RADIATION PROTECTION TRAINING AT VASIL LEVSKI NMU AND NRU "MOSCOW POWER ENGINEERING INSTITUTE"

ОБУЧЕНИЕТО ПО РАДИАЦИОННА ЗАЩИТА В НВУ „ВАСИЛ ЛЕВСКИ" И НИИ МЭИ

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Abstract: *The article reviews the main sources of ionizing radiation that are most common in our everyday life. The impact of some radioactive isotopes on the surrounding environment and living nature is shown. The curricula for radiation protection at the two universities are analyzed and the general issues and specificities specific to each specialty are shown.*

Keywords: *radiation protection, radiation safety, traning, teachers, university, atomic energy, curriculum, lesson, theme*

1. Introduction

Radioactivity is one of the greatest discoveries in the newest history of mankind. In 1896, shortly after the discovery of X-rays, the great French physicist Henri Becquerel, studying the phosphorescent properties of various chemical compounds, began an experiment with potassium uranium sulphate. The essence of the experience was that, after exposure to daylight, the mineral, well wrapped in light-tight black dense paper, was inspected a little later if it phosphorescent. The astonishment was great when the silhouette of the mineral emerged under the influence of strong radiation with great penetrating ability on the photoemulsion. Thus, the presence of new urinary bears called Becquerel was found. The phenomenon itself is called after several years by the Polish physicist and chemist Maria Curie radioactivity.

This new discovery quickly finds application and the first devices that use these beams for visualization and diagnostics are created, which leads to the rapid development of medical research. Subsequently, in the early twentieth century, in the troubled years characterized by numerous regional conflicts that led to the First World War, advanced and modernized X-ray apparatus led to increased accuracy of diagnostic activity and allowed to save hundreds of lives among the warring and peaceful population.

At the same time, X-rays and radioactive beams are also a serious environmental pollutant with an extremely strong impact on the vital and physiological activity of humans and other living organisms, ranging from positive stimulation to killing, depending on the dose absorbed.

All of this is all the cause of the perturbation of the various natural and anthropogenic, terrestrial and cosmic sources of ionizing radiation, ie. in particular in the natural and manufac- tured environment. Ionization beams accompany the life of the planet in various areas of concern at all stages of the world. They are an integral part of our existence because, as we all know, the largest source of light and heat in our universe is the sun, and there is a continuous thermonuclear process and we reach the gamma rays that determine the natural radioactive background in the Earth's atmosphere.

2. Development of radiation protection

2.1. State of Radiation Safety

Immediately before and during the Second World War, laboratories at various points of the planet were working extremely hard on artificial radioactivity and its use for military purposes. For the first time in the world, the United States, Russia (former USSR), France, the United Kingdom, China, and other nuclear weapons have been expanding their efforts in the field of nuclear power and atomic endeavors. the problem of contamination of the soil is warranted. Slow over-the-air explosion produces products that protect against pollution, droughts, infestations, living, animal, food products, and so on. Similarly, in the case of underwater and underground nuclear experiments, the water, the earth's surface crust, the animals and the plants that inhabit these layers are polluted.

The importance of these new human-induced problems arising from radioactive contamination requires the emergence of many new sciences that integrate and investigate various aspects of contaminants with radio-nuclides, emerging and emerging new disciplines and approaches. Scientists and experts from many countries and non-governmental organizations have made enormous efforts to limit the consequences of nuclear tests and accidents.

Even before the creation of the atomic bomb and the emergence of the nuclear industry, the pollution of the environment with radioactive substances began. The harmful impact of radiation on living organisms and humans was not known at first, and its discoverers were one of the first victims. At the dawn of the nuclear age, as with almost all major discoveries, the public did not have the necessary information about this activity because of the secrecy of nuclear production, and it was not possible to accurately assess the impact and magnitude of that pollution.

Nowadays, modern biotechnologies have been developed in a number of countries where, with the help of special algae, uranium is extracted and concentrated in their biomass and thus water is cleansed.

The first serious environmental and soil pollution caused by human activity is that in Japan, dated August 6-9, 1945. Above the Japanese cities of Hiroshima and Nagasaki, with no special military necessity, the Americans throw the first atomic bombs in the history of mankind. Previously, a nuclear experience has been made in the Nevada desert, for which there is hardly any information in the public domain. The era of the atomic race began, including the former USSR, France, Britain, etc., and the number of nuclear states today is over 20.

