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Hygienic Assessment Of The Class Of Working Conditions According To The Chemical Factor In The Production Of Polyethylene Products

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Annotation. This article contains a class of working conditions according to sanitary rules and regulations No. 0141-03 “The severity and intensity of the labor process in a production environment, hygienic classification of indicators of harmfulness and danger of working conditions” and the determination of the summation coefficient.
Key words: summation coefficient, polymer products, chemical factor, total sum of harmful substances, class of working conditions

Introduction. The chemical factor is the leading factor determining working conditions in the production of polyethylene materials. The complex of harmful substances entering the air of the working area includes chemicals used as raw materials in the production of intermediate and final products. The impact of harmful substances on the body of workers is combined or intermittent [1, 4, 10].

Assessing the intensity and duration of exposure to factors of working conditions and the production environment, developing management mechanisms to reduce their adverse effects to the level of perceived risk leads to maintaining the professional health of workers and preserving labor resources. Occupational safety and health is a very important area of social policy in any country [3, 5,11].

It has been established that the main unpleasant factor in the production of polymers is air pollution in the working area with harmful substances of hazard class 2-4, which have various toxic effects on the body. For each specific polymer production, the degree of exposure of workers to chemical substances is individual [2,12]. In our daily lives, we come into contact with various plastics, rubber and synthetic fibers. Reducing its harmful effects on the external environment and the human body using polymer products remains a pressing problem today [6,7,8].

Research methods: The concentration of chemicals in the air of the working area of an enterprise for the production of polyethylene products was studied based on the results of sanitary and hygienic analysis.

Results and Analysis:

The assessment of working conditions in the production environment for the presence of harmful substances with two or more multidirectional effects was simultaneously carried out as follows (0141-03) (Table 1):

for substances whose concentration corresponds to the highest class and level of danger;

if the level of any active substances corresponds to the 1st level of the 3rd class, the level of danger of working conditions does not increase;

if three or more substances correspond to the 3rd class of the 2nd level, the working conditions are transferred to the next 3rd class of the 3rd level of the harmful (heavy) class;

if two or more harmful substances correspond to the 3rd class of the 3rd level, the working conditions are transferred to the next 3rd class of the 4th level extremely harmful, (extremely dangerous) class. In the same way, class 3 is transferred from class 4 - extremely harmful (extremely dangerous) to class 4 (extremely dangerous, extremely dangerous).

The study was conducted at an enterprise for the production of polyethylene products located at Tashkent street, 5, Jizzakh city, Jizzakh region. Polyethylene films with diameters ranging from 200 mm to 3000 mm for greenhouses and agricultural irrigation systems are produced in the polyethylene products workshop, which currently employs 38 workers, of which 7 are women.

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Table 1
Classes of working conditions depending on the amount of harmful substances present in the air of the workplace

Harmful factors	Class of working conditions					
	Harmful - 2nd class	Harmful - 3 classes				Class 4 (extremely dangerous)
		3rd grade 1st level	3rd grade 1nd level	3rd grade level 3 malicious (Severe)	3rd grade level 4 – extremely harmful, (extremely severe, dangerous)	
Class 1-2 harmful substances	≤MPC	1.1-3	3.1-6	6.1-10	10.2-20	>20
Class 3-4 harmful substances	≤MPC	1.1-3	3.1-10	>10		
Dangerous substances that cause sharp, itchy, acute poisoning according to the mechanism of action	≤MPC	1.1-2	2.1-4	4.1-6	6.1-10	>10
Allergen	≤MPC	1.1-2.0	2.1-3	3.1-10	>10	
Long-term carcinogen, mutagens, etc.	≤MPC	1.1-3	3.1-6	6.1-10	>10	
Aerosols with a predominantly fibrogenic effect	≤MPC	1.1-2	2.1-5	5.1-10	>10	
Antitumor drugs, hormones (estrogens)					XX	
Narcotic analgesics				XX		

The technological process at the enterprise consists of placing 25 kg of polypropylene and polyethylene raw materials (pellets) into a special hopper, transferring them from the hopper to the injection molding machine using an extrusion device, and heating the raw materials transferred to the injection molding machine. at a temperature of 180-210^{0}C, it is brought to the state of a solution, slowly poured into a special molding device and polished, the polished product is transferred to a cooling device, and the plastic film of the finished product begins to fall from top to bottom. At the next stage, it is brought to the rolling equipment and packaged, which consists of receiving film products of different thicknesses according to the order.

