

# TEXNOSFERA XAVFSIZLIGI

Journal of Technosphere Safety

№2[3] 2023





**№2 [3]/2023**Jurnal har chorakda  
bir marta chop etiladi.**Muassis:**

“Toshkent irrigatsiya va qishloq  
xo‘jaligini mexanizatsiyalash  
muhandislari instituti”  
Milliy tadqiqot universiteti

O‘zbekiston Respublikasi  
Prezidenti huzuridagi  
Axborot va ommaviy  
kommunikatsiyalar agentligi  
tomonidan 12.10.2022 yildan  
№ 042945 sonli guvoohnoma  
bilan ro‘yxatga olingan.

**Manzil:** 100000, Toshkent sh.  
Mirzo Ulug‘bek tumani,  
Qori-Niyoziy ko‘chasi, 39-uy.  
“Toshkent irrigatsiya  
va qishloq xo‘jaligini  
mexanizatsiyalash  
muhandislari instituti”  
Milliy tadqiqot universiteti  
G-bino, 604-xona

**Telefon:** +99871 237-19-86.  
+99897 719-77-92

**E-mail:** technosphere@tiame.uz

**Veb-sayt:** www.technosphere.tiame.uz

Maqolada keltirilgan fakt va  
raqamlar uchun mualliflar  
javobgardir.

**Dizayner:**

Mamajonov Ulug‘bek  
Rustam o‘g‘li

**Bosh muharrir:**

**Rajabov Nurmat Qudratovich,**  
“TIQXMMI” MTU dotsenti, q.f.f.d (PhD)

**Ilmiy muharrir:**

**Haydarov Tuyg‘un Anvarovich,**  
“TIQXMMI” MTU dotsenti, t.f.n.

**Muharrir:**

**Utepov Burxon Bektursinovich,**  
“TIQXMMI” MTU dotsenti, t.f.n.

**Tahrir hay‘ati tarkibi:**

**Norov Begmat Xolmatovich**  
“TIQXMMI” MTU dotsenti, t.f.n.

**Xojiyev Aliakbar Abdumannopovich**  
“TIQXMMI” MTU dotsenti, t.f.f.d (PhD).

**Mirxasilova Zulfiya Kuchkarovna**  
“TIQXMMI” MTU dotsenti, t.f.f.d (PhD).

**Tahrir kengashi tarkibi:**

**Andreev Andrey Viktorovich,**  
Sankt-Peterburg politexnika universiteti “Texnosfera  
xavfsizligi” Oliy maktabi direktori, dotsent, h.f.n.

**Yefremov Sergey Vladimrovich,**  
Sankt-Peterburg politexnika universiteti dotsenti, t.f.n.

**Musayev Ma‘ruf Nabiyevich,**  
TDTU dotsenti, t.f.n.

**Xusanova Sunbul Islamovna,**  
FVV akademiyasi huzuridagi FMI professori, p.f.d.

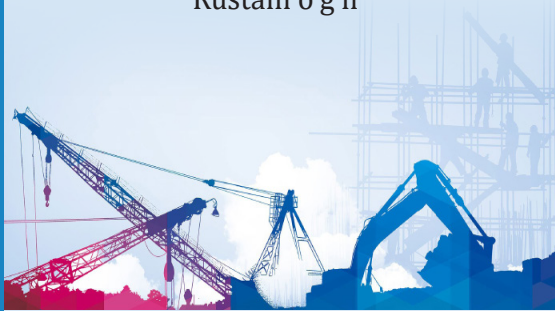
**Yo‘ldosheva Ozoda Muxammadsodiq qizi,**  
TTESI professori, t.f.d.

**Qurbonov Bobomurod,**  
FVV akademiyasi huzuridagi FMI boshliq o‘rinbosari,  
podpolkovnik, t.f.f.d (PhD).

**Yuldashev Orunbay Raxmanberdiyevich,**  
FVV akademiyasi huzuridagi FMI dotsenti, t.f.n.

**Ochildiyev Otobek Shodiyevich,**  
TMTI dotsenti, t.f.f.d (PhD).

**Narziyev Shovqiddin Murtozayevich,**  
TDTU professor v.b, t.f.f.n (PhD).



## MUNDARIJA

### ISHLAB CHIQRISHDA MEHNAT MUHOFAZASI MUAMMOLARI

**К.Усмонов.**

Биогаз олиш қурилмаларини ишлатиш жойларида меҳнат муҳофазаси ва техника хавфсизлиги ташкилий асослари ..... 3

