THE NEUTRONIC CALCULATION AND OPTIMIZATION OF SCHEMES OF STORAGE SPENT NUCLEAR FUEL

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Today the improving of efficiency of nuclear power is the result of the decision of two basic problems. The first one, it is recovery of uranium from spent nuclear fuel and return it to the nuclear fuel cycle. The second problem is the increase of burnup of usual fuel and new types of fuel compositions such as (Pu, Th)O_2, (U, Pu)O_2, UC / (U, Pu)C, UN / (U, Pu)N [1-3]. The solution of these problems, in turn, leads to an increase in the volume of spent nuclear fuel, the complexity of ecological conditions, nuclear and radiation hazards of existing reactors and reactor facilities of the new generation. Nowadays in Russia there is one vexed problem, it is storage of spent nuclear fuel (SNF) of uranium-graphite reactors and others reactor facilities whose fuel is not reprocessed and stored in the intermediate-storage pools in Nuclear Power Plant [1].

In this work, the conceptual approaches and features of exploitation of technical systems of «dry» storage of spent ceramic nuclear fuel after thermal reactors are considered. The results of numerical studies aimed at determining the neutron-physical and radiation characteristics of spent ceramic nuclear fuel. The studies will allow to develop technical and regulatory solutions when handling perspective spent fuel of new generation reactor facilities. [1-3]. On the basis of numerical studies it's possible to create the safe circuits of layout and permutations of spent nuclear fuel in systems of conservation and transportation, if it is necessary, to develop technological regulations of removal from service of these systems including the possible dismantling and disposal of individual nodes. The study was supported by grants of the President of the Council of the Russian Federation. Competition for the scholarship of the President of the Russian Federation for young scientists and graduate students. Grant number SP-295.2015.2.

REFERENCES

1. Stroganov A.A., Kyriyndin A.V., Anikin A.Y. Analysis of the compliance of the Russian and international regulatory framework for the regulation of safety during transportation of radioactive materials and spent nuclear fuel // Nuclear and Radiation Safety. – 2011. – № 3. – P. 23–25.
2. Shamanin I.V., Bulanenko V.I., Bedenko S.V. The field of neutron radiation of ceramic SNF of different types // News of high school. The nuclear power engineering. – 2010. – № 2. – P. 97–103.
3. Bedenko S.V., Gnetkov F.V., Kadochnikov S.D. The dose characteristics of neutron fields of ceramic nuclear fuels of different types // News of high school. The nuclear engineering. – 2010. – № 1. – P. 6–12.
4. Bedenko S.V., Plevaka M.N., Knyshev V.V., Savasichev K.A. The study of neutron-physical characteristics of perspective ceramic spent nuclear fuel and optimization schemes it's storage // Abstracts of the V International School-Conference of Young Nuclear Workers of Siberia. – 2014. – P. 78.

CREATION OF AUTOMATED TRAINING SYSTEM OF CONTROL AND ACOUNTING OF NUCLEAR MATERIALS

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In the world, considerable efforts are made to ensure safe handling with nuclear materials (NM). Besides, safe handling is aimed at ensuring safety and continuity of knowledge on nuclear material. This implies three main

components of safe handling: physical protection, control and accounting of nuclear materials.

The main purpose of the activities on accounting and control of nuclear materials - providing the enterprise with the possibility of determining available amount of nuclear material, as well as providing with necessary information to compile, register and keep records and reports in the enterprise. In addition, properly organized control and accounting (C&A) system of NM should contribute to the prevention of loss of nuclear material, as well as its theft and unauthorized use and movement [1].

In C&A of nuclear materials, information technologies occupy a special place. The amount of information on nuclear material which must be collected, processed, stored and used in procedures related to accounting and control requires the use of modern computer technologies. In parallel with the creation of these blocks we were working on the developing of a laboratory course in two directions – bar coding and databases in computerized system of accounting and control of NM.

Thus, by now, the following results of the work have been achieved:

– Database showing the main functions of the system of accounting and control of NM has been designed.

– For a training laboratory a training system of automated data collection has been created, which helps demonstrate the operation of the system of accounting and control on a conditional enterprise.

– A number of laboratory works have been developed in two directions - bar coding and databases in computerized system of accounting and control of NM.

Further, it is proposed to develop the block “Physical inventory”, namely the study of methods and procedures for physical inventory, control methods of nuclear materials, as well as the development of methodological recommendations for the use of the training system.

REFERENCES

1. The Black and White Solution: Bar Code and the IBM PC – Russ Adams and Joyce Lane, Helmers Publishing, ISBN 0-911261-01-X, p. 169.

THE APPLICATION OF IDENTIFICATION METHODS IN SECURITY SYSTEMS OF NUCLEAR FACILITIES

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To fulfill the requirements of nonproliferation of nuclear material (NM) at a nuclear facility (NF), it is necessary to implement activities designed to ensure physical protection of nuclear materials (NF), nuclear installation (NI) and storage facilities (SF). Proper organization the pass regime is the basis of the physical protection system. It is a combination of organizational-legal restrictions and rules, establishing the procedure for crossing check points on the borders of protected zones, as well as separate buildings and premises of facility personnel.

The mechanism for the implementation of the CRC is based on the application of the relevant prohibitions and restrictions in relation to subjects crossing the borders of protected objects, to ensure the safety of nuclear facilities. Such a mechanism should be obliged to conform to norms and rules of physical protection of NM, NF and SF [1].