BULLETIN 2022

dekonta

Services and technologies
for a better environment

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Hello,

welcome to the third issue of our magazine. This time I would like to reminisce a little, to take stock and to thank a lot.

This year DEKONTA celebrates 30 years since its foundation.

We have been through a lot in 30 years, we have grown a lot, but most of all we have done a lot of honest and meaningful work.

Millions of tons of soil cleaned of oil, tar and other toxic contaminants.

Millions of meters³ of purified groundwater.

Millions of meters³ of purified air emission and waste gases.

Comprehensively cleaned chemical plants, contaminated airports, gas stations, military facilities.

Thousands of environmental accidents cleaned up.

But also, dozens of new remediation technologies, patents and processes.

For this, I would like to thank and admire all those who participated. Hopefully, we have managed to turn back the wheel of human plundering of nature.

We want to continue to observe, study and learn about the processes by which nature defends itself against human damage. And to apply these processes sensitively and gently in the places of greatest ecological stress.

I would very much like to ask all employees of our holding company, as well as other collaborators, to continue our meaningful and important work. Work professionally, honestly, decently, with humility towards nature and people. At the same time, we have maintained our camaraderie and, last but not least, our common non-work activities and fun.

Thank you very much.

Tomáš Havlík
Chairman of the Board of Directors of DEKONTA Holding, a.s.

dekonta 30 years

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1. HYDRAULIC FRACTURING IS NOT ONLY USED IN THE OIL INDUSTRY

Radek Červinka, Ondřej Lhotský, Ondřej Urban

Historically, the site of the former Duchcov area is associated with the production of prams, scooters, tricycles, cars, swings, furniture and other products, which was founded by the company HIKO - Hirsch and Co. in 1907 in the building of the former sugar factory. After the war, the Factory of Children's Vehicles (TDV), n. p. Duchcov was established here. After 1989, the state enterprise was bought by Josef Konejl, who continued production, but after his death in 2012, the premises began to deteriorate and were subsequently demolished. During the period of operation, the unsaturated and saturated zones were significantly polluted with heavy metals, especially hexavalent chromium from galvanization, and chlorinated hydrocarbons (e. g. CIE) used in the degreasing of components.

As part of the remediation, it was first necessary to remove the colliding construction debris at the location of the identified contamination hotspots and to conduct a follow-up survey to specify the area and depth extent of the contamination. For this purpose, a combination of MIP (Membrane Interface Probe) and direct push sampling was used. Based on the refined contamination contours, three contamination hotspots were confirmed with a total area of approximately 3200 m^2 and a depth range of up to 11 m at a location below the original degreasing plant. Here, CIE concentrations of up to 1566 mg/kg dry weight were observed. Luckily the mobility of the contamination is low in the poorly permeable clays present in the subsoil.

