

**Training Activities on Radioactive Waste Management at Moscow SIA “Radon”:
Experience, Practice, Theory - 8164**

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ABSTRACT

Management of radioactive waste relates to the category of hazardous activities. Hence the requirements to the professional level of managers and personnel working in this industry are very high. Education, training and examination of managers, operators and workers are important elements of assuring safe and efficient operation of radioactive waste management sites.

The International Education Training Centre (IETC) at Moscow State Unitary Enterprise Scientific and Industrial Association “Radon” (SIA “Radon”), in co-operation with the International Atomic Energy Agency (IAEA), has developed expertise and provided training to waste management personnel for the last 10 years.

The paper summarizes the current experience of the SIA “Radon” in the organisation and implementation of the IAEA sponsored training and others events and outlines some of strategic educational elements, which IETC will continue to pursue in the coming years.

INTRODUCTION

Moscow “Radon” is the main organisation of the Regional system for radioactive waste management from non-nuclear applications in the Russian Federation [1]. The SIA “Radon” is responsible for radiation safety of the Central part of the Russia with almost 40 million inhabitants. For improvement of the existing waste management practices it is required the qualified staff for efficient and safe operation of waste management facilities. The key personnel of the SIA “Radon” pay particular attention to education and training of not only own employees but specialists of regional system with the same name “Radon” operating within the country since 60-s.

The International Education Training Centre (IETC) at Moscow State Unitary Enterprise Scientific and Industrial Association “Radon” (SIA “Radon”) [2], in co-operation with the International Atomic Energy Agency (IAEA), has developed expertise and provided training to

waste management personnel for the last 10 years. Some of IETC activities were previously described in WM Conference proceeding in 1999, 2002, 2006 and in 2007 [3-7].

After ten years IETC activities it is interesting to say some words about the paper's title. Nobel Prize Laureate Peter Kapitsa, an outstanding Soviet physicist who discovered the superfluidity of He, published in 1974 a book entitled "*Experiment, Theory, Practice*" [fig.1]. This book has been published in English in 1980. He discussed about the scope of scientific work and the role of the Scientist-organizer; assimilating the achievements of science and technology; theory, experiment and practice; the efficiency of scientific work; questions about the organization of training and management. What is the first important issue in education and training? Experiment or theory? We decided that the logic follows the row: experience, practice, theory. Then again experience, practice, theory ...



Fig.1. Peter Kapitsa and his famous book "Experiment, Theory, Practice"

EXPERIENCE, PRACTICE, THEORY

Experience

The SIA "Radon" has an almost 25 years experience in training of national specialists in the field of radioactive waste management including pre-treatment, treatment, conditioning and storage of radioactive waste. These training activities are carried out jointly with the Lomonosov's Moscow State University. During this long period a variety of training programs in the scientific fundamentals, applied research and in practical operational areas of the all pre-disposal activities of the radioactive waste management were realised. Since 1997 this system was upgraded to internationally accepted requirements. It now acts as the International Education Training Centre (IETC) of Moscow SIA "Radon" under the guidance of the IAEA [1]. The IAEA supported a large number of specialized regional training courses and workshops, fellowships, in addition on-the-job training and scientific visits are additional means to assure development of personnel capabilities.

During 10 years more than 350 specialists from 32 European and Asian countries, sponsored by IAEA, have increased their knowledge and skills in radioactive waste management.

Practice

The training provided by IETC, applies various approaches to transfer sound waste management experience to individuals sponsored by the IAEA and national specialists. The specialized regional training courses were organised by providing training activities under two general modules either on technology or safety. Each of these modules were designed with the specific objectives and directed to different audiences.

The first experiment with a joint, e.g. on both technology and safety training programme which was a combination of the two above modules, took place in 2006. This Training Course was supported by both the IAEA Waste Safety and the Waste Technology Sections. Particular attention was given to the transfer of knowledge from the experienced Moscow “Radon” personnel to young individuals from the IAEA Member States [6].

The IETC Activities for 2007 are given in the table 1, more details are described below.

Table 1. IETC activities which were held in 2007 under sponsorship of IAEA

The title	Duration	Number of attendees	Member States	Responsible section of IAEA
1. Regional training course on radioactive waste management – predisposal technologies	2 weeks (May-June)	12	Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Lithuania, Moldova, Tajikistan, Ukraine, Uzbekistan	Waste Technology section
2. CRM on behaviour of cementitious materials in long term storage and disposal of radioactive waste	1 week (September)	20	Australia, Belgium, Brazil, China, Czech Republic, Finland, France, India, Italy, Republic of Korea, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and United Kindom	Waste Technology section
3.Regional Workshop on Safety Assessment Driving Radioactive Waste Management Solutions	1 week (October)	12	Belarus, Russia, Serbia, Ukraine	Waste Safety section
4.Regional training course on the development of a national workplace monitoring programme by Member States	2 weeks (November)	22	Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Estonia, Kazakhstan, Kyrgyzstan, Lithuania, Moldova, Poland, Russia, Tajikistan, Ukraine, Uzbekistan	Waste Safety section

1. In May-June IETC hosted the IAEA Regional training course ***on radioactive waste management – predisposal technologies***. The target audience was 12 young operators that might actually need an overall training on waste management technologies as well as practical demonstration of these technologies. This was a modest approach partly due to the limited funds of TC project but also to limitation of Moscow SIA Radon to handle large number of people on training while the regular activities were going on. The syllabus of the new training course was designed for operators of waste facilities to obtain information on the best operational practices, technologies and solutions for common problems in the region.

