

**NUCLEAR KNOWLEDGE MANAGEMENT SYSTEM**

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**СИСТЕМА УПРАВЛЕНИЯ ЯДЕРНЫМИ ЗНАНИЯМИ**

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***Аннотация.** На сегодняшний день, одной из актуальных проблем атомной промышленности является сохранение ядерных знаний. Одной из заинтересованных сторон в данной проблеме являются высшие учебные заведения. Управление ядерными знаниями в университетах имеет немаловажную роль. Данная работа описывает опыт применения системы управления ядерными знаниями, на примере Национального исследовательского Томского Политехнического Университета.*

The problem of knowledge loss is the issue of the present day in all types of industry. Special attention should be paid to nuclear industry. Nuclear energy technologies have a long life cycle, an obvious example is a nuclear power plant. Designing of a nuclear power plant takes at least ten years; its construction is also a long-term process, which needs the required knowledge and past experience. The next step is operation of nuclear power plant and the last one is shutdown. The whole process requires fixing the stored knowledge in the process of operation and in addition, it requires build-up and improvement of knowledge. For example, Fermi identified the concept of fast reactors development in 1944. In 1946, an experimental plutonium-fueled reactor was created (Climentina, USA). To date, over twenty experimental and development fast breeder reactors have been created, the first industrial prototypes of fast power reactors, cooled by liquid metal (sodium), are in operation: in Russia (BN-600), France (PHENIX). These facts required knowledge transfer to the next three generations of researchers. Countries, which had no knowledge transfer of fast neutrons reactors technologies and closed nuclear fuel cycle, lost this knowledge considerably. The losses of experience and knowledge are not just economic losses. It is full-on scientific and technology disaster causing losses of skilled workers, strong system of higher education, research and trial facilities, generation of young researchers. It may take decades for the government to recoup the losses.

Often, the knowledge and experience of past years have not been documented. A variety of factors, such as aging of employees, decline of technological skills and loss of know-how, potential reduction in the safety and feasibility of innovation potential disappearance can be the reasons for the loss of nuclear knowledge. With reference to the above subject matter, nuclear knowledge stakeholders such as governments, international

organizations, and industry have a vigorous activity in the development of knowledge management. It includes strategies and programs to collect, exchange, store and transfer information to new generation.

Incidentally, knowledge management is needed to be applied to academic institutions too. Knowledge management formation in National Research Tomsk Polytechnic lets provide us with an access to legacy of the past, present and future of nuclear industry.

The IAEA nuclear knowledge management activities assist in transferring and preserving knowledge, exchanging information, establishing and supporting cooperative networks, and training next generation of nuclear experts. These activities in assisting Member States in the preservation and enhancement of nuclear knowledge and in facilitating international collaboration have been recognized by the General Conference of the International Atomic Energy Agency. Much work has been done by the IAEA in addressing the knowledge management needs of different nuclear organizations [1].

Experience of other international organizations, not just in nuclear industry, shows there are no universal systems of knowledge management for any kind of organization. Every system has unique elements, tools and technologies. All knowledge systems are developed according to the purposes of a company, type of activity and specificity of company's knowledge. For the moment, the concept of knowledge management is integrated in developed global scale companies. This can be exemplified by Siemens AG, in which the information exchange system ShareNet29 started operating in Siemens Information and Communication network (ICN) in 1999 [2]. The next example is Skanska Group, which has IT-platform called Skanska Knowledge Network [3]. Skanska Knowledge Network helps corporate employee to find necessary information in in-house database. The example of application of nuclear knowledge management system is Canadian project CANTEACH [4]. This knowledge repository provides high quality technical documentation relating to the CANDU nuclear energy system. The CANTEACH Project aims to provide an information exchange network for people interested in the CANDU energy system. Contributors are industry experts, who hold valuable knowledge and experience in diverse aspects of CANDU technology and its applications, and unique expertise in the areas of science and technology, nuclear power design and construction, project management and development of engineering tools [4].

Consequently, one of the main points of successful usage of stored knowledge is systematization and management. Nuclear industry needs individual approach for integration of knowledge management system.

