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## HYGIENIC CHARACTERISTIC OF POLLUTION OF INDUSTRIAL SOILS AND HOUSEHOLD WASTES

### SUMMARY

In this article during the conducted researches it is established that the main sources of pollution of soils in the Atyrau region are the industrial wastes of the enterprises of oil production and oil processes including chemical reagents, drilling mud fluid, boring slime, sewage boring, oil slimes and crude oil. Besides, one of the main reasons for an adverse ecological situation of the studied area remains impurity of the city and its vicinities industrial unauthorized household and other wastes. The actual question for the region is the cleaning of the territory of the large inhabited places of municipal solid waste which is carried out unsatisfactorily. There is an acute shortage of special transport, garbage containers and container platforms. At the same time, the condition of a radiation situation in the studied region demands systematic monitoring. Because of potential dangers of distribution of radionuclides from abnormal sites of pollution in environment, and also radioactive infection of underground waters and an emission of radionuclides from underground cavities on a land surface. The huge territory is polluted by the stiffened sulfur and toxic agents - products of burning of the open fountain of gas and oil. Also there is a pollution by sulfur dioxide - one of the most toxic components of industrial pollution of the environment. Moreover, high concentration of such heavy metals as lead, zinc, copper and iron are characteristic of this region. High impurity oil and oil products leads to a degradation of a soil cover, violation of a geochemical structure of the soil, destruction of a biogeocoenosis. Also in article interrelations between the content of oil products and concentration in them heavy metals in system the soil and the soil plant are considered. At the same time sources of literature have noted positive correlation between accumulation of heavy metals in the soil and receipt them in plants. Genetic consequences of impact of the heavy metals on a human body which are contained in oil and oil products such as lead, zinc, copper and iron are especially dangerous.

**Key words:** sewage, soil, industrial wastes, household waste.

**O**n explored reserves of hydrocarbonic raw materials the Republic of Kazakhstan is included into ten the largest oil powers of the world, conceding only to some states of the Middle East, Latin America, and also Russia and the USA. The state of human health is one of the important indicators of social development, manifestation of social and economic and sanitary and hygienic well being, and also defense capability and cultural capacity of the state. Rapid development of the oil and gas industry leads to changes in medical and demographic situation of these regions that is connected both with the natural movement of the population, and with migratory processes [1-3].

Research objective was studying of the soils pollution and their cleaning in oil and gas regions on shores of Caspian Sea.

In analyzed area according to research of B. Tynybayev only for 2000 there were 2395,15 hectares of the affected lands, from them restored 493,04 hectares, and should be restored 1902,11

hectares of the land. The most part of the affected lands falls to the share of the following main enterprises: "TCO" LLP, OGM "Kulsaryoil", OGM "Prorvaoil". So, for the part of "TCO" LLP - the area of the affected lands was 1881,6 hectares, restored - 3,2 hectares, OGM "Prorvaoil" - the area of the affected lands - 14,02 hectares, restored - 2,7 hectares, OGM "Kulsaryoil" - the area of the affected lands of 14,1 hectares, restored - 7,926 hectares of the earth [4].

Author has been established that on studied area was formed wastes 22878,6 tons, from them is neutralized - 6608,5 tons, stored in stores of the enterprises - 15798,9 tons; they belong to 3-4 classes of toxicity. Generally waste of productions is formed during the developing of oil and gas fields, storage and transportation of hydrocarbonic raw materials. And, the considerable part of industrial wastes has decreased due to burning in furnaces, a composting and a reuse as road mix or an asphalt covering. It is known that at oil production on all oil and gas fields

passing water is extracted, the part her is pumped in the underground horizons for maintenance of reservoir pressure, and other part is dumped on fields of evaporation, forming at the same time a huge amount of the sewage containing in the structure oil products, etc.

So, in TCO LLP the limit level is 25665,31 tons, and only 12034,9 tons of them is formed waste, waste of the industry 3-4 classes of toxicity have made of them 5680 tons and municipal solid waste of 6353,9 tons. Oil slime and drilling mud fluid on an oil basis is processed into compost which has made 4941 tons. In the furnace for combustion of municipal solid waste 16791,5 tons of waste are neutralized. Besides, in the territory of the enterprise a large amount of lump sulfur, in the volume about 4 million tons which volume due to the lack of sale daily grows has accumulated.

