SOIL RADON (^{222}RN) CONCENTRATION AS A TOOL FOR MAJOR TECTONIC LINES DETERMINATION IN THE POLISH PART OF THE CARPATHIAN MOUNTAINS.

Leszek Jankowski [(1)], Sylwia Kowalska [(2)], Rafał Skupio [(2)], Marek Dohnalik [(2)]
(1) Polish Geological Institute - National Research Institute, Kraków,
(2) Oil and Gas Institute – National Research Institute, Kraków, Poland, e-mail: kowalska@inig.pl.

One of the essential elements of a petroleum system in the Carpathian mountains and a place where circulation process of fluids and bitumen occurs are major fault zones. These zones tend to be reservoir seals or reservoir migration paths. Recognition of fault type, its strike and locking depth, as well as tectonic system regime, are crucial element for seismic interpretation process. Radon concentration measurements (RAD7 portable spectrometer device) in soil was tested as a tool to verify regional importance and precise localization of the most important tectonic zones in the Polish part of the Carpathians. Measurements ware conducted in the areas with well documented tectonic system by means of cartographic field works: in the Lanckorona – Żegocina zone, the Bieszczady melange zone in the Grajcarek tectonic zone, in the Pieniny Klippen Belt and in the area of Węglówka – the northern border-zone of the Central Carpathian's Depression. The obtained results allowed not only for precise localisation of analysed fault zone, but it was also possible to define their hierarchy in Carpathian orogenic wedge. Obtained data show enormous differences of radon exhalation intensity between fault zones and surrounding regions. Our studies showed, that the Grajcarek tectonic zone is much more important migration pathway than normal fault separating Podhale Flysch from the Pieniny Klippen Belt region, as it was fought before. The Grajcarek fault zone, similarly to the Bieszczady melange, seems to be major tectonic zone responsible for creation of the huge tectonic melange of the Pieniny Klippen Belt.

Key words:
Radon concentration, Carpathian, faults, oil and gas deposits

INDUSTRIAL MANAGEMENT OF USED DRILLING FLUIDS

M. Uliasz, T. Steliga, S. Błaż, G. Zima, P. Jakubowicz
Oil and Gas Institute – National Research Institute
uliasz@inig.pl, steliga@inig.pl, blaz@inig.pl, zima@inig.pl, jakubowicz@inig.pl

When drilling a borehole the most frequently used drilling fluids are bentonite and polymer clayless, i.e. inhibited with properties limiting the hydration of clay and shale rocks and for completion of reservoir rocks levels (drill-in fluid), with different compositions and properties.

After drilling a section of a borehole, each of these fluids, along with the carried out drillings (borings), constitutes drilling waste, the amount of which is significant and depends both on the depth and the volume of borehole. The analyses conducted on the basis of industrial data showed that for one linear meter of a vertical borehole the amount of produced drilling waste is at the level of approx. 0.6 m^3, while their basic part amounting to approx. 60 – 80% comprises used drilling fluids as liquid waste, whereas the remaining part comprises solid waste in the form of borings "covered" with drilling fluid and hydrated sediment removed from the borehole wall. The results of chemical analyses of the produced drilling waste show that it poses a potential threat to the environment as it contains significant amounts of contaminants such as: insoluble substances, dissolved solids (TDS), SPCz, chloride and sulphate ions, dissolved organic carbon (DOC), heavy metals and radioactive elements.

In connection therewith, INiG - PIB has attempted to bind the entirety of drilling fluids containing, in the liquid phase, dispersed polymers and scrubbing materials used to prepare it and to process

technological parameters while drilling, and the dispersed clay minerals particles coming from the drilled rocks. Based on a series of conducted laboratory tests with the use of waste drilling fluids varying in composition, rheological properties, density and content of chemical contamination, it was proven that, using a suitable set of binding agents such as soluble glass - Portland cement or soluble glass - hydraulic binder with a commercial name of Silment, it is possible to perform a colloid suspension solidification process of such drilling fluids in a solid having a specific compression strength and a limited ability to elute dangerous substances.

Based on the waste drilling fluids solidification technology developed by INiG - PIB, bentonite drilling fluid was subjected to the solidification process. To solidify 1 cubic meter of waste bentonite drilling fluid with a density of 1.12 kg/dm^3, characterized by low rheological and structural parameters, minor salinity, high filtration and pH values and containing more than 4% active parts of bentonite, a binding agent composition was used, containing: 4% of soluble glass and 25% of portland cement, as well as 4% of soluble glass and 35% of Silment.

The compression strength teste performed during the solidification process of this drilling fluid of the samples of an intermediate obtained in the 7th, 14th and 28th day, showed a systematic increase in the values over time. The obtained results of compression strength of samples, the binding process of which took place at a max temp. of 10°C, solidifed using a composition of an agent containing 35% of Silment, fell within the range of 0.6 to 0.775 MPa, while when adding 25% of Portland cement - from 0.4 to 0.425 MPa. The tests of water leachate elution from filter sediment of waste drilling fluid and solidified drilling fluid at 1 kg s.m. of sediment: 10 dm^3 of H_2O and toxicity tests of this leachate proved that over time (up to 28 days), in samples containing Silment, a significant reduction in the amount of elution of dangerous substances from the obtained solid was marked, as well as reduction in the toxicity of the leachate.

The conducted industrial trial showed that in order to solidify the waste bentonite drilling fluids it is possible to use an agent composition containing Silment. The solidification process of the used drilling fluids can be one of the ways of managing the liquid waste obtained in significant amounts during drilling works. The developed agent composition for solidification of the used drilling fluids should be considered as an effective agent to bind the entirety of the waste drilling fluids making up liquid and solid phase. The obtained intermediate can be used for utility purposes such as recultivation of surface excavations and filling of underground excavations or even for strengthening of road surfaces of e.g. local roads.

THE ANALYSIS OF THE CHANGES MECHANICAL PARAMETERS OF CEMENT SLURRIES FOR UCGS (CAVERN UNDERGRUND GAS STORAGE DEPENDING ON THE DURATION OF EXPOSURE

mgr inż. Łukasz Kut
Oil and Gas Institute-National Research Institute kut@inig.pl

Sealing casings in salt layers requires the use of specially developed cement slurries recipes, which received the cement stones are characterized by an increased resistance to the corrosive effects of salt therefore, it is very essential to carry out detailed examination on the selection of appropriate formulas. Developing an appropriate recipes requires to take action and implementation of innovative laboratory research on selection of the most appropriate types of chemicals and sealing materials affecting the improvement of mechanical properties of cement stones. The goal of this study was the analysis of the impact salt environment on changes technological parameters of cement stones in time. Cement stones samples were long-term seasoning (12 months)in the full saturated brine and technological properties were examined for a predetermined period of time. Interpretation of obtained results allows to identify appropriate cement slurries formulas with potential application in sealing of underground gas storage in salt cavern.

Developed and selected recipes thanks to proper rheological and mechanical parameters can be successfully used during such procedures. The aim of laboratory tests were to develop cement slurries based on fully saturated brine as mixing water that can be used during sealing the casings in salt layers.