National Research Tomsk Polytechnic University (TPU) is one of the leading nuclear universities of Russia. Today TPU consists of twelve institutes, thirteen management units and has its own nuclear reactor. Also, the university is included in association of consortium of main academic institutions of Rosatom State Atomic Energy Corporation (Rosatom). Rosatom is integrating nuclear knowledge management system in all branches of company. TPU with such a complex organizational structure has the significant knowledge and information flow. This flow needs to be managed. The goal of the present work is to investigate the Rosatom's experience in creating nuclear knowledge management system and, as a result, integrate this system in the Institute of Physics and Technology (IPT). The introduction of the concept into the structure of the Institute will provide access to the existing legacy of nuclear expertise, ensure the transfer of knowledge to a new generation, and will fill the gaps emerged in connection with the loss of nuclear knowledge. Scientific and technical information portal of IPT has the form of library, which collects all scientific researches, projects, IPT employees and students' publications; in addition, it consists of work experience of last generations. All this information is available for both employees and students, thereby reducing the time for information search.

By means of a web-browser users connect to the portal and can perform the following actions: view information collections; add, edit and delete the items in information collections; perform a full-text, attributive search, and a search using the industry classifier or the thesaurus; create permanent thematic queries; use the "Calendar of scientific and technical activities".

Home page includes general information about this project, a news portal, and materials of knowledge management system with operating manual and history of the project. One can also find contact information, and technical support line, where users can seek the advice of the portal content administrators and technical experts on the issues related to the preparation of the documents and their posting on the Scientific and Technical Information portal. Portal includes nine information sections (fig. 1).

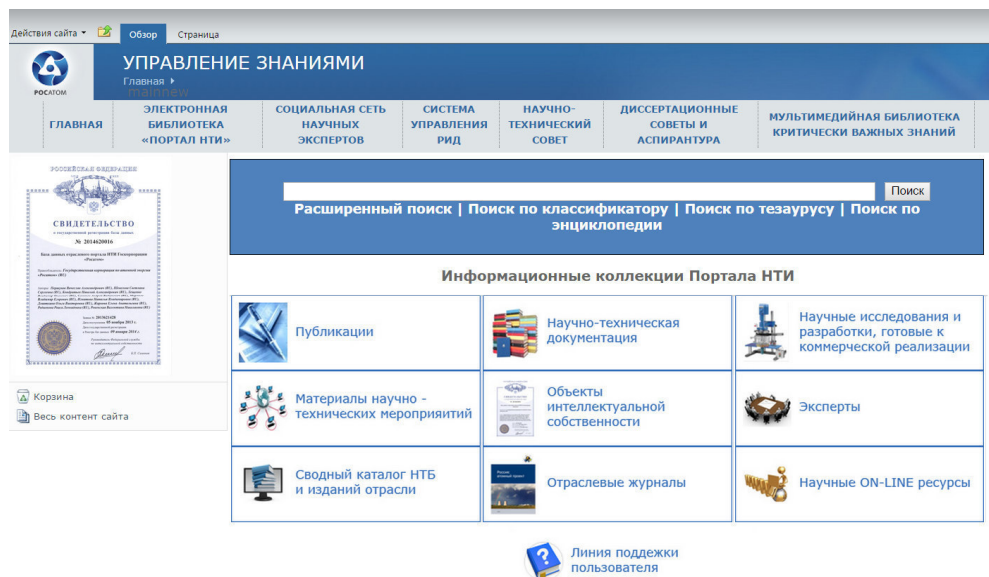


Fig. 1. Scientific and Technical Information portal of IPT

At the beginning of scientific work, a researcher spends eighty percent of time for solving old tasks and just twenty percent for searching innovative solutions. Thanks to the Scientific and Technical Information portal of IPT, this proportion can be changed exactly the opposite. Currently, TPU is integrating into knowledge management system of Rosatom. The process of developing IPT system is on the early stage. Digitisation of IPT stored knowledge, as well as filling-in of the library has already started. After successful application in IPT, it is planned to expand and integrate the system into all institutes of TPU.

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