BULETINUL Universităţii Petrol – Gaze din Ploieşti	Vol. LXIII No. 3/2011	39 - 44	Seria Tehnică

Biopiles for Hydrocarbons and Isolation for Heavy Metals

Lazăr Avram[*], Traian Octavian Susanu[**], Sorin Alexandru Avram[***], Julien Troquet[****]

* Universitatea Petrol-Gaze din Ploieşti, Bd. Bucureşti, 39, Ploieşti, Romania
e-mail: lavram@upg-ploiesti.ro

** Emirom Grup, Str. Ştirbei-Vodă, 26-28, Bucureşti, Romania
e-mail: octavian_susanu@emirom.ro

*** Romgaz S.A., P-ţa C.I. Motas, 4, Mediaş, Romania
e-mail: sorinel_ap@yahoo.com

**** Biobasic Environnement, Biopôle Clermont-Limagne, Saint-Beauzire, France
e-mail: jtroquet@biobasicenvironnement.com

Abstract

It has been realized, in multiple stages, a rehabilitation operation – by combining the Ecotertre *procedure from Biobasic Environment firm, associated with hydrocarbons, with the isolation procedure, associated with heavy metals – for an industrial area of Clermont – Ferrand. To maintain the rehabilitation costs in reasonable limits, respectively for obtaining a favorable global environment balance, the polluted soils have been maintained on the interest site.*

Key words: *biopile, biological decontamination, polluted soil.*

General Aspects

Just before submitting the rehabilitation operation and the management plan for contaminated soil, a short definition of confinement and biopile it is necessary.

From the biological decontamination methods, used mostly along the last years, there can be mentioned: composting, landfarming (scattering) and biopile technique. They concern only the solid materials and are realized on the site. The first two techniques – the composting and the landfarming – are very well adapted to the lightly volatile hydrocarbons biodegradation.

Compared to the composting and the landfarming techniques, the biopile technique supposes replacing the reactors that work in free atmosphere with reactors or gas and liquid flows that are perfectly controllable (fig. 1).

In this case a few meters tall stack it is first realized and placed upon a drainage layer. For the gases recovery are used, most often, a ventilation/extraction system that allows either aspiring the volatile products or injecting fresh air after inverting the flux. To recover the liquid effluents, an aspersion system and a draining system are being used.

The *isolation (confinement*) supposes removing the pollution source with some synthetic and argyle materials mixes. It refers to using sealed materials (geomembranes) or less permeable and/or some absorbs.

In some cases, isolating the polluting substances with a sealed layer on the surface, as well as constructing a sealed wall to block the subterranean waters circulation, has been realized in a manner of avoiding the leaching and training the undesirable substances in the groundwaters (fig. 2).

