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How digital models and simulation are used by regulatory bodies in legacy management: examples from Russian/Norwegian regulatory cooperation

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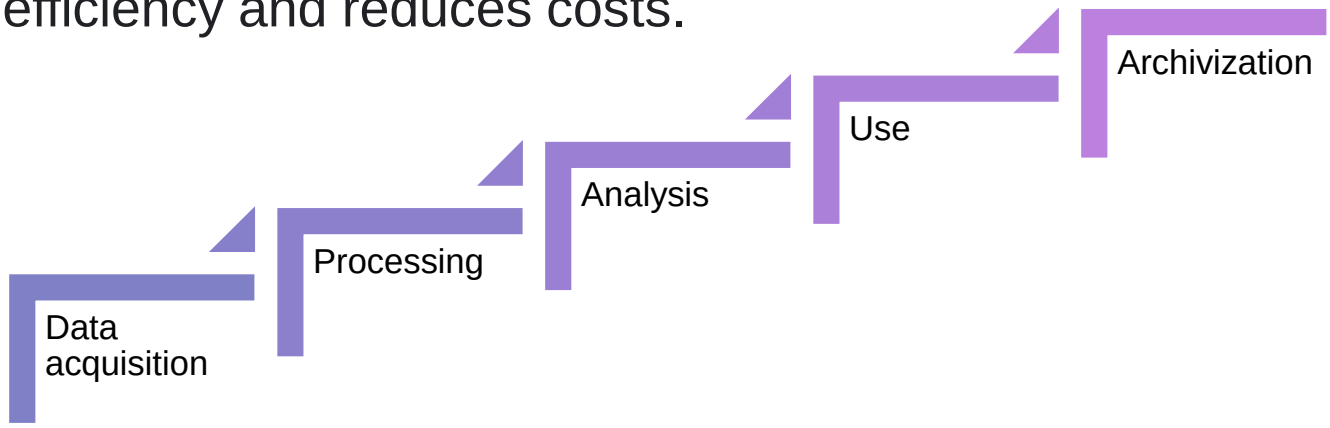
Digitization

Digitization is an application of digital technologies to specific processes and includes:

→ data acquisition by creating a digital representations of the real world as a result of digitization;

→ integration (processing and joining of data sets) and data analysis using algorithms.

The main goal of digitization is good work organization which effectively increases efficiency and reduces costs.



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Challenges at Andreeva Bay and potential benefits of digitization

At complex sites like Andreeva Bay there is need for continuous and reliable exchange of information between individual teams of specialists and individual employees.

Possible foreseen benefits of digitization included capacity to :

- store, analyze and manipulate data
- visualize and understand the radiation situation, around the site and inside key structures
- support prospective assessments and understand impacts of possible alternative options, and hence support strategic decisions on progress to next steps in a long-term remediation program
- improve communication between policy makers, management, technical implementers, workers representatives regulators, and
- communicate to wider non-technical stakeholders.