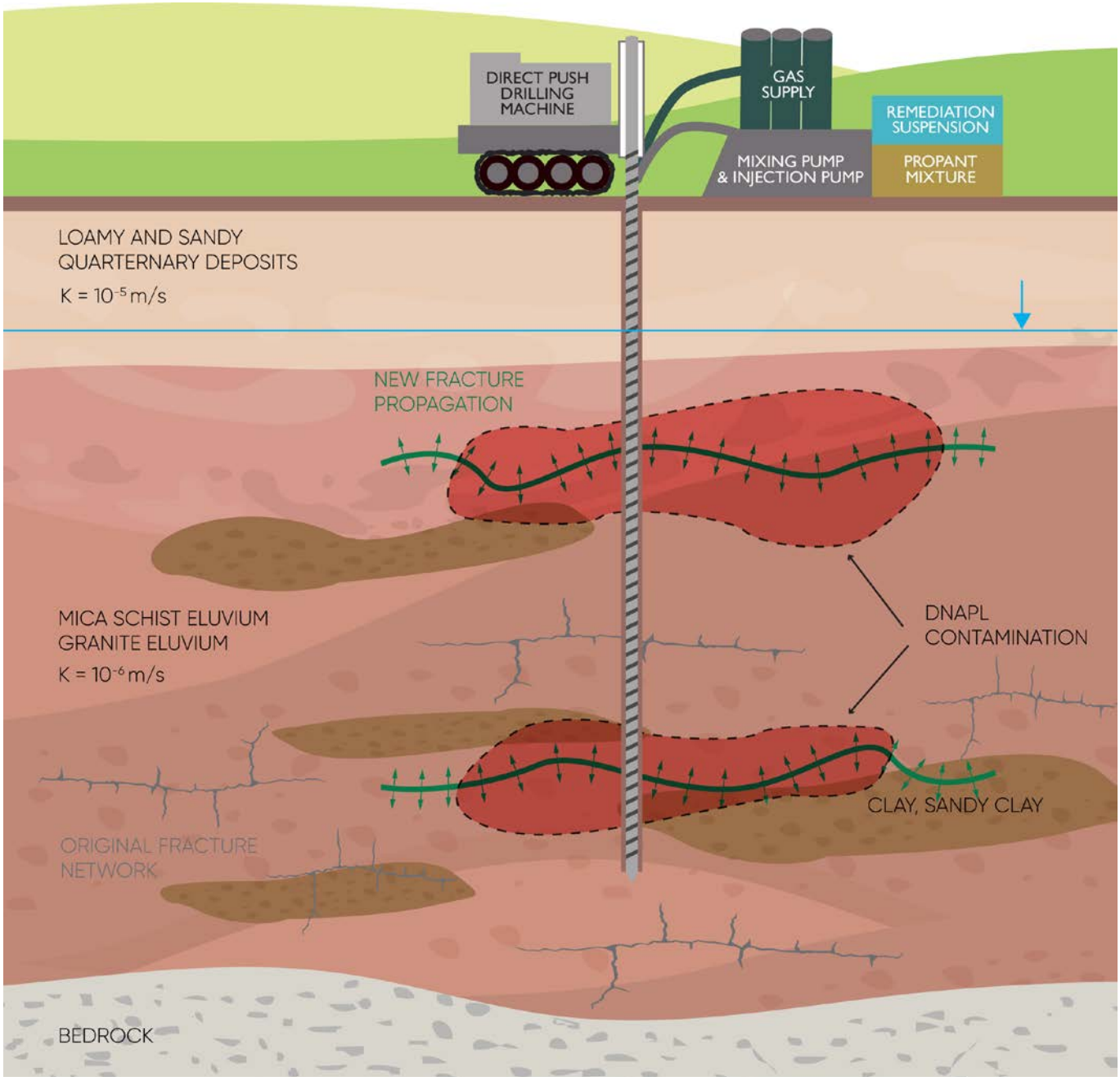
The soil of the unsaturated zone was successively extracted and with the help of monitoring was divided into under-limit soil, which was deposited on the intermediate deposit, and over-limit soil, which was taken for further pre-treatment - venting. The construction-remediation pumping with purification at the remediation station then ensured smooth earthworks up to a depth of 4.5 m below the ground level.

Within the remediation excavations and their vicinity, a unique Frac-In technology is applied in the saturated zone, which allows for direct push pneumatic fracturing combined with hydraulic application of solids suspensions into the created fractures in a low-permeability rock environment. In principle, steel rods with a special injection tip are

driven into the underground using a penetrating drilling rig. When the desired depth is reached (in contaminated horizons), the hammering is stopped and the rock environment is 'blown' by pressurized air, leading to the formation of fractures. In the next step, a gel containing solid particles (a mixture of sand and micro-iron) is pumped into the fractures, which causes the fractures not to close and also acts to remove the contamination present. The fractures are then further treated with an organic substrate solution and the fracturing/drilling is continued to deeper horizons where the process is repeated. In addition to the degradation of chlorinated ethenes, the hexavalent chromium present is reduced and immobilized in this way.

Last but not least, a groundwater circulation system was installed to ensure an even distribution of the carbon sources and to help the rapid start of the biological reductive dichlorination process. It has long been shown that the appropriate combination of remediation methods leads to faster and more effective remediation.

The client of the works is the company ProPark. nu I s.r.o., while the project is co-financed from EU funds through the OPE. The main supplier of the remediation works is the company G-servis Praha spol. s r.o., where DEKONTA a.s. provides the majority of the remediation works with the unique Frac-In technology.