At the same time, in the Atyrau Oil pipeline management have been formed 550 tons of wastes. Waste is formed as a result of cleaning of tanks from ground adjournment when exporting them on capital repairs, because of not commissioning of the sludge collector waste was temporarily stored in PS Atyrau storage. The Atyrau oil refinery represents the largest center for complex oil refining and production of petrochemical synthesis, with a productivity over 6 million tons/year. Due to production of ethylated gasoline by plant, there is a considerable pollution of the environment highly toxic compounds of lead. Annually fields of evaporation grow, the level of ground waters decreases, on many sites ground water reaches a land surface.

In Kulsary Oil pipeline management 100 tons of oil-contaminated soil and oil slime which is formed when cleaning tanks have been formed. There are no accumulation as oil-contaminated soil is used for fixing of ridging from a wind soil erosion; the remained oil slime is stored and punched. The new sludge collector is constructed, but so far into operation it isn't put.

Similar high content of oil and oil products in the soil of the Kulsary field, most likely, can be explained with the fact that it of Kulsary belongs to old oil fields. Therefore there the old equipment is applied - rocking chairs, are also frequent emergency dumping's of oil from wells, and the soil is characterized by high corrosion activity. In the territory of the Kulsary field the soil and vegetable cover is strongly broken and processes of a deflation of the soil are noted.

In general, we investigated deposits are

characterized by the development of salt domes with numerous industrial accumulations of oil and gas. Tengiz field area also contaminated by oil lakes. There is even less oil spill around the wells.

Oil of Tengiz field differs a high content of hazardous and highly corrosive compounds such as mercaptans and hydrogen sulfide. A huge territory of the enterprise is contaminated frozen lumpy gray and toxic substances - products of burning open the fountain of gas and oil. So it is pollution with sulfur dioxide - one of the most toxic industrial pollution components.

Oil of the Tengiz field differs in high content the highly toxic and the corrosion of active of connections, such as died also hydrogen sulfide. The huge territory of the enterprise is polluted by the stiffened sulfur, and also toxic agents - products of burning of the open fountain of gas and oil. There is a pollution by sulfur dioxide - one of the most toxic components of industrial pollution of the environment.

It has been established that at a distance of about 15 km from plant the content of sulfur equaled 2,1 mg/g of solid, in 10 km - 7,6 mg/g, and in 1 km from plant concentration of sulfur is 12,8 mg/g.

Considering the fact that oil includes a wide range of heavy metal, we have allocated group of metals which share is high as a part of a oil of the studied region and in emissions that represent an dangers in the toxicological relation. So, high concentration of such heavy metals as lead, zinc, copper and iron are characteristic of this region. It should be noted similarity of these elements in the chemical relation, namely rather close hydro chemical properties that has to promote manifestation the chemical of regularities in their behavior at the ecosystem level [5, 6].

Interrelations between the content of oil products and concentration in them heavy metals in system the soil and the soil plant are also considered. Positive correlation between accumulation of heavy metals in the soil and receipt them in plants is noted. In the analysis of the vegetation growing in this region it has become clear that mesophyte accumulate zinc; halophyte - manganese, molybdenum, copper, zinc; xerophyte - copper, zinc, manganese. Toxic metals cadmium and lead collect equally all ecological groups.

The majority of heavy metals are cellular poisons which mechanism of action is rather well studied. Toxicity of heavy metals depends on in what form he is in water, the dissolved form

usually toxic connected.

Danger is that heavy metals, collecting in plants, being transferred on trophic ways, negatively influence both animals of various taxonomical groups, and a human body.

So, for example, the natural level of lead in the atmosphere makes 0,005 mg/m<sup>3</sup>. The big part him is besieged with dust, the share of losses with an atmospheric precipitation makes less than 40%. Lead gets to plants from the soil, water and atmospheric losses, in the form of dust. And metal gets to an organism of animals and the person together with food, water and dust. It should be noted that the content of lead in the polluted air of industrial regions in ten thousand times more, than his natural level in the atmosphere. About 300 thousand tons come only to a surface water together with pollution lead in a year.

Thus, the maintenance of toxic elements in organisms of animals is defined by structure of diets and the maintenance of a pollutant in them. There are data that at rodents of concentration of lead in a skeleton are directly proportional to the maintenance of this element in the vegetation which is a part of a diet of rodents it tells about linear dependence of content of lead in an organism of animals from the level of concentration it in vegetation.

Studying of the nutrient cycling of toxic element caused by activity of mammals needs to be consider in several aspects of a problem. First - in aspect of an assessment of a condition of the natural populations living in conditions of industrial pollution, and secondly - roles of population of mammals in the general system of a circulation of toxic elements in natural ecosystem. All this promotes not only a direct intensification of a cycle of the industrial pollutants accumulated by plants but also in some cases the chemical of the ingredients containing toxic elements is followed by biological transformation. The third aspect is especially important - it is genetic consequences of influence, toxic influences of oil, oil products and in it the contained heavy metals, such as lead, zinc, copper and iron on a human body.

