

DECOMMISSION-2009

Mayak PA

Unsolved Problems of Radiation Safety



Chelyabinsk 2009

Mayak Production Association developed at Plant 817 the first enterprise for industrial production of fissile material including uranium-235 and plutonium-239 for use in nuclear weapons.

The plant was built in the South Urals, not far from the old Ural towns of Kyshtym and Kasli. The construction site for residential housing was chosen on the southern shore of the small lake Irtyash and not far from there, on the southern shore of the lake Kyzyl-Tash, the first manufacturing facility of the Plant was built – the uranium-graphite reactor for arms-grade plutonium breeding. Today the town where Mayak PA employees and their family members live is called Ozersk.

Originally, the enterprise consisted of the following facilities:

- ✓ Uranium-graphite reactor;
- ✓ Radiochemical factory for extracting plutonium from uranium exposed to radiation in the reactor;
- ✓ Chemical and metallurgical factory for metal plutonium production.

Today Mayak Production Association, Federal State Unitary Enterprise, is a part of the Russian nuclear weapons complex and a member of the Rosatom State Corporation for Nuclear Energy.



Mayak PA comprises reactor, radiochemical, chemical and metallurgic, radioisotope and instrument-building production. Their business is focused on defense orders, nuclear reactor irradiated fuel regeneration and the production of radioactive isotopes.

Two industrial reactors with unique neutron-physical characteristics operate at Mayak PA today. They allow production of a wide range of radioactive isotopes. Mayak produces more than half of all radionuclide products exported by Russia and is one of the world leaders in radionuclide production.

The RT-1 Plant. In March 1977, in the Chelyabinsk Region, the plant for regeneration of irradiated fuel (IF) was put into operation. It was based on radiochemical plants suitable for arms-grade plutonium production. At the RT-1 radiochemical plant irradiated fuel (IF) is reprocessed from the following reactors: WER-400, BN-350, BN-600.



■ *Railroad transportation of spent fuel.*

DECOMMISSION-2009

The plant also processes material from transport and research reactors and related transport and power generating systems. During its operational lifetime RT-1 has reprocessed fuel not only from Russia, but also from foreign nuclear power plants including Paksh, Hungary; Loviisa, Finland; Nord and Greisfald, Germany; Kozloduy, Belarus; Dukovany and Rzhesh, Czech Republic, Bogunice, Slovakia, Rovenskaya, Ukraine.

4,000 tons of IF, including 3,500 tons of IF from VVER-440 reactors, have been reprocessed since the plant became operational.

In addition, the Chemical and Metallurgical business of Mayak PA focuses on the disposal of fissile material from decommissioned nuclear weapons. While measurement and automation instruments, parameters control and production control systems are designed and produced in the Instrument-building section.

GENERAL RADIATION SITUATION IN THE REGION

Operation of the country's first industrial complex for plutonium production, the forerunner of Mayak PA, resulted in numerous discharges of radioactive waste in the South Urals covering a period from 1949 onwards. This caused an extremely complicated ecological situation in this large region.



From 1949 to 1951 the Enterprise for plutonium production in the Chelyabinsk Region discharged the total of 2.76 million Ku of liquid radioactive waste into the open drainage system of the rivers Techa – Iset – Tobol. In 1956 the river Techa was blocked by a dam and as a result the amount of radioactive material discharged into the drainage land of the river Techa was reduced to about 0.5 Ku/day. In 1963 an additional dam was built. This provided significant isolation from the hydro facilities of Mayak PA. The 10th and the 11th reservoirs, built after the construction of dam, together with the 2nd, the 3rd, and the 4th reservoirs have radioactivity of 2 million Ku. Downstream, beyond the dam of the 11th reservoir, there are the Asanovskiye bolota – swamps with an area of 30 sq. km and containing about 6 kKu of strontium-90 and cesium-137. These swamps are the source of a continuous discharge of radioactivity into the river Techa.

