



FSUE «RADON»

ENTERPRISE OF STATE CORPORATION "ROSATOM"

Practical Approaches of the FSUE "RADON" to the Problem of Reducing Radioactive Waste Volume at the Decommissioning Nuclear and Radiation Hazardous Facilities

Speaker:

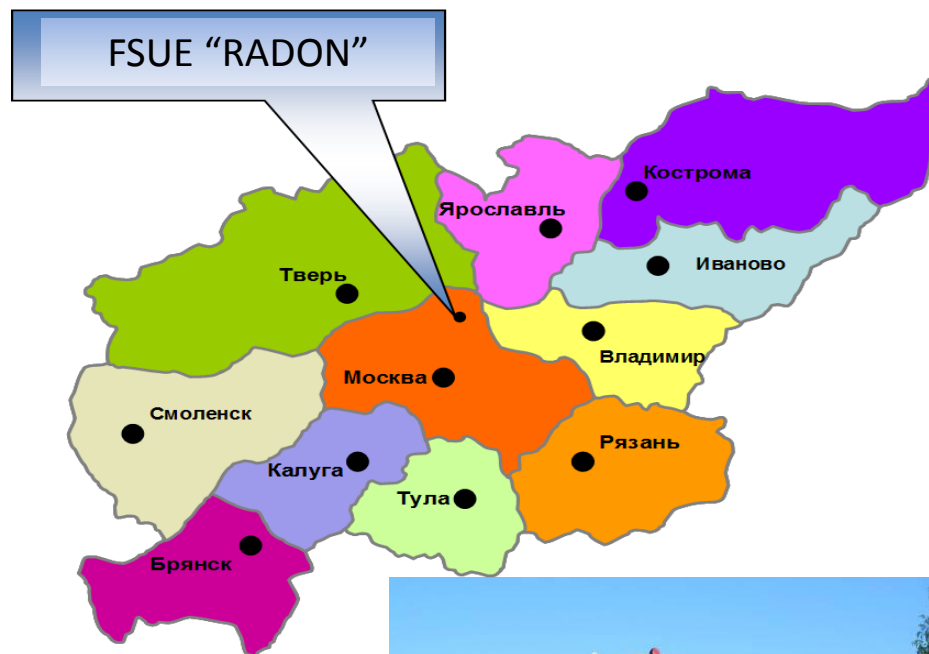
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History of the Federal State Unitary Enterprise "RADON"



The company was founded in 1960.
The first transportation of radioactive waste was
made on January 27, 1961.



Decommissioning Nuclear and Radiation Hazardous Facilities: FSUE «RADON» competences

Activity types for decommissioning	FSUE «RADON» competences
Design and engineering works	Technical background
Carrying out complex engineering and radiation survey of Nuclear and Radiation Hazardous Facilities (NRHFs)	Radiation survey and drilling
Research and development	Development of technologies, materials research, safety case, etc.
Preparatory work, infrastructure construction	Technical background for construction of radwaste treatment facilities, production of the containers, etc.
Destruction of the facilities	Dismantling and decontamination of buildings and equipment
Radioactive waste management	Collection, sorting, fragmentation, transportation, treatment, conditioning and storage of radwaste prior to the transfer to the National Operator
Rehabilitation of the site	Removing and cleaning contaminated soil, site remediation, etc.
Monitoring sites for final isolation and delayed elimination	Radiation monitoring of groundwater and surface water, near surface air and ventilation emissions, buildings and areas of the objects



Major NRHF's of SC "Rosatom" to be decommissioned



АМБ 2



ВВЭР 15



ЭГПИ 4



РБМК 11



ИР 50



ПХ РАО 40



ПХ ОЯТ 39



Полигоны >20



Хранилища >100



Реабилитация
территорий



Объекты
добычи 3



Металлургия 2



Радиохимия 4



ПУГР 13



Научные
объекты 7



Options for decommissioning NRHFs

Option	Objects for decommissioning
Deferred liquidation	Nuclear facilities with equipment having the induced activity - NPPs, research reactors
Creating an object for final isolation	Objects classified as "special (non-removable) radioactive waste": pools for liquid radioactive waste storage, industrial reactors, the tailing dumps
Immediate liquidation	All other objects