The participants were operators of waste processing or storage facilities, responsible for organisation and implementation of waste management practices including radioactive waste collection, handling, characterization, treatment, conditioning and storage of Low and Intermediate Level Radioactive Waste, and management of spent sealed radioactive sources.

The two-weeks training programme was implemented in accordance with the schematic of basis waste management stages (Fig.2). The training was based on the standardized IAEA training material: “Technical and Organizational Aspects of Radioactive Waste Management”, published by IAEA in 2005 in Russian. The training programme consisted of theoretical lectures on waste management technologies provided by lecturers from the IAEA, which were delivered in addition to the published training material based on numerous published IAEA technical documents (TECDOCs), and by practical lectures provided by lecturers from Moscow SIA “Radon”, which were accompanied with training and demonstration of technologies involved.

Some of IAEA training activities at IETC (practical and theoretical exercises) are shown in Fig.2.

2. The first Research Coordination Meeting (CRM) ***on behaviour of cementitious materials in long term storage and disposal of radioactive waste*** was held in Radon in September 2007. The purpose of this meeting was to identify the objectives of individual projects and to justify individual R&D programmes for the future work in the framework of the coordinated research project (CRP). The capabilities of individual institutions and the availability of resources and facilities for implementing individual project was evaluated. The work plan for implementation of CRP was discussed and adopted by representatives of Member States.

3. The Regional Workshop ***on safety assessment driving radioactive waste management Solutions*** was designed for the use of Moscow “Radon” radioactive waste treatment, conditioning and storage facilities as a test case for the development of the SADRWMS methodology and Safety Assessment Framework (SAFRAN) software tool. The purpose of the workshop was to provide operators of centralized facilities for treatment, conditioning, and storage of radioactive waste, as well as regulators of such facilities, with fundamental knowledge and training on the SADRWMS safety assessment methodology and SAFRAN software tool.

The workshop was addressed international standards on safety assessment for predisposal management of radioactive waste.

