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The Impact of Automobile Tires on the Environment from the Period of Raw Materials to the Disposal of Them

Ismayilov Kubaymurat, Karimova Kamola Gulomovna,

Abstract*: *In this article, all stages on the life cycle of automobile tires and technical ISO standards are used to assess. One of the life cycle of the use of tires, this time allocated to chemical and mechanical connections. Developing countries account the amount of tires in the press and processing methods, as well as used tires on the environment and human health impact of information.

Keywords*: *Tires of automobile, full life cycle, raw materials, ISO standards, chemical compounds, waste tires, natural resources, the environment, human health

I. INTRODUCTION

The growth rate of the car parking per year is twice as fast as the population growth, and their number is about one billion. Typically, two car (winter and summer) tires are used for each vehicle in turn this reflects a set of tires, which have a negative impact on the environment in full lifecycle.

In assessing the environmental impact of vehicle tires, all periods of their life cycles (raw materials, raw material processing, using them for transportation, utilization after working time) should be considered. Consumption of energy resources and natural resources also their impact on environment and human health are evaluated all times.[1]

II. LITERATURE REVIEW

In order to evaluate the entire cycle of tire lifecycle, ISO 14000 offers standards and evaluation methods Table 1.

Table 1 ISO standards

ISO 14040	Life Cycle Assessment - Principles and Structure
ISO 14041	Life Cycle Assessment - Identification and Recognition of Purpose and Scope
ISO 14042	Life Cycle Assessment - Environmental Impact Assessment
ISO 14043	Life Cycle Assessment - distribution of results (interpretation)

The method of evaluation of the life cycle based on ISO 14040 is defined as environmental impact of product on environment:

- Collection and distribution of inputs and outputs (material and energy) in the life cycle of the product and product system;
- Evaluating potential impact on the environment related to incoming and outbound flows;
- Differentiation of the accounted data and their environmental impact assessment.

As a result of the analyzing ecological impacts of tires on environment and human based on ISO 14040, ISO 14060 certification of tires is carried out in accordance with ISO 14010 and ISO 14001, ISO 14001.

The main impacts of tires on the environment and human health are the degradation of natural recourses, environmental degradation, and deterioration of human health.

The life cycles and processes of the automobile tires are shown in Table 2

Table 2. Life cycle of car tires

Cycles	Steps
Production	The process of making construction materials
	The process of getting fuel
	Raw material processing
	Energy production
	Manufacture of car tire details and components
	Preparation of car tires
Period of operation	Using of car tires
	Current repair
	Reconstruction
Recycling	Disassemble car tires
	Reuse of materials
	Utilization of tires

The first phase of the technical life cycle begins with the production of raw materials. The main raw material for production is oil. Oil extraction, transportation and processing will lead to environmental pollution.

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* Correspondence Author
***Ismayilov Kubaymurat*,** Professor, Mechanics of Deformable Solids, Samarkand State Architectural and Civil Engineering Institute Samarkand, Uzbekistan
****Karimova Kamola Gulomovna,** Lecturer, Department of Elevated transport systems, Jizzakh Polytechnic Institute, Jizzakh, Uzbekistan
E-mail address: kamola.karimova1987@gmail.com

The main pollution in oil extraction lies in soil and water basins, and falls in the air during processing. Annually, approximately 10 million tons of oil is pumped to world water basins (oceans). Aero photographs from satellites have shown that more than 30% of the ocean floor is covered with oil pellets. Basically the Mediterranean, the Atlantic Ocean and their shores are affected.

Many sources of oil have been discovered in the ocean, sea and freshwater basins.

One liter of oil deprives 40 liters of seawater from the oxygen required for life. One ton of oil pollutes the 12 km2 ocean floor. Many young fishermen live in the vast area of the water basin, and oil pollution is very dangerous for them.

If an oil pellet is available, about 100 million fish may die in a hectare of water. For this formation, 1 liter of oil is enough.

As a result of combustion of liquid, solid and gaseous fuels for energy, a large amount of carbon dioxide, carbon monoxide, sulfur compounds, nitrogen oxides, carbohydrates and so on discharge.

As well as, as a result of combustion of various fuels, the amount of carbon dioxide in the half-century exceeded 288 million tons, and 300 tons of oxygen was used. Reduced oxygen supply and increased amount of carbon dioxide leads to climate changes. Carbon dioxide molecules lead to ultraviolet light from the sun into the earth's crust, helping to hold ultraviolet light and ultimately it helps with great heat. Pollution of atmosphere with carbon dioxide leads to gasp of people in urban areas.

Sulfur and nitrogen oxide combine with atmospheric moisture and in turn it causes acidic rainfall, hydrocarbonic compounds are harmful to the flora and fauna.