In this production process, workers work in 9 different occupational groups, of which workers from 4 groups (technologists, putters, foremen and extrusion machine operators) are in direct contact with the chemical agent.

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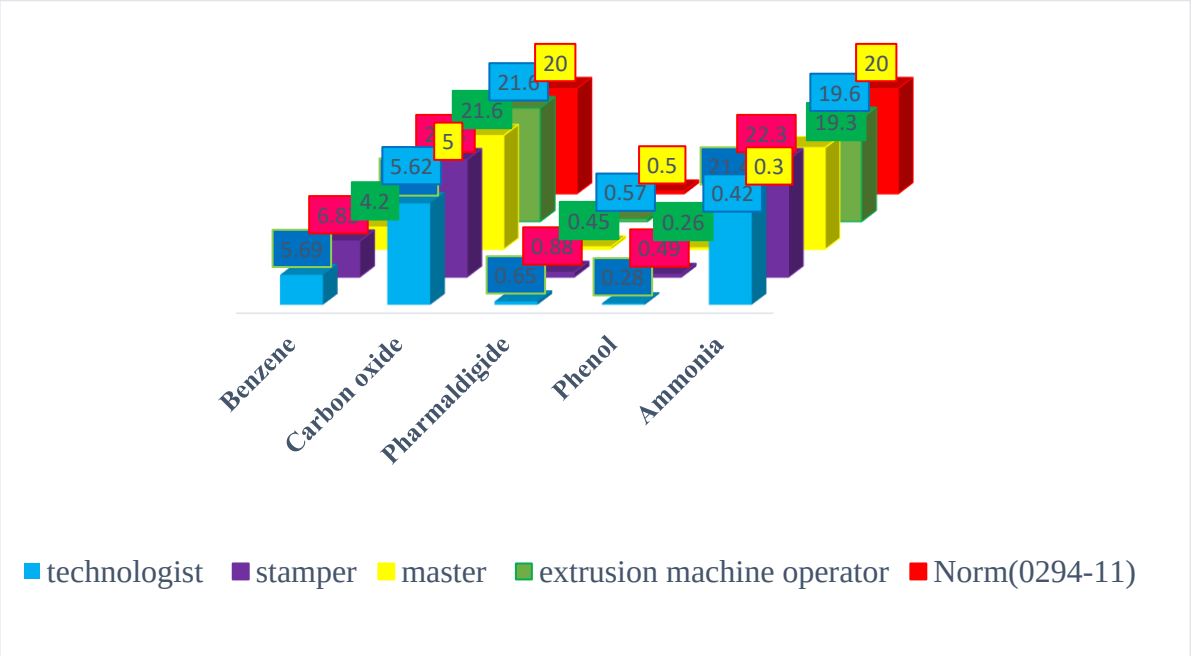
When sampling at three points for each chemical substance at the workplace of a technologist working at the enterprise, the benzene content (class 2) averaged 5.0 mg/m3 (5.69±0.18), which is 0.69± 0.08 times exceeds the permissible limit. limit, formaldehyde (class 2) 0.5 mg/m3 on average (0.65±0.03) higher than the permissible norm, which is 0.15±0.05 times, ammonia (class 4) 20.0 mg/m3 on average (21.4±0.23) 1.4±0.06 times higher than the permissible limit, it was found that carbon monoxide (class 4) and phenol (class 2) do not exceed the permissible limit (Fig. 1) [9,10,11].

When sampling at three points for each chemical substance in the working area of the clubs, the benzene content (class 2) averaged 5.0 mg/m3 (6.83 ± 0.21), which is 1.83 ± 0.11 times exceeded the permissible norm, carbon monoxide (class 4) 20.0 mg/m3 on average (22.3±0.12) permissible norm (22.3±0.12), which is 2.3±0.4 times, formaldehyde (class 2) 0.5 mg/m3 on average (0.88±0.02). is 0.38±0.07 times, phenol (class 2) - 0.3 mg/m3 on average (0.49±0.01) of the permissible norm (0.19±0.04 times), and ammonia (class 4) turned out to be 20.0 mg/m3 (22.3±1.23) higher than the permissible norm by 2.3±0.6 times (Fig. 1).

