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CONSIDERATIONS REGARDING THE SOIL POLLUTION WITH OIL PRODUCTS IN SĂCEL - MARAMUREȘ

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Abstract: *Extraction and transport of crude oil by developing environmentally friendly processes both themselves and by some unwanted accidents, such as discharges from tanks, underground or above ground pipe breakages, etc. The phenomenon of environmental pollution produced fluids from wells (oil, gas, condensate, salt water, sludge, sand) occurred with the start of oil exploitation and use as an energy source. Problems of environmental pollution by hydrocarbons has recently become more and more relevant. Each year brings us the increasing number of hydrocarbons' sources in the environment as well as innovative solutions to this problems. For the present paper the results of the given studies, established in database, come to bring to the attention of the interested public a clear image of the actual situation of the state of soil contamination with petroleum products.*

Keywords: *cross-border project, oil products, contaminated sites, pollution management*

1. INTRODUCTION

Problems of environmental pollution by hydrocarbons has recently become more and more relevant, due to the high cost of work during the use of mechanical, physical, chemical and thermal methods of cleaning, as well as their limited capabilities. In addition, each year brings us the increasing number of hydrocarbons' sources in the environment [2].

Their list includes almost all automobile enterprises, pipelines, petrochemical and oil and gas company industry. Accidents associated with the release of hydrocarbons occur as a result of equipment failure (usually electrochemical corrosion and biological) and unauthorized entry into pipelines [3].

During the construction of the wells potential pollutants include: oil-well drilling

fluids and solutions; drilling waste water and drill cuttings; reservoir fluids; fuel and lubricants and other waste building wells.

These effects are seen various components of the environment, including species, formation water, groundwater, soil and surface water.

Consequently, there is a gradual filtering pollution component of the environment.

The sources of soil's contamination within Maramureș region are:

- oil and gas production refineries or facilities and different objects of oil and gas production;
- compressor stations;
- gas distribution stations and points;
- automobile company;
- gas and oil stations;
- aviation company, rail and enterprise.

The results of the given studies established in database [1,3], showing the pollution of soils by oil products in Maramureș region and conducted peer review of possible levels of soil contamination due to the sources with oil activity [4].

The greatest likelihood of soil's contamination with oil products within the given area are: refineries, pipelines and pumping stations [3].

In areas along the oil fields and pipelines, ground and surface waters are being contaminated by oil products and related toxic substances that bring soil to environmentally critical ecosystems.

The oil and oil products along with pesticides internationally recognized priority pollutants. Their negative effect on soil and vegetation, air, surface and ground water, ecological systems and human health observed at all stages of the industrial use of these products from refining, storage, transportation and elimination of equipment [3].

2. THE ACTUAL STATE OF SOILS IN MARAMUREȘ COUNTY

One of the recipients of oil pollution is soil. The contamination of soil is closely associated with increased negative impact of pollutants on vegetation and fauna. The oil and gas pollution is caused the powerful negative impact from various chemicals and highly wastewater.

The main reason for the ecological situation's aggravation in the areas of enterprise production and refining of oil spills are a result of the technical facilities and equipment wear and tear as a result of emergencies, and the soil quality in the respectively region.

Thus, reduction of anthropogenic impact on the environment is achieved by a complex – as prevention measures emergency situations and the modern methods of response, which firstly differ under the soil classes and land use type, and secondly after the following attributes:

- average annual temperature and rainfall - indirect factor;
- gleyzation and pseudo-gleyzation;
- salinization / alkalization;

- texture, slope and landslides;
- total porosity compaction or restrictive horizon;
- humus reserve;
- CaCO₃ content;
- the reaction (pH), debazification;
- excess moisture from the surface.

Regarding Maramures county, but especially the Săcel, below shows some of the most important characteristics of soils that determine one way or the other emphasizing pollution or printing a key environmental behavior change.