Lake Karachay contains about 120 million Ku of radioactive waste, and the reservoir Staroye Boloto has 2 million Ku. In the radioactive waste burial area, on the territory of Mayak PA, a lens of ground water 30 sq. km in size has formed (from that, 10 sq. km is due to radioactive waste discharged into Lake Karachay). Four million cubic meters of this lens is contaminated with radionuclide (to the depth of 100 m). This area is drained by the rivers Techa and Mishelyak which creates a potential threat of contaminated waters rising to the surface.

Throughout the period of Mayak PA's operation, a significant quantity of solid radioactive waste has been buried on its property. At least 1 billion Ku of radioactive solution is contained in its storage tanks.

As a result of a radioactive waste storage tank explosion in 1957, about 23,000 sq. km were contaminated (with a contamination density of more than 0.1 Ku/km² of strontium-90). This accident caused the formation of the East-Urals Radioactive Trace (EURT) and a discharge of 20 million Ku of various radionuclides into the environment. In 1967 one more radioactive trace appeared; radioactive sprays carried by the winds from the shores of Lake Karachay, exposed due to draught, led to radioactive pollution of an additional 2,700 km² (with a pollution density of 0.1 Ku/km² of strontium-90, 0.3 Ku/km² of cesium-137, and a total radioactivity of 0.6 million Ku).

Between 1957 to 1960, more than 10 million people were evacuated from the territory of the East-Urals Radioactive Trace and 119 thousand hectares of land were temporarily removed from the agricultural fund. Even today 16.7 thousand hectares of the East-Urals Radioactive Reserve are forbidden for agricultural activity. In other areas restored for agricultural use it is still necessary to constantly perform radioactivity checks of agricultural and forest lands, as well as checks on the products produced in these areas.

■ *Control panel of the radiochemical production at the IF reprocessing plant from BBP-40 and naval reactors, Mayak PA, Ozersk, Chelyabinsk Region*



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Furthermore, Mayak has been polluting the environment by ongoing discharges from its plants into the air and other planned discharges of radiochemical waste.

In total since 1949, Mayak PA has discharged at least 150 million Ku of radioactive material into the environment. The total area of surface contamination amounts to 26,700 sq. km. Potentially hazardous sources of contamination are the reservoir Karachay, solid waste repository sites, and storage tanks for radioactive solution. These sources have a total radioactivity of more than a billion Ku and create a constant and worsening hazard of radionuclide contamination of a large region of the river Ob basin. Up to now more than 437,000 people have been exposed to radioactive pollution.

Every year Mayak PA discharges several million cubic meters of liquid low-level and medium-level radioactive waste (2 to 5 million cubic meters according to official data) into the open hydrographic system. Liquid medium-level radioactive wastes are discharged into Lake Karachay and into the Staroye Boloto reservoir.

The practice of handling radioactive waste at Mayak PA has caused three serious radiation accidents and created several potentially hazardous sources of environment pollution – storage tanks for radioactive waste and open reservoirs containing radioactive material.

UNSOVLED PROBLEMS OF RADIATION SAFETY

The analysis of data on the radiation situation shows that numerous unsolved problems have been created in the Urals Region. All together they point to a high probability of a new radiation accident. In addition, every ecological problem has at its source a radiation safety problem (or, if unsolved, a hazard). The unsolved problems can be categorized as follows:

- ✓ radiation reservoirs,
- ✓ former Lake Karachay,
- ✓ deployment of new industrial and/or nuclear facilities in the region,
- ✓ life-sustaining activity, population health support,
- ✓ strategic planning of Mayak PA's future development.