2. ADDRESSING THE IMPACTS OF CLIMATE CHANGE IN TAJIKISTAN

Aleš Kulhánek, Davide Messana

In the first half of this year 2022, DEKONTA implemented the project Assessment of the Cost and Benefits of Climate Change Adaptation in Agriculture, Forestry and Water Management Sectors of Tajikistan. The assignment was funded by United Nations Development Programme (UNDP) and was carried in cooperation with the experts from the Czech University of Life Sciences Prague, BEZK and in support of the Tajik Agrarian University named after SH. Shotemur and the Tajik State University of Law, Business and Politics.

The main objective of the Tajik UNDP is the facilitation of access to climate finance to contribute to building climate-resilient communities in disaster-prone mountainous regions across Tajikistan. The project aimed to assess climate change's biophysical and socio-economic impacts and estimate the total economic losses and damages to the country in agriculture, forestry and water management by 2050 through the following main steps:

1. Assessing the existing and predict the future climate change in Tajikistan.
2. Studying the effects of climate change on agriculture, water resources, and forestry.
3. Assessing the benefits and costs of adaptation interventions to climate change and land degradation.

The assessment was performed for the six target districts of Kuhistoni Mastchoh, Gissar, Shaartuz, Fayzabad, Kanibadam and Muminabad representing a wide variety of environmental, climatic and agricultural profiles of the country, as well as different patterns in land degradation patterns.

Results of the project will support the development of future policies and programs for climate change adaptation in Tajikistan, including initiatives for regional cooperation and capacity building in climate-resilient development.

To achieve the sound outcomes, the project team applied following tools:

- structured interviews with the representatives of international and national stakeholders;
- obtaining statistical data from the relevant ministries and state agencies;
- quantitative modelling of climate change over next 10 and 20 years, its impact on agriculture, water management and forestry and the economic implications;
- organizing focus groups at jamoat level in the target districts aiming at participants' perception of the climate change and its future development
- cost-benefit analysis of the selected implemented projects including comparisons of the current and projected trends and evaluation of indicators in the selected sectors if no adaptation interventions are done.

The results suggest that the climate change in Tajikistan is visible both on the level of meteorological data and on the level of local communities.

The climate change presents significant pressures to the local communities. In case of no adaptation

measures, the country will have to face desertification of the land, increased migration and brain drain, depopulation of affected localities, increase in morbidity and need of health care. In the worst case these effects might be irreversible.

The rapidly growing population of Tajikistan will put more pressure on the food supplies in the near future. The climate change adaptation should be viewed as one of the measures to meet these increased needs.

While most of the effects of climate change are negative (increasing temperatures and evapotranspiration, stronger winds, change in seasonality precipitation, and increase in extreme weather events such as heat waves, spring frosts, sudden intensive rains, etc.), the climate change also presents some opportunities. Namely, increasing temperatures is predicted to increase crop yields of particular crops and enable the population to collect three harvests per year instead of two. However, this positive effect will not be most likely manifested due to the lack of irrigation water. Thus, the adaptation projects related to water use were prioritized as the most urgent.

3. OSTRAVA LAGOONS – GROUNDWATER ISSUES

Vladislav Knytl, Radim Šimon, Martin Fousek

The landfill area located on the outskirts of Ostrava, also known as the Ostramo Lagoon, still represents one of the leading environmental burdens in the Czech Republic. The area was mainly used to dump oil sludge from a mineral oil refinery. The bodies of the individual dumps were removed and further treated. However, there is still a significant problem of groundwater contamination and a non-functioning underground sealing wall that was implemented in the past. On the basis of previous investigations, it has been found that the groundwater has a very low pH and contains a number of other toxic substances besides oil pollution, which are also highly mobile. It was also found that inorganic pollution is stratified in the aquifer. Previous remediation interventions, consisting of the injection of lime slurry to raise the pH and start processes to reduce the mobility of contaminants, have been unsuccessful

The main reasons that led to the failure of previous remediation interventions were inappropriate grouting techniques, insufficient quantities of the remediation agent and lack of data on its effectiveness and distribution in the rock environment. For this purpose, in the initial pilot experiments, which were carried out in cooperation with MEGA a.s. and the Technical University of Liberec, it was decided to use the tracer fluorescein and to mix it into the remediation agent in the form of a calcium hydroxide solution. A welcome feature of fluorescein is its instability in acidic environments. As a result, it can serve as an indicator of whether the rock horizons of interest are sufficiently affected by the lime milk to establish an alkaline environment. The Optical Image Profiler + Hydraulic Profiling Tool technology (OIHPT, Geoprobe, USA) was used for exploration work related to contamination assessment at the site and fluorescein tracing. This is a unique use of this survey technology for this purpose.

