 2