

System and Experiences in the Area of Radioactive Material Seizure Assurance

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Introduction

In recent years, a number of radioactive seizures have been increased (i.e. the materials that contain one or more radionuclides and their activities from the point of view of radiation protection are not negligible). This is mainly due to newly installed technical equipment that monitors metal scrap resp. communal waste during its entry to metallurgical plants and iron works resp. incinerators or waste dumps. Our experience suggests that the majority of events are related to either handling (collection, handling and transportation) the secondary raw material or the use of machines and equipment that are produced from the contaminated metal materials. Among other events materials and equipment that contain radionuclides, but they are usually used in the civil sphere (i.e. ionisation fire alarms, etc), are not negligible especially with connection with seizures in incinerators and dumps.

In compliance with the Act No. 18/1997 Coll. everyone who performs the radiation practices is liable to keep such a level of radiation protection so that the risk to human life, personal health and to the environment shall be kept as low as reasonably achievable taking into account economic and social factors. From the mentioned above it is evident that all the events during which radioactive materials are seized, or if there is suspicion on radioactive material seizure either due to a warning signal from the detection equipment or for a reasonable suspicion based on the other information source, should be subjected to the next analyses.

In the Nuclear research Institute Řež plc. (NRI Řež) was established a working group which provides, among other activities, full system of radioactive material seizure assurance. Part of this service contents also transport, storage, treatment, conditioning and disposal of the seized radioactive source. This service was firstly established for communal waste dump, but other organizations can take advantage of this service not only for the seizures in communal waste dumps.

System of seizure assurance

The system of radioactive material seizure assurance is consisted of the following parts:

1. seizure on stationary detection system,
2. 24 hours emergency service of the working group,
3. event classification, detailed counting a tracking of radioactive source,
4. found radioactive source transport to NRI Řež for storage,
5. radioactive source characterization,
6. seizure evaluation and protocol providing,
7. State Office for Nuclear Safety (further SONS) decree about next procedure.

Stationary detection system (detection gate) is usually installed at the entry to dumps area, metallurgical plants, iron works etc. The detection gate traces changes of vehicle dose rate comparing to the average background by vehicle measurement. If the vehicle dose rate is significantly higher then the average background (usual alarm level is 10-30% above background), the vehicle is postponed by the gate operator and put aside on the determined place. Seizure is announced to the police of the Czech republic and to the SONS.

24 hours emergency service is held for the purpose of an internal emergency plan in NRI Řež, working group is involved in the part of emergency service focussed on the accident during radionuclide source transportation. It consists of the workers, which have licenses for a particular practices in accordance the section 9 of the Act.No. 18/1997 Coll. (execution decree No. 146/1997 Coll. as amended decree No. 315/2002 Coll.). Drives for the seizure are provided firstly in the working hours, only in the exceptional cases (vehicle dose rate exceeding 10 Sv/hour) drives for the seizure are provided 24 hours a day. One or two workers usually provide the drive after phone call activation.

Working group obtains maximum amount of information about seizure material (measured dose rate values on the detection gate, type of the transported material, etc.) from the contact person after activation and on the basis of this information working group leaves with requested measuring equipment and requested amount of workers. Working group provides in-situ radiation situation measurement, event classification and if necessary defines safety (dose rate level above 10 Sv/hour) and if need also dangerous zones (dose rate level above 1mSv/hour). Working group decides whether the vehicle can be released to continue in its transport or to provide detailed counting for tracking of a radioactive source on the basis of all collected dates. The found source is transported to NRI Řež for storage, treatment, conditioning and disposal.

Characterization and description of the seized source is provided in NRI Řež. All these collected information attend to produce seizure protocol, which is sent to SONS.

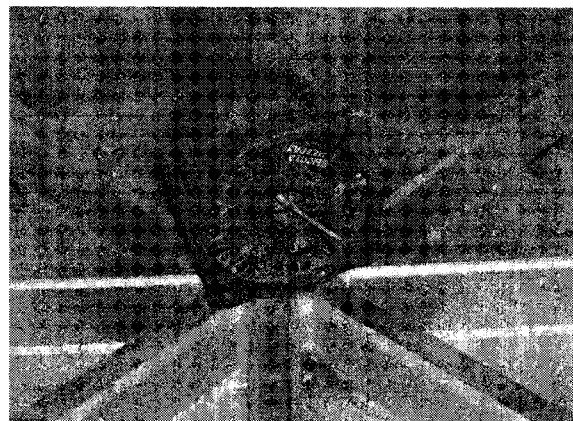
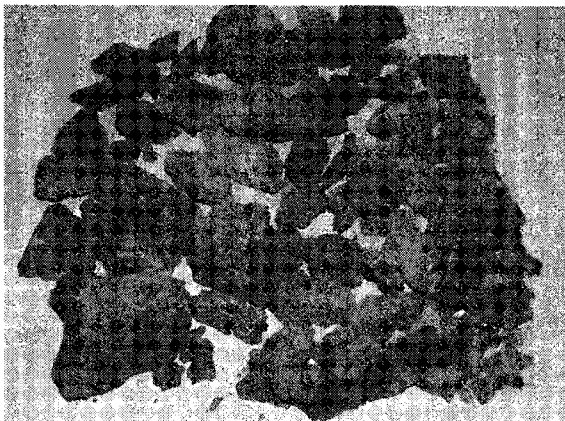
After that, SONS decree about next procedure what can be for example seizure treatment.

Experiences in seizure assurance

The service was firstly established for communal waste dump in Prague in 2003, where stationary detection equipment was installed at that time. More then 50 drives have been realized since 2003, from which 18 cases were natural occurring radioactive material like a structural rubble, sand etc. In the rest cases, there were found a radionuclide source.

Typical examples of the seized radionuclide sources are: military devices coated with ^{226}Ra and miscellaneous minerals from personal collections, fire detectors with ^{226}Ra and ^{241}Am removed during building reconstruction, medical materials contaminated by artificial short-lived radionuclides, etc.

Figure 5: Seizure of the minerals (with uranium) Figure 6: Example of the seized military device



Literature

1. Act No. 18/1997 Coll., Atomic Act.
2. State office for nuclear safety, Radiation protection – Recommendation – Procedure for radioactive material seizure, SONS Prague 2002
3. Publication IAEA, INES: The international Nuclear Event Scale (1992)