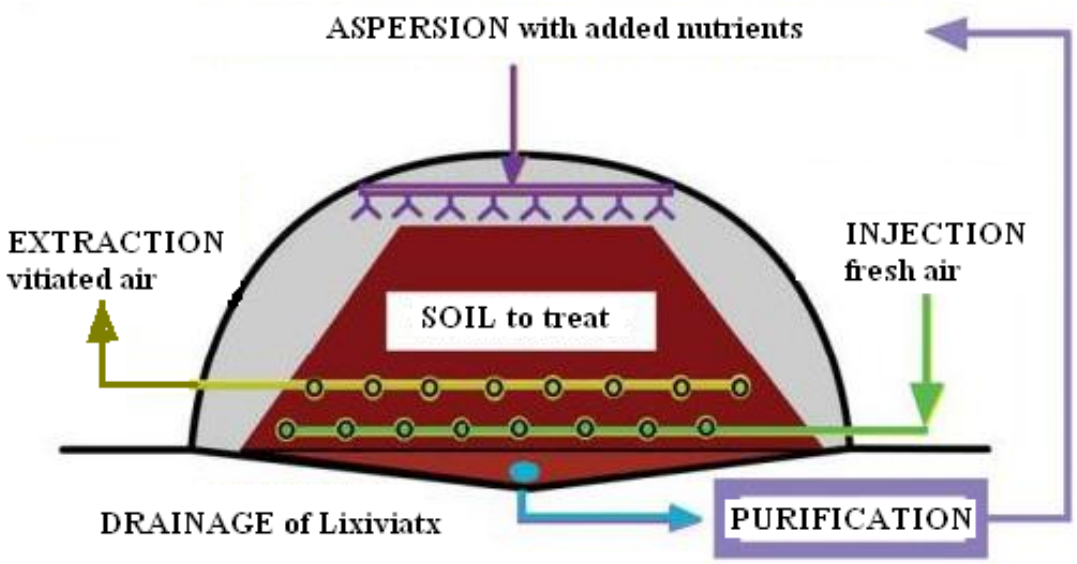

Fig. 1. Biopile scheme [2].

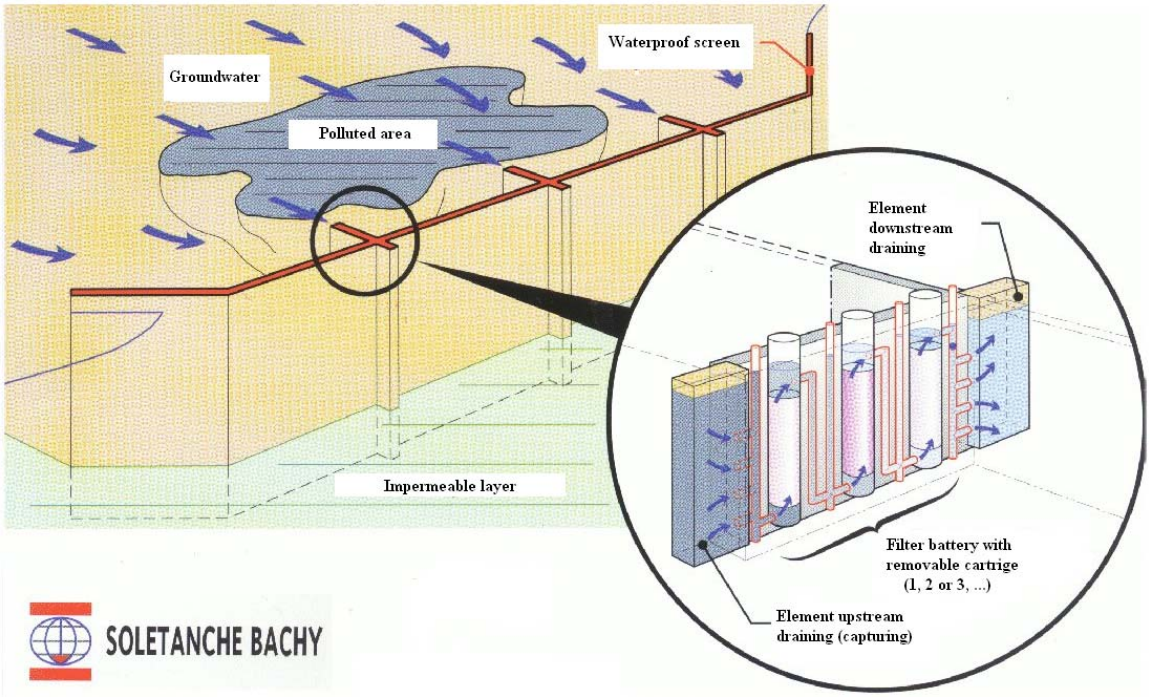

Fig. 2. Confinement and active barrier (SOLETANCHE BACHY TECHNIQUE)

The confinement can represent a method of rehabilitation of the entire site, or it can be used to isolate only certain parts belonging to the areas treated with other methods, with the purpose of preserving the environment and control the operations.

Ongoing with the Rehabilitation Operation

During the first soil pollution diagnosis it has been detected, in several places, the presence of hydrocarbons and heavy metals, mostly chromium and lead.

Then it has been established an in–depth diagnosis, that allowed establishing a spatial cartography of the diverse impact areas in a way that the rehabilitation project could be defined. A tight network pointed out, on a side, the impact zones only for hydrocarbons or just for metallic elements, and on the other side, the impact zones with the two polluting types. In the future it is possible to use the special networks that allow visualizing the animation sequences in a simplified format VRML (fig. 3).

