



ROSATOM



STATE ATOMIC ENERGY CORPORATION "ROSATOM"

# **Increasing Safety of RAW Management at Isotopic and Chemical Plant, FSUE "MCC"**

**Igor Seelev**  
Chief Engineer of ICP, FSUE "MCC"

# RAW Management Strategic Objectives at FSUE “MCC” (2008-2015 yrs)

- **Eliminate Open Liquid RAW Storage pool # 354;**
- **Develop a sludge handling technology to be implemented at RAW Storage pool # 365;**
- **Remodel the solid RAW repository (Burial site);**
- **Improve solid RAW storage safety at facilities 650 and 347;**
- **Preparation of above-ground liquid RAW storage tanks for redesign;**
- **Establish HOT-2 RAW handling area (Building 26);**
- **Create a long-term storage facility for solidified radioactive wastes in underground mines of the enterprise;**
- **Extend an operating period for the RAW Reprocessing and Storage Complex (Workshop #1 of ICP).**

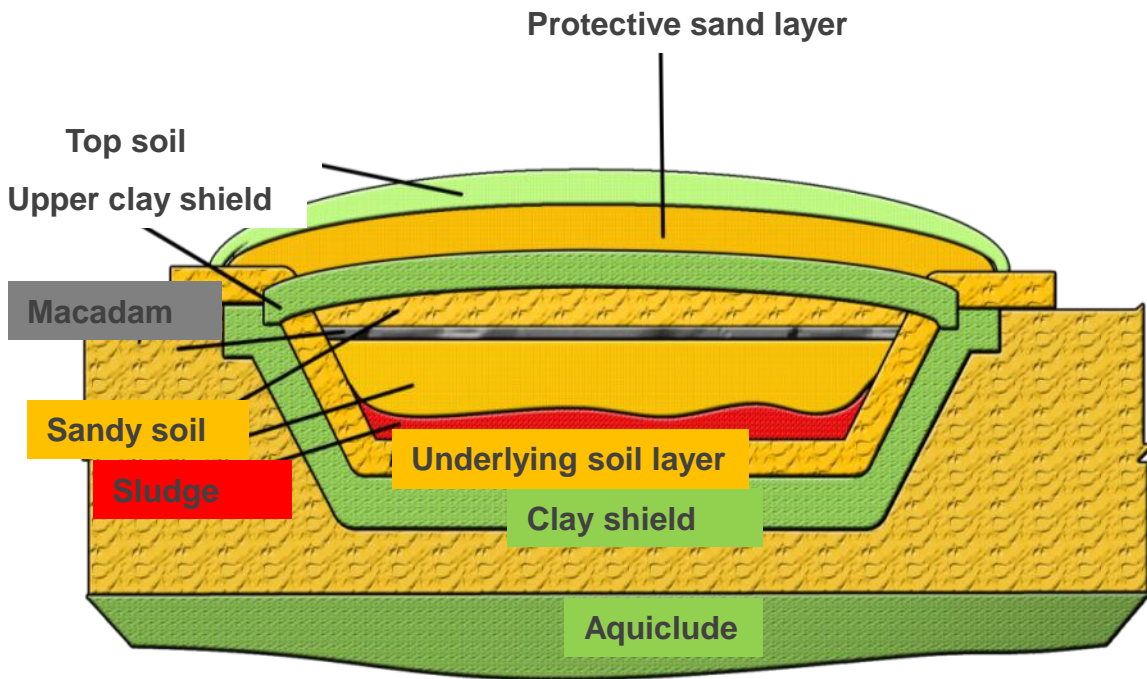
# Elimination of Open Liquid RAW Storage Pool #354

Storage pool #354 was used for interim storing low-active wastes generated by the enterprise plants. After the facility was shut down, in 1990-1991, R&D began to determine optimum technologies to landfill (“bury”) the pool.