One of the reasons of an unsuccessful ecological situation of the regional center remains impurity of the city and its vicinities industrial unauthorized household and other wastes. They also exert impact on pollution of the soil, and also located in the downtown of railway flushing and steaming station, chemical and oil refinery and other enterprises. The central city dump isn't fenced completely because of what all easy fractions are

carried by wind, polluting big land. Considering proximity of a dump to city line and the route of a water carrier Astrakhan-Kulsary construction of plant on processing of waste, and also new grounds is necessary for highly toxic waste. The developed actions for appropriate operation of dumps in necessary volume aren't carried out. Restore of the fulfilled pits isn't carried out. The great influence on environment is exerted by emissions on a dump, together with household and industrial wastes of the fulfilled mercury-containing lamps (or storage in the territory of the enterprise).

It should be noted that most landfills polygons transported glass, paper and cardboard (3 8 and 31.3 %). The composition of plastic waste consists mainly of containers and utensils that are in mass landfills account for 6 % of the exported waste. Waste materials (stone, concrete, ceramics, timber, etc..) - It is mainly "products" from community work days and month of improvement of human settlements. However, they account for only 2.8% of the total amount of municipal solid waste.

However, cleanup of large localities from municipal solid waste is carried out extremely unsatisfactory. In the region, there is an acute shortage of special vehicles, garbage containers and container yards.

Besides, on all oil and gas fields the part of passing and reservoir water at oil production is pumped in the underground horizons for maintenance of reservoir pressure, the part is absorbed by wells, and the rest highly mineralized passing waters are dumped on fields of evaporation or on the territory of the oil-field areas near settlements. A source of ecological danger to the city are fields of evaporation of left-bank part. Operation of this field doesn't meet nature protection standards, leads to flooding and bogging of adjacent lands, pollution of underground waters and there was a real threat of hit of sewage in the sea. The area of evaporation from fields has increased by 5 times, the considerable part of a surface of the water is covered with oil products up to 30 cm thick. The proximity of fields of evaporation to the riverbed of Ural River, existence of a hydraulic bias of waters to the river, lack of protection devices from penetration of toxic substances into ground waters create danger of pollution by these components of waters of Ural River. A problem of utilization and burial of industrial and household wastes in Atyrau rather sharp. Burial of quickly decaying waste in hostile environment can lead to unpredictable consequences. And in many places,

especially in areas of oil production and prospecting works final fracture of a soil and vegetable cover is noted, on big squares valuable pasturable grounds are destroyed.

It should be noted that in the territory of the area in 16 enterprises, institutions and the organizations were available 291 sources of ionizing radiation, from them 10 sources with 9031 Curie's activity were in 2 medical institutions. Behind their activity the public health epidemiological service of area controls. Besides, in the territory of the city of Atyrau 12 radioactive points are revealed. The taken measurements have shown that the A-2 and A-10 platforms by quantity of spots of radioactive anomalies are the most polluted. And on the A-1, A-2 and A-10 platforms sites with the increased specific content of radionuclides in the soil are recorded, at the same time the maximum concentration are noted in a soil layer of 5-10 cm in depth, in comparison with a layer of 0-5 cm.

The condition of a radiation situation in the region of inspection demands regular monitoring because

of potential dangers of possible distribution of radionuclides from abnormal sites of pollution in environment, radioactive infection of underground waters and an exit of radionuclides from underground cavities on a land surface. Radiological methods have determined phase structure of samples of the soil, in all samples presence of quartz at the greatest numbers, at smaller quantities is noted plaster contains. Distribution of radionuclides from the polluted spots depends on such factors as a soil erosion, a form of stay and degree of coherence of radionuclides with a soil complex. The main part of caesium - 137 is in an inactive and fixed form [7].

Thus, the main sources of pollution of soils in the Atyrau region are industrial wastes of the enterprises of oil and gas production and oil and gas processing. The main pollutants of soils are chemical reagents, drilling mud fluid, boring slime, boring sewage, oil slime, crude oil and oil-contaminated soil. High impurity oil and oil products leads to a degradation of a soil cover, violation of a geochemical structure of the soil, destruction of a biogeocoenosis.