Simultaneously, the in–depth diagnosis allowed pointing out a small proportion groundwater, but with small depth leaking (1 – 1.5 m), next to the interest area. The impact soils volumes were so quantified on a total surface of 2890 m^2. For this surface, respectively for depths between 25 and 50 cm, the estimated polluted soil volume was 1445 m^3, from which approximately 416 m^3 with impact only on hydrocarbons.

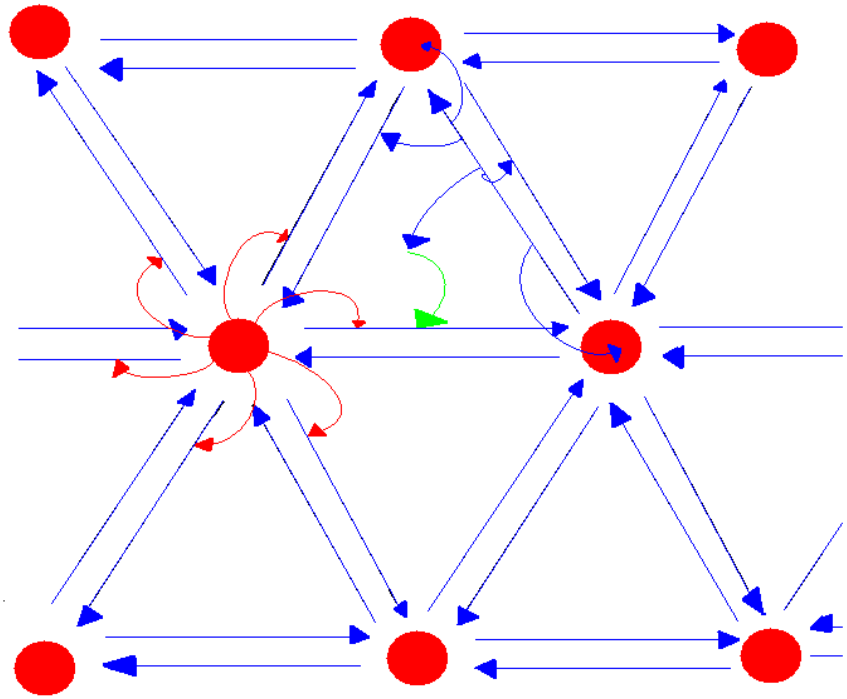

Fig.3. Network sequence

The Proposed Management Plan

The earth polluted with hydrocarbons was treated with the biopile procedure right on site. To validate this option it was realized, in the laboratory, a bio-degradability evaluation of the impact soils (the maximal containments were of the order of 5000 mg/kgMD). Based on these results, the treatment procedure was developed and dimensioned in such a way not to generate

any impact on the environment. After the earth` excavation, the excavation`s permeability was realized, on bottom and on surface, by using a geomembrane (fig. 4).

