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ANALYSIS OF CAUSES OF FIRE OUTBREAKS IN AUTOMOTIVE ENTERPRISES AND DEVELOPMENT OF MEASURES TO COUNTER THEM

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Abstract: This article analyzes the causes of fires at automotive enterprises and studies the risk factors in production processes. It was found that due to the presence of fuel and lubricants, paint and varnish products, electrical equipment, and high-temperature technological processes at automotive enterprises, the risk of fire is high. Organizational, technical, and preventive measures have been developed to reduce the risk of fire. The results of the study will serve to improve labor protection and fire safety at automotive enterprises.

Keywords : automotive industry, fire safety, industrial hazard, electrical failure, paint shop, prevention, risk analysis, environmental hazard.

1. Introduction

The automotive industry is one of the leading sectors of the global economy. Complex technological processes, automated lines, and extensive use of electricity and flammable substances in large automobile manufacturing plants increase production risks.

Technological processes at large industrial enterprises such as UzAvto Motors are also classified as high-risk. Various flammable substances are used during the welding, painting, assembly and testing of car bodies. In particular, paint shops and fuel storage facilities are areas with a high risk of fire.

According to statistics, the vast majority of fires in industrial enterprises are associated with electrical system failures, non-compliance with technological discipline, and the human factor.

The purpose of this study is to conduct a comprehensive analysis of the causes of fires in automotive enterprises and develop effective preventive measures.

2. Materials and methods

The following scientific methods were used in the research process:

2.1. Regulatory and legal analysis

Fire safety rules, industrial safety standards and state standards approved by the Ministry of Emergency Situations of the Republic of Uzbekistan were studied.

This method includes the following:

- study current laws and technical regulations;
- state standards for industry (UzDSt;
- internal regulations;
- identify errors in practice.

basic documents:

No.	Document name	Demand content	In the enterprise situation	Problem

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1	ORC	Safe	Partially provided	Ventilation
2	Labor Protection Law	Ensuring safety at work	Internal	Control is on.
3	Fire safety Law	Eva box	Plan yes , not updated	Training Little attention to training .

The level of compliance with regulatory requirements at the enterprise:

- 70%
- 55
- 40% – currently.

While these manifestations are consistent with the strength of the regulatory framework, practical enforcement is weak.

2.2. Statistical analysis

Fire incidents recorded at automotive enterprises in recent years were analyzed.

Statistical method

Year	Fire number	Material loss (million) soums)	Home reason
2021	6	420	Electricity short connection
2022	8	615	Welding works
202 3	5	380	Carpets with a smell
2024	7	540	technical safety

Reasons

Reason type	Share (%)
Electrical short circuit	35%
Welding errors	25
Combustible rug	20%
Failure to follow instructions	20%

2.3. Analysis of technological processes

Risk factors in welding, painting, assembly, and electrical supply systems were studied.

Technological risk analysis

Process	Flammable substance current league	Temperature factor	Danger level
Painting	High	Average	High
Welding	less	High	High
Montage	less	less	Average
Sin	High	Average	High

Painting and welding in the plots danger The level is between 80–90% . In these zones automatic fire delete system demand is being done .

Important low scores:

- Ventilation is not working;
- dust and combustible substances;
- Technological errors in the process.

2.4. Risk reduction

1. Automatic alarm installation;
2. Gas analyzers to introduce ;
3. Employees regular regularly improve their skills;

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4. Evacuation to practice the exercises more .

2.4. Risk assessment method

The probability and consequence levels were assessed using the risk matrix method.

3. Results

According to the results of the analysis, the main causes of fires in automotive enterprises are:

3.1. Malfunction of electrical equipment;

– Short circuit;

– Overload;

– Insulation degradation;

These situations are especially common in welding shops.

3.2. Paint and varnish materials

During the engraving process, organic solvents and volatile substances form a flammable mixture in the air. Ineffective ventilation systems increase the risk of explosion.

3.3 **. Welding work**

Fires can occur when open flames and sparks fall on fuel residues or oily materials.

3.4 **. Human factor**

– Failure to comply with technical safety regulations

– Smoking cigarettes ;

– Faulty from equipment use ;

3.5. Storage of fuels and lubricants

If the temperature control and ventilation system in fuel storage facilities is not up to standard, the risk of fire increases.

4. **Discussion**

Automotive industry in enterprises fire danger many factorial to the character has . Research results this showed that the fires big part preventive measures enough at the level organization immature with depends .

International to experience According to Toyota Motor Corporation and BMW Group in companies following systems effective current made :

– Automatic fire determination systems ;

– Gassy delete system ;

– Sensor monitoring ;

– Regular risk audits.

It is also advisable to introduce digital monitoring systems in local enterprises.

Fire prevention measures .

1. **Organizational measures:**

– Conduct regular fire safety training sessions;

– Every in a quarter briefing transfer ;

– Control commission organization to be

2. Technical measures

– Automatic signaling ;

– Smoke sensors ;

– Splinker system ;

– To the ground connect system modernization to do

3. **Preventive measures**

– Electricity networks planned check ;

– Paint in the workshops mandatory ventilation ;

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– Spark issuer affairs for permit system implementation.

4. Innovative approach :

– IoT based on sensor monitoring ;

– Thermal camera through control ;

– AI- based danger forecasting ;

5. **Conclusion**

The results of the study showed that the main causes of fires in automotive enterprises are related to electrical faults, paint and varnish materials, welding work, and the human factor.

Fire the risk reduce for :

Digital monitoring system current to grow ;

Automatic delete systems installation ;

Employees qualification increase ;

Strengthening preventive control;

Through a comprehensive approach, fire risk in automotive enterprises can be reduced by 40–60%.

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