**Sh.Xojieva.**

Farmatsevtika sanoati xodimlari mehnatini muhofaza qilish bo'yicha bajarilgan tadqiqotlarning ayrim natijalari ..... 6

### FAVQULODDA VAZIYATLAR AHOLI XAVFSIZLIGINI TA'MINLASH MUAMMOLARI

**С.Хусанова.**

Своевременное и качественное оповещение способствует значительному сокращению человеческих жертв и материального ущерба ..... 9

### EKOLOGIK XAVFSIZLIK VA UNI TA'MINLASH MUAMMOLARI

**М.Авлиyakulov, N.Rajabov, Sh.Kulmamatova, B.Kulmamatova.**

Indices to assess the soil salinity impact over wheat crop ..... 12

### ISHLAB CHIQRISHDA XAVFSIZLIKNI TA'MINLASHNI MODELLASHTIRISH

**A.Xojiyev, M.Xikmatov.**

Labor protection digitalization and automation processes as a key piece of the occupational safety management system ..... 23

**Y.Shirokov, A.Xojiyev.**

Assessment of occupational risks of elderly tractor drivers in agriculture ..... 28

## ASSESSMENT OF OCCUPATIONAL RISKS OF ELDERLY TRACTOR DRIVERS IN AGRICULTURE

**Shirokov Yuri Alexandrovich,**

Doctor of Technical Sciences, Professor,

Russian State Agrarian University – Timiryazev Moscow Agricultural Academy.

**Xojiyev Aliakbar Abdumannopovich,**

Doctor of Philosophy (PhD) in Technical Sciences,

National Research University “Tashkent institute of irrigation and agricultural mechanization engineers”.

**Abstract.** Occupational risks of an increase in the number of accidents and accidents may increase due to natural biological processes occurring in the organisms of most people after 50. and even more so after 60 years, who noticeably lose attention, memory, performance, etc. Age-related declines in attention, memory, decision-making speed, and efficiency of elderly tractor drivers may be aggravated by the presence of harmful production factors in the workplace. At the same time, due to the health disorders that have already accumulated over many years of work in unfavorable sanitary and hygienic conditions, with the continued exposure to harmful production factors, the risks of occupational diseases may also increase. As a result, managers of agricultural enterprises need to adjust their professional risk assessment system. so are the occupational safety and health management systems of elderly tractor drivers.

**Keywords:** agriculture, occupational risks, tractor drivers, old age, labor protection, attention, memory, emergencies, accidents.

## ОЦЕНКА ПРОФЕССИОНАЛЬНЫХ РИСКОВ ПОЖИЛЫХ ТРАКТОРИСТОВ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

**Широков Юрий Александрович,**

Доктор технических наук, профессор,

Российский государственный аграрный университет РГАУ-МСХА имени К.Тимирязова,

**Хожиев Алиакбар Абдуманнопович,**

Доктор философий по технической наук (PhD), доцент,

Национальный исследовательский университет “Ташкентский институт инженеров ирригации и механизации сельского хозяйства”.

**Аннотация.** Профессиональные риски роста числа несчастных случаев могут возрастать в связи с естественными биологическими процессами, протекающими в организмах большинства людей после 50, и тем более после 60 лет, которые заметно теряют внимание, память, работоспособность и др. Возраст- связанное с этим снижение внимания, памяти, скорости принятия решений и работоспособности у пожилых трактористов может усугубляться наличием вредных производственных факторов на рабочем месте. В то же время из-за нарушений здоровья, уже накопившихся за многолетнюю работу в неблагоприятных санитарно-гигиенических условиях, при длительном воздействии вредных производственных факторов, могут повышаться и риски профессиональных заболеваний. Как следствие, руководителям сельскохозяйственных предприятий необходимо корректировать свою систему оценки профессиональных рисков. как и системы управления охраной труда и здоровья пожилых трактористов.

**Ключевые слова:** сельское хозяйство, профессиональные риски, трактористы, пожилой возраст, охрана труда, внимание, память, аварийные ситуации, несчастные случаи.

