MOBILITY MISSION REPORT

This work has been partially supported by the EURAD project that has received funding from H2020-EURATOM 1.2 under grant agreement ID 847593.

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KLIKNETE NEBO KLEPNETE SEM A ZADEJTE TEXT.

MISSION TITLE

Participation at ACED/DONUT workshop

DESCRIPTION

Concerned organisations

SÚRAO (Waste management organisation) to which Techncial University of Liberec is the linked third party in EURAD
SCK-CEN (Research entity) as the conference organizer

Concerned infrastructures or facilities

none

Concerned phases

- Phase 3: Facility construction
- Phase 4: Facility operation and closure
- Phase 5: Post-closure

Themes and topics

- Theme 3: Engineered barrier system (EBS) properties, function and long-term performance
    - Spent Fuel and high-level waste disposal canisters
    - Containers for long-lived intermediate and low level wastes
    - Clay-based backfills, plugs and seals
    - Cementitious-based backfills, plugs and seals
    - Salt backfills
    - EBS system understanding
- Theme 4: Geoscience to understand rock properties, radionuclide transport and long-term geological evolution
    - Long-term stability (uplift, erosion and tectonics)
    - Perturbations (gas, temperature and chemistry)
    - Aqueous pathways and radionuclide migration
- Theme 5: Geological disposal facility design and the practicalities of construction, operations and closure
    - Facility and disposal system design
    - Constructability, demonstration and verification testing
    - Health and safety during transport, construction, operations and closure
    - Monitoring and retrievability
- Theme 7: Performance assessment, safety case development, and safety analyses
    - Integration of safety-related information
    - Performance assessment and system models
    - Treatment of uncertainties

Keywords

Numerical modelling; reactive transport; waste package corrosion; results comparison; communication

EXECUTIVE SUMMARY

I participated in the EURAD WORKSHOP “Assessing the long-term evolution of engineered barrier systems of waste disposal systems” with a talk “Double-case canister lifetime evaluation with reactive-transport and chemo-mechanical models” prepared as overview of a national repository programme project, i.e. extra from the participation and results of the EURAD DONUT participation.

My previous personal knowledge and experience cover various fields of numerical modelling application in THM processes and radionuclide transport, relevant to the deep geological repository planning and safety assessment, but with minor interest to chemical and reactive transport modelling. The topic of the conference, i.e. the numerical modelling in relation to the chemical evolution of the repository barriers, was considered a convenient occasion to get deeper knowledge in this direction, making the progress more efficient than with individual literature study.

The experience and contacts will help me in the current and future work in the SURAO’s waste package lifetime project, both as a leader and as a numerical modeller in partnership with corrosion and bentonite mineralogy experts from other Czech institutes.

Additionally, presenting the SURAO's concept of couble-case steel waste package to wider expert audience could bring valuable feedback not only to own numerical modelling work, but also to SURAO for future decisions in waste package development and use. In particular, it attracted attention of participants looking for alternative waste package concepts.

1. MISSION BACKGROUND

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1.1. R&D background

Regarding the conference, the background is given by the extent of the DONUT and ACED workpackages, in particular (1) rather generic field of numerical modelling applied to repository processes and the safety assessment and (2) chemical processes related to interaction of various barrier materials in different waste type and host rock cases.
Regarding the individual participation, the focus is on numerical modelling problems supporting the steel waste package lifetime, i.e. reaction-transport or THMC coupled problems.

1.2. Mission objectives

The objective is to improve experience in modelling of coupled processes involving chemistry, in relation to iron-bentonite interface.

This extends the previous participation in DONUT Task 3 and the existing numerical modelling experience and supports the recently launched project in the national repository programme, for the waste package lifetime prediction.

1.3. Mission request

The planned mobility consists of a regular workshop participation for its full length, 8-10th November 2023. A considered active participation depends on the level of progress of the SÚRAO's project on corrosion modelling, possible option could be a poster with description of considered concepts and methods, structure of tasks and various expertise combinations, and introductory team results.

1.4. Mission composition

Host organisation

SCK-CEN as the conference organizer

Host facility

Lamot Mechelen - Congress and heritage center (conference venue)

Mechelen, Belgium

Mission dates

8-10 November 2023

2. MAJOR PRACTICES, TECHNIQUES, METHODS, TOOLS OR SYSTEMS OPERATED OR STUDIED

This seems not specifically relevant for a conference participation, so only one item regarding the communication is elaborated, with either generic notes or particular examples.

2.1. Practice, technique, method, tool or system operated or studied during the mission

Communication of methods and results in a conference participation – presentation, discussion.

Description

I gave a regular conference talk, with overview of a running national project on the waste package lifetime prediction. This represents a preparatory phase for SURAO's waste package type decision and for future application at the regulator.

Usage

Within the discussion, I responded several requests for more details on the SURAO's double-case concept of carbon and stainless steel.

The presented models of chemical evolution near the iron-bentonite interface will be an inspiration for own work on this type of reaction-transport model.

