Атомная энергия - мирное
использование

ISOTOPES AT WORK

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On October 7, 1968, the All-Union scientific-technical conference "20 Years of Production and Application of Isotopes and Nuclear Radiations in the Soviet Economy" opened in Minsk.

Although it is only 20 years since isotopes went into industrial production, they have come to be widely used in the various branches of the national economy, in science, medicine, and agriculture.

The 20th century is the age of atomic energy, the age of electronics, the age of the great and unfadable achievements in space. It is not our fault that mankind came to know the formidable power of the atom, the nuclear energy, through destruction rather than construction for the first time.

The USSR was the first nation in the world to launch peaceful applications of the atomic energy. On December 25, 1946, the Soviet Union started Europe's first atomic reactor which produced a few score milligrams of plutonium for the first time and, two year later, enabled us to begin commercial production of isotopes. In this way the foundations for a wide-scale application of the atomic energy were laid.

In recent years self-contained sources of thermal and electric power have been evolved on the basis of radioactive isotopes.

The isotopic sources of electricity stand out for their high reliability, long service life and relative simplicity of design. They can find most different applications to supply power to different devices in outer space, in the hardly accessible out-of-the-way regions of the globe, out in the sea and in the ocean's deeps.

For instance, the Beta-2, 10 generator can operate in conjunction with an automatic meteorological station for 10 years without a break.

It is clear that the small-sized isotope power sources are of inestimable value for cosmic expeditions since there

are no other power sources that are completely independent of the environmental conditions and dispensing with complicated processes and mechanisms.

At present, 12 new trans-uranium elements have been included in Mendeleyev's periodic table. Though none of them have been found in nature, all were synthesized in the laboratory, and some even in industrial conditions. The No.104 element discovered by the physicists of the Joint Nuclear Research Institute (JNRI) at Dubna in 1966 was named "kurchatovy" in honour of Academician I.V.Kurchatov, the eminent Soviet scientist.

The achievements of nuclear physics alongside of the general scientific and technological progress in our country have led to the formation of a new trend in the use of atomic energy, namely, the production and application of isotopes, nuclear radiation sources and all kinds of radiation equipment in the national economy.

The production of isotopes in atomic reactors on a large scale has been studied and mastered sufficiently well. We can expect to obtain new isotopes of trans-plutonium elements in the future.

The first radioisotope devices were manufactured by the Kharkov control and metering equipment factory, the Nuclear Physics Institute of the Latvian Academy of Sciences, and the Bardin Research Institute of the Iron and Steel Industry. Later, other organisations and institutes joined in this work.

The output of the first consignment of radioisotope devices by the Tallinn experimental control and metering equipment factory in 1957 marked the beginning of serial production of radioactive isotope instruments for production process control.

Since then efforts have been made to improve the radioisotope instruments, to perfect their parameters and characteristics, and to extend their practical applications.

Instruments used to determine the composition, structure and properties of substances and materials passed from the laboratory on to the factory.

The metal makers, engineers, chemists, and geologists --representatives of many branches of industry--can hardly visualise today the development of their branch without the use of isotopes and isotopic equipment. Here are a few examples.

The Kirov Iron and Steel Plant in Makeyevka which used radioisotope devices to study production processes and

automation has gained a saving of 300,000 roubles a year. The Minsk Worsted Mills, using more than 100 isotope instruments, has achieved an economy of 200,000 roubles a year. The North-Donetsk Chemical Factory has also applied more than 100 isotope gadgets for automatic and contact-free regulation in aggressive and toxic media.

Nuclear equipment is also widely employed in other leading branches of science and technology, for instance, in space research. Equipment to record and measure ionising radiations is found in the Earth artificial satellites and space probes that went to the Moon, Venus and Mars. It is with these instruments that the radiation belts were discovered. These instruments also help to study the formation of radiation zones, to detect their connections with the Earth's magnetic field and cosmic radiation.

The measurements taken with the aid of meters mounted on rockets and sputniks have helped to study the composition and density of the flux of primary cosmic rays outside the atmosphere and the Earth's magnetic field, to determine the nature and density of the interplanetary proton-electron gas, the fluxes of charged particles emitted by the surface of the Sun and the stars. Valuable information on the concentration of protons and electrons in the ionosphere has been obtained. The multi-channel gamma-spectrometer installed in the Moon's first artificial satellite--the Soviet probe Luna-10--has helped to ascertain the nature of the Moon's surface layer by its spectrum.

Equipment with powerful radiation sources has become a common tool in the oncological hospitals. It must be mentioned that the Soviet "Rokus" machine is superior to similar foreign makes as to its technical qualities and efficiency.

Agriculturists and land reclamation workers have at their disposal the tagged atom method, irradiation units and devices to measure the humidity and density of soils and grounds.