OIHPT is a direct rock environment survey tool primarily used for the detection of oil pollution (NAPL). Exploration using OIHPT technology has shown very valuable results in terms of characterizing the stratification of oil sludge residues and horizons affected by fluorescein, the phase interface in the reservoir and defining the permeability of the lithological profile (HPT). The results of the pilot experiments have confirmed the usefulness of fluorescein both in terms of monitoring the distribution of the remediation agent and in terms of estimating the time scale of its effect. In terms of permeability change, only a moderate effect on the reduction of permeability of the rock environment was observed. It is evident that for successful remediation results it will be necessary to inject the remediation agent in larger quantities and monitor its effect over a longer period of time. The next phase of the project is also to potentially modify the remediation agent and increase its effectiveness.

4. REMEDIATION OF LAKE BOYUKSHOR IN AZERBAIJAN

Robert Raschman, Donald Shosky

Earlier this year, we successfully completed the implementation of a major remediation project in Azerbaijan. The project involved the remediation of the north-eastern part of Lake Boyukshor, located in the wider centre of the capital city of Baku. This is a large body of water (16.2 km^2) that is fed by rainfall and - unfortunately - polluted wastewater from adjacent residential and industrial areas. The lake is waterless and salty.

The source of the pollution was mainly an old oil field located northeast of the lake. Industrial oil production there dates back to 1886 - long before the US and the Middle East. Since the 1930s, waste from oil extraction and processing has been dumped into the adjacent part of the lake, creating a huge dump of massively contaminated waste. There has also been pollution of the water and sediments in the lake. Other oil waste was transported to the area from the construction site of the new stadium on the eastern shore of the lake (where Czech footballers have played several times).

Our remediated site had two parts: (1) the so-called "Interception Lake" - the most contaminated part of the lake, which was separated from the remaining (less contaminated) part by a dike, and (2) the coastal zone with a number of large and local deposits of oil sludge, waste, contaminated soil and municipal waste. The total area of the remediated site was 130 ha, of which the coastal zone was 93 ha and the "Interception Lake" was 37 ha.

For the remediation of the "Interception Lake" part of the lake, sediment removal below the water surface and subsequent removal using off-site solidification/stabilization (S/S) technology was

initially considered. However, we recommended an alternative solution: dividing Interception Lake into five sections separated by dikes, dewatering each section in turn, and S/S of the dewatered sediments in-situ. Our proposal was accepted and the implementation proved its technical and economic viability.

The principle of the S/S in-situ method is to incorporate a binder (e.g., cement) directly into contaminated soils, sludges and sediments - without removing them. Excavators were used to mix the waste with the binder (various alternative mixing mechanisms were tested during the remediation, but these did not prove successful).

The physical implementation of the remediation work was carried out by the local construction company Archico according to the procedures we developed, including the provision of the necessary mechanization, personnel and materials (especially cement) and demanding organizational and logistical support (30 to 40 excavators and other service equipment - trucks with binder, loaders, bulldozers, diesel tankers, etc.).

In total, 1.1 million m^3 of sediments, soils and petroleum waste heavily contaminated with oil were remediated in situ using the S/S method within the Boyukshor project, making it one of the largest remediation projects of this type in the world and also the largest remediation project (in terms of volume of remediated soils) in which DEKONTA has participated.

Territory before remediation

Territory after remediation

5. ECOLOGICAL ACCIDENT ON A PRODUCT PIPELINE NEAR EJPOVICE

Tomáš Staněk, Radek Štech

On 28 September 2021 in the afternoon, an accident was reported to the emergency dispatching centre of the ecological emergency service DEKONTA, a.s. on the product pipeline network of ČEPRO, a.s. near the village of Ejpovice, Plzeň Region. The DEKONTA emergency group was dispatched to the site of the emergency immediately after the report.

