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THEORY OF DEVELOPMENT AND IMPROVEMENT OF THE MATHEMATICAL MODEL OF THE METHODOLOGY OF PUBLIC CONTROL IN THE MANAGEMENT OF OCCUPATIONAL SAFETY AND INDUSTRIAL RISKS


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CONTENTS

CHEMISTRY AND CHEMICAL TECHNOLOGY

- N.Z.Saydalieva.** Globular Protein For Surface Modification of Cellulose-Containing Materials 5
V.D.Khamidova. Dying of Natural Silk Deglued by Various Methods. 10
Kh.Sh.Sultonov, Sh.T.Khojiev, G.B.Beknazarova, M.S.Saidova. Selective Oxidation of Iron in Chalcopyrite For Enhanced Copper Recovery 15

CIVIL AND ENVIRONMENTAL ENGINEERING

- R.M.Rakhimov.** Solving Water Resources Problems - Water Saving in the Republic of Uzbekistan 21
A.X.Rasulev, S.S.Sulaymanov, N.B.Gaibnazarova. Theory of Development and Improvement of the Mathematical Model of the Methodology of Public Control in the Management of Occupational Safety and Industrial Risks 25

GEOLOGICAL ENGINEERING

- M.N.Juraev, A.R.Almordonov, B.U.Mukhammadiev.** Ore-Generating Role of the Focal Structure During the Formation of Apogranitoid Tungsten Mineralization at the Yakhton Deposit 29

ELECTRICAL AND COMPUTING ENGINEERING

- Sh.A.Sultanova, J.E.Safarov, A.A.Mambetsheripova.** Modelling of Heat Transfer in an Air Solar Collector 37

THERMAL ENERGY AND POWER ENGINEERING

- F.J.Nosirov, A.S.Uroqov, G.P.Arzikulov, Z.A.Sayfutdinova.** Implementing a Solar Photovoltaic Station in Watering Systems Utilizing Complex Software 44
M.O.Gafurova, K.G.Abidov. Electromagnetic Field Model as a Source of Water Cavitation Energy 51
A.I.Mirolimov, X.M.Iliev. Research of The Influence of Dust on Photovoltaic Modules 56
N.B.Pirmatov, D.R.Abdullabekova. Use of Mathematical Skills For Technical Condition Assessment of Power Autotransformers 60

MECHANICAL ENGINEERING

- Yu.A.Akhmedjanov.** Experimental Studies on Determination of Loading and Laws of Motion of the Accelerator of the Raw Material Chamber of the Saw Gin 66

CONTROL OF TECHNOLOGICAL PARAMETERS

- O.V.Tuyboyov.** Quantitative Assessment and Characterization of Tool Wear Phenomena in Advanced Manufacturing Processes 74
Z.N.Mukhiddinov. A Study on the Influence of Cutting Parameters on Surface Roughness and Visualization Through Contour Plots And 3D Surface Profiles 80

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MUNDARIJA**KIMYO VA KIMYOVIY TEXNOLOGIYA**

- N.Z.Saydaliyeva.** Sellyuloza asosidagi to'qimachilik materiallarini yuzaviy modifikatsiyalash uchun globulyar oqsil 5
- V.D.Xamidova.** Turli usullar bilan yelimsizlantirilgan tabiiy ipakni bo'yash 10
- H.Sh.Sultonov, Sh.T.Hojiev, G.B.Beknazarova, M.S.Saidova.** Xalkopiritdagi temirni selektiv oksidlash orqali mis ajratib olinish darajasini oshirish 15

FUQAROLIK VA EKOLOGIYA MUHANDISLIGI

- R.M.Raximov.** O'zbekiston Respublikasida suv resurslari muammolarini yechish – suv tejamkorligi 21
- A.X.Rasulev, S.S.Sulaymanov, N.B.Gaibnazarova.** Mehnat havfsizligi va ishlab chiqarish xavflarini boshqarishda xaqiqiy nazorat uslubini matematik modelini ishlab chiqish va takomillashtirish nazariyasi 25

GEOLOGIYA MUHANDISLIGI

- M.N.Jurayev, A.R.Almardonov, B.U.Muxammadiyev.** Yaxton konida apogranit volfram ma'danlashuvining shakllanishida ochag (uyasimon) strukturasi ma'dan xosil bo'lishidagi roli 29

ELEKTROTEXNIKA VA KOMPYUTER MUHANDISLIGI

- Sultanova SH.A., Safarov J.E., Mambetsheripova A.A.** Quyosh kollektorida issiqlik almashinish jarayonini modellashtirish 37