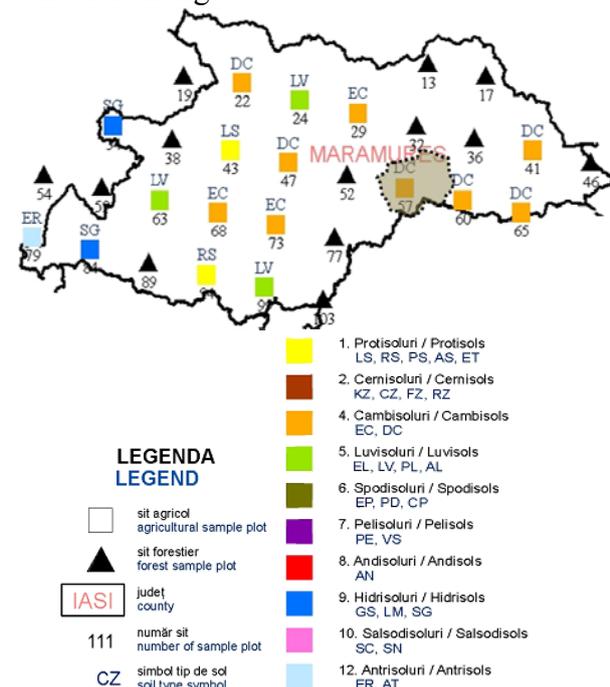


Fig. 1. The representation of the Maramures soil classes [7]

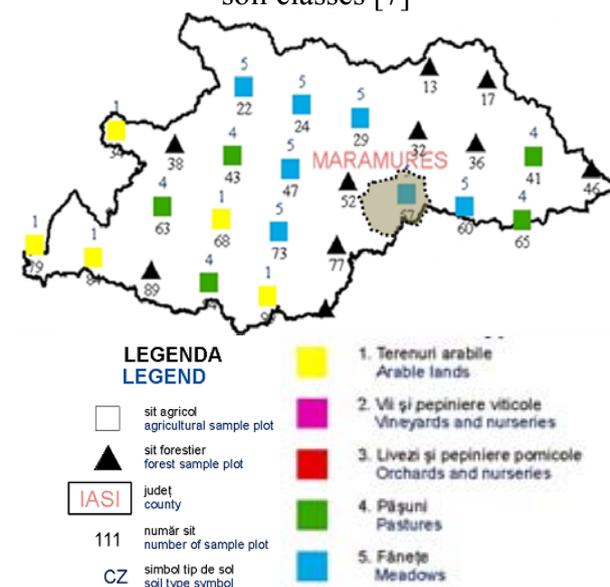


Fig. 2. The representation of the Maramures land use type [7]



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3. MIGRATION AND BEHAVIOUR OF OIL PRODUCTS POLLUTANTS IN SOILS FROM SĂCEL - MARAMURE

3.1. General aspects of migration and behavior of oil pollutants in soil. Following the physical configuration of the underground is found that the surface soil pollution produced in one area generates system-wide risks. Thus, if an area contaminated by the discharge of a pollutant oil, more or less viscous, the migration of pollutants from surface to depth is likely to be affected aquifer, and vice versa.

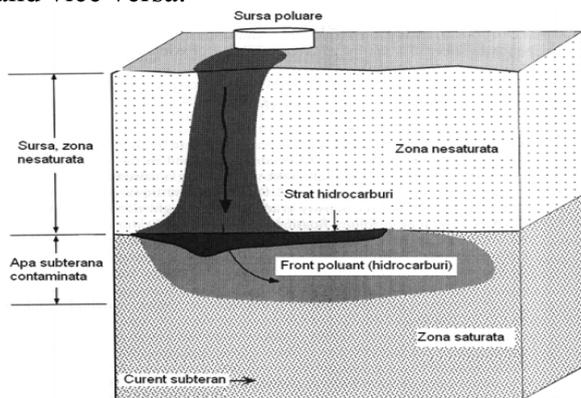


Fig. 3 Scheme of oil pollutants migration

If a contaminated aquifer through a borehole depth, for example, as by vaporization and the capillary rise of water contaminated is likely to be contaminated ground. This type of connection is evident in any other environment components, but each medium presents peculiarities of diagnosis, monitoring and treatment.