Upon arrival at the site, a survey of the vicinity of the accident site was carried out to determine the status and extent of the accident and to determine the type of contaminant for the establishment of safety zones and related measures.

Immediately after the arrival, work was started to lay out the route of the pipeline and other utilities in close proximity to the accident site. Work was started to uncover the pipeline.

All the equipment needed for the earthworks and special equipment to provide environmental and fire assistance throughout the initial intervention, which consisted of:

- access to the accident site for machinery - felling of fruit trees in the orchard area;
- uncovering the damaged pipeline;
- construction of a holding pit at the site of massive contamination - the occurrence of the product phase;
- removal, transport and disposal of the free product phase from the excavation pit;
- measurement of the explosiveness of the environment;
- removal of insulation on the pipeline for the purpose of defectoscopy;
- monitoring of the wider surroundings of the accident site;
- start of drilling exploration of the site;
- providing site security and securing the accident site against unauthorized persons.

All work within the initial intervention was aimed at minimizing further damage to environmental components and finding the defect in the pipeline, or repairing the pipeline as quickly as possible.

At the Ejpovice site, a total of almost 26, 000 t of contaminated soil was extracted and transported for disposal, which was deposited at the biodegradation sites in Slaný, Žihle and Denětice. The excavation of the contaminated soils was completed in March 2022. The maximum depth of the excavation pit was approximately 14 m below the surrounding ground level. During the works, the pipeline was secured against movement by wooden supports. After the completion of the excavation, the loading of the excavation pit started.

During the remediation work, contaminated water was pumped from both the constructed boreholes and the constructed pumping facilities in the area of the excavation pit. Here, an in-situ remediation system was constructed for injecting the bio-treatment and for injecting the treated water through the remediation station. A total of 22 TE boreholes, 10 CT pumping facilities and 8 CW injection facilities have been constructed to date. The pumping of contaminated water and its subsequent injection, including regular monitoring, is currently underway, as well as the documentary preparation for the construction of an electrical connection. Until the connection is operational, the site will be operated using an electrical generator.

6. EXTENSION OF IPR AQUA, S.R.O. SERVICES

Jan Ottis

IPR Aqua
Inženýrink – Projekce – Realizace

IPR Aqua, s.r.o. was founded in 2016 and this year is a key and significant year for the company in several respects.

Most importantly, in the six years of its existence, the company has considerably expanded its supply potential for various technological constructions that "have to do with water". While at the beginning of our existence, we supplied about two chemical treatment plants per year as a start-up company, this year we can boast the following portfolio of services, including design preparation:

- supply of three water treatment plants;
- supply of two chemical wastewater treatment plants (WWTPs);
- supply of two cooling circuits with open towers;
- delivery of two biological WWTPs;
- supply of two absorption columns.

In addition, a service department for water technology has been established, servicing the following customers, for example:

- WWTP for the multinational Amazon;
- WWTP and water treatment plant for bakery products supplier, Penam;
- WWTP for MOL filling stations;
- WWTP in Prague.

In addition to our own implementations, we also provide design and consulting services in the field of water management and related energy savings. If you are interested in any of our offerings, get in touch, we will find a solution for you!

An overview presentation can be found on our Facebook page.