## ҚИШЛОҚ ХЎЖАЛИГИДА КАТТА ЁШЛИ ТРАКТОРЧИ ХАЙДОВЧИЛАРИНИНГ КАСБИЙ ХАВФЛАРИНИ БАҲОЛАШ

Широков Юрий Александрович,

Техника фанлари доктори, проффессор,

К.Тимирязова номидаги Россия давлат аграр университети

Хожиев Алиакбар Абдуманнопович,

Техника фанлари бўйича фалсафа доктори (PhD), доцент

“Тошкент ирригация ва қишлоқ хўжалигини механизациялаш муҳандислари институти”

Миллий тадқиқот университети.

**Аннотация.** Бахтсиз ҳодисалар сонининг кўпайишининг касбий хавфи 50 ёшдан кейин ва ҳатто 60 ёшдан кейин кўпчилик одамларнинг танасида содир бўладиган табиий биологик жараёнлар туфайли ортиши мумкин, бу эса эътиборни, хотирани, ишлашни сезиларли даражада йўқотади ва ҳоказо. Касбий хавфлар ёши катта трактор хайдовчиларининг эътиборини, хотирасини, қарор қабул қилиш тезлигини ва иш қобилиятини пасайишига, иш жойида зарарли ишлаб чиқариш омиллари ортишига олиб келиши мумкин. Шу билан бирга, кўп йиллар давомида ноқулай санитария-гигиена шароитида, зарарли ишлаб чиқариш омилларининг узоқ вақт таъсирида тўпланган соғлиқ муаммолари туфайли касбий касалликлар хавфи ҳам ошиши мумкин. Шулардан келиб чиққан ҳолда, қишлоқ хўжалиги корхоналари раҳбарлари ўзларининг қўл остида меҳнат қилаётган ходимларни касбий хавфларни баҳолаши ва меҳнат шароитларини тўғри ташкил этиши лозим.

**Калит сўзлар:** қишлоқ хўжалиги, касбий хавфлар, трактор хайдовчилари, қарилик, меҳнатни муҳофаза қилиш, диққат, хотира, авария ҳолатлари, бахтсиз ҳодисалар.

**Introduction.** Prevention of occupational injuries and occupational diseases of tractor-machinists in agriculture should be based on in-depth research and analysis of its causes through the improvement of existing methods and methods of probabilistic assessment of the risk of accidents, taking into account the characteristic features of mechanized processes in agro-industrial production [1,2].

At the same time, it should be taken into account that in agriculture there is a significant proportion of workers over the age of 50, and tractor drivers over the age of 60 work in a number of agricultural enterprises. This cannot be ignored, since an increase in the proportion of elderly workers can potentially lead to an increased risk of accidents and accidents, manifestations of occupational diseases and will require serious work to improve occupational safety and health in agricultural enterprises, especially tractor drivers working in field farming [3]. This determines the relevance of this work.

It is widely believed that age and experience jointly affect the reduction of the risk of accidents and participation in accidents by drivers and tractor drivers [4,5]. But the relationship between age and accident rate is manifested in drivers and tractor drivers older than 60 years. It is believed that from 25 to 60 years, the individual safety of the driver and the tractor driver remains approximately at the same level [5].

The purpose of the article is to study the risk of an increase in the probability of accidents and accidents with an increase in the proportion of elderly tractor drivers in agriculture.

**Materials and methods.** The methodological basis of the work is the study and analysis of research materials on changes in human cognitive abilities with age and factors of the working environment of tractor drivers that affect their fatigue and

performance.

One of the expected problems due to the increase in the share of elderly tractor drivers in field farming is a possible increase in the risks of accidents and emergency incidents. This, presumably, may be due to two factors.

The first is cognitive impairment: a decrease in attention, memory and working capacity of a person with age, which can cause accidents and accidents, not only in the process of driving a tractor or a tractor unit, but also during its maintenance, repair, refueling, carrying out emergency repairs in the field [6 -9].

The second is an increase in the probability of an increase in the negative reaction of the organisms of elderly tractor drivers to dangerous situations accompanying the process of controlling a machine—tractor unit [10 -12].

**Results and discussion.** In the system of ensuring the safety of performing field mechanized work, attention, reaction speed, and the ability to preserve them throughout the entire work shift are important. Studies show that at least 80% of people over 60 years of age who have turned to neurologists for various reasons have complaints of decreased attention and memory [4,7,13].