III. RESEARCH METHODOLOGY

Many of tires emit harmful toxic substances which pollute the environment, air, water basins and soil in the production of tires and at all stages of raw material handling. Ensuring environmental safety in the use of tires resembles the protection of the environment in tire production in the rubber industry but has a distinctive feature. Solids from vehicle tires to the atmosphere due to chemicals and tires can adversely affect the environment and human health. The high environmental risk of tires is the lubricant and the components contained therein, and more than 100 chemicals and aerosols separated from the atmosphere, which are released during water use. Table 3 lists the hazardous substance with their derivatives and isomers to be released, each containing more than ten compounds. Chemical reagents, which are discharged from the rubber tires, are reactive aromatic toxic chemical compounds.[3]

Table 3 Chemical compounds discharged from tire usage:

S/n	Name of groups	Number of items	Hazard class
1	Binzopyrins	14-15	1-3
2	Nitrolites	3-4	1-3
3	Aliphatic and aromatic alkynes	5-8	2-3
4	Alpylomatomatic hydrocarbons	20-25	2-3
5	Sulfuric hydrocarbons	5-8	2-3
6	Galogenic hydrocarbons	3-5	2-3
7	Phenols	1-3	2
8	Aliphatic aldegites and ketones	10-15	2-4
9	Aliphatic alcohol and acids	3-6	2-4
10	Alkiaromatic esters	3-6	2-4
11	Oligomers	1-3	2-41
12	Cycloaromatic hydrocarbons	15-20	3-4
13	Aliphthous saturated hydrocarbons	25-30	4
14	Other compounds	5-10	2-41

Hydrocarbons are non-aromatic hydrocarbons and discharge due to incomplete combustion of fuel benzene, xylene, sterol, toluene; conjunctions - aliphatic amines, concentrates - sulfuruguerod, formaldagid, phenols; sulfur and nitrogen dioxide.

The above-mentioned substances are poisonous and they are part of the list of toxic substances in the list of the International Cancer Research Organization.

The chemical analysis of the tire impacts indicates that the amount of separated semi-aromatic hydrocarbons is 55-60% more compared to the semi-aromatic hydrocarbons in used gases and it is characterized by high volatility or water solubility but, their diffusion into the environment is caused by the heat generated by friction of the tires. It also reacts with discharged semi-aromatic hydrocarbons to form new semi-aromatic hydrocarbons, chlorine aromatic hydrocarbons, and hydroxy aromatic hydrocarbons. The dust emerged by tearing of the tires is so harmful for lungs and it causes diseases such as allergic reactions, bronchial asthma.

IV. ANALYSES AND RESULTS

Taking into account the fact that these standards are gradually coming to Russia and the CIS countries, the ecological testing and certification of tires used in these countries are a topical issue. Increased car parking in all developed countries of the world leads to accumulation of used tires. Used tires are the most widely used garbage. According to the published data, annual consumption of tires is 2 million tons in Europe and 2.8 million tons in the USA.

The number of tires used in the US and Japan as well as in some European countries and their recycling methods are given in Table 4.[4]

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Table 4 Tires produced in Europe, USA and Japan and their recycling methods:

Countries	Tire capacity, tons	As garbage, %	To get energy,%	Restoration of protectors, %	Rubber powder , %	Export, %	Others,%
Germany	550	2	38	18	15	18	9
England	450	67	9	18	6	-	-
France	425	52	10	13	6	19	-
Italy	330	53	14	27	-	6	-
USA	2800	59	22	9	9	3	1
Japan	840	8	43	9	12	25	3
Russia	800	96	-	1	1[1]3	-	-

The annual increase in the number of used tires makes the European Union develop programs designed to address the following challenges:

- Reduce the number of tires by 10%;
- Increase the tire protector restoration by 25-30%
- Stop using waste disposal facility

In Russia, this problem is more acute. For example, according to the Tire Industry Research Institute, about 1 million tons in Russia, only 60,000 tons of used tires in Moscow alone. 10-12 tons of it is recycled, and the rest is disposed of into unusable waste disposal facility, forests and ravines. This aggravates the ecological situation in Moscow.[4]

Unused tires are the source of pollution for a prolonged period of time:

- tires don't fracture
- They burn quickly and it is very difficult to remove and emit large quantities of waste to the environment as well as concertogens;
- Losing tires is one of the most pressing environmental problems of the modern era. The toxic substances that come from them are given in Table 3.
- Exhausted or buried tires do not dry up for a hundred years. Their stay in rain or underground water forms congenic compounds such as diphenylamine, deputy phthalate, phenanthrene.[4]

V. CONCLUSION

23% of tires is used as fuel and powder for other purposes, while the remaining 77% is not lost because they are not effective. Ejected tires appear in auto farms, industrial enterprises, auto services and private sectors. [5] Many industrialized countries have programs and tools designed to collect and process used tires. In most cases, the cost of tires is up to 50-400 euro per ton. Recycling car tires through economical will not only solve ecological problems, but also ensure high return on processing industry.

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AUTHORS PROFILE

Ismayilov Kubaymurat, Professor, Mechanics of Deformable Solids, Samarkand State Architectural and Civil Engineering Institute Samarkand, Uzbekistan

Karimova Kamola Gulomovna, Lecturer, Department of Elevated transport systems, Jizzakh Polytechnic Institute, Jizzakh, Uzbekistan

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