7. REMEDIATION OF THE JIHOSTROJ VELEŠÍN SITE

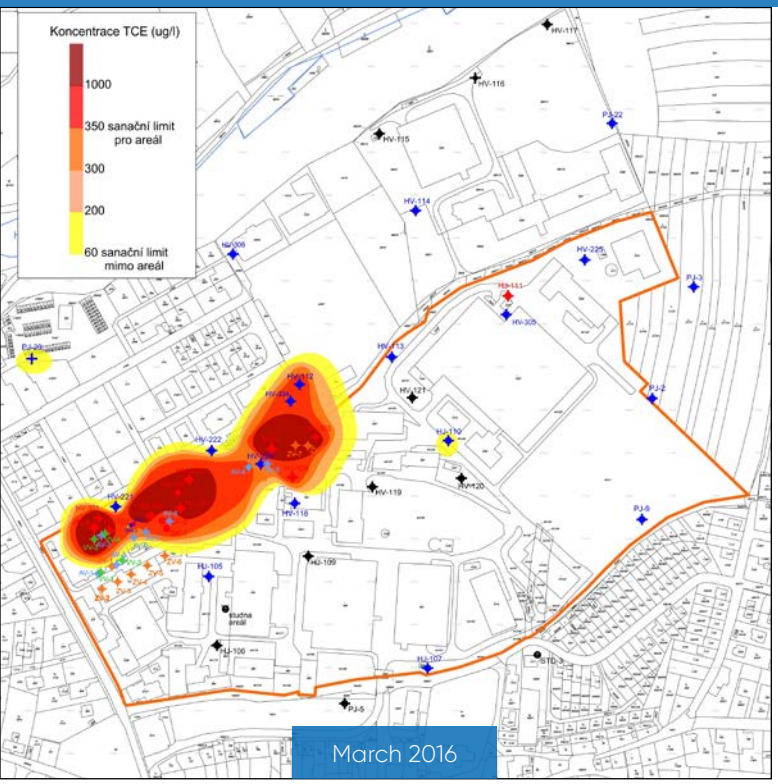
Jana Kolářová, Ondřej Lhotský

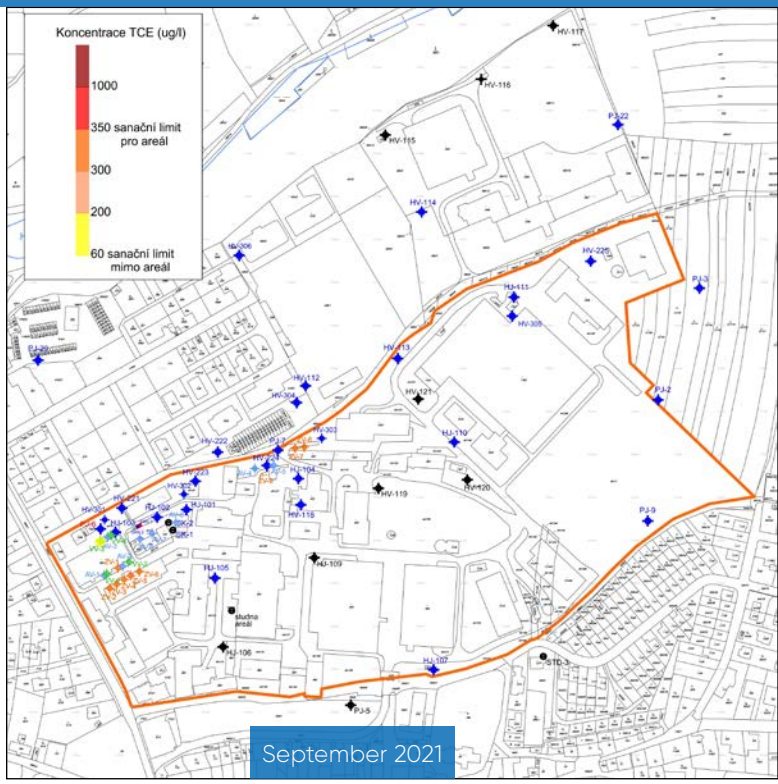
At the beginning of the year, after six years, we successfully completed the remediation of the old environmental burden at the Jihostroj a.s. site. Velešín, which was implemented as a public contract financed by the Ministry of Finance. The aim of the remediation was to resolve contamination not only with petroleum hydrocarbons, but also with pollutants heavier than water (chlorinated hydrocarbons) in a fractured environment, in addition to the proximity of an important water source.

After the removal of contaminated structures and the extraction of almost 400 t of soil, remediation pumping and treatment of contaminated groundwater was carried out, combined with the reinjection of purified water, venting (extraction of contaminated soil air) and the promotion of attenuation processes (reductive dichlorination by the application of whey and aerobic degradation by the application of hydrogen peroxide).

After modification of the remediation pumping regime and the injection of treated water, which played a significant role in the effectiveness of the hydraulic remediation method in the environment with fracture permeability, the removal of ineffective venting and the setting of a new regime for the support of attenuation processes, it was possible to achieve relatively strict remediation limits for both the contamination hotspots on the site and the groundwater outlet profile towards the Rimov Dam.