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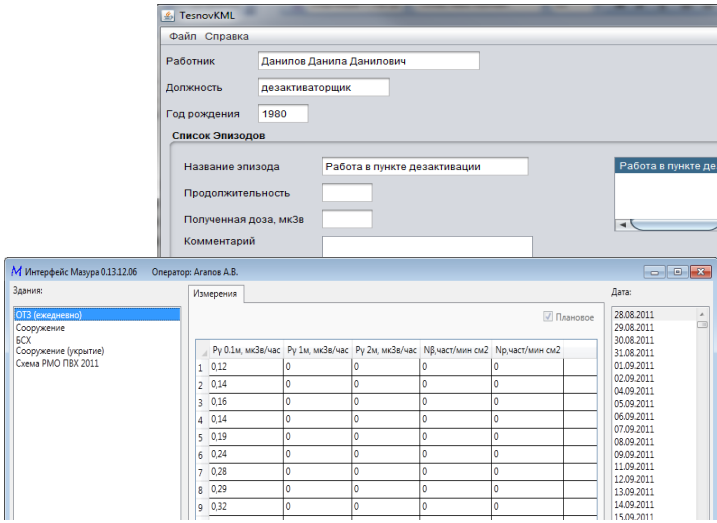
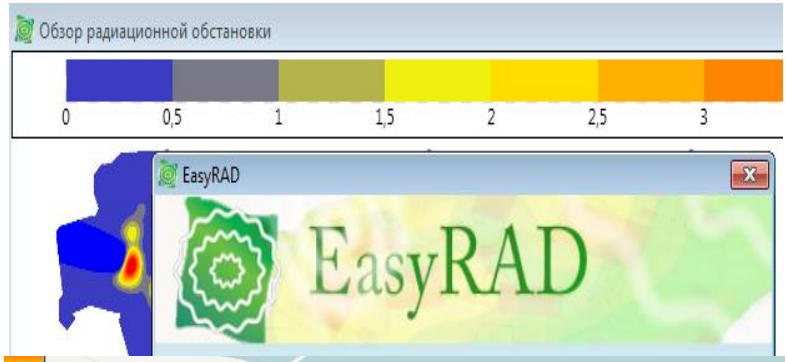
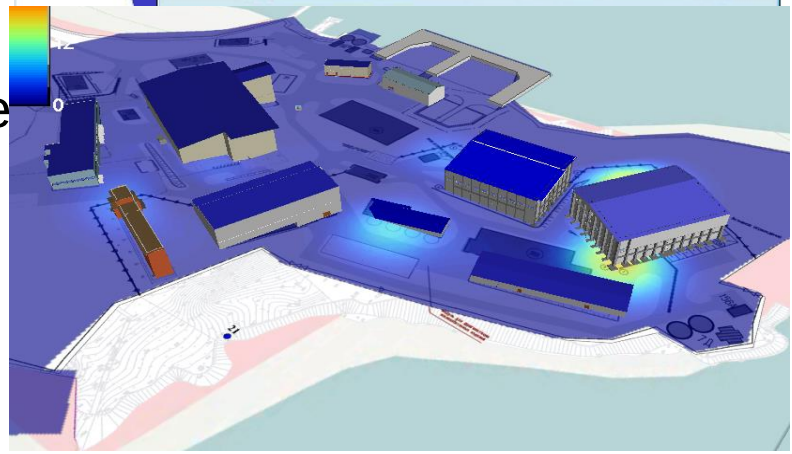
DOSEMAP

- → Database of area radiation measurements
- → Mapping dose rate
- → Classification of the site into radiation zones
- → Assessment of doses linked to specific operations
- → Identifying optimal work and evacuation routes
- → Database of individual doses of personnel
- → Digitizing the set of building
- → Creating analytical data processing tools
- → Introducing and implementation of software for use by SevRAO staff
- → Analysis and visualization of retrospective data on radiation situation in Andreeva