■ *Unloading of a IF transport tank from the special-purpose car at Mayak PA (Ozersk, Chelyabinsk Region).*

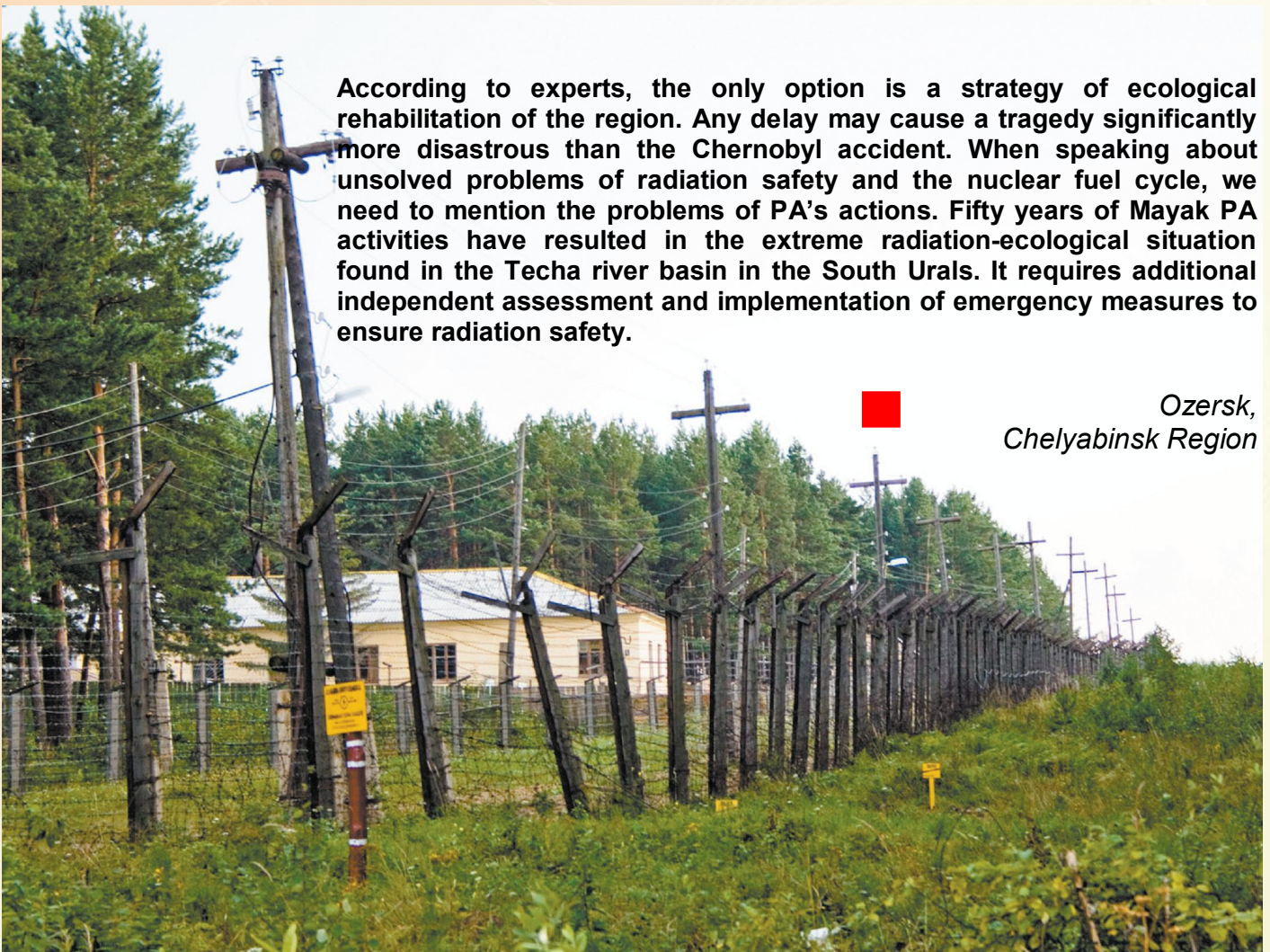


STRATEGIC PLANNING OF MAYAK
PRODUCTION ASSOCIATION
FUTURE DEVELOPMENT
(RECOMMENDATION OF THE
EXPERT TEAM UNDER THE SUPERVISION
OF PROFESSOR A.G NAZAROVA, 1991)

The main focus of Mayak PA's future strategy should be on the development and execution of a long-term program of environmental enhancement and recovery of the population's health. The Expert team considers crucial the need to create a modern engineering-ecological center at Mayak PA for the practical realization of this huge project. PA has its own experts who are able to set and meet ecological challenges despite a large number of ongoing problems and a lack of ecological education. The latter can be overcome by training, self-education and the appointment of qualified ecologists with a broad range of knowledge.