After appropriate studies, the decision was made to select a method of RAW isolation by filling the water-surface area with local soil, and to create a complete clay shield, a drainage system, and a monitoring system.

The isolation method should be based on the following criteria:

- Ensure safety of physical and chemical processes that take place in the storage pool;
- Meet requirements of radiation and nuclear safety;
- Attain economic feasibility.



# Post-elimination RAW Storage Pool # 354



Over the 2007 to 2009 period the work was conducted to decommission the storage pool; currently this facility presents an area buried with rocky ground with a maximum background radiation level of less than 30 microR/hr.

# Develop Sludge Deposits Handling Technology to be Implemented at Liquid RAW Storage Pool # 365



RAW Storage pool #365 is meant for receiving and temporary storing substandard, conventionally clean Reactor Plant's process waters and regulatory clean Radiochemical Plant process waters, as well as for substandard non-technological liquid wastes generated at the enterprise.

The storage pool began its operation in 1958. To complete the entire life cycle, the use of the storage pool according to its designated purpose was ceased in 2014, and the work began to prepare the facility for decommissioning.

The basic problem in the storage pool decommissioning is how to manage sludge deposits accumulated over the period of the pool operation.

The liquid phase radionuclide composition is mainly Cs-137, and the bottom deposits contain predominantly Co-60 and Cs-137.

Design capacity, thous. m <sup>3</sup>	Water-surface area, thous. m <sup>2</sup>	Sludge volume, thous. m <sup>3</sup>
204	54.5	≈ 5.4

# Develop Sludge Deposits Handling Technology to be Implemented at Liquid RAW Storage Pool # 365

## Main Tasks:

1. Create an experimental bed to elaborate a sludge deposits handling technology;
2. Develop several sludge handling alternative technologies.



Experimental bed creation

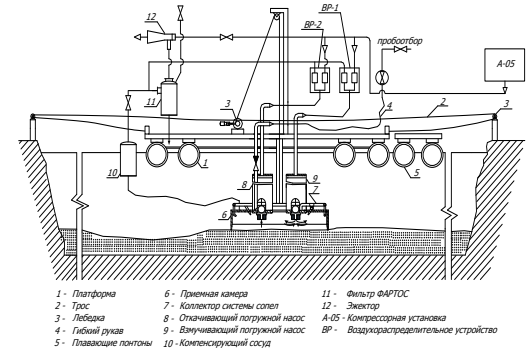
Sludge deposits removal

Grouting (conversion into a cementitious compound)

Calcination at a temperature of up to 600°C

Forwarding to Operating pool #354a

Grouting (conversion into a cementitious compound)



# Remodeling Solid RAW Repository (Burial Site)

## Main tasks:

1. Create solid RAW Conditioning Area.
2. Prepare new places for storing solid radwastes of ILW and LLW categories



### Conditioning Unit Throughput (in terms of radwaste volume being fed)

Waste category	Unit of measure	Throughput
LLW (solid)	m <sup>3</sup> /yr	up to 3000
ILW (solid)	m <sup>3</sup> /yr	up to 850
Closed radioactive sources	pcs/yr	386

[www.rosatom.ru](http://www.rosatom.ru)

### Rate of Production of Solid RAW Conditioning Unit

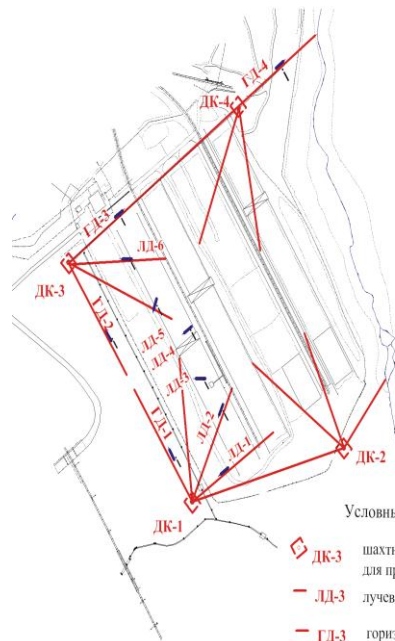
Solid radwaste sorting and fragmentation unit (hydropress, hack-saw, hot air gun)	up to 2 m <sup>3</sup> per shift
Combustible RAW incinerator	up to 60 kg/hr (solid RAW)
	up to 20 kg/hr (liquid RAW)
Solid RAW grouting setup	up to 2-4 nonretrievable containers per shift

