Available online at
http://journals.usamvcluj.ro/index.php/promediu

ProEnvironment

ProEnvironment 7 (2014) 137 - 140

Original Article

The Monitoring of the Groundwater and the Drilling Mud Stabilization Method, at the Ogra Specific Waste Deposit, Mures County

OTGON Maria Claudia, Tiberiu RUSU*, Andrei Tudor RUSU, Călin Ovidiu SAFIRESCU

Technical University, Memmorandumului St.., No. 28, 400114 Cluj-Napoca, Romania

Received 14 July 2014; received and revised form 22 August 2 014; accepted 31 August 2014
Available online 23 September 2014

Abstract

The paper describes the composition of one environmental factor, namely groundwater, which is monitored at the specific waste deposit in Ogra. Due to the modern processing technology of the drilling mud resulted from natural gas extraction, in the specific waste deposit in Ogra, Mures county, as well as to the treating method of these wastes using a specific recipe and to the safety measures consisting in the impermeabilization of this deposit, a minimum environmental impact of the treated and deposited wastes is ensured. In order to determine the indices analyzed in the laboratory, some witness samples from the underground water in the control shaft and the respective collected leachate were sampled. According to the results of these analyses, the wastes' aggressiveness towards the groundwater-soil complex can be established.

Keywords: groundwater, waste, method, monitoring, drilling mud, Ogra, treatment.

1. Introduction

Romgaz operates a non-dangerous waste deposit resulted from the drilling activities, namely the Ogra waste deposit. This deposit was built on a former gravel pit, having a 20-year concession and it consists in a waste conditioning installation and two cells for unloading the wastes [2].

The groundwater's quality is monitored every three months (for example the pH, chemical consumption of oxygen (CCO), example the pH, total dissolved solids, substances extractable with chemical consumption of oxygen (CCO), chlorides, organic solvents, petroleum products and total chrome).

2. Material and Method

In January, April, May and June 2013, the grountwater monitoring in the Ogra waste deposit was made in order to determine the environmental impact of the processing and deposition g of the drilling mud resulted from natural gas extraction. The results of the monitored parameters are shown in table 1.

3. Results and Discussions

Observing the results obtained from the groundwater samples, it can be seen that the analyses results are below the maximum accepted limit imposed by NTPA 001/2002, with subsequent modifications [5].

* Corresponding author.
Tel: +40-264-401727
Fax: +40-264-401727
e-mail: Tiberiu.Rusu@imadd.utcluj.ro

Table 1. Results of the monitored parameters in groundwater, in the Ogra deposit [3, 4]

Monitored parameter	Measurement unit	Groundwater samples, 2013				Limits acc. To Law 458/2002	Limits acc. to HG 188/2002 NTPA 001/2002
		12.01.2013	25.04.2013	17.05.2013	01.06.2013		
pH	pH units	7.8	6.81	6.85	7.87	-	6.5 - 8.5
Chlorides	mgL	360	286	303	248	250	500
CCO-Cr	mg O_2/L	38.64	70.89	52.8	30.15	-	70
Petroleum products	mg/lL	0	0	0	0	-	5
Extractable substances	mg/L	0	0	0	0	-	20
Total chrome	mg/L	0.77	0.811	0.0134	0	50(µg/L)	1.0
Filtered residue regarding the monitoring and report o emission in groundwater	mg/L	990	1150	1280	960	2500	-

3. Results and Discussions

Observing the results obtained from the groundwater samples, it can be seen that the analyses results are below the maximum accepted limit imposed by NTPA 001/2002, with subsequent modifications [5]. Comparing the obtained results for the analyzed indices with the norm values imposed by Law 458/2002 [3] regarding drinking water quality, it can be observed that the limit imposed for chlorides is exceeded.

In addition, by analyzing a witness sample from a well situated about 1 km. downhill of the deposit, it can be seen that the value obtained for the chlorides is more or less equal with the values obtained for the monitored groundwater samples, which proves that the natural phreatic resource in the area contains a higher amount of chlorides.

Considering that in the draining network and leachate collection network there are no losses and also considering the impermeabilization of the deposit, it is unlikely that this parameter be exceeded as the result of the activity in the deposit [6]. The results of the monitored parameters are shown in table 2.

Analyzing the above data it can be concluded that there were no significant modifications of the pollutants' concentrations, either in the groundwater sampled from the control borehole or in the collected leachate.

Table 2. Results of the monitored parameters in leachate, in the Ogra deposit [3, 4]

Monitored parameter	Measurement unit	Leachate samples collected in 2013	Limits acc.to law 458/2002	Limits acc. to HG 188/2002 NTPA 001/2002
		01.06.2013		
pH	Units of pH	7.00	-	6.5 - 8.5
Chlorides	mg/L	310	250	500
CCO-Cr	mg O_2/L	8.48	-	70
Petroleum products	mg/L	0	-	5
Extractable substances	mg/L	0	-	20
Total chrome	mg/L	0	50(µg/L)	1.0

Currently, the stabilization of the specific waste resulted from the methane gas extraction activity (detritus and contaminated drilling fluid) is accomplished using a method proposed by S.C. Fitpol S.A. Bucharest [7], with the following recipe:

- dm^3 waste (contaminated drilling fluid and detritus, in equal portions)
- 200g cement S1 or S2RRS;
- 1g NaOH.