ISSIQLIK ENERGETIKASI VA ENERGETIKA

- F.J.Nosirov, A.S.Uroqov, G.P.Arzikulov, Z.A.Sayfutdinova.** Kompleks dasturiy ta'minotni qo'llagan holda sug'orish tizimida quyosh fotoelektrik stansiyasidan foydalanish 44
- M.O.Gafurova, Q.G.Abidov.** Elektromagnit maydon modeli suvning kavitatsiya energiyasi manbai sifatida 51
- A.I.Mirolimov, X.M.Iliyev.** Fotoelektrik modullarga changni ta'sirini tadqiqot 56
- N.B.Pirmatov, D.R.Abdullabekova.** Kuch avtotransformatorlarining texnik holatini baholash uchun matematik ko'nikmalardan foydalanish 60

MASHINASOZLIK

- Yu.A.Axmedjanov.** Arra djin xom ashyo kamerasi tezlatkichining yuklanishi va harakat qonunlarini aniqlash uchun eksperimental tadqiqotlar 66

TEXNOLOGIK PARAMETRLAR NAZORATI

- O.V.Tuyboyov.** Ishlab chiqarish jarayonlarida kesuvchi asboblarning yeyilishi xarakteristikallari va miqdoriy baholash 74
- Z.N.Muxiddinov.** 3D profilli grafiklar va chiziqli grafiklari vizualizatsiyasi yordamida kesish parametrlarining ishlov berilgan yuzadagi sirt g'adir-budirligiga ta'sirini o'rganish 80

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- Н.З.Сайдалиева.** Глобулярный белок для поверхностной модификации целлюлозосодержащих материалов..... 5
- В.Д.Хамидова.** Крашение натурального шелка, обесклеенного различными методами..... 10
- Х.Ш.Султанов, Ш.Т.Хожиев, Г.Б.Бекназарова, М.С.Саидова.** Селективное окисление железа в халькопирите для повышения извлечения меди 15

ГРАЖДАНСКАЯ И ЭКОЛОГИЧЕСКАЯ ИНЖЕНЕРИЯ

- Р.М.Рахимов.** Решение проблем водных ресурсов - экономия воды в Республике Узбекистан 21
- А.Х. Расулев, С.Сулайманов, Н.Б.Гайбназарова.** Теория разработки и совершенствования математической модели методологии общественного контроля в управлении охраной труда и производственными рисками..... 25

ГЕОЛОГИЧЕСКАЯ ИНЖЕНЕРИЯ

- М.Н.Жураев, А.Р.Алмордонов, Б.У.Мухаммадиев.** Рудогенерирующая роль очаговой структуры при формировании апогранитоидного вольфрамового оруденения на месторождения Яхтон..... 29

ЭЛЕКТРОТЕХНИКА И ВЫЧИСЛИТЕЛЬНАЯ ТЕХНИКА

- Ш.А.Султанова, Ж.Э.Сафаров, А.А. Мамбетшерипова.** Моделирование теплообмена в воздушной солнечной коллектор.... 37

ТЕПЛОВАЯ ЭНЕРГЕТИКА И ЭНЕРГЕТИКА

- Ф.Ж.Носиров, А.С.Уроков, Г.П.Арзикулов, З.А.Сайфутдинова.** Использование солнечной фотоэлектрической станции в системах полива с применением комплексного программного обеспечения .. 44
- М.О.Гафурова, К.Г.Абидов.** Модель электромагнитного поля как источника кавитационной энергии воды..... 51
- А.И.Миролимов, Х.М.Илиев.** Исследование влияния пыли на фотоэлектрических модулей 56
- Н.Б.Пирматов, Д.Р.Абдуллабекова.** Использование математических навыков для оценки технического состояния силовых автотрансформаторов..... 60

МАШИНОСТРОЕНИЕ

- Ю.А. Ахмеджанов** Экспериментальные исследования по определению нагруженности и законов движения ускорителя сырьевой камеры пильного джина 66

КОНТРОЛЬ ТЕХНОЛОГИЧЕСКИХ ПАРАМЕТРОВ

- О.В.Туйбойов.** Количественная оценка и характеристика явлений износа инструмента в современных производственных процессах . 74
- З.Н.Мухиддинов.** Исследование влияния параметров резания на шероховатость поверхности и визуализация через контурные графеты и 3D профили поверхности 80

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THEORY OF DEVELOPMENT AND IMPROVEMENT OF THE MATHEMATICAL MODEL OF THE METHODOLOGY OF PUBLIC CONTROL IN THE MANAGEMENT OF OCCUPATIONAL SAFETY AND INDUSTRIAL RISKS

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Abstract: The article develops and analyzes a mathematical model based on a logical flowchart of the methodology of public control in the management of occupational safety and industrial risks and probability theory, according to the model, the results of compliance with the requirements of social cooperation on occupational safety lead to a sharp increase in the probability of reliability, management efficiency becomes higher. Analysis of the mathematical model of the developed logical flowchart based on probability theory has shown that when the parties cooperate to monitor the results of compliance with labor protection requirements, they lead to a sharp increase in reliability and a high level of management efficiency, the right of every person to fair working conditions is ensured.