# Improving Solid RAW Storage Safety at Facility #650

## Main tasks:

1. Perform Comprehensive Engineering and Radiation Safety Survey (CERSS) of the operating storage facilities status and determine their remaining life.
2. Bring physical protection of solid RAW storage facilities (Facility #650) to conformity with the Federal Rules and Regulations in the sphere of use of atomic energy (NP-034-01).
3. Establish a subsoil water drawdown system at the solid RAW storage facilities site.

- To prevent unauthorized access of persons and vehicles to Facility 650, the following activities were done:
  - A new barrier system created;
  - Access control points, a guard post and gates rehabilitated;
  - Secure enclosure equipped with detection systems;
  - The entire site perimeter illuminated etc.
- According to the water drawdown system monitoring, after the system began its operation, an average value of discharged water flowrate came to 2.5 m<sup>3</sup>/hr at UK-1 and 3 m<sup>3</sup>/hr at UK-2.
- At present, the system continues its operation, subsoil waters were brought down for about 1 m.



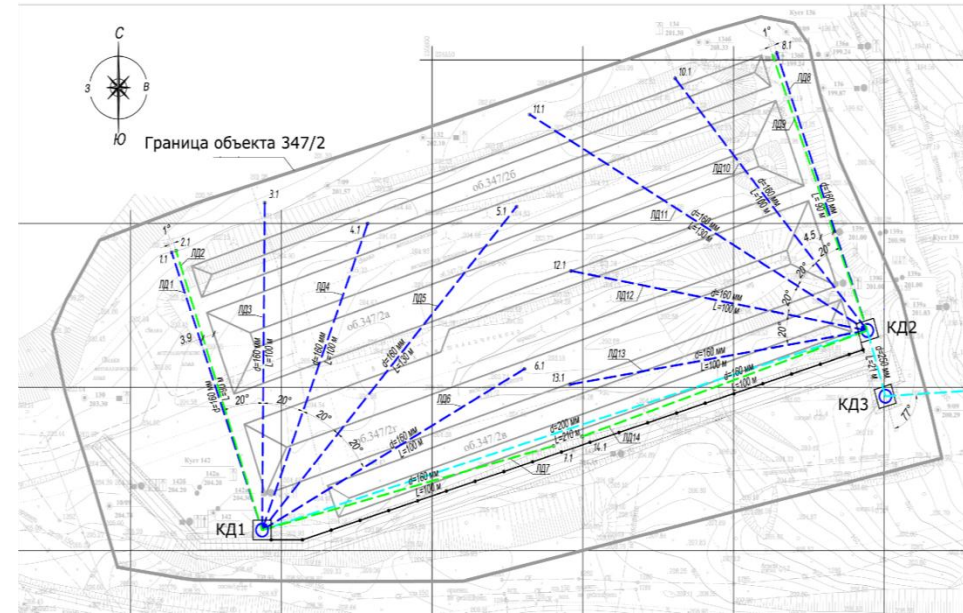
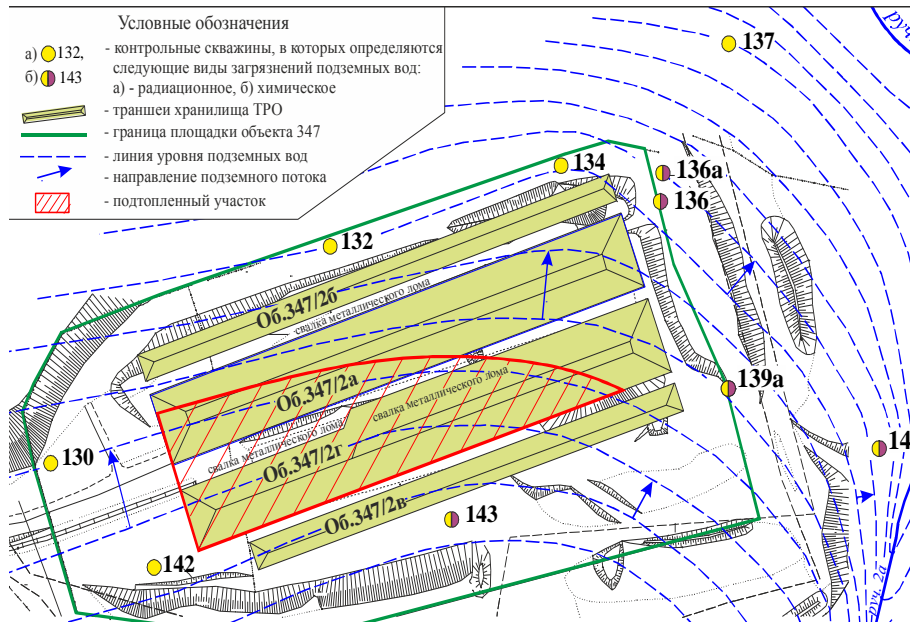
***CERSS proved that nowadays, after the 46-years' period of operation, the storage facilities do not show a significant physical depreciation and meet the design and regulatory documentation requirements. Hence, it is possible to extend an operating life of the facilities according to their designated purpose for 30 years.***