At the foreman's workplace, samples were taken for each chemical substance at three points, the following results were obtained: permissible limit of carbon monoxide (class 4) 20.0 mg/m3 on average (21.6 ± 1.16), which is 1.6 ±0.7 times exceeds the permissible limit. that benzene (class 2), formaldehyde (class 2), ammonia (class 4) and phenol (class 2) did not exceed the permissible limit (Fig. 1).

Figure 1.



Concentration of chemicals determined in the air of workers at an enterprise for the production of polyethylene products, mg/m3

At the extrusion machine operator's workplace, samples were taken at three locations for each chemical and the results were as follows: Benzene (Class 2) permitted limit 5.0 mg/m3 on average (5.62 ± 1.14), which is 0 .62±0.03 times more, carbon monoxide. (class 4) the permissible norm is 20.0 mg/m3 on average (21.6±1.19) which is 1.6±0.04 times, formaldehyde (class 2) the permissible norm is 0.5 mg/m3 in on average (0.57±0.02) by 0.07±0.01 times, the permissible norm of phenol (class 2) is 0.3 mg/m3 on average (0.42±0.06) by 0.12± 0.03 times, and for ammonia (4 classes) the permissible norm is 20.0 mg/m3 on average (22.6±1.43), which, as a result of the analyses, exceeded the permissible norm by 2.6±0.9 times.

As a result of the above analysis, it turned out that at the main workplaces of the enterprise for the production of polyethylene products, a class of working conditions is allowed - the technologist's workplace corresponded to the 2nd class, the technologist's workplace corresponded to the 1st class. level - 3rd hazard class, and the workplaces of installers and the extrusion machine operator - 2nd level, which is defined as corresponding to the 3rd hazard class (Table 2).

Table 2

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Class of working conditions for workers according to the chemical factor in the working area of the production of polyethylene products

Professional groups	Chemical agent (hazard class)					
	Benzene (Class 2)	Carbon monoxide (SO) (Class 4)	Formaldehyde (Class 2)	Phenol (Class 2)	Ammonia (Class 4)	General class
Technologist	3,1	2	3,1	2	2	3,1
Pourer	3,1	3,1	3,1	3,1	3,1	3,2
Master	1	2	1	2	1	2
Extrusion machine operator	3,1	2	3,1	3,1	1	3,2

The concentration of benzene, carbon monoxide, formaldehyde, phenol, ammonia substances in the air of workplaces is a complex of chemical factors, while the unilateral action of several harmful substances occurs simultaneously, and the actual amount (K1, K2...,) in each air is an acceptable norm(AN) (AN 1, AN2...ANn) substances should not exceed unity (1.4):

Calculation of the summation factor

$$\frac{К_1}{AN_1} + \frac{К_2}{AN_2} + \frac{К_3}{AN_3} + \frac{К_n}{AN_n} \leq 1 \quad (1.4)$$

Conclusions.

1. At the workplace of a technologist of an enterprise for the production of polyethylene products, benzene is 0.69 times higher, formaldehyde is 0.15 times higher, ammonia is 1.4 times higher, benzene is 1.83 times higher, carbon monoxide is 2.3 times higher, formaldehyde is higher 0.38 times at the installers' place, phenol increased by 0.19 times, ammonia by 2.3 times, carbon monoxide at the foreman's workplace by 1.6 times, benzene by 0.62 times, carbon monoxide by 1.6 times, and formaldehyde in the workplace of the extrusion machine operator was exceeded by 0.07 times. the permissible limit is 0.12 times and 2.6 times according to the analysis results.

2. An assessment of the working conditions of the enterprise under study made it possible to determine the class of hazards and dangers of chemical hazardous factors in the production environment on the basis of sanitary rules and regulations №0141-03 “The severity and intensity of the labor process in the production environment, hygienic Classification of indicators of hazards and dangers of working conditions.” The class of working conditions at the workplaces of craftsmen is allowed - it is established that the workplaces of technologists, layers, and extrusion machine operators belong to the 2nd class, and the workplaces - to the 1st level, 3rd hazardous class.

3. A summation coefficient <1.0 was observed in all workplaces and in the workplace of the most productive workers, which, in turn, leads to the early manifestation of productive fatigue

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