In 1994, the International Psychogeriatric Association at WHO proposed the term “adipd-associated cognitive decline - age-related cognitive decline”. Until the age of 50, the decline in mental functions is smooth and imperceptible, and after 50 years, and especially after 55 years, signs of weakening of memory, attention, thinking make themselves felt in an increasingly obvious form. An elderly person is less capable of rapid reactions [14-16].

This is confirmed by the results of a study by scientists at the Stanford Alzheimer’s Research Center. They found that the physiological aging of a person occurs stepwise. Three pronounced stages in the life cycle were revealed, which are mainly

expressed at the age of 34, 60 and 78 years. This happens due to sudden changes in the ratio of a number of amino acids — most of the time it remains unchanged, and at some point there is a sudden increase or decrease. That is, at the age of 60, the age when there are still five years left before the retirement of poultry workers, there are sharp changes in the health of workers, primarily their cognitive abilities. Especially for workers who have been in harmful conditions for a long time, as is the case in transport [6,9,10]. At the same time, it becomes more difficult for a person to focus on a certain object or action, switch from one object to another, respond in a timely manner to the flow of information coming from outside, which is one of the main aspects of mindfulness.

And the consequence of this is a violation of coordination of movements, visual disorders, inattention, loss of vigilance and control of the real situation. An employee often violates the requirements of safety regulations, traffic rules, makes mistakes in the process of controlling a machine-tractor unit, his sense of danger decreases. A violation of attention and memory is the way to an even greater increase in accidents and accidents.

It is noteworthy that elderly people aged 60 years and older belong to the maximum risk group both in terms of the likelihood of life-incompatible injuries and in terms of the frequency of injuries requiring hospitalization. The death rate due to injuries among people aged 60 years and older is 113 cases per 100 thousand population, which is more than twice the corresponding figure for all other groups combined (Federal State Institution of the Central Research Institute of the Ministry of Health of the Russian Federation, Moscow).

Surveys of pilots of PJSC Aeroflot conducted by the Scientific Research Institute of Occupational Medicine named after Academician N.F. Izmerov showed that most often dangerous acts are committed by pilots over 55 years old. An in—depth study showed a decrease in intellectual functions at the age of 50 in every tenth pilot, at the age of 55 in every fifth, and at the age of 60 in every co—pilot [8].

Naturally, fatigue manifests itself faster with age, as a result of which a tractor driver has a condition that can also lead to errors in work, dangerous situations and accidents. Thus, every fourth accident is associated with pronounced fatigue of workers [3,17,18],

B. Thorslund’s research also revealed noticeable changes in workers after 60 years of working memory, information processing speed. And these are the functions that are necessary for controlling the machine-tractor unit and for actions in emergency situations [19-21], The dynamics of changes in the cognitive abilities of workers is shown in Fig.1.

We should not forget that after the age of 50, there is usually a decrease in attention and memory, and by the age of 65, memory decreases in almost half of people. In 2004-2005, an epidemiological study of Prometheus was conducted in 33 cities of 30 regions of Russia. It showed that at least 80% of people over 60 years old, who for various reasons turned to neurologists, have complaints of memory loss [16,17].

Impaired attention and memory is a path to an increase in injuries and accidents in transport. Injuries in the elderly are higher than in the young. Mainly due to decreased attention, impaired coordination of movements and osteoporosis.

The analysis of the map of hazards and risks for tractor drivers shows that the risk of accidents is not only in the process of moving a tractor or a tractor-tractor unit. The risk of injury is possible when carrying out minor repairs and maintenance of a machine-tractor unit, eliminating minor operational malfunctions of machine-tractor units that occurred while working in the field. There is a risk of an accident when operating a manual locksmith and assembly tool, the operation of manual lifting mechanisms (jacks) and others.