Decommissioning NRHFs : processes accompanied by the formation of radwaste

- **Unload and removal of spent nuclear fuel and nuclear materials from the site (transfer of nuclear facility into a safe condition);**
- **Removing the working environments;**
- **Decontamination of equipment and facilities;**
- **Dismantling, demolition of constructions and buildings;**
- **Treatment of the resulting radioactive waste, their containerization and delivery for storage and disposal;**
- **Remediation of contaminated sites.**



Measures to reduce the volume of radwaste at the facility decommissioning

Operations at the facility and methods of radioactive waste management	Reducing the volume of waste removed
The separation of radioactive materials resulting from the dismantling of facilities and rehabilitation of areas, according to radiation categories and morphological composition	5 ÷ 200 times
Deactivation of zones of radioactive contamination on the basis of results of comprehensive engineering and radiation survey before dismantling of buildings or equipment	20 ÷ 300 times
Separation of radiation contaminated soil during the rehabilitation of the site	4 ÷ 20 times
Purification of liquid radioactive waste generated from decontamination and dismantling of buildings and equipment	10 ÷ 40 times

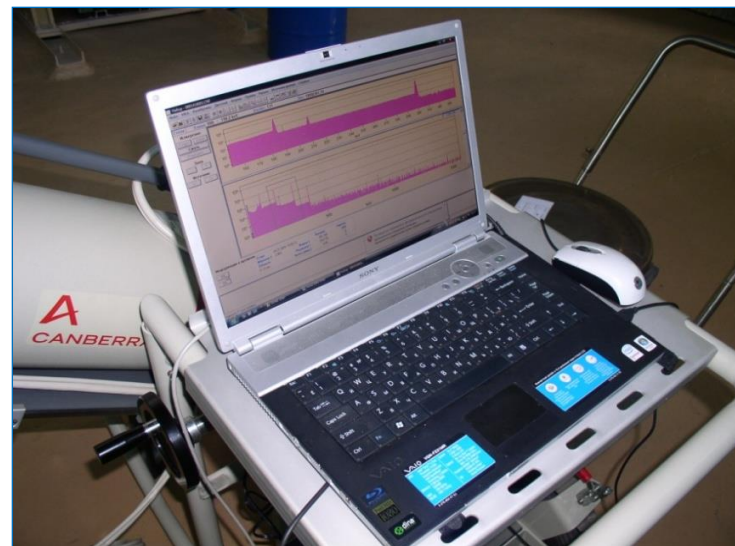


- Development of a special part of the project documentation for the decontamination and rehabilitation of contaminated sites and areas
- Collecting, sorting and preparation for transportation of radioactive waste
- Rehabilitation facilities and areas for further use without restriction
- Control radiation inspection facilities and areas after the completion of decontamination and rehabilitation



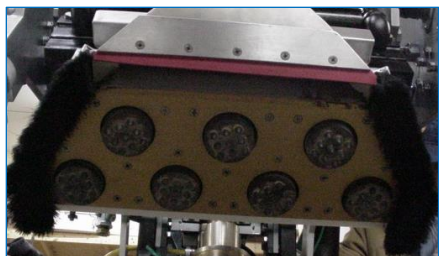
The controlled parameters of radwaste

- radionuclide composition
- the specific activity of each nuclide
- the total activity of the contents of the package
- weight
- volume
- ambient dose equivalent rate of gamma-radiation of the package
- morphological composition.





Mobile decontamination system VacPac and robotic systems MOOSE for decommissioning NRHFs



- The vacuum system Vac-Pac for collecting radioactive waste into 200 l drums
- 2-stage air cleaning system
- Simultaneous operation of several modules
- Operation at a distance up to 75 m from the container
- Models with electric and pneumatic actuators
- Easy filter maintenance.