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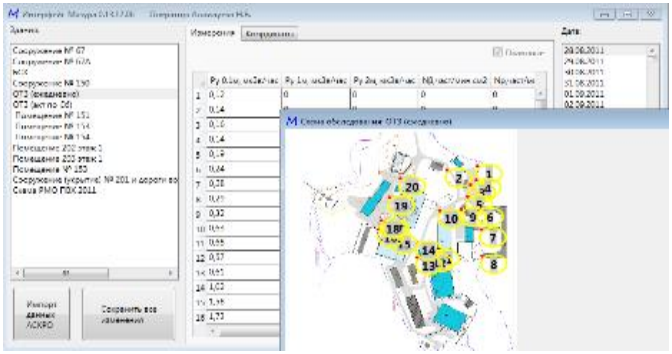
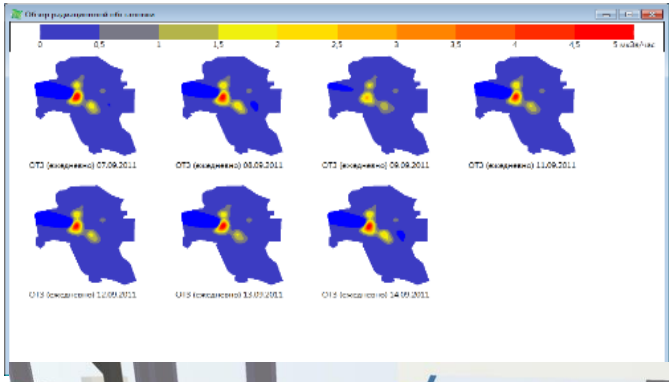
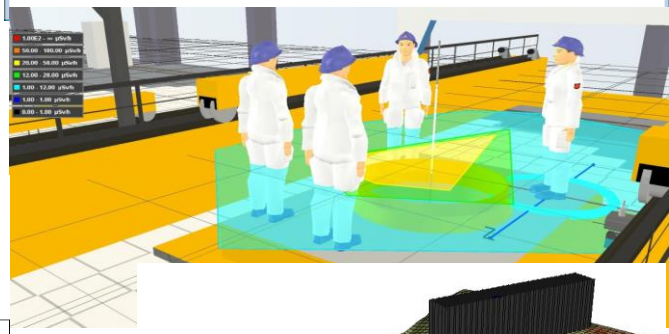
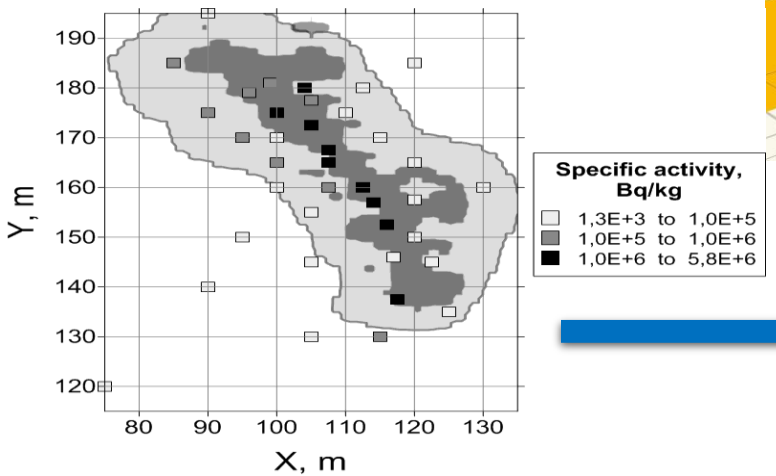
Visualization and prognosis tools

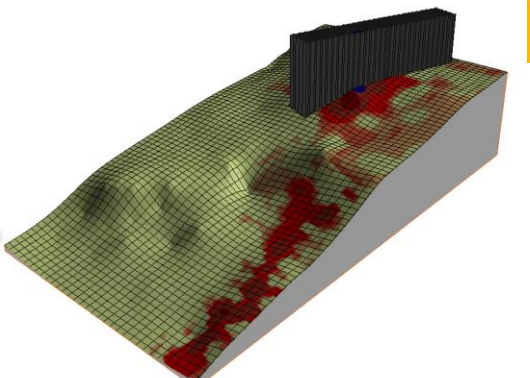
- Radiation monitoring
- Personnel dose database
- Personnel dose analysis
- Dose assessment
- Work planning
- Work optimization
- Training of personnel











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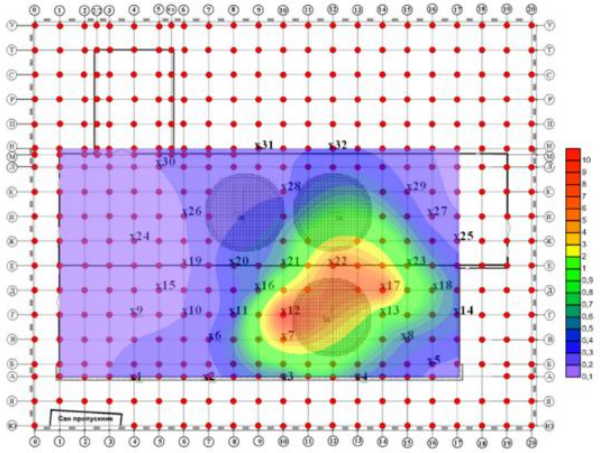
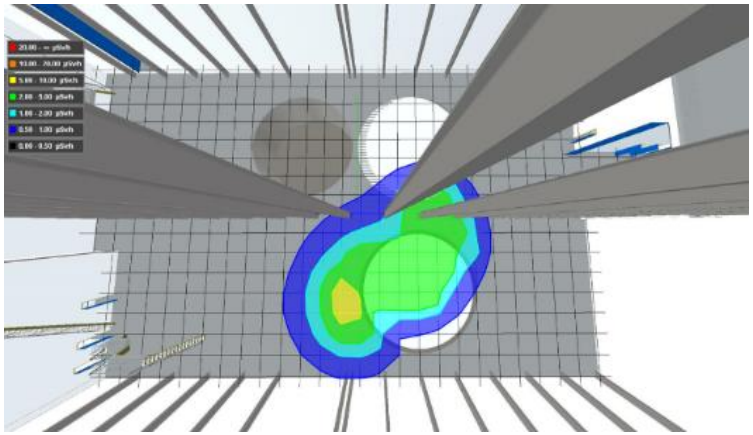
Data analysis