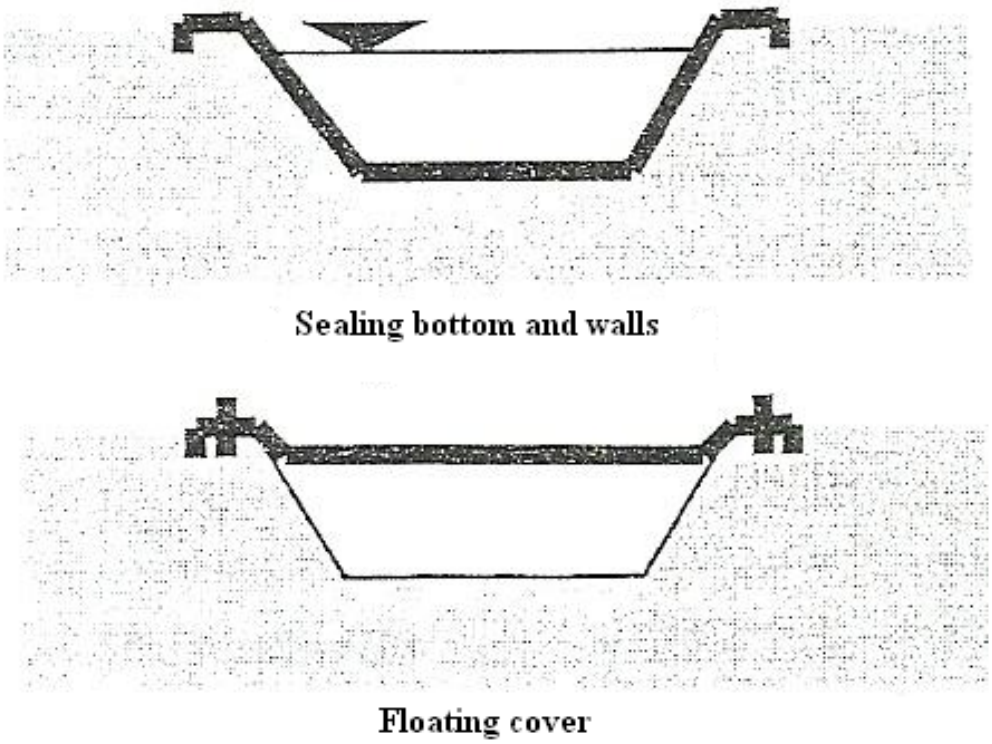

Fig. 4. Scheme of a geomembrane used in the effluent retention basin

At the same time, the landfill, or storage, or confinement of industrial and domestic wastes use the geomembranes. In figures 5 and 6 are presented some elements of sealing barriers for the bottom, walls and cover landfills.

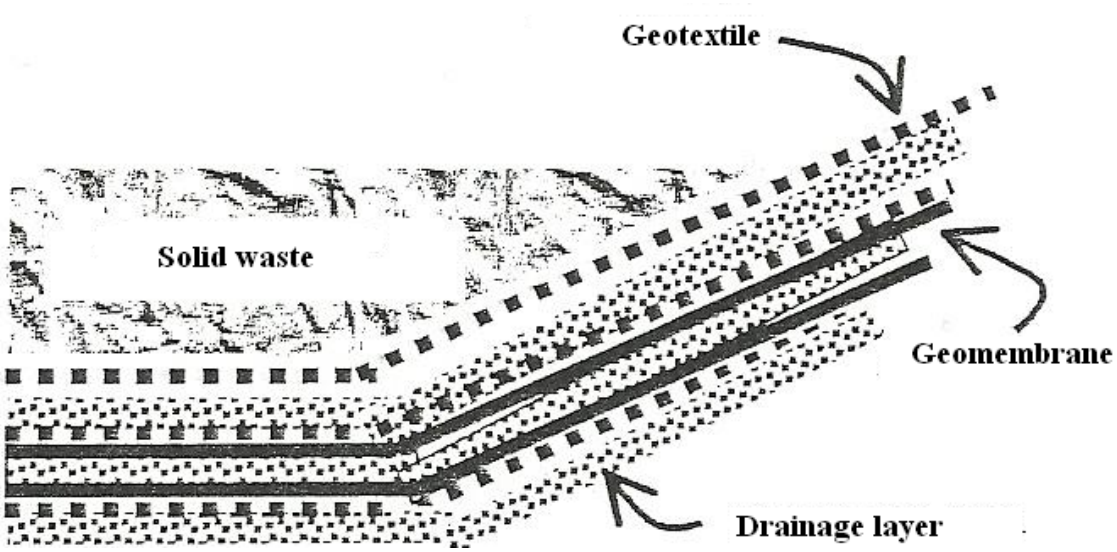

Fig. 5. Maximum cell sealing (double seal at the bottom)

The treatment of these soils was realized in a period of nine months, and a part of them was ready for re - utilization immediately after checking the residual containments.

Also, the impact soils for the heavy metals were excavated and isolated on site using some surface barricades (it was impossible to realize an isolation underground, due to the presence of ground-water layer at a very small depth).

The isolation of the polluted soils was realized with the help of some bentonitical geotextiles materials with optimal permeability, to restrict the migration of the metallic elements to the underground and the ground-water layer. Also, the merlons were impermeabilitated in the surface, before they were re-enclosed with vegetal earth for their integration in the specific view of the area.