Events leading to injury may be . the fall of materials, products, parts, cargo and other objects from the work surface, from the hands; the departure of the locking ring of the tractor wheel when it is removed, installed, inflated tires; flying particles, fragments of the working parts of the tool when eliminating

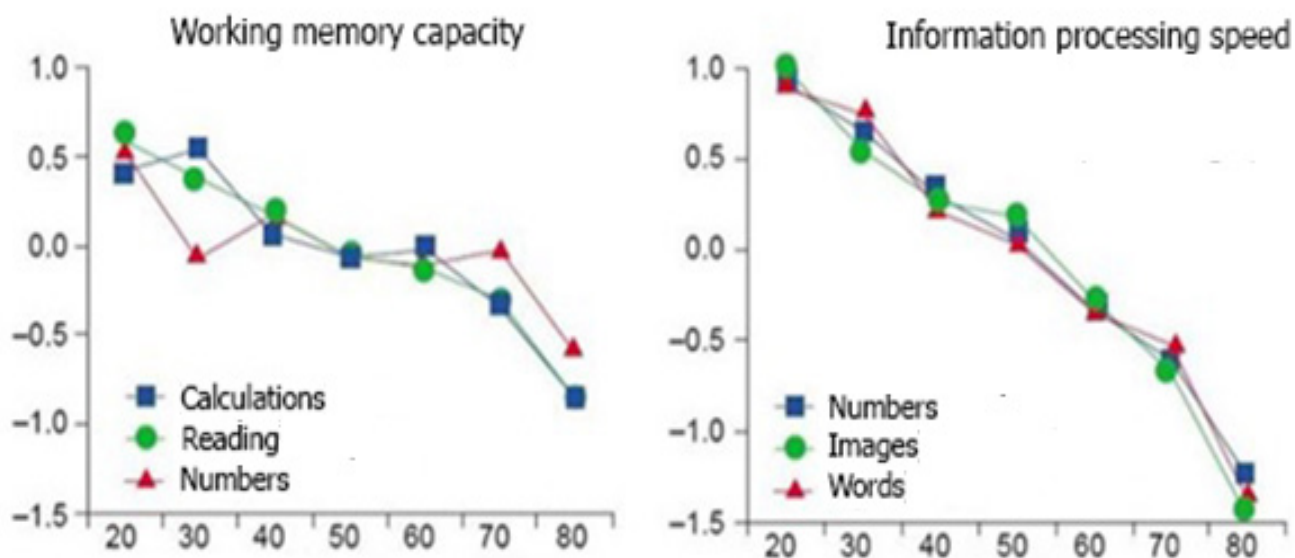


Fig. 1. Dynamics of age-related changes in cognitive abilities of employees (Compiled on the basis of materials [22]).



malfunctions of the machine-tractor unit that occurred while working in the field, etc. The probability of these events among experienced tractor drivers-machinists, but having breakdowns with attention, reaction speed, increases. At the same time, the severity of the consequences of injuries increases in elderly tractor drivers and the recovery time after injuries increases. As the facts show, from the age of 45, the consequences of injury can be much worse than those of young people in a similar situation. The results of numerous studies indicate a higher mortality from injuries among the elderly.

Milzman studied the prevalence of comorbid conditions in trauma patients with increasing age and found that their frequency is 17% by the age of forty and 40% by the age of 60. Bergeron, working on the improvement of the TRISS prognostic scale (a scale based on the scale of injury and the scale of severity of injuries), found that in the general population of the studied patients, the frequency of comorbid diseases corresponded to 26.8%. In the age group younger than 55 years, it was 4.6% and 57.2% in the group of patients older than 55 years [16].

It is noteworthy that elderly people aged 60 years and older belong to the maximum risk group both in terms of the likelihood of life-incompatible injuries and in terms of the frequency of injuries requiring hospitalization. The death rate due to injuries among people aged 60 years and older is 113 cases per 100 thousand population, which is more than twice the corresponding figure for all other groups combined. Also, these patients will account for an equivalent, if not a large, share of injury-related expenses incurred by hospitals and emergency departments.

As shown above, if preventive measures are not taken, an increase in the proportion of employees of "retirement" age will certainly lead to an increase in the risk of accidents and accidents at work.

When considering the map of hazards and risks for tractor drivers, it should be noted that the description of the danger (dangerous situation) includes an increased (lowered) air temperature at the workplace in the summer (winter) period and an increased noise level. Moreover, the presence of climate control and air conditioning systems does not always solve this problem due to a misunderstanding by the tractor driver himself of the level of comfortable microclimate parameters to minimize fatigue. As a result, the microclimate parameters are adjusted according to the sensations, which does not always correspond to sanitary and hygienic standards.

