

DBE TECHNOLOGY NEWS

2014



FEASIBILITY STUDIES FOR
AN HLW REPOSITORY IN
BELGIAN CLAY FORMATIONS

FUNCTIONALITY OF SALT BACK-
FILL IN AN HLW REPOSITORY

NEW HEAD OF THE INTERNATIONAL
COOPERATIONS DEPARTMENT

GERMAN STATE OF THE ART IN HLW
DISPOSAL IN SALT FORMATIONS

Verantwortung
für Generationen
Responsibility
for Generations

DBE TEC
DBE TECHNOLOGY GmbH



Consulting of NWMO (Canada) by DBE TECHNOLOGY GmbH



Dear colleagues,

“Todo pasa y todo llega”, wrote Antonio Machado, my favorite poet. All goes by, and so my time at DBE and DBE TECHNOLOGY GmbH is now coming

to an end. I look back at 25 years of exciting experiences, initially with my German colleagues in Northern Germany, and later with friends and partners all over the world. It would have been difficult, back in the summer of 1988, to foresee what later came. I joined a small company as staff number 148. I should have heavily bet this number in the lottery, for it proved to be a quite lucky one!

My first job was to develop a temperature calculation code, LINSOUR. We still occasionally use it these days. I then worked in a variety of R&D projects and very soon focused on a first international project for ENRESA, our Spanish sister company. Later, the pace continuously accelerated, with work for the EU in Eastern Europe, for Japanese, Canadian, French and Belgian colleagues, more recently for the United States, Ukraine, Bulgaria, and most recently, as support to the main contractor for the French repository project CIGEO. The topics my colleagues and I dealt with covered everything even remotely related to waste final disposal. The geographical area spanned from the Andean foothills in Western Argentina to

the archipelago of Novaya Zemlya in the Arctic Ocean, from East Asia to North America. I was lucky to have generous (and patient) principals, who granted me the freedom I needed, but, most important, excellent and loyal associates and friends that were instrumental to our joint success.

Now it was time to pass the responsibility to younger hands and step back from the front line. I still plan to continue working in the field for a while out of my home in Aachen for DBE TECHNOLOGY GmbH and others. I will be answering the phone and my e-mails. My former and current colleagues and partners can be sure of my outmost appreciation. To my DBE TECHNOLOGY GmbH colleagues I wish continued success in our joint endeavor to make a small but fine engineering company of Peine, Lower Saxony, a key international player in the waste management field.

Happy Reading!

*Dr. Enrique Biurrun
International Cooperation Department
DBE TECHNOLOGY GmbH*

Dr. Thilo von Berlepsch – the new Head of the ‘International Cooperations’ Department

On January 1st, 2014, Dr. Thilo von Berlepsch took over the responsibility for the ‘International Cooperations’ Department from Dr. Enrique Biurrun.

Thilo von Berlepsch studied engineering at the Leibniz University in Hanover, and prepared his PhD thesis on nuclear safety at the Ruhr-University Bochum. In 2003, he started his work at EON Kernkraft GmbH (Hanover). He first worked as an engineer in sys-

tems and plant engineering and later as senior engineer in international licensing. In 2010, he became performance manager for nuclear new build and coordinated a large-scale nuclear project in UK. During his career, Thilo von Berlepsch has gained extensive experience in nuclear safety and the management of nuclear projects.

In 2012, he joined DBE TECHNOLOGY GmbH as deputy head of the ‘International Cooperations’ Department. For one year, Dr. Biurrun familiarised his designated successor with his future work by involving him in projects and by introducing him to international partners.

Concerning his future work, Thilo von Berlepsch said: “The special attraction of my present and future work lies in the diversity of the projects and tasks. The continuation of Enrique Biurrun’s work is a special challenge. Furthermore, I see the chance to implement new ideas for future work. An important issue is an integrated approach to waste management projects, taking into account not only technical aspects but economic and financing aspects as well. Here, DBE TECHNOLOGY GmbH offers new options and solutions....”



Dr. Enrique Biurrun (left) and his successor Dr. Thilo von Berlepsch (right)

**DBE
TECHNOLOGY
GMBH**



Construction of a flow barrier at the Asse mine (Germany)

Feasibility studies for an HLW repository in Belgian clay formations

ONDRAF/NIRAS, the Belgian Agency for Radioactive Waste and Enriched Fissile Material, proposed geological disposal in poorly indurated clay as the reference solution for the long-term management of high-level and/or long-lived radioactive waste in Belgium. ONDRAF/NIRAS is currently preparing a safety and feasibility case (SFC), which will describe, substantiate and, as far as possible, quantify the safety and feasibility of the proposed disposal system.



Connecting gallery of the HADES underground research laboratory (Belgium) (Source: ONDRAF/NIRAS).

DBE TECHNOLOGY GmbH was commissioned to support ONDRAF/NIRAS by carrying out feasibility studies in regard to the future operation of such a repository. The studies focus on essential parts of the conceptual repository design that need further development and confirmation of technical feasibility, on the demonstration of compliance with safety requirements,

and on a cost evaluation. The feasibility studies for a hoisting system for payloads of up to 80 tons, for underground transport and waste emplacement systems, and for repository ventilation have been completed. All systems for transport and ventilation are based on state-of-the-art equipment. The shaft transport system is based on components that have been built and tested at full scale during R&D work carried out by DBE in connection with the German repository projects at Gorleben and Konrad.