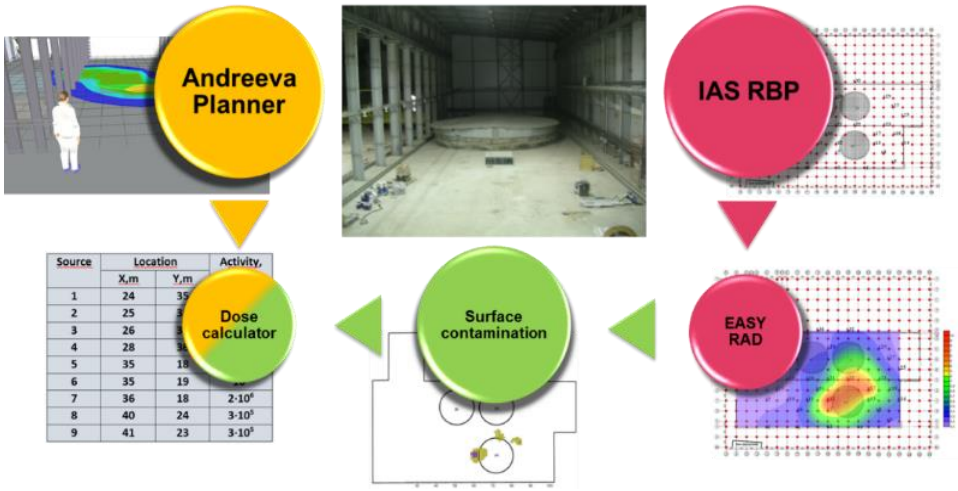
The radiation situation data analysis

→ Restoration of the surface activity outdoors and indoors based on the instrumental monitoring of the radiation situation

→ Changing radiation situation on-site and at the premises of the industrial site of the Andreeva Bay NWC SevRAO after the beginning of the active phase of normal SFA removal



Optimization of the technological operation from the technological working plan on SFA re-loading for the subsequent optimization of doses to workers and attached persons.



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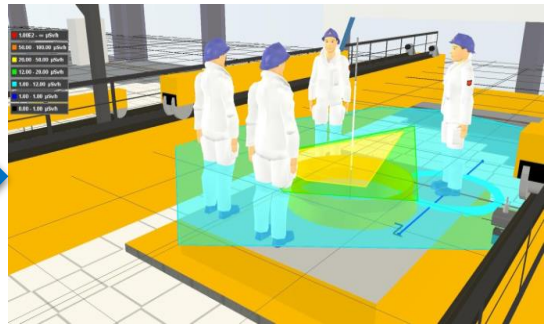
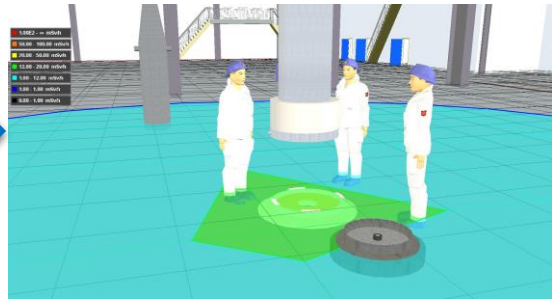
Control of doses and optimization

- Optimization of the production operation (modeling of actions of staff, dose assessment and optimization, visualization of the radiation field and training of the personnel)
- **Optimization of the technological operation:** unloading the conditional SNF from the DSU