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### ТУЙН

Бул макалада Атырау облысында журпзшген зерттеулер барысында непзп ластау кездер! болып табылатын - топырактын, химиялык реагенттер!, бургылау ерггнд1с1, енеркэшт калдыктар камтитын кэсторындардын. шлам агынды сулары, мунайшлары және енделмеген мунай сипатталды. Сонымен катар, колайсыз экологиялык жагдайды тугызатын облыстын. непзп себептершц б1р1 болып кала мен онын, енеркесшлк руксат етшмеген шартараптардагы сулары зерттелт, турмыстык және баска калдыктармен ластануы талданган. Аймак бойынша **ip1** елднмекендердц когамдык орындарында таза рту жумыстары нашар журпзтедг Катты турмыстык калдыштар мэселеа езекл болып отыр. Контейнерлер мен контейнерлк аланшалар тапшылыгы, кокыс тасымалдайтын арнайы кел1ктермен каматамасыздандыру меселес! езектк Соныц салдарынан коршаган ортага ыктимал **асер1** зерттелт отырган аймактагы радиациялык жагдайдын. жай-куй1 жуйел1 мониторинг талап етедк Сондай-ак радиоактивт1 улану, жерасты сулары мен жер бетшдеп арналган жер асты куыстары, радионуклидтер аномалияларыныц таралуы, радионуклидтер ластану учаскелершц улгаюу байкалады. К1р баскан улкен аумақ, сондай-ак газ бен мунай ен1мдер1мен улы заттармен жануы кекейтест! мэселелершц б1р1. Сонымен катар енеркэстлк ластанудын, уытты компоненттершц б1р1 кук1ртт1 ангидридпен ластануы да хальц денсаулыгына колайсыз есер1мен аныкталган. Онын, уст1не, ауыр металдар, коргасын, мырыш, мыс және тем1р аталган аймакта жоғары концентрациясымен белпленген. Мунай және мунай **ен1мдер1** судыч, топырак кабатынын, тозуныц, топырактын, жоғары геохимиялык курылысынын., бузылуына экеп согады, бул урду биогеоценоздын, бузылуына алып келедк Сондай-ак курамында ауыр металдар және мунай ен1мдер1 шогырланган зиянды заттар топырак-ес1мд1кдер және топырак-топырак **жуйес1нде** езара байланысты закымдайды. 9с1ресе, мунай мен мунай ен1мдер1 курамындагы адам агзасына ауыр эсерш типзетж кау!пт! - коргасын, мырыш, мыс және тем1р сиякты металдардын, салдары генетикалык бузылыстарга ыкпалын типзед1.

**ТуйшСИ сездер:** Акаба су, топырак, енд1рю калдыктары, турмыстык калдыктар.

### АННОТАЦИЯ

В ходе проведенных исследований установлено, что основными источниками загрязнения почв в Атырауской области являются промышленные отходы предприятий нефтедобычи и нефтепереработки, включающие химические реагенты, буровой раствор, буровой шлам, сточные воды буровых, нефтешламы и сырую нефть. Кроме того, основной причиной неблагоприятной экологической ситуации исследуемой области остаётся загрязнённость города и его окрестностей промышленными несанкционированными бытовыми и другими отходами. Для региона актуален вопрос очистки территории крупных населённых мест от твердых бытовых отходов, который проводится неудовлетворительно. Существует острый дефицит спецтранспорта, мусорных контейнеров и контейнерных площадок. Состояние радиационной обстановки в исследуемом регионе требует систематического мониторинга из-за потенциальных опасностей распространения радионуклидов из аномальных участков загрязнения в окружающую среду, а также радиоактивного заражения подземных вод и выхода радионуклидов из подземных полостей на наземную поверхность. Огромная территория загрязнена застывшей комовой серой и ядовитыми веществами - продуктами горения открытого фонтана газа и нефти. Загрязнение сернистым ангидридом - одним из самых токсичных компонентов промышленного загрязнения среды. Для данного региона характерны высокие концентрации таких тяжелых металлов, как свинец, цинк, медь и железо. Высокая загрязненность нефтью и нефтепродуктами приводит к деградации почвенного покрова, нарушению геохимического строения почвы, разрушению биогеоценоза. Рассмотрены взаимосвязи между содержанием нефтепродуктов и концентрацией в них тяжелых металлов в системе "почва - почва" и "почва - растения". При этом в источниках литературы отмечена положительная корреляция между накоплением тяжелых металлов в почве и поступлением их в растения. Особенно опасны генетические последствия воздействия тяжелых металлов на организм человека, содержащихся в нефти и нефтепродуктах, таких, как свинец, цинк, меди и железо.

**Ключевые слова:** сточные воды, почва, промышленные отходы, бытовые отходы.