# Improving Solid RAW Storage Safety at Facility #347

## Main tasks:

1. Carry out pre-engineering for Facility 347 site.
2. Develop design documentation for the subsoil water drawdown system for Facility 347 .



- The pre-engineering and mathematical modeling work determined optimum options for the drawdown system location.
- The work was completed on developing DED 106025.0347.140022 entitled «Design Development for subsoil water drawdown in the area of Facility 347”.

# Preparation of Above-ground Liquid RAW Storage Tanks for Redesign

## **Main activities performed within the framework of the NRS Federal Target Program :**

- Tanks AG-3201/6, AG-3201/7, AG-3201/8 were examined with CERSS that determined that: their bearing building structures are serviceable; the walls and interior coating are reliably isolated and have not been exposed to a liquid aggressive medium, as well as they have no defects and damages. Based on the survey results and subsequent calculations, the decision was made that the tanks are in such a condition that they can withstand to the existing loads for 50 years and hinder radionuclides from releasing to the environment .
- The analysis of hydrogeological conditions of the site area proved that the site hydrology has not changed for a period of operation.
- Experimental work was conducted to decontaminate liquid radwaste storage tanks with the use of pulsating equipment in a mode of decontamination solutions recirculation and with a regular removal of resultant wastes, making it possible to decrease MED to the maximum.
- Engineering solutions were developed to handle non-retrievable decontamination solution amounts (in the form of suspension) from AG-3201/6÷8 tanks by bringing them into a solid state through burying with sorption materials on a layer-by-layer basis.
- Clay rocks and sorbents were evaluated for their properties with the view of considering their use as additional protective barriers for AG-3201/6÷8 tanks entombment. According to the evaluation results, the choice was made in favor of clinoptilolite as a sorbent.

*In 2013, AG-3201/6-7 tanks were transmitted to FGUP “NO RAO” organization as a part of the equipment of Severny Repository site. AG-3201/8 tank is in the FSUE “MCC”’s inventory, its state being “entombment”.*

# Establishment of HOT-2 RAW Handling Unit (Building 26)

The ICP Workshop #3 RAW handling unit is a part of the “Dry” SNF Storage Facility meant for handling liquid and solid radioactive wastes arisen from HOT-2 operations, as well as liquid radwastes from HOT-1.