Key words: labor security, public control, trauma, occupational diseases, risk management, prevention, preventive measures, expertise.

Аннотация: В статье разработана и проанализирована математическая модель, основанная на логической блок-схеме методологии общественного контроля в управлении охраной труда и производственными рисками и теории вероятностей, согласно модели, результаты соблюдения требований социальной кооперации по охране труда приводят к резкому увеличению вероятности надежности, эффективность управления становится выше. Анализ математической модели разработанной логической блок-схемы на основе теории вероятностей показал, что при социальном сотрудничестве сторон по контролю результатов соблюдения требований охраны труда приводят к резкому увеличению надежности и высокому уровню эффективности управления, обеспечивается право каждого человека на справедливые условия труда.

Ключевые слова: охрана труда, общественный контроль, травматизм, профессиональные заболевания, управление рисками, профилактика, профилактические мероприятия, экспертиза.

Introduction

The golden rule of occupational safety and industrial risk management, including public control: the public, employees, are obliged to participate directly in improving working conditions at the workplace, in monitoring compliance with labor protection requirements. Development of a mathematical model of the methodology of public control carried out in compliance with the requirements of occupational safety and risk management, and improvement of methods of existing types of control based on the model for injury prevention and occupational diseases at work, as well as to eliminate the causes of their occurrence, adverse events, expand the practice of studying the condition and occupational diseases, dramatically reduce the likelihood of their occurrence.

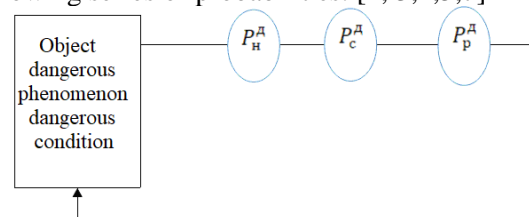
When developing and improving the mathematical model of the methodology of public control, the laws of probability theory were used, provided that observance of labor protection requirements and the risk management control carried out should be reliable, lead to a decrease in the likelihood of adverse (adverse) and accidents and occupational diseases [1,2,3,4,5,6].

Research Methods and the Received Results

As it is known, dangerous (traumatic and harmful) factors of the production facility, technological processes, technical systems, "man-machinery-production environment" are the causes of accidents, occupational diseases and accidents. In the event of an unpleasant incident (incident) that occurred or occurred at the facility, it is observed that

the process is carried out without complying with the requirements of the documentation on occupational safety of a dangerous condition. An increase in the frequency of risk cases is considered an indicator that affects a sharp increase in the probability of a dangerous phenomenon. The greater the frequency of dangerous situations at the facility, the greater the number per unit of time (hour, day, month, year), the higher the probability of dangerous events (accidents with employees, occupational diseases, accidents) in accordance with it. Prevention of dangerous situations at the facility, taking preventive measures, preventing the occurrence of factors caused by dangerous events, is to increase the reliability of monitoring compliance with the requirements of the labor inspection at the facility [7, 8,9,10,11,12,13].

The implementation of three types of control over compliance with the requirements of the labor regulations at each production facility is clearly established by law, regulations and instructions. In addition to the results of each type of control, the elimination of a dangerous situation at the facility is put into practice in three stages. A logical mathematical model of preventing or eliminating a dangerous condition can be expressed in the following series of probabilities. [2, 3,4,5,7]



Picture. 1. Block diagram of occupational health and safety management.