According to experts, the only option is a strategy of ecological rehabilitation of the region. Any delay may cause a tragedy significantly more disastrous than the Chernobyl accident. When speaking about unsolved problems of radiation safety and the nuclear fuel cycle, we need to mention the problems of PA's actions. Fifty years of Mayak PA activities have resulted in the extreme radiation-ecological situation found in the Techa river basin in the South Urals. It requires additional independent assessment and implementation of emergency measures to ensure radiation safety.

 Ozersk,
Chelyabinsk Region



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Currently thousands of socially vulnerable people, without proper medical assistance, live in the Techa river basin that is constantly exposed to radiation.

Emergency measures for rehabilitation of the territory contaminated by radionuclides, and measures to improve the inhabitants' health should be taken immediately.

The main issues of radiation safety in the region – localization and handling of radioactive waste with a total activity of 1 billion Ku and, as a consequence, the real hazard of overflow and discharge from the technical storage reservoirs of radioactive waste.

The South Urals region is characterized by a high probability (once in 5 years) of extreme meteorological effects (wind spouts, hurricanes) which have already led to a radiation accident in 1967. This emphasizes the need to urgently develop a program of emergency measures to ensure radiation safety in the region.

The highest-priority measure for radiation safety is securing the dam of the 11th reservoir to ensure there will not be any discharge of radioactive waste from Mayak PA. Further rehabilitation of the technical reservoirs such as gradual cascade decontamination of radioactive waters, safe discharge of waters into the hydrographic system up to the level of harmless dilution, tarring (or other ways of fixing) exposed radioactive sludge on the shores of the reservoirs together with the development of future technology for its localization, reprocessing or relatively safe burial. These measures should be subjected to full scientific assessment and additional research.

Another problem of ecological safety is the problem of the treatment of radioactive fall-out as well as treatment of the waters of Lake Karachay which are contaminated in the area of intensive water exchange to a depth of 100 m and are threatening the Chelyabinsk water intake facilities.

Solving the multidimensional problems caused by the critical situation in the areas where Mayak PA operates, and on the territory of the plant itself, is an unprecedented challenge. According to the experts on the team, it should become the main objective of Mayak PA's operations during the period of defense production conversion. For organizational management of this solution, a powerful modern engineering-ecological center should be created at Mayak PA. This Center can be formed by an internal reorganization of Mayak PA along with the involvement of qualified personnel and engagement of new experts within the shortest possible time. The noble objectives of improvement of the environment and of the health of the region's population will ensure support of the Center from the community of Chelyabinsk Region, the whole country and the world public. Successful work at the ecological Center will serve as an illustration of how to solve complicated ecological problems in regions of environmental disaster; both in our country and perhaps in the rest of the world.

**Report of V. Ustinov, Prosecutor-General,
at the extended session of General Prosecutor Office Board
of the Russian Federation
with participation of V.V. Putin,
the President of the RF, January 21, 2005**

**Dear Mr. President,
Colleagues,**

...One more priority is the ecological safety of the population. Prosecutors discover 75,000-80,000 violations of environment protection regulations annually.

The main concern is that there is no order in handling radioactive wastes and nuclear materials.

In Murmansk Region complexes for the storage of spent nuclear fuel were built in the 1960s.

**They have very weak protection and are obsolete.
Despite that, about 17 thousand cubic meters of radioactive waste are stored there.**

I charge Yury Zolotov, my Deputy in the Urals Region, to review the situation concerning Mayak. And if needed, to initiate a criminal case. We need to get to the underlying cause, to those people who take any measures today regardless to the threat of an accident.



*This brochure contains information from
official sources of the Rosatom State Corporation.*