3.2. Aspects of migration and behavior of oil pollutants in Săcel area soils. Regarding the migration of pollutants in the underground's correspondence stands visible from one activity to another, so that even if oil exploration activity pollutant behavior remains the same.

In the county of Maramures presented below are images where possible migration of pollutants from the unsaturated zone to the saturated zone.



Fig. 4 Physical migration forms of oil products pollutants in Săcel soils

The discharge of a pollutant oil in a field immediately lead to the formation of unsaturated soil zone of a body soak. Its shape and penetration depth will be controlled by convection phenomena and specific pollutant dispersion and adsorption capacity and soil biological activity.

The direction and speed of the pollutant will mainly depend on its viscosity, the morphology of the land and soil permeability and aquifer rocks roof.



Fig.5 Soil profile from Săcel area

The main force acting on the pollutant in this area is gravity. Therefore, if the soil is slightly permeable soil pollutant infiltrate predominantly by a vertical component. Also, there will be a side impregnation of the pollutant more or less obvious due to its dispersion. Advancing to the aquifer, soil horizons pollutant meets physicochemical and biological properties different, so the different possibilities of absorption and biodegradation. As a result, the pollutant will be partially filtered by soil particles, partly absorbed volatilized and biodegraded in a greater or lesser extent.

The presence of impermeable barriers in the unsaturated zone can divert or halt the migration of pollutants to the saturated zone.

A not insignificant aspect is that the storm water pollutants can detach retaining matrix involving them into shallow groundwater. Because of this mathematical modeling of pollutants in soil full migration is difficult and requires remediation practice, together with mathematical models of dispersion and empirical methods to estimate the following parameters:

- impregnation body shape pollutants;
- the maximum depth of penetration of pollutants;
- the volume of pollutants retained in the unsaturated zone;
- the time required to reach the aquifer pollution.

Laboratory research conducted to estimate the behavior of pollutants in soil in the unsaturated zone, reduce the number of variables in the field.

The research conducted by EPA Baia Mare [5] analyzed the percentage by volume of hydrocarbons retained sand, depending on the mean diameter and size distribution thereof.

For other textural fractions (clay, loam) modest results are expressed:

- research conducted for evidence of oil pollutants ability to be retained in the soil make available a series of coefficients valid only in dry soils;



Fig.6 Laboratory investigations on polluted soils from Săcel area

- concret situations of land or soils with varying degrees of moisture and land use are proposed reduction percentages depending on the physical and geographical concrete and vegetation;
- research conducted to estimate the time of transfer of oil pollutants in the unsaturated zone to the saturated zone established as a standard water permeability of the soil type for which the experimenter; a series of spreads come closer then proposed model so diverse situations on the ground.

4. CONCLUSIONS

Based on data obtained from both the light field measurements and observations made and through other reliable sources of information (EPA Maramures [5], OSPA Maramures [6], Maramures County Council) we noticed that the quality status of soil resources from the County Maramures is a little known and publicized, at least in the eyes inventory and mapping of sites potentially contaminated with petroleum products.

Among the physical characteristics of soils from sites studied for the present project were pursued: soil texture in the upper horizon and the horizon intermediate structural instability index, the degree of compaction, saturated hydraulic conductivity, penetration resistance and edaphic volume.

These elements were helpful in discerning the extent to which soil is polluted or not /



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contaminated with hazardous substances or wastes which can to a disease that is subject to the population or the occurrence of undesirable effects in the environmental factors.

Aware of the fact that the extraction and transport of crude oil - research objective pursued during the project - both by developing environmentally friendly processes themselves, and by some unwanted accidents, such as discharges from tanks, underground or aboveground piping burglary etc, I tried to perceive the phenomenon of environmental pollution produced fluids from wells (oil, gas, condensate, brine, sludge, sand) in a completely different way.

Therefore extrapolation to research in other fields we used the specific applications of new information and communication technologies, including mobile technology in data acquisition and field observations.

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