The Unit equipment is located in Building 26 and is to:

- Decontaminate the supernatant liquor of radionuclides after drainage and desorbent solutions having been settled, the latter being arisen from decontamination of the process equipment of VVER-1000 SNF Storage facility and that of SNF canister assembling chambers at HOT-2;
- Grout residues and sludges generated during decontamination of liquid ILW at the ICP Workshop #3 RAW handling unit;
- Grout residues and sludges (slurry, spent ion-exchange resins) coming from Building 25 of the ICP Workshop #2;
- Store containers NZK-150-1.5P with solid RAW and solidified liquid RAW for a period of up to 10 years.

# Extending Operating Period for the RAW Reprocessing and Storage Complex (ICP Workshop #1)

## Main milestones to extend the HOT-1 operation period

### Milestone 1

- State Corporation “Rosatom” approved the developed General Program for comprehensive survey of the systems and elements being important for safety reasons, and of a set of buildings meant for storage and reprocessing radioactive wastes (Workshop #1) that were generated by the Isotopic and Chemical Plant, FSUE FYAO “Mining and Chemical Combine”, with a view of extending the operating periods of the said facilities.
- 12 systems and more than 1400 elements were identified for survey;
- 11 individual survey programs were determined for development.
- A number of technical commissions was set up at FSUE “MCC”.

### Milestone 2

- 1400 elements were examined/surveyed, the survey sheets were prepared.
- Technical reports were issued on completion of 11 individual survey programs.
- Final survey documentation was issued.

### Milestone 3

- Residual serviceability examination was conducted.
- State Corporation “Rosatom” approved the Decision made on extending an operating period for the Processing and Storage Complex for additional 30 years.

ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

Федеральная ядерная организация  
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ УНИТАРНОЕ ПРЕДПРИЯТИЕ  
«ГОРНО-ХИМИЧЕСКИЙ КОМБИНАТ»  
(ФГУП «ГХК»)

СОГЛАСОВАНО

Директор по государственной политике  
в области РАО, ОЯТ и ВЭ ЯРОО  
Госкорпорации «Росатом»

УТВЕРЖДАЮ

Генеральный директор  
ФГУП «ГХК»

О.В. Крюков  
201\_\_ г.

П.М. Гаврилов  
201\_\_ г.

№ 212-25-40-01/ 7292 от 07.12.2015

РЕШЕНИЕ

о продлении срока эксплуатации комплекса,  
предназначенного для хранения и переработки радиоактивных отходов  
(цех № 1 Изотопно-химического завода ФГУП «ГХК»)

Руководитель проектного офиса  
«Формирование единой  
государственной системы обращения  
с РАО» Госкорпорации «Росатом»

А.Н. Дорофеев  
«\_\_» 201\_\_ г.

г. Железнодорожск  
2015 г.

# Outlook for Future

## **Regarding Storage pool #365:**

- **Create a radioactive sludge deposits removal unit and clear the storage pool bottom of radioactive wastes;**
- **Having the liquid phase removed, perform CERSS;**
- **Develop the facility decommissioning project and implement it by the year 2025 (a final state should be a soil “lawn”).**

## **Regarding Facility #354 (the eliminated liquid RAW storage pool):**

- **Perform a suite of activities to justify that this facility falls into a category of special radwaste burial facility.**

## **Regarding Workshop #1, ICP (after getting a permit for extending the operating period):**

- **Ensure implementation of recommendations and actions providing for serviceability, long-term performance and reliability of its elements and systems during additional term of the facility life.**

**Develop the PDC technology providing for liquid RAW absence at a final stage of the process radwaste handling.**

**Provide for introducing changes into NP-019 adding characteristics of borosilicate glass as a HLW immobilization matrix.**