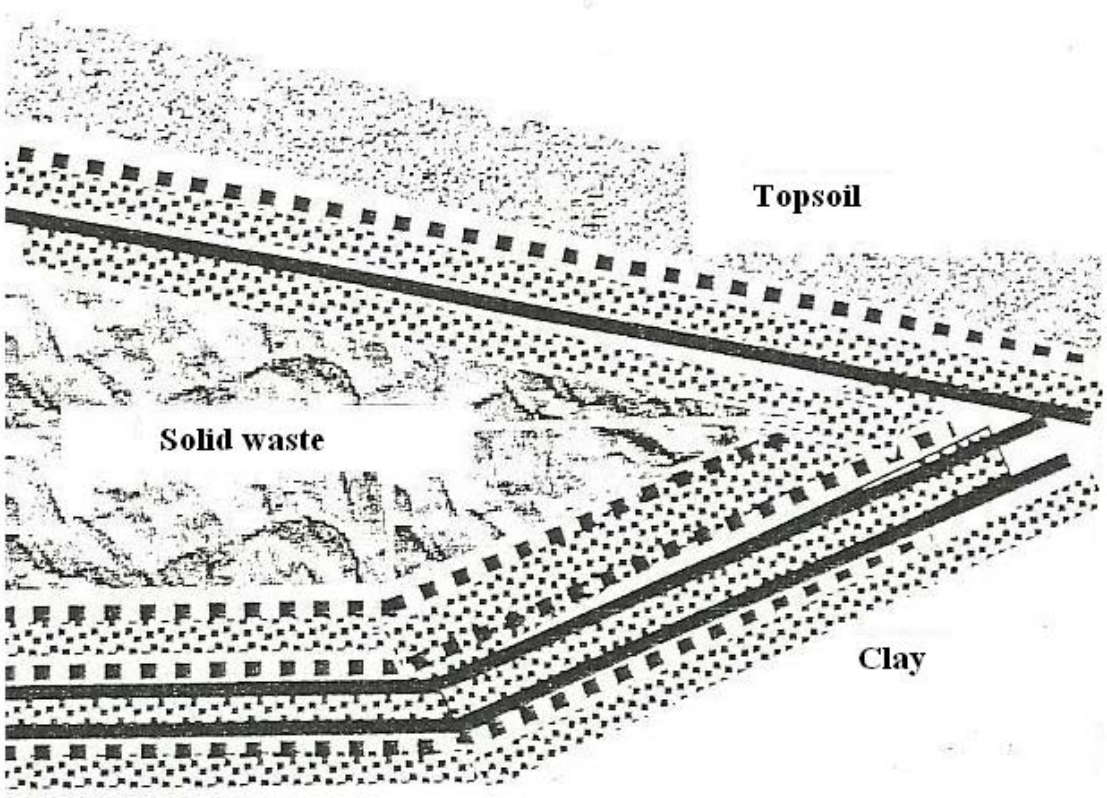

Fig. 6. Maximum cell sealing (simple seal in coverage)

Conclusions

1. The operation, realized with an acceptable cost and a favorable environment balance, has allowed the rehabilitation of the interest area without eliminating the impact materials on the site`s periphery.
2. In the same time, the rehabilitation operation has allowed restoring the terrains in complete compatibility with their future destination: a clean area with industrial and handcrafted activities.

References

1. * * * – Archive de la Company Biobasic Environnement, France, 2000 – 2011;
2. * * * – www.cedre.fr/project/erocips/.../trait.htm;
3. * * * – evasion.inrialpes.fr/Membres/Franck.../3.../index.html;

4. Rollin, A.L., Pierson, P., Lambert, S. – *Géomembranes. Guide de choix*, Editions Presses internationales, Monréal, 2002.

Biopile pentru hidrocarburi şi izolaţie pentru metale grele

Rezumat

Prin combinarea procedeului Ecotertre *al firmei Biobasic Environnement, aferent hidrocarburilor, cu cel al izolării, aferent metalelor grele, s-a realizat, în mai multe etape, o operaţie de reabilitare pentru o zonă industrială din Clermont-Ferrand. Pentru menţinerea costurilor de reabilitare în limite acceptabile, repectiv pentru obţinerea unui bilanţ global de mediu favorabil, solurile poluate au fost menţinute pe situl de interes.*