Removal of trichloroethylene in groundwater





8. KOS CBRN CONTAINER SYSTEM

Jakub Kanta, Ivo Hlásenský

Within the framework of the research task No. VI20192021115 "Container system for safe handling, storage and transport of CBRN materials" DEKONTA in cooperation with SÚJB developed a device for safe handling, storage and transport of CBRN materials found or misused in critical infrastructure (model of Prague Airport). The project was implemented within the framework of the Security Research of the Ministry of the Interior.

The KOS CBRN container system is designed to be chemically resistant and is sealed against leakage of liquid and gaseous chemical vapours into the surrounding environment. The equipment allows the safe storage and transport of highly hazardous substances. The container is equipped with an internal environmental monitoring system that allows real-time monitoring of the physicochemical properties of the transported material for emergency personnel. It is also equipped with an inerting system for internal spaces, a vacuum system and a filter-ventilation unit. Inside, there are boxes with special resistance to chemical, biological and radioactive agents. It is an energy autonomous facility.

KOS CBRN

The facility is designed to be stable, but, if necessary, it can be moved to a temporary storage location using the ABROLL container transport vehicle.

Potentially hazardous substances and objects, potentially infectious biological material, small sources of ionizing radiation, as well as contaminated objects or materials used or found during the liquidation of emergency situations or the remediation of the consequences of criminal acts - drug breweries, illegal chemical warehouses - may be placed in the facility. The facility is not intended for the storage and transport of explosives or munitions.

The internal storage space of the container allows to store and secure for subsequent transport a larger number of compressed gas cylinders, 4 IBC containers with a volume of 1 m³ or substances stored in shipping containers and drums on so-called Euro pallets.

The container is equipped with a temperature-controlled cooling compartment for the storage of thermolabile substances. The entire internal space of the container is air-conditioned to ensure a stable required temperature of the interior, to prevent unwanted overheating or cooling in extreme climatic conditions in summer or winter, or unwanted temperature changes related to the type of stored substance. The internal equipment of the system includes a special composite shielding container for the storage of radioactive substances and FIGs.

The container is also equipped with a fire extinguishing and decontamination system with holding tanks for the waste water generated. It is equipped with its own power sources (batteries, power plant) so that it can be completely energy independent in critical situations.

View into the container's control room

Device control panel

The prototype of the decontamination device was developed by DEKONTA, a.s. in cooperation with SÚJCHBO v.v.i. with the support of the Ministry of Interior, within the framework of the Security Research Programme of the Czech Republic in 2015/2022), project No VI20192021115 "Container system for safe handling, storage and transport of CBRN materials".

Abroll transport system

9. RECYCLING OF PHOTOVOLTAIC PANELS AND LITHIUM BATTERIES

Barbora Štěpánová, Robert Raschman

The last ten years have witnessed a massive global development of alternative energy sources (especially wind and photovoltaic power plants) and electromobility. As a result of ongoing and upcoming investment programmes aimed at reducing greenhouse gas emissions, this trend will accelerate further in the coming years. While the relevant production capacities ('gigafactories' for battery production, new and ever larger solar parks) are being built at an unprecedented rate around the world, much less attention is being paid to the waste treatment that these investments will necessarily bring with a time lag of 10 to 20 years. Millions of tons of waste facilities will be involved, the safe, environmentally acceptable and economically viable treatment of which requires advanced technology and professional and operational experience. For this reason, it is also necessary to prepare appropriate recycling capacities in the Czech Republic as soon as possible.

DEKONTA is involved in this process with a project aimed at acquiring the new knowledge needed to develop innovative technologies that enable the recycling of photovoltaic panels and lithium batteries at a technical, capacity, environmental, safety and economic level appropriate to the expected future challenges. In this project, DEKONTA is working with a wide range of universities and commercial entities to ensure that the research has the widest possible scope and that the knowledge gained is applied.