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DATA-MAP system and ENVIRONMENT

Information complex on the radio-ecological situation at the SevRAO facilities:

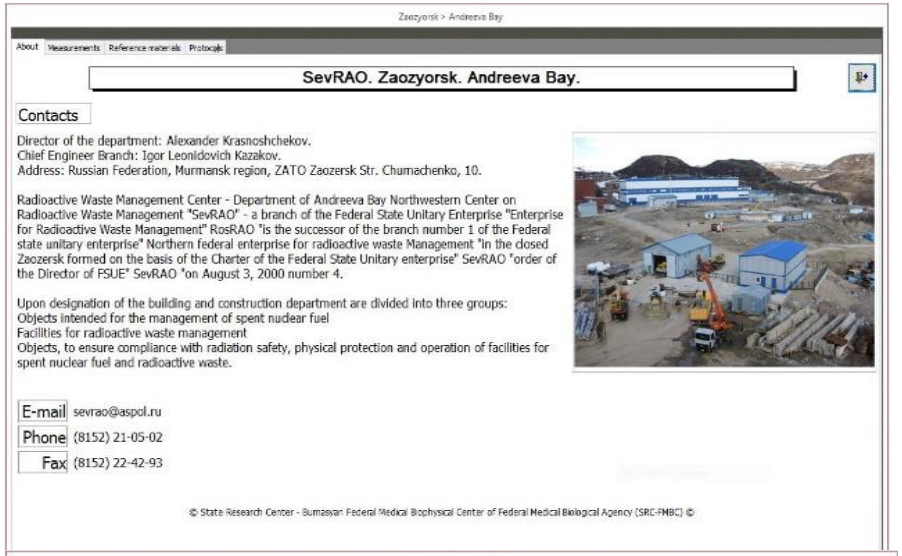
→ obtain timely and reliable information for the performance of expert evaluations;

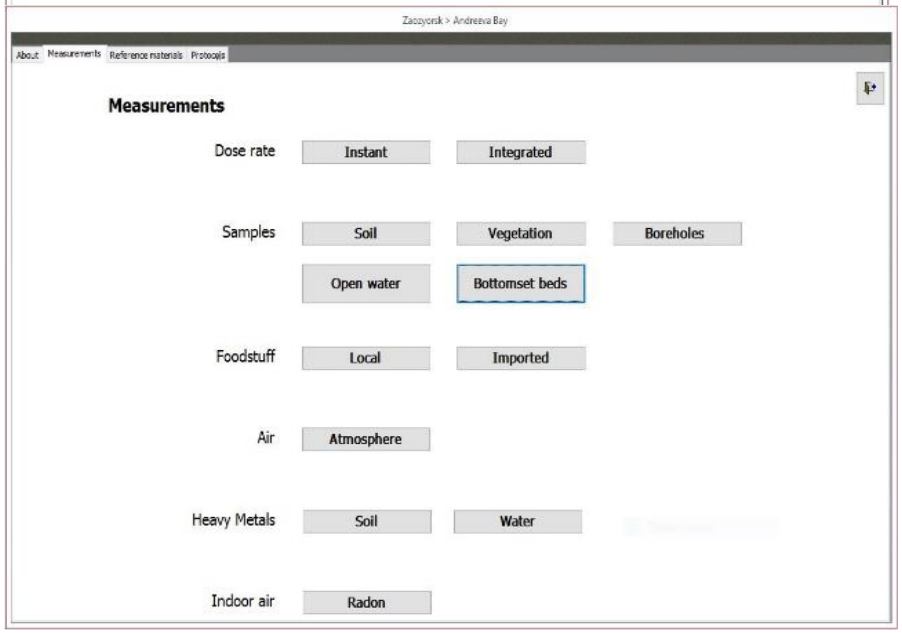
→ information systematization;

→ structuring existing information materials with convenient and easy access to these materials;

→ refer to materials on previous studies and measurements;

→ obtain or clarify information about the participants, time and place of the previous events or ongoing activities.