Of course, the pollution of the environment and the soil with radioactive substances is also increasing with the emergence of the nuclear industry. This was not known at first, and there was a lack of reliable information on the negative impact of radiation on the environment and humans due to insufficient theoretical and field studies and the secrecy of production, was not an opportunity to accurately assess the amount of this pollution, environmental and social damages caused by it.

For a long time, due to lack of information, it was considered to be relatively limited, local and not very dangerous. Later it was found that the various stages of production of uranium fuel (open or closed mines, hydrometallurgical production and uranium concentration, purification, enrichment, etc.) is possible to "enrich" the environment with uranium radionuclides and especially with radon (radon-222). The waste from the major hydrometallurgical plants was first discharged without purification and sufficient additional treatment in the nearest water bodies and, when irrigated, polluted the agricultural areas and the plants grown on them. Only about 50 years ago it is recommended that uranium-contaminated and other radioactive products lead to the agricultural areas and the plants grown on them. Only about 50 years ago it is recommended that uranium-contaminated and other radioactive products lead to

the cultivation of special crops that can extract and concentrate uranium and purify water, and indirectly protect the soil from radioactive contamination.

Of course, the most radioactive contamination of the environment and soil after the Chernobyl accident, Ukraine (former Soviet Union) on 26.04.1986, Trimail Island - USA - 1976; Fukushima, Japan - March 2011 and other minor nuclear accidents and accidents.

Local pollution of the environment and soil was also described in Spain in 1966, as a result of a collision in the air of a nuclear-carrying aircraft with a tanker. Radioactive substances from the unexploded nuclear device were scattered over an area of several thousand hectares. 990 tonnes of soil was buried and buried in tombs for radioactive substances in South Carolina, USA. These and a number of other known and unknown cases indicate that in the current armament, despite the high degree of certainty, the risk of nuclear pollution in vast territories actually exists, even in relatively peaceful times and quiet regions.

2.2. Study of radiation safety

In the aftermath of the major accidents in Chernobyl and later in Fukushima, more attention has been paid to the need to train specialists whose main task is preventive action to prevent radiation accidents and mitigate the consequences of their eventual occurrence. Increasing influence is being given to the prevention of work with sources of ionizing radiation in more and more sectors of the economy, healthcare and related activities. A special place is also devoted to possible terrorist acts in which sources of ionizing radiation and various radioactive isotopes can also be used. This would affect all inhabitants of a region, continent or larger territory of our planet without being interested in nationality, religion, gender, race or other distinctive features of people.

From this point of view, in many military, specialized, technical or other higher education institutions, the study of radiation protection is considered as a discipline or as a module of discipline. One-sidedly, the particular higher education institution respects the content of the studied material with its specificity and with the specialties under which it teaches. The content of the course includes the basics of ionizing radiation for the relevant area of the economy, which are in accordance with the knowledge of the students. Preventive measures and the mechanism of action to prevent incidents and what should be done to reduce the effects of exposure are also studied.

Because of the autonomy of higher education institutions, each has the right to determine independently the content of curricula in different curricula. That is why the paradoxical situation sometimes leads to the trainees of the same specialty, to study fundamentally different things on the same or similar discipline of the curriculum of the same accredited specialty.

I will study and compare the curricula for the subject of radiation protection at the National Military University "Vasil Levski", Veliko Tarnovo, Bulgaria and the National Research Institute "Moscow Energy Institute", Moscow, Russian Federation. Although the two universities train specialists in different specialties and work on their own curricula that meet the requirements of Bulgaria and Russia, there are common moments in the training in this field. This must be because the problem of protection against ionizing radiation is the same in all parts of the world, and humanity is responsible for both the state of the radiation background at that moment and how we will leave our planet to future generations. Just radiation protection is viewed from a different angle and is broken through the prism of the specifics of the training in different specialties and the application of the prepared staff for the respective branch of the economy.

In the NMU "V. Levski "course is taught in 4 years at the Bachelor's degree in the specialty" Protection of the population from disasters, accidents and catastrophes "with 60 lessons of lessons, 24 of which are lectures and 36 exercises. The subject "Radiation accidents and radiation protection" is studied in 7 semesters of students and students of this specialty only. It is made up of 2 modules: Radiation accidents and radiation protection. Students have previously studied the principle of obtaining and impacting ionizing radiation in the disciplines "Nuclear Physics", "Metrology of Ionizing Radiation" and "Dosimetry", and are familiar with the physical foundations of these rays and their impact on man and living nature. Due to the specificity of the university, this problem has been partially addressed in other disciplines as well. Greater attention is paid to the assessment of the actual situation when changing the radiation background as a result of an accident or accident mainly in the NPP.