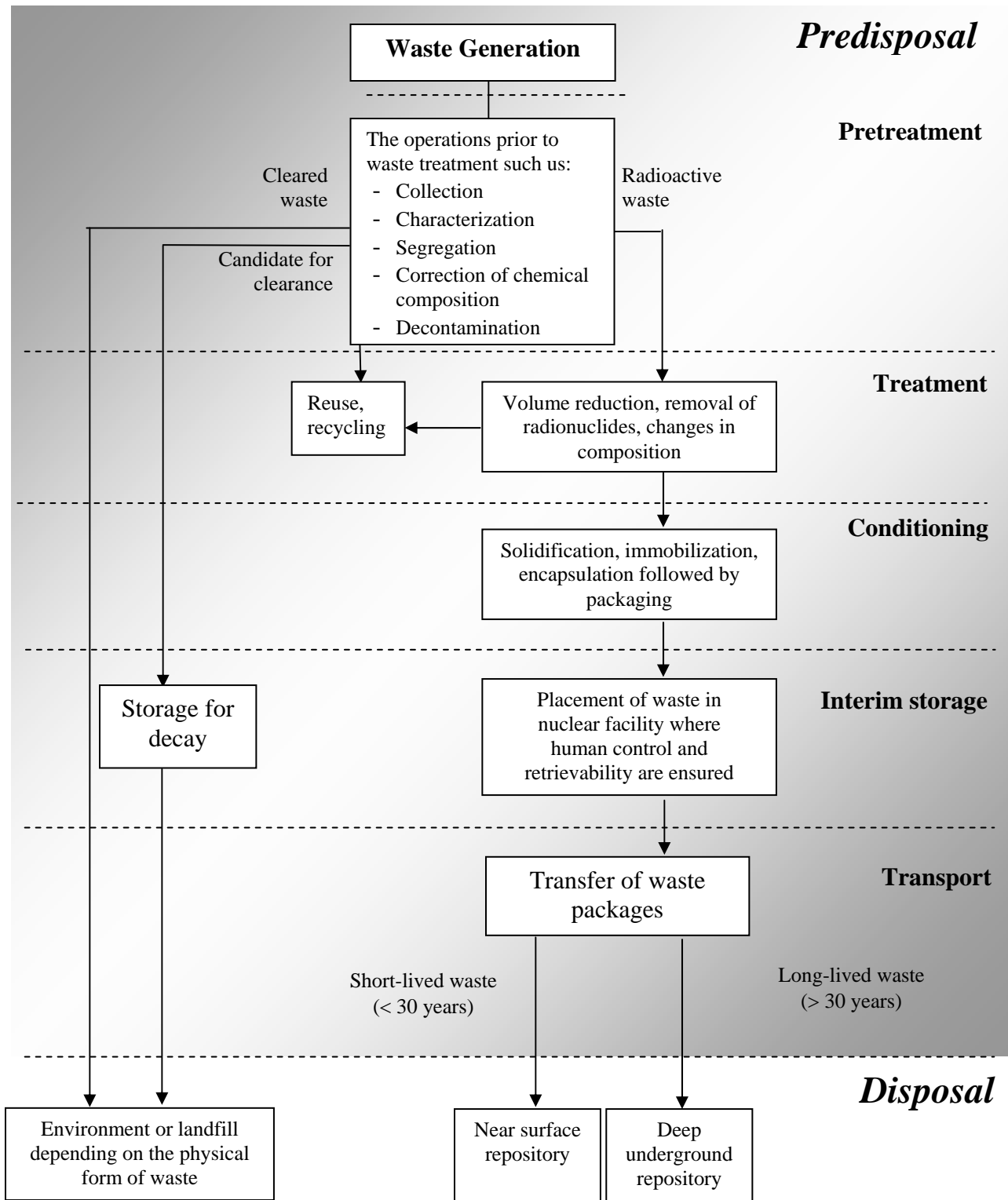


Fig.2. Schema of basis waste management stages

The Workshop involved the following issues:

- a) lectures on safety requirements for treatment, conditioning, and storage of radioactive waste;
- b) site visits to the Moscow City Radon Scientific Production Association installations;
- c) presentations and discussions of national experience on licensing, regulating, and operating predisposal radioactive waste management facilities;
- d) testing of SADRWMS safety assessment methodology and SAFRAN software tool; and
- e) panel discussions of key issues identified as important within the scope of the Workshop.



Fig. 3. Some pictures from practical and theoretical exercises, IAEA Training Course, 2007

4. The new IAEA regional training *course on the development of a national workplace monitoring programme by Member States* was held in November 2007 jointly with Scientific Production Company “Doza”. The purpose of the Training course was to provide the participants with the fundamentals as well as the practical techniques essential for the establishment and implementation of a national workplace monitoring programme in full compliance with the principal IAEA requirements. Areas were covered include principal concepts, methods and equipment used for implementing workplace monitoring programme in nuclear, medical, industrial, etc, facilities using radiation sources in their practices. 21 attendees from 12 Member States including the staff of the regulatory bodies, end-users, service providers, and other professionals participated in this event. The training course consisted of lecturers and practical exercises. The structure of the course was based on three chapters covering the radiation dose rates measurements, the surface contamination measurements and the airborne contamination measurements. General principles of measurements, as well as of quality management were also provided at the beginning of the course. Exercises and measurements techniques and procedures were complete the theoretical approach.

Theory

The main objective of training activities is to demonstrate to Member States the radioactive waste management methods and procedures which are documented in IAEA technical reports and that are in agreement with international accepted standards and criteria. Organization and implementation of IETC training activities are useful for SIA “Radon” and other R&D organization to promote there technological achievements. For example, due to training in IETC many international projects were initiated and realised including developing and commissioning of radioactive waste treatment facilities, expertises of technical documents, and provision of technical expert assistance to Member States.

The efficiency of training at IETC was systematically analysed using the structural adaptation of educational process as well as assessing factors, which have influenced on education quality. Social-psychological aspects were also taken into account in assessing the overall training efficiency. Based on its efficient training one of the main tasks of IETC became preparation of textbooks, technical manuals and guidance documents for trainees in collaboration with colleagues from Nuclear Technology Education Consortium (NTEC), UK [8] (fig.4).



Fig.4. Published books by IETC specialists for trainees.

CONCLUSION

This report outlines the main lessons learned during training activities of the International Education Training Centre (IETC) of Moscow SIA “Radon” under the guidance of the IAEA. The training based on standardized training packages can be done in many other different ways and places, and can be adjusted to fit the needs of the end-user.

The training material can be adjusted to the level of training required for unskilled labour force to understand the fundamentals of waste management to the level of management professionals that are foreseen as a managers or key operators of the waste facilities, that may require deep knowledge to either operate, or provide for design changes of the existing facilities, or provide for selection of the technologies. The basis is there so that the training material can be modified for practically any particular need;

The training modules can be adjusted to fir the need of end-user (e.g. sealed radioactive source management may not be required for waste streams arising from NPP; or incineration theory is not of the interest to some end-user that is not dealing with incineration);

Training and practical demonstrations of the waste management principals and technologies in this current outline can be used to train the trainers from two to four weeks combination of theoretical and practical courses, who can then deliver the training required to the much wider population of the labour force;

Then again experience, practice, theory...

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