Robotic complex WallWalker for decontamination of pools for FE exposure



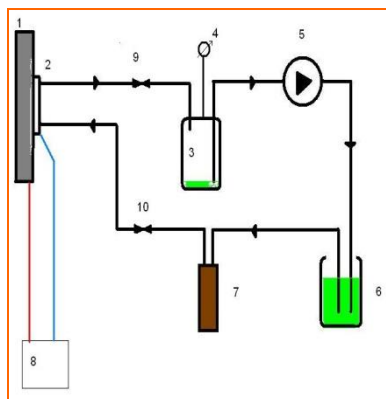
Removal of surface contaminants, including vertical surfaces



Electrochemical decontamination of metal surfaces



Unit for spot electrochemical decontamination





Removal of construction debris and contaminated soil

Remediation operations at the sites of dismantled objects and the contaminated territories





Mobile plant for hydro-separational treatment of soil



- Productivity on the ground: 1 t/hr
- Installed capacity: 50 KW
- Dimensions of site for the plant : 14×11m
- Operation temperature: +5 to +45 °C



Plants for treatment of liquid radioactive waste

Modular mobile plants for LRW treatment "Aqua - Express" and "ECO"



*Filtration
module*



*Ultra filtration
module*

*Electrodialysis
module*



Hyper filtration module



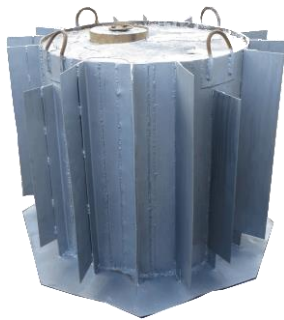
Containers for transportation and storage of radioactive waste: KMZ-RADON and KRAD-T

- Containers are certified for transportation and storage of radioactive waste
- There is a possibility of conditioning (cementing) of the filled container with the lid closed

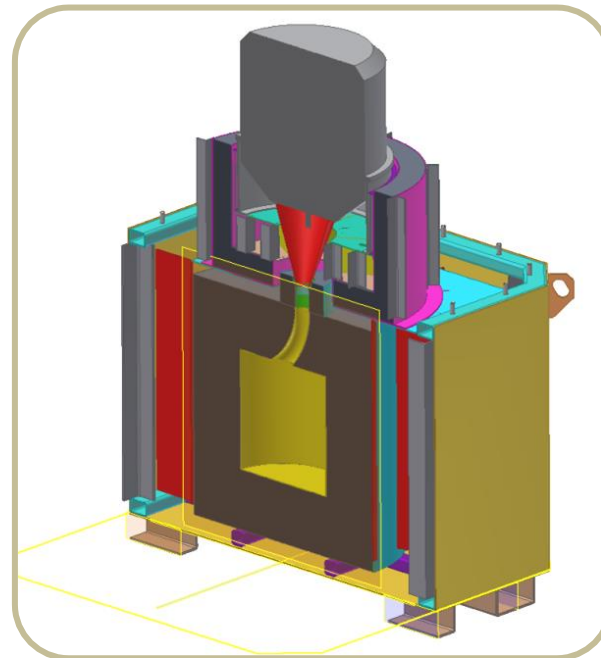




Containers KMZ-RNI for managing sealed radioactive sources



- A bushing with biological protection is inserted into the certified container for storage of solid radioactive waste KMZ-RADON
- There is the possibility of including spent SRS into the metal matrix





A convoy of vehicles for transportation of solid RW



The vehicle for transportation of liquid RW



Measures to reduce the volume of radioactive waste at the site of FSUE "RADON"

Operations at the site and methods of radioactive waste management	Reducing the volume of radwaste removed
Fragmentation, sorting and repackaging SRW for processing by various methods	3 ÷ 15 times
SRW pressing at the facility "Super-compactor"	5 ÷ 7 times
Decontamination of metal waste contaminated with radioactive substances	10 ÷ 20 times
Plasma treatment of SRW of mixed morphology to obtain a glass-like slag	15 ÷ 40 times



FSUE «RADON» main technological capacities for treatment of radioactive waste

The main plants for RW processing	Annual throughput
Sorting SRW	2500 ÷ 3500 m ³
Pressing and super-compacting SRW	500 ÷ 1000 m ³
RW incineration	250 ÷ 500 m ³
RW plasma treatment	800 ÷ 1000 m ³
Concentrating LRW	1000 ÷ 1500 m ³
Cementing RW	1000 ÷ 1500 m ³
Treatment of metal RW	1000 ÷ 1200 t



Fragmentation of radioactive waste





Compacting and pressing solid RW



**Plant for pressing solid RW PAO
(100 tf)**

Plant «Super-compactor» (1500 tf)