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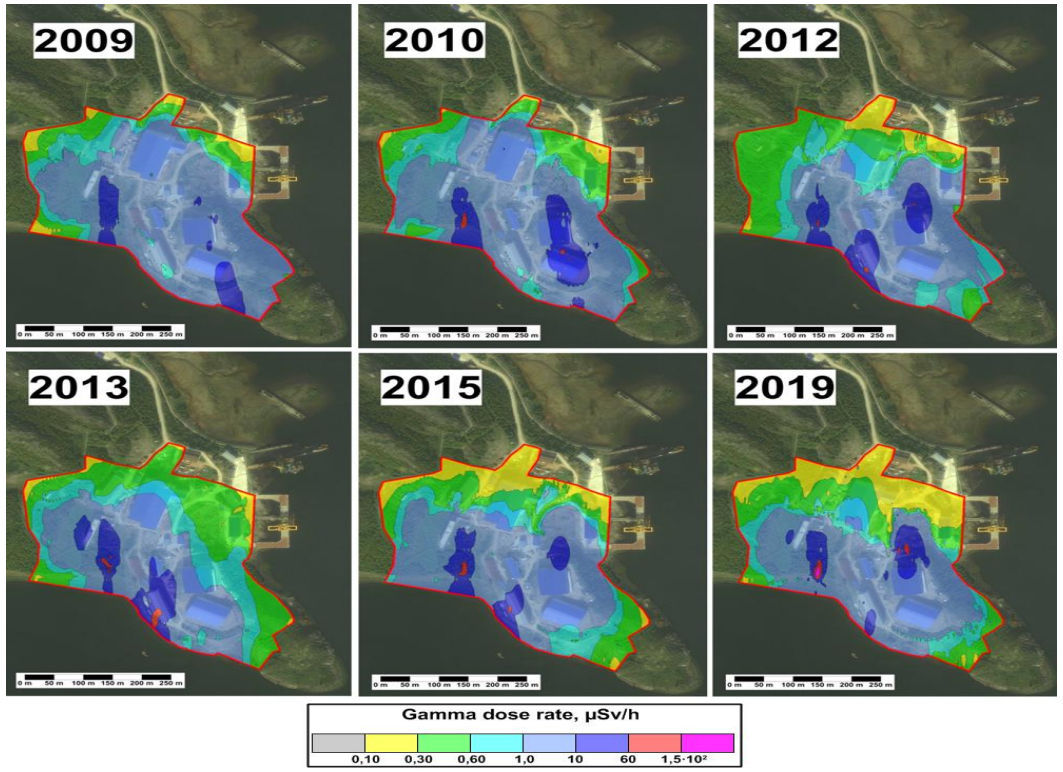
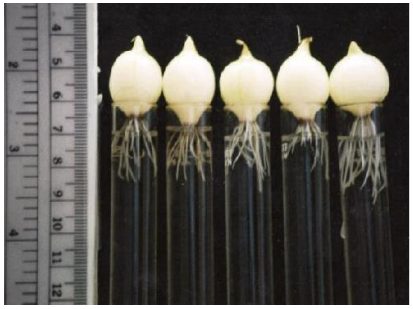
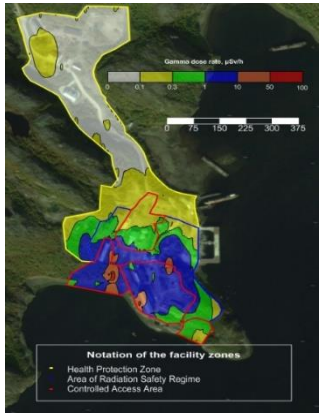
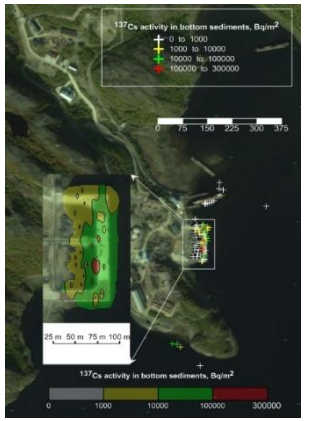
Radio- ecological monitoring based on data analysis

- → Radiation monitoring during the SNF removal
- → Radiation situation assessment at the Andreeva bay
- → Original studies of the radio-ecological situation at the Andreeva Bay STS.
- → Study of the marine off-shore water area contamination.
- → Assessment of impact of manmade radiation contamination on representative flora and fauna.