The use of isotopes in the food and canning industries is very interesting and promising. For example, meat exposed to radiation can be preserved for two weeks in any heat without any cooling facilities at all. In the same way it is possible to preserve vegetables, fruit, fish and other products which, incidentally, maintain their gustatory and nutrient qualities and are absolutely harmless to eat. After many careful tests and investigations the USSR Ministry of Health has authorised the use of many irradiated foods.

Special mention must be made of the research into chemonuclear processes with the aid of nuclear reactors and powerful radiation sources for the industrial production of chemical compounds (that is the use of the energy of fission fragments for the acceleration of endothermic non-chain chemical reactions). This trend takes a special place among other uses of nuclear energy for peaceful purposes.

The planned nature of development of all the branches of the socialist national economy calls for the design and use of ever more perfect and accurate instruments.

Technical progress is unthinkable without electronics and cybernetics today. There is a need in a reliable, economical and flexible control of major production processes. The Soviet Institutes, such as the Radiation Equipment Research Institute and the Instrument Making Research Institute, are expected to play an important role in this respect.

The production facilities for the manufacture of nuclear instruments are expected to grow considerably in the next few years. New factories for the fabrication of nuclear equipment and radioisotope instruments will be built. This will help improve the quantity, quality and reliability of instruments and facilitate an early introduction of new developments into production.

The development of the new, very specific and promising branch of atomic instrument-making will foster a wider application of the achievements of atomic science and engineering in science, industry, agriculture and medicine.

The "Isotope" All-Union Association takes into account the requirements of the national economy in the radiation equipment, and analyses the economic effects of its application.

The Soviet Union has for years been advocating the peaceful use of atomic energy. In all our scientific activities we promote international ties with many countries of the world.

We feel great responsibility for the effort of our scientists and experts in the communist upbuilding as well as for the contribution which the world's first socialist country makes to world science.

On August 5, 1963, a treaty banning nuclear weapons tests in the air, on land and underwater, was signed. The treaty eliminated the danger there was for the health of the present and future generations.

On July 1, 1968 the Treaty on non-proloferation of nuclear weapons was signed.

At the moment, all the socialist member countries of the Council of Mutual Economic Aid (CMEA) are engaged in research on important scientific problems connected with the application of atomic energy and the development of technical ideas to make for a broader use of atomic energy in the national economy.

The CMEA Standing Commission for the use of atomic energy in peaceful purposes set up in October 1960 is a collective body designed to organise effective cooperation of the CMEA member countries in the peaceful uses of atomic energy.

Special attention is given to the organisation of a broad reciprocal exchange of information on the development of nuclear techniques, and the co-ordination of joint research and design work.

This cooperation has already yielded fruit. Physical facilities for a rapid progress of atomic science and engineering have been built up in the socialist countries during this time. Research centres provided with up-to-date research atomic reactors, special radiochemical and physical laboratories to work with radioactive substances and isotopes have been set up in Bulgaria, Poland, Rumania, Czechoslovakia and Hungary.

The CMEA Standing Commission has drawn up certain documents and adopted a number of recommendations for the unification and standardisation, specialisation and cooperation of the production of nuclear devices and isotope instruments.

The Commission has developed and accepted radiation safety standards, rules for the transportation of radioactive substances, the common methods of dosimetric control. The long-term plan of co-ordination of scientific and technical researches in the field of peaceful uses of atomic energy for 1966-1970 envisioned 39 themes and more than 200 study projects connected with them. About 130 scientific organisations of the CMEA member countries concerned, including more than 40 specialised organisations of the Soviet Union, take part in the fulfilment of these research targets.

The Commission sponsors scientific symposiums, seminars, meetings and conferences of specialists to discuss urgent problems of atomic science, engineering and power production.

A great deal of attention is given to the further improvement of atomic power units for marine vessels. Notably, the Soviet government has taken a decision to build two new atomic icebreakers similar to the atomic-powered flagship of the Soviet Arctic fleet Lenin.

We are now planning to push the application of all knowledge accumulated by nuclear science into practice.

The USSR State Committee for the Use of Atomic Energy, its research, planning, design and industrial organisations will render any necessary aid to the enterprises and organisations of Soviet industry which are applying isotopes and radiation technique of various designations into the national economy and medical institutions.

We are sure that the Minsk conference will make a new contribution to the further development and improvement of isotope goods, radioisotope devices and radiation equipment.

The materials submitted to the conference in Minsk, the papers and/contributions evidence that the application of atomic energy in science, technology, industry, agriculture and medicine has assumed a large scale in the Soviet Union.

A broad development of this new branch of industry and science will be a good present of the Soviet scientists and experts for the centenary of the birth of the great Lenin.

(APN)