Decontamination of metal waste contaminated with RW

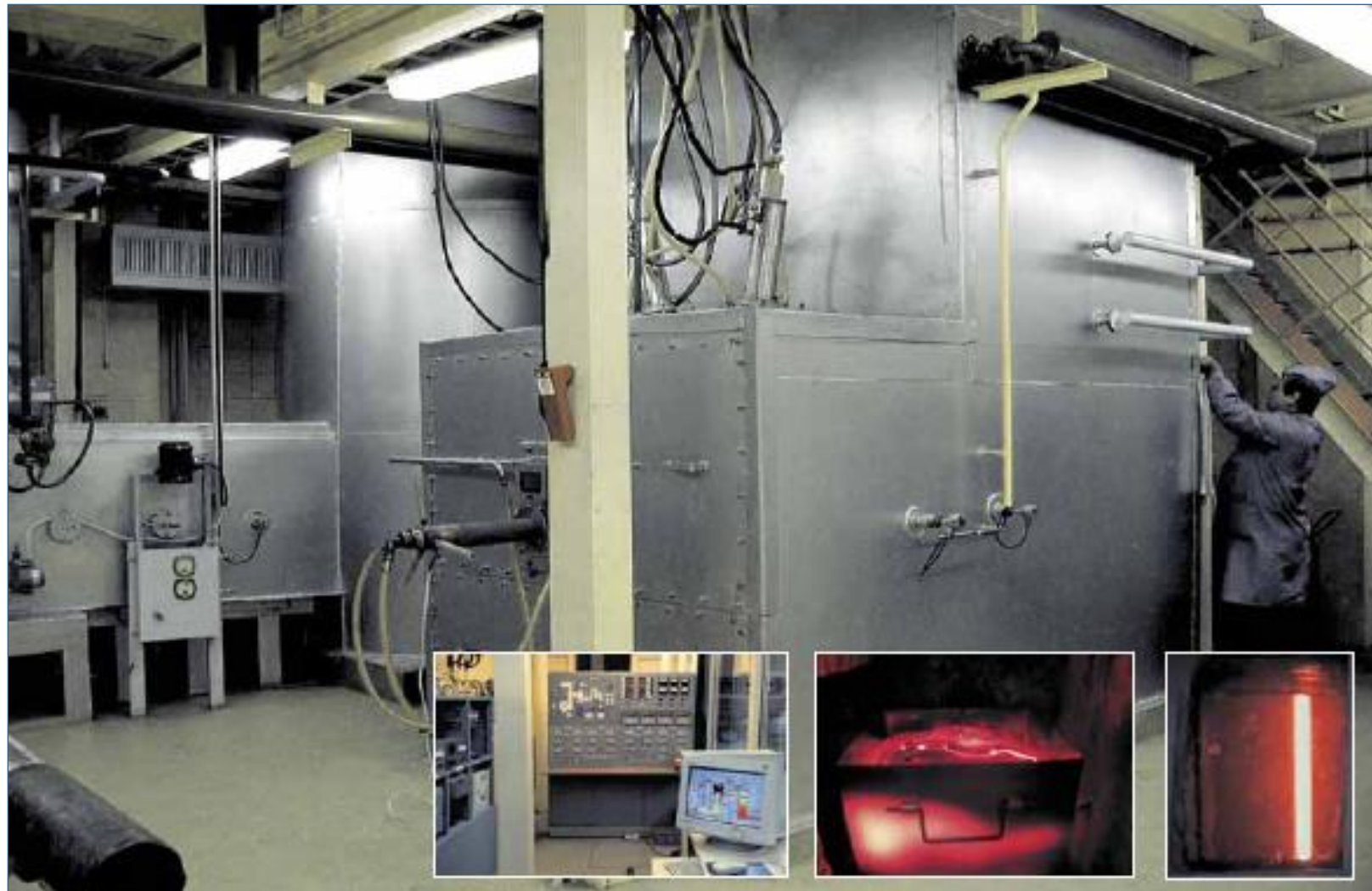


**Plant for abrasive blasting
decontamination**





Plant for plasma treatment of solid RW





The morphology of solid RW treated by the plasma method

Component	Limit of Content, wt. %
Paper	90
Wood	50
Textile (rag)	20
Plastic (polyethylene, polycarbonate, PP, PET etc.)	20
Chlorinated polymers (PVC, PCV)	5
Rubber (hoses, tires)	5
Electric boards, radio components	10
Glass (domestic and laboratory)	20
Construction waste (debris)	25
Heat insulating materials	30
Metal scrap	5
Soil, sand, asphalt	20
Ion-exchange resins	5
Vegetable materials, berries and silt	15
Overall ash content of the waste	40
Overall ash content of the waste	50