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PRM series- personnel reliability monitoring

Safety of SevRAO facilities

Regulatory activities

Assessment and regulation of performance reliability
(PRM Project)

→ **Digitized**

Periodic psycho-physiological examinations
(PRM Project)

Pre-shift psycho-physiological monitoring
(PRM2 Project)

Psycho-physiological support of training/re-training
(PRM3, PRM4 Project)

Assessment and regulation of safety culture

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Personnel reliability monitoring

Pre-/post-shift monitoring of psycho-physiological conditions of workers using the vibraimage parameters

→ Criteria

→ Hardware system

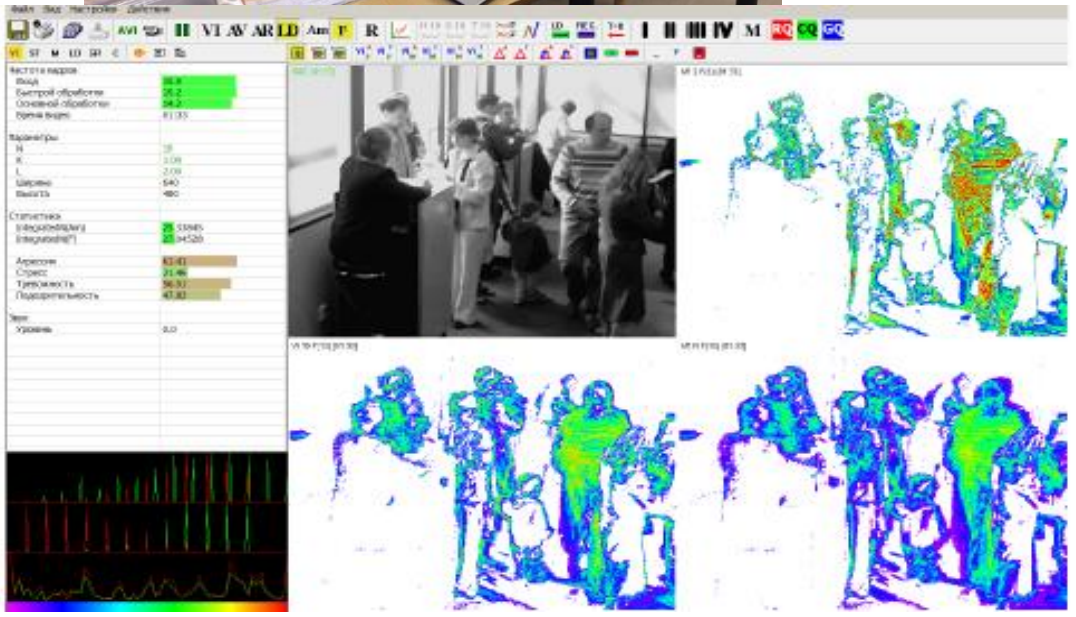
→ Methodical recommendations

Professional selection of workers to carry out especially important operations of SNF and RW management

→ Criteria

→ Prototype model of the system

→ Methodical recommendations



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Stakeholder involvement

NEA, EGLM,
Rosatom, FMBA, FMBC, SevRAO,
Murmansk Regional Authorities,
Public Council under Rosatom,
Administration of Murmansk

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Benefits of DSA-FMBA program and introduction of digitization into the legacy management

- → Quicker and more effective flow of information
- → Easier sharing of complex data
- → Easy storage of large amounts of information
- → Better security of information, digital versions are not exposed to flooding or destruction
- → Easy access to data at any time
- → Possibility of remote work
- → Improving communication
- → More effective planning
- → Greater efficiency by saving time, the ability to return to archived data at any time or trouble-free remote operation

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General observations

Digitization allows for the introduction of "new quality" of:

→ work efficiency,

→ ergonomics/optimization by introducing appropriate solutions

→ increases the level of acceptance of changes and facilitates their activation

→ optimization through the architecture of changes or processes including appropriate tools

→ Continuing training and improvements of planning.

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Thank you!

More information and publications are available at www.dsa.no