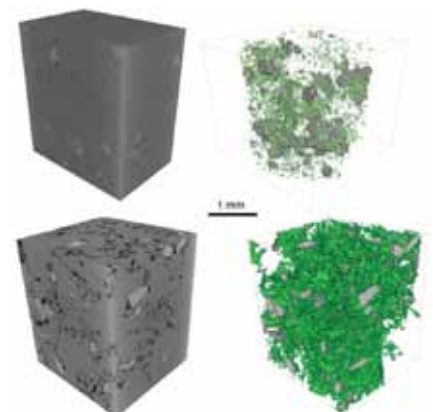
As a result of the analyses conducted as part of the feasibility studies, several recommendations for optimizations of the original design basis were formulated. In all cases, systems with proven technical feasibility could be designed, which also complied with the requirement for safe and cost effective technical implementation.

Functionality of salt backfill in an HLW repository in salt formations

The long-term containment of radioactive waste in a repository in salt formations relies on the properties of the host rock as well as on the sealing and backfilling of the mine excavations. As backfill material, crushed rock salt is considered as the reference material. An R&D project (REPOPERM) to investigate the long-term development of the backfill properties has been sponsored by the Federal Ministry of Economics and Technology represented by the Project Management Agency Karlsruhe (PTKA-WTE, KIT). An advantage of crushed salt is its ability to consolidate into a dense material

as a result of long-term compaction. A final assessment of the material's suitability as backfill material requires an understanding of its response to compaction on a microstructural level, e.g. the reduction of porosity and pore connectivity.

In this context, significant permeability changes due to porosity changes near the threshold porosity are of special relevance. The relationship between these microstructural properties and the degree of compaction are the basis for assessing the sealing properties of compacted crushed rock salt. For analysis, X-ray computer tomography (XCT) was used to obtain 3D reconstructions of the macro- and microporosity of test samples with different degrees of compaction and different porosities. The analysis showed that pore connectivity, which is relevant for fluid permeability, is directly related to porosity. At porosities below 3-5 %, the pores are mainly isolated from each other, and thus the backfill is no longer permeable to solutions. Hence, the backfill porosity in a repository should be below this target value.



3D models of samples with a higher porosity (bottom) and a lower porosity (top). Porosity green coloured. Top sample with low pore connectivity.

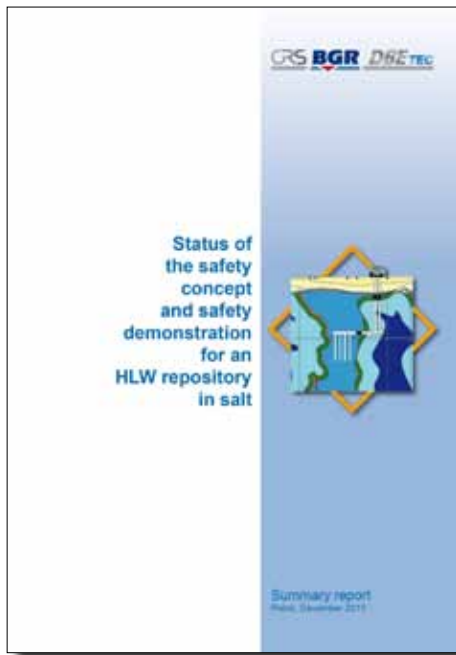


Emplacement device for borehole disposal

German state of the art in HLW disposal in salt formations

The summary report for the R&D project 'ISIBEL' documents an analysis and evaluation of the German state of the art in high-level radioactive waste (HLW) disposal in salt formations. The project has been funded by the Federal Ministry of Economics and Technology, represented by the Project Management Agency Karlsruhe (PTKA-WTE, KIT).

Salt formations have been the preferred host rocks for HLW disposal in Germany for more than 40 years. During this period, a wide range of concept and safety related R&D work has been carried out. This included large- and full-scale demonstration tests of the equipment needed for the transport and emplacement of radioactive



waste. In recent years, a safety assessment and demonstration concept that takes into account the favourable

properties of salt formations has been developed and applied in the course of the R&D projects 'ISIBEL' and 'Preliminary Safety Analysis Gorleben'. The results of these projects show that reliable safety assessments of HLW repositories in salt formations are possible and that both the technology and the know-how for the construction as well as the safe operation and closure of an HLW repository in a salt dome with a suitable geologic structure are available.

To download the ISIBEL report, please visit www.dbetec.de.

For further information visit our website www.dbe-technology.de or scan the QR code below.

**DBE
TECHNOLOGY
GMBH**

Published by: DBE TECHNOLOGY GmbH
Eschenstraße 55 · D-31224 Peine
www.dbe-technology.de
January 2014

Edited by: Dr. André Lommerzheim, Michael Brinkert
Design and Production: GLANDT WERBUNG PEINE

Copyright: Texts and pictures are protected by copyright. Use, either in part or in full, requires explicit written permission.