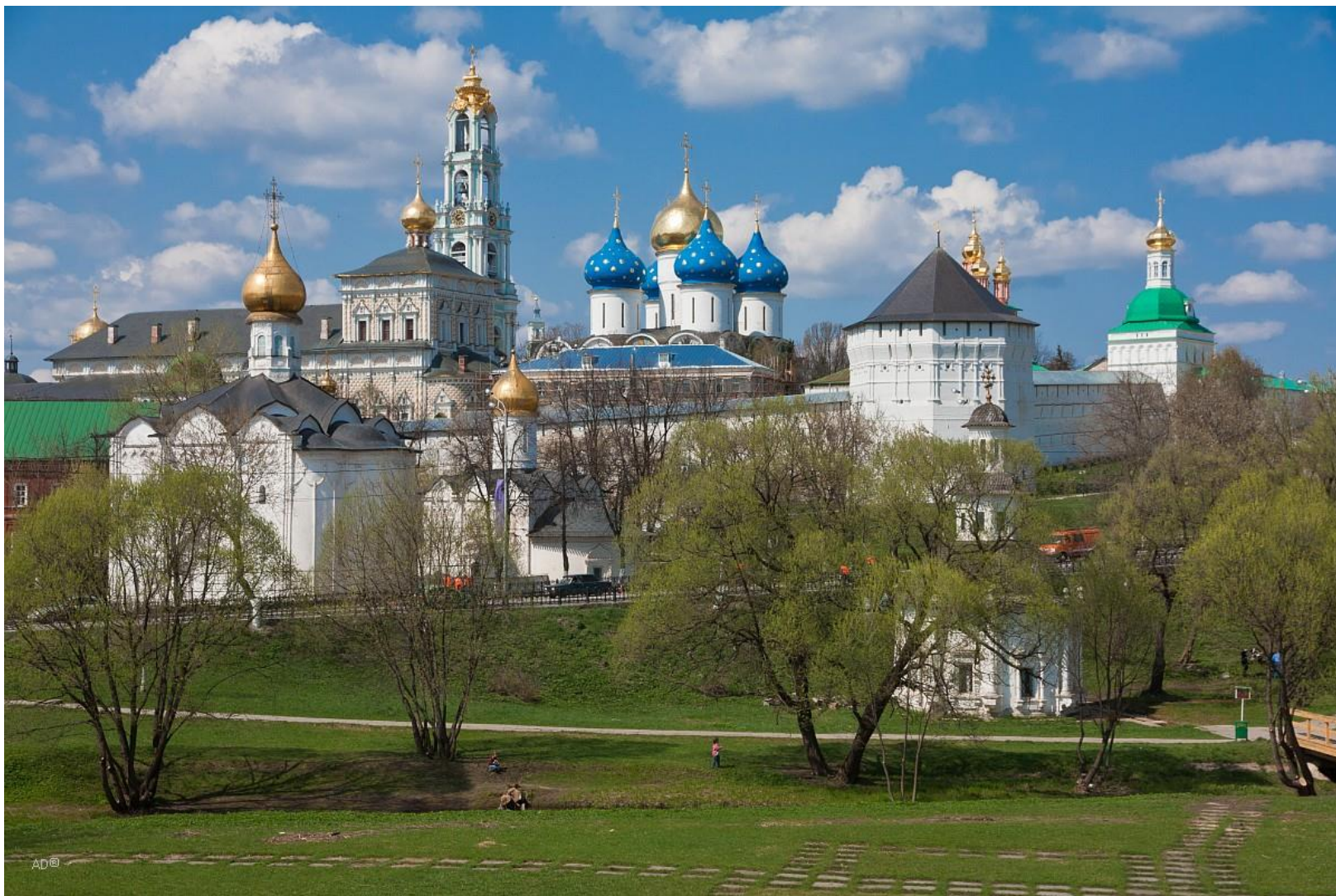


Storage of conditioned radioactive waste





Thank you for attention!



AD®