The fee for controlled elimination of specific wastes using this method is 29 euro/m^3. Test results are presented in table 3.

Table 3. Results obtained from the tests

Old technique [8]	New technique [8]
Processing batch: - 40 m^3 (20 m^3 detritus + 20m^3 used fluid) - 6 t cement - 40 kg NaOH dissolved in 200 L water	For the same quantity of processed waste, the materials used for solidification-stabilization are: - 40m^3 waste - 40kg NaOH dissolved in 200 L water - 4.500 kg cement - 1.700 kg plaster
Obtaining a material which can be assimilated with hard soil. Costs for batch process: 18.480 lei	The materials used for solidification-stabilization are commonly used in construction and do not require special handling methods. Using the same technology there can be incorporated other types of wastes in the mass of the stabilized material. The achieving of important benefits by diminishing the technological cost, due to the diminishing of the cement quantity used (plaster is a material with a relatively low price). Cost for batch process: 16.900 lei. Possibility of accepting other types of wastes from third parties to be deposited, applying a fee.

4. Conclusions

By presenting the buffer deposit in Ogra and the two tests conducted by Lafarge Romcim in the Hoghiz factory, I wish to emphasize the importance of the environmental policies adopted and applied by the above-mentioned institution in the case of the impact of the wastes generated by using the drilling fluid. The Romanian industry has started to be aware that the environment protection must be seen as a competitively factor.

This imposes the development of clean technologies and products which will have an effect upon the minimizing of the environmental costs growth and will stimulate a more rapid implementation of the scientific research and technological development results.

Here may be applied the concept of clean driling process, rendered in fig. 1 [9].

Figure 1. The concept of clean drilling process

The environmental impact of the specific activities is reduced due to the methods taken, of which we can mention: the use of a closed and safe system for the surface drilling fluid circuit, for the wastewaters and detritus; the cleaning of the drilling fluid which enabled the reduction of the total mud volume used at a drill; mud and residual waters recycling by adding coagulants and flocculants followed by the mechanical separation of the solid particles; the replacement of the components and additives, lubricants, corrosion inhibitors with high toxicity with other substances less toxic; the elimination of residual waters by injection under the deep water level; the use of biodegradable additives and foams; the use of barite with a low content of Hg and Cd; avoiding the discharge of residual waters in natural receptors; the use of drilling muds with high LC50 (800000 - 1000000 ppm) and their biological testing; the ecological reconstruction of the establishments temporarily used.

After finishing the drilling activities and the production samples or the starting of the drill production (in the case of exploitation drills) the drilling installation is dismantled, the installation, annexes and other buildings are evacuated.

The soil is cleaned of the terrace materials and wastes:

- sterile resulted from detritus
- concrete tiles
- metal tanks and concrete caissons
- pavements, collecting and protection networks
- fencing materials of the drill's area
- gravel materials.

The drill's area and temporary access roads (cleaned of terrace material) are chiseled and repurposed according to the initial configuration of the used terrain.

The layer of fertile soil is uniformly spread and leveled.

The soil is fertilized with natural fertilizers (acc. to the project plan) and the terrain is ploughed.

Soil samples are collected and the quality is compared with the analyses conducted before the surface activity started.

The terrain is handed over to its owners with an official report, endorsed by legal representatives according to the current legislation.

Acknowledgments

This paper was written with the help of S.N.G.N Romgaz S.A. Medias and of Prof. Dr. Eng. Tiberiu Rusu, Technical University of Cluj-Napoca.

References

[1] Ştefănescu D., 1998, The practice of extracting natural gas [Practica extracţiei gazelor naturale] - vol.II, Editura Universităţii Lucian Blaga

[2] Ştefănescu I., I. Varvara, 1998, The impact of exploration and mining drilling for natural gas on the environment in the basin of Transylvania [Impactul forajelor de explorare şi exploatare pentru gaz metan asupra mediului, în Bazinul Transilvaniei, Revista Minelor]

[3] ***, http://lege5.ro/en/Gratuit/heztcojy/legea-nr-458-2002-privind-calitatea-apei-potabile, accessed 16/09/2014

[4] ***, http://aquamax.ro/fileadmin/content/ Download /Diverse/hg-188-2002_si_hg-352-2005.pdf, accessed 16/09/2014

[5] ***, 2002, Normative NTPA-001/2002 and NTPA-002/2002 concerning waste waters

[6] Gavrilescu E., 2007, Sources of pollution and pollutants of the environment agents [Surse de poluare si agenti poluanti ai mediului] – Editura Sitech

[7] ***, 2012, National gas magazine [Revista natională de gaze natural], no. 2, octombrie, Impact of water leachant on the environment [Impactul apei de zăcământ asupra mediului]

[8] ***, 2013, Documentation of the environment of exploration and mining probes within 2013 SNGN ROMGAZ SA, [Documentaţia de mediu a sondelor de explorare şi exploatare din cadrul SNGN ROMGAZ SA, 2013, nepublicata]

[9] ***, http://phys.org/news187626106.html