Each stage in this diagram is performed unrelated to each other, and the probability of reliability of their execution is at the stage of control_n^A, at the stage of comparison_c^A, at the stage of adjustment. According to the laws of probability theory, the overall reliability of a flowchart consisting of elements that perform sequentially in terms of reliability, that is, are calculated as follows, since they are independent stages:

$$P_{YM} = P_H^A \cdot P_C^A \cdot P_P^A \quad (1.1)$$

The following is considered to be the general reliability in the implementation of the above stages of ensuring compliance with labor protection requirements through civil and collective control in labor protection management, that is, all independent sequential stages have a multiplicity of reliability extremes:

$$P_{YM}^M = P_H^M \cdot P_C^M \cdot P_P^M \quad (1.2)$$

Similarly, public control (a representative of a trade union or community, a group) will be equal to the product of the probability of reliability: Similarly, public control (a representative of a trade union or community, a group) will be equal to the product of the probability of trustworthiness:

$$P_{YM}^K = P_H^K \cdot P_C^K \cdot P_P^K \quad (1.3)$$

$$P_{YM}^X = (P_H^A \cdot P_C^A \cdot P_P^A) + (P_H^M \cdot P_C^M \cdot P_P^M) + (P_H^K \cdot P_C^K \cdot P_P^K) - [(P_H^A \cdot P_C^A \cdot P_P^A) \cdot (P_H^M \cdot P_C^M \cdot P_P^M) + (P_H^A \cdot P_C^A \cdot P_P^A) \cdot (P_H^K \cdot P_C^K \cdot P_P^K) + (P_H^M \cdot P_C^M \cdot P_P^M) \cdot (P_H^K \cdot P_C^K \cdot P_P^K)] + (P_H^A \cdot P_C^A \cdot P_P^A) \cdot (P_H^M \cdot P_C^M \cdot P_P^M) \cdot (P_H^K \cdot P_C^K \cdot P_P^K) \quad (1.4)$$

If we assume that all the elements in this control flowchart (Fig. 2) are equal in terms of reliability probability values, then the mathematical model of occupational safety management developed on the basis of probability theory will have the following form:

$$P_{YM}^X = 3 \cdot P_i^3 \cdot 3P_i^6 \cdot P_i^9 \quad (1.5)$$

By analyzing the generated mathematical model, the following results can be obtained, for example, if the probability of reliability is 0.9 of the result of sequentially connected mutually

$$P_{YM}^X = 3 \cdot P_i^3 \cdot 3P_i^6 \cdot P_i^9 = 3 \cdot 0.729 - 3 \cdot 0.531 + 3.387 = 2.187 - 1.593 + 0.387 = 0.981$$

As can be clearly seen from the results of the accounting, the probability of social cooperation, that is, the occupational safety management system, in which the participation of the state, officials of enterprises, representatives of the public is provided, increases by 34%. The development of a mathematical model of public control and its improvement, based on this, the introduction of occupational safety management based on social cooperation leads to a 34% reduction in the probability of a dangerous situation, a dangerous

Compliance with the requirements of the workforce and timely, high-quality implementation of all related activities, the implementation of social cooperation at the stage of public control by the state, civil society and the public ensure that the results of management are likely to be high in reliability. When the participation of government officials and the public in the management of state protection in the management of labor protection is carried out jointly, the control flowchart is formed from the following elements (pic.2) [2].

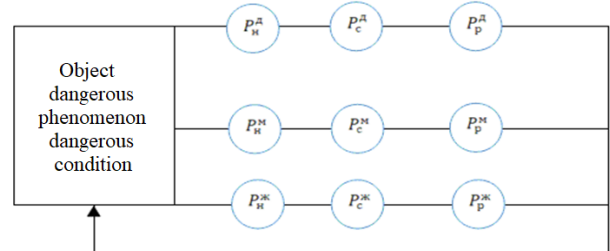


Fig. 2. Block diagram of the implementation of labor force management based on social cooperation (state, company official, public).

This control block diagram consists of sequential and parallel connected elements of control stages with a single purpose, independent of each other, the total value of the reliability probability of the stages is as follows:

independent stages that are part of the control flowchart (Fig.2)

$$P_{YM}^D = P_i^3 = 0.9 \cdot 0.9 \cdot 0.9 = 0.729$$

From this it is worth summarizing that = 0.729 and = 0.729

The introduction of social cooperation in the management of occupational safety and health serves to increase the probability of reliability; the results of management increase the probability of reliability.

From this, that is, from the probability of reliability of the elements of the developed flowchart:

phenomenon at the control facility, this result is formed by exchanging for an increase in the reliability of control results.

Analysis of the mathematical model of the developed logical flowchart based on the probability theory of social cooperation, the results of compliance with labor protection requirements lead to a sharp increase in reliability, a high level of management efficiency, and the right of every person to fair working conditions is ensured.

Conclusion

The results of compliance with the requirements of social cooperation on labor protection will lead to a sharp increase in the probability of reliability, management efficiency will be higher. The introduction of occupational safety and industrial risk management in a style based on social cooperation: the state, company officials, public control, allows ensuring safety at the required level, dramatically reducing the likelihood of dangerous cases (accidents, unfortunate workers).

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