In our MPEI, the discipline "Radiation Safety" is studied by the students in the Department of Engineering Ecology and Safety at the fourth degree of baccalaureate. Here the class is 48 hours, of which 40 lectures and 8 exercises. From the point of view of the priority training in the institute, the course starts from the basics of obtaining the ionizing radiation, because the students have not previously undergone other similar disciplines. Their knowledge is based on what has been learned in the Physics course in the first and second courses. The content of the program is aimed at the students' acquisition of knowledge, skills and habits at the level necessary to carry out activities related to the use of atomic energy in accordance with the requirements of the controlling state authorities Rosophenadzoror and Rostehnadzor. The whole course is also divided into two modules - radiation safety and radiation control. Both the theoretical foundations of the questions and the practical actions required in the respective enterprises or organizations are presented.

In both universities, the main normative acts to be met by ionizing radiation activities in Bulgaria and Russia are considered in the course and the international legislation in the field under consideration is also considered. Despite the differences in some regulations, there is generally a great deal of proximity in the basic regulations in both countries. This can not be otherwise, because this activity of mankind can not be seen in isolation in any country, and the actions taken must be coherent. It is important to mention that Bulgaria is subordinate to the IAEA branch with the Moscow Center in the International Agency for the Use of Atomic Energy for Peaceful Purposes, and for any change in the radiation situation we report to the IAEA the Russian capital. In both curricula, an appropriate place is given to national legislation in the field of radiation safety and radiation control, broken down through the specif The main objectives for both programs have many common points and can be formulated as acquiring knowledge about the organization of the production radiation monitoring, the fulfillment of the requirements for radiation safety in the nuclear power plants and in the enterprises and organizations using sources of ionizing radiation, the study of the regulatory and the technical documentation and regulatory requirements for handling radioactive substances, radioactive waste. Obtaining skills for working with dosimetric and radiometric equipment and measuring instruments and assessment of the current radiation situation are among the tasks assigned to the training.

In each of the courses, the use of nuclear energy is studied according to the country's economy. Bulgaria focuses on nuclear power plants and military applications, while in Russia, the use of nuclear submarines, atomic ice breakers, uranium processing plants, underground experiments, other types of nuclear reactors, and other applications of nuclear energy in the Russian economy are being explored in Russia. The use of nuclear energy in Russia is on a much wider scale and therefore the applications involved are in large volumes and scale.

The primary objective of the discipline at the NII MEI is to increase the students' ability to apply their knowledge to predict the radiation situation in order to ensure the safe and efficient performance of work with sources of ionizing radiation. It is achieved by:

1. Definition of the scope of work on the organization of industrial radiation monitoring of a predetermined facility or plant.

2. Development of activities and events in the event of an emergency in an enterprise.

3. To be able to draw up a management plan for the state of radiation safety in an enterprise, to specify the rights and responsibilities of those responsible.

4. Develop a justification as well as a list of specifications and technical, managerial and methodological documents and instructions necessary for organizing radiation safety at the plant.

The aims of the course "Radiation Accidents and Radiation Protection" are similar in the "B. Levski ", because of the character of the university, the students should also recognize the need for knowledge on the basic principles of radiation protection and the peculiarities of the damaging factors of the radiation accidents necessary to protect the population and economy of the country.

During the training at both universities attention is paid to the complicated international environment and the presence of many terrorist organizations in all parts of the world. This can not be bypassed by our two countries, and a brief overview of the possible terrorist attacks with radioactive materials and their consequences for humanity is made in the disciplines under consideration. Although this aspect of the development of the world over the last decade has been seen in a small volume.ics of the training in the respective majors.

3.Conclusions:

1. Radiation safety training is necessary in view of the current international environment. Upon passing, learners acquire basic knowledge, skills and habits for action in changing the radiation environment as a result of an accident, accident, terrorist act or otherwise.

2. The training at the "Vasil Levski" National Military University and the NRU "Moscow Power Engineering Institute"is carried out according to established programs, in compliance with the specifics of the educational institution and the curricula. There are many common points in the curricula and, to a great extent, they overlap, taking into account the current requirements and regulations in Bulgaria and Russia.

3. After passing the course, students acquire skills and knowledge to study the radiation situation, handle basic dosimetric quantities and can independently assess the radiation situation.

4. It is possible to cooperate between the two universities and to improve teachers in close disciplines by exchanging and jointly developing programs in close learning disciplines.

4.Literature:

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