General objectives of the project:

- increasing the level of material recycling of waste;
- reducing the negative environmental impact of recycling technologies (dust, noise, etc.);
- Increasing the safety of recycling technologies (eliminating the risk of fire during storage and processing of lithium batteries, etc.);
- the possibility of flexible adjustment of the processing capacity of the recycling plant (according to the current demand) with the possibility of gradual addition of serially sorted technological modules;
- reduction of recycling costs (in particular by reducing energy consumption and flexible optimization of the operating capacity of the technology).

The project "Research and development of technology for recycling of waste photovoltaic panels and lithium-ion batteries" No. CZ.01.1.02/0.0/0.0/21_374/0026809 is financed from the Operational Programme Enterprise and Innovation for Competitiveness.

SHORT REPORTS FROM EVENTS

Quantifying health and environmental risks and supporting the rehabilitation of the former Batumi refinery site

At the end of 2021, we launched a foreign development cooperation project in the Georgian city of Batumi, where there is an old environmental burden - the remains of the former Batumi refinery. The aim of the project is to prepare the basis for the remediation of the former refinery site in Batumi through joint cooperation between Czech and Georgian entities. A detailed site survey will be carried out and a risk analysis of the former refinery site will be prepared. An important part of the project is the transfer of know-how in the management of contaminated sites to the project partner in the form of training and a final workshop. The project is implemented in cooperation with the Czech Development Agency and is planned to last until mid-2023.

Czech Development Agency continues to remediate contaminated sites around Mărculeşti Airport in Moldova

The project addresses severe contamination of water resources in the Floreşti region of northern Moldova. A military airfield operated in close proximity to the villages of Lunga and Mărculeşti from 1957 until the early 1990s. Inadequate security in the handling of fuel and improper handling caused widespread spills and subsequent damage to the drinking water sources in the area. The project is the fourth phase of a long-term intervention of Czech foreign development cooperation in the cadaster of the municipalities of Lunga and Mărculeşti, where the pumping of contaminated water and the separation of the oil product in the remediation stations built during the previous phases is operated. In total, more than 50 tons of petroleum product have been removed so far by the remediation operation. The remediation activities have also contributed to preventing the further spread of oil, in particular into the Raut River, one of the tributaries of the Dniester.

Helping Moldova to remove environmental burdens at a transformer station site

We have successfully completed the implementation of the project "Risk mitigation of the 400/110/35 kV transformer station in Vulcăneşti" supported by the Czech Development Agency within the framework of the Czech Foreign Development Cooperation Programme. The aim of the project was to find a conceptual solution for the area of the transformer station in Vulcăneşti, where almost 1000 capacitors exploded in 1979, resulting in long-term contamination of the rock environment in the affected area with carcinogenic polychlorinated biphenyls and dioxins.

Georgian delegation in Prague

In May 2022 representatives of Georgian institutions active in the management of chemicals visited Prague. The participants of the study tour had the opportunity to learn about the implementation of legislation and common practice in the management of chemicals according to the European CLP and REACH regulations in practice in the Czech Republic, both through discussions with representatives of the Ministry of Environment, Czech Environmental Inspectorate, Customs and the Union of Chemical Industry, as well as through a visits to major chemical distributors in the Czech Republic and Central Europe - Brenntag ČR, s.r.o. and HSH Chemie s.r.o. The project "Capacity building in the field of sound management of chemicals - Implementation of REACH and CLP" is implemented under the Czech Development Cooperation Programme and is paid for by the Czech Development Agency.

Workshop in Chemical Management for representatives of Georgian state administration, Tbilisi - Georgia, July 2022

DEKONTA organized the 1st workshop in chemical management according to the draft Code on chemical substances and mixtures, which was created within the development project "Capacity building for proper management of chemicals - Implementation of REACH and CLP" funded by the Czech Development Agency. The workshop was opened by Mr. Solomon Pavliashvili, Deputy Minister of Environment and Agriculture, and Mr. Alverd Chankseliani, Head of the Waste and Chemicals Management Department. The outputs of DEKONTA's project will significantly support Georgia's activities in fulfilling the commitments set out in Georgia's Association Agreement with the European Union.

This year we visited the following exhibitions:

- IFAT, Munich 31.5-3.6.2022
- Aquatherm Almaty, September 2022, Atakent Expo Center Kazakhstan
- Future Forces Forum, October 2022 PVA Expo Praha Letňany - Dekonta CBRN

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