

ENVIRONMENTAL IMPACT ASSESSMENT OF LEACHATE FROM ELV STORAGE PLACE AT THE DESIGN STAGE

Anastasia M. Soboleva

Vasilii Yu. Rud'

Mikhail P. Fedorov

St. Petersburg State Polytechnic University, Russia

ABSTRACT

There is the acute problem of growth of motor vehicles reached the end of their useful lives in Saint-Petersburg [1]. One of the possible ways for solving this problem it is establishment of a recycling system for "end-of-life-vehicles" (ELV's), including collection system and the creation of a storage places. Storage places are intermediate links in recycling system of ELV's. Necessity of creation of storage places is connected with absence of possibility of city authorities takes away ELV thrown their owners on the street earlier than one year will up. Now it is difficult to tell exactly where storage places will be situated within the precincts of a town or in the country. At the designing of storage places it is necessary to carry out the environmental impact assessment (EIA). Appearance of the given task is connected with potential leakage of car operating fluids from ELV units at the collection and the storage process. This leakage is being mixed with surface water and it cause soil and water pollution [2]. The problem of leachate from storage place is significant if it has wide spread.

KEY WORDS

EIA, ELV, storage places, leakage of car operating fluids

1 BACKGROUND

Necessity of creation of storage places is dictated by absence of the legal norm system allowing municipal authorities to take away of ELV abandoned on city streets by their owners. The motor vehicle admits ownerless after one year will up and than it can be collected on the storage place. The illegal export of a private ownership doesn't exclude possibility of filing of claims compensating material and moral damage to the automobile owner.

The most part of a city motor-vehicle fleet is made with cars belong to physical persons. Therefore it is necessary to be guided by this category of cars at the designing of storage places.

For EIA of storage places it is necessary to be specifying by the following basic data: quantity of cars needed for accommodation on the given place, sizes of a storage place, the average characteristics of car operating fluid volume and on their qualitative structure data; to determine the rain and snow water rate from surface of a storage place.

There are quantity of cars elder ten years belong to physical persons make 565,3 thousand units in Saint-Petersburg at present. Taking into account dimensions of the average car are in limits 4,1×1,8 m [4] and providing of automobile approaches must be 0,5 m, area under one car have to be approximately 9,4 m². The size of a storage place will make 53,1 hectares.

The average statistical car contains near of 28,2 L operating fluids possessing a different hazard potential (see Table 1).

Table 1. Hazard factors from automobile operating fluids[5].*

Operating fluid	Humane	Water	Soil	Air	Total
Gasoline	4	3	3	3,5	3,4
Diesel fuel	3	3	3	3	3
Motor oil	4	4	3	1	3
Gear lubricating oil	4	3,5	3	1	2,9
Shock absorber oil	4	3,5	3	1	2,9
Brake fluid	2,5	3	2,5	1	2,3
Coolant	2	2,5	-	0,5	1,7
Windshield washer	1	1,5	-	0,5	1
Battery fluid	4	2	2	0,5	2,2

*) 1 – minimal concern; 2 – slight hazard; 3 – hazardous; 4 - very hazardous.

The problem of leakage of car fluids is significant if it has wide spread. Cars requiring for disposition on the storage place can create 15,9 mln L leakage of mineral oil.

Flowing out these fluids get in the ground representing complex self-regulated system with high ability to regeneration and accumulation.

Impact of the mineral oil on the environment it is described:

- a degree of toxicity in relation to living organisms;
- speed of decomposition in an environment;

- character of made changes in the atmosphere, soil, water and biocenosis.

Next forms of mineral oils can be in the soil:

- in the porous medium like a liquid easy – mobile state in the free water-dissolved phase;
- in the porous medium in a free state playing a role of viscous or firm cement between particles of rock;
- as an adsorbed film on soil particles and colloids;
- in a superficial layer of ground as dense organo-mineral paste [6].

The mineral oils are contained in the bound state can give flying fractions to an atmosphere and soluble compound in water.

Migration process of leakage of car fluids in the ground, water and atmospheric air depend on physical and physicochemical properties of car fluids, such as density, viscosity, temperature of boiling, water solubility and sorbing of geological material.

Besides a pollution source specification it is necessary to define characteristics of distribution sphere of mineral oil. That is necessary to make investigations of lithologic and geomorphological structure of lower layer and hydrochemical and hydrological characteristics of nearby water objects.

The justification of the territory choice intended under a storage place should be in view of the environmental and town-planning conditions.

Environmental conditions suppose: location of water objects, forests and peatbogs; possibility of a storage place flooding by subsoil waters at the high water period.

Town-planning conditions are meant location of residential areas, the organization of a sanitary – protective zone and value of the ground resources under projected land.

The theoretical description of migration process of car fluid leakage in the soil is a difficult mathematical task. At the decision of it's necessary to take into account set of various factors. The laboratory researches modeling of processes of mass transfer and distribution of mineral oil in the different soil would give more exact estimation of a severity of exposure to the soil and to the water.

At the following stage of work it is necessary:

- To estimate the contribution made by car operational fluids in the total pollution of soil and water;

- To estimate ecological damage rendered by car operational fluids to the environment;
- To take into account of possibility of accumulation of car operational fluids in the environment and contact to the person;
- To take into account of possibility of emergency conditions;
- To develop the nature protection actions, allowing to minimize probable ecological damage.

2 CONCLUSION

EIA is a procedure of analyzing of designing object impact and forecasting of consequence to the environment. EIA could allow us to choose optimum the protection measures of the environment from ecological and economic point of view. It's necessary to create collection system of car operational fluids for further use. Variant of soil regeneration should be provided at the design stage.

For the reason that Russia does not possess essential experience on providing of ecological safety of similar objects, it is necessary to use of experience of the Western countries have faced this task much earlier.

The given work is a very actual, because it will be the beginning of establishment of the complex recycling system of ELV in North-Western region of Russian Federation, integrated together with Northland Baltic countries technologies.

REFERENCES

- [1] Soboleva A.M., Fedorov M.P., 2002. The conceptual approach to the problem of motor vehicles utilization// Materials of IV-th International Youth Environmental Forum of Baltic Countries "Ecobaltica 2002", SPbSPU, 62 p.
- [2] Pavlova E.I., 2000, Ecology of transport: the university textbook.-M.: Transport, 248p.
- [3] Brouks I.I., Fomin S.A., 1999. Environmental impact assessment. Book 1 – M: MNEPU. - 128p.
- [4] Kravets V.N., 1992. Designing of car: the university textbook, - N. Novgorod – 230p.
- [5] Förstner U., 1998. Integrated pollution control, Springer-Verlag Berlin Heidelberg– 506 p.
- [6] Goldberg V.M., Zverev V.P., 2001. Man-caused pollution of natural waters by hydrocarbon and its ecological consequence. –M.: Nauka-125 p.
- [7] Muraviyev A., 2000. The evaluation of soil environmental conditions. – SPb.: Kriskas+– 164p.