Benefits

I could give specific questions to various numerical concepts used for corrosion interface modelling. The conference participation was very efficient complement to individual literature study especially in the particular phase of own project on waste package lifetime evaluation for SURAO.

Limitations

Naturally, the conference talks and side discussions do not give a level of experience like it would be from practical training with numerical calculation in a software.

Applicability

The topic of the conference was very well focused for the topic I am currently working outside of the EURAD project – the corrosion interface modelling. So the experience and feedback will directly affect the research work.

2.2. Practice, technique, method, tool or system operated or studied during the mission

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Description

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Usage

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Benefits

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Limitations

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Applicability

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2.3. Practice, technique, method, tool or system operated or studied during the mission

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Description

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Usage

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Benefits

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Limitations

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Applicability

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2.4. Practice, technique, method, tool or system operated or studied during the mission

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Usage

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Benefits

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Limitations

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Applicability

Klikněte nebo klepněte sem a zadejte text.

3. MISSION FINDINGS AND CONCLUSIONS

3.1. Lessons learned and conclusions

I could get better acknowledged with the EURAD results than I would with my regular participation as a team member in the WP DONUT. I could understand the WP DONUT results in wider context than in the WP meetings I participated and especially with the whole WP ACED which I did not have opportunity to observe during the EURAD running period. This was intended, as a shift in my research topic, from other physical processes in the repository, to coupled processes involving chemistry, with application to the corrosion interface modelling.

It was important to recognize various cases of chemical evolution, depending on the type of waste, configuration of engineering barrier, and the type of the host rock. Although such differences do not directly affect the numerical algorithms, it was important to capture ideas how to conceptually handle the various interactions and what can be typical problems for solution and what it a typical achievable level of model-to-reality relation.

I also discussed individually with the conference participant, in particular the representation of solid phase and pore water at the interface by discretisation cells with Alba Mon (Univ. Coruna) and practical questions of iCP software use with Andrés Idiart (Ampros 21).

I got usefuls feedback to my talk helping to further work on the canister lifetime project.

3.2. Relevant findings and conclusions for home organisation

Regarding SÚRAO, which is not directly my home organization but it is the primary partner in my research work, there was a feedback for their development of the container combining carbon steel and stainless steel. I was addressed by several participant regarding this concept, which I interpreted that it is not yet widely known and that it could be of potential interest for other national repository programme. I provided references to technical reports to Gyula Dankó and László Molnár (PURAM) and to Ayantika Banerjee (BAM).

3.3. Relevant findings and conclusions for host organisation

Not relevant.

3.4. Relevant findings and conclusions for other organisations

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4. POTENTIALS FOR IMPROVEMENT OR DEVELOPMENT

4.1. Generic potentials

In general, the obtained experience should improve the further progress with numerical models application on reactive transport and the corrosion interface in particular, both from personal research point of view and for SÚRAO's national programme of the deep geological repository.

4.2. Potentials for home organisation

The conference participation with a new topic and to partly new audience, with respect to previous coverage of the team at the home organization, could improve the visibility and chances for potentical future cooperation and projects.

4.3. Potentials for host organisation

Not relevant.

APPENDICES

Mission journal

7 Nov 2023 arrival

8 Nov 2024 conference programme (includes own 25 minutes talk)

9 Nov 2024 conference programme

10 Nov 2024 conference programme, departure.

Mission bibliography

The conference contrinution:

M. Hokr, J. Šembera, J. Stoulil, L. Baborová, E. Bedrníková, P. Večerník, D. Vopálka, M. Hasal, J. Novák, Z. Michalec: Double-case canister lifetime evaluation with reactive-transport and chemo-mechanical models. Presented at EURAD ACED-DONUT Workshop “Assessing the long-term evolution of engineered barrier systems of waste disposal systems” November 8-10 2023, Mechelen, Belgium

MISSION BENEFICIARY

Milan HOKR
Senior researcher
Faculty of Mechatronics, Informatics, and Interdiciplinary Studies
Technical University of Liberec, Czech Republic

PARTNER EXPERTS CONTRIBUTING TO THE MISSION

Host organisation experts

- Conference main organizers – WP leaders: Francis Clarets (BRGM), Diederik Jacques (SCK-CEN)

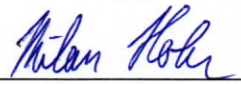
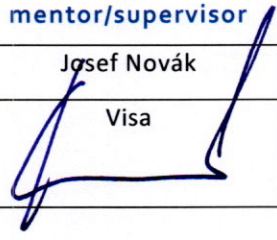
Home organisation experts

- Josef Novák – head of the department (but my research work is independent without direct supervision)

Other organisations experts

- none

REPORT APPROVAL

Date	Beneficiary	Home mentor/supervisor	Host mentor/supervisor
10 May 2024	Milan Hokr	Josef Novák	Not relevant
	Visa 	Visa 	-