Prolonged exposure to high temperatures, especially in combination with increased humidity, can lead to a significant accumulation of heat in the body and the development of overheating of the body above the permissible level – hyperthermia – a condition in which the body temperature rises to 38-40 degrees, headache, weakness, nausea, vomiting appear. The pulse and respiratory rate increase, the content of residual nitrogen and lactic acid in the blood increases. There is pallor, blueness of the skin, dilated pupils, sometimes there are convulsions, loss of consciousness. Studies have shown that workplace temperature has a noticeable effect on fatigue.

This means that for elderly tractor drivers, it is necessary to forcibly stabilize the temperature at the workplace in the comfort

range of 22-24 oC and exclude its deviations by independent actions..

The second, constantly present physical factor at the workplace of a tractor driver is noise. Even a small noise (50-60 dB) creates a significant psychological burden on the nervous system.

This load varies depending on the age of the tractor driver, health status, type of work, mental state, etc. The consequence for the tractor driver is an even greater increase in fatigue, decreased attention and reaction speed. Excessive noise in the body reduces the immune barrier and increases the frequency of diseases, and the most diverse - from colds to gynecological.

Studies show that exceeding the level of sound exposure to overthrow hygiene standards contribute to an increase in morbidity by 20% above average. Moreover, older people are most sensitive to noise. For example, 46% of people under the age of 27 respond to noise, 57% of people aged 28-37, 62% of people aged 38-57 and 72% of people aged 58 and older. A large number of complaints are related to the age characteristics and the state of the Central nervous system of this population group. This should be taken into account by employers when increasing the relative number of elderly tractor drivers due to an increase in the retirement age [21]. The combined effect of increased (lowered) temperature, noise, especially when applying pesticides and fertilizers [21-24] on fatigue, decreased attention and reaction speed of elderly tractor drivers has not been studied enough.

Labor protection services cannot ignore this. Therefore, in the process of forming a full-fledged professional risk management system for tractor drivers, it is necessary to take into account the upcoming increase in the share of elderly workers with all the ensuing consequences.

The employer is obliged to determine methods for assessing the level of professional risks of tractor drivers, taking into account the nature of the activity of the agricultural enterprise and the complexity of the operations performed.

In this case, the employer must take into account the following:

- professional risk management of tractor drivers is carried out taking into account the current, past and future activities of the employer;
- the severity of possible damage increases in proportion to the increase in the number of people at risk;
- all assessed professional risks are subject to management;
- the procedures for identifying hazards and assessing the level of occupational risks should be constantly improved and maintained in working order to ensure the effective implementation of measures to reduce them;
- the effectiveness of the developed professional risk management measures should be constantly evaluated.

It is advisable to carry out risk assessment at the workplace of tractor drivers in a certain sequence:

1. Identification of hazards and their manifestations (if necessary).
2. Determination of the conformity of each identified hazard, possible damage and the corresponding weighting factor.
3. Determination of the qualitative values of the probabilities of the occurrence of damages and the outcome not related to the

occurrence of damage, and the corresponding weighting coefficients by logical analysis of the event tree or using a verbal description of probabilities (frequencies).

4. Determination of risks for each of the identified hazards by multiplying the numerical values of the probabilities (frequencies) of the occurrence of damage and the corresponding weight coefficients of damage.

5. Assessment of the significance of risks for each of the identified hazards according to the risk significance assessment scale.

6. Determination of the total risk at the workplace of tractor drivers by adding up the risks of each identified hazard.

**Conclusions.** The beginning increase in the share of elderly tractor drivers due to the increase in the retirement age for old age imposes a certain responsibility on employers, labor protection services of agricultural enterprises, medical workers conducting medical examinations of tractor drivers.

Employers, labor protection services of agricultural organizations must also take into account the fact that natural age-related changes in the organisms of tractor drivers can be aggravated by the imposition of painful health changes accumulated over many years. With an increase in the duration of work of tractor drivers for five years in unfavorable conditions, already diseased

organs of workers will be exposed to additional effects. Moreover, in conditions of natural age-related weakening of health and immunity. This can lead to a more obvious manifestation of accumulated pathologies and loss of working capacity of tractor drivers due to the detection of occupational diseases.

An objective assessment of the occupational risk of elderly tractor drivers and the development of additional measures to reduce it, taking into account natural elderly changes, should lead to effective measures to reduce it in elderly tractor drivers.

It is advisable for the labor protection services of agricultural enterprises with elderly tractor drivers to develop, in relation to production conditions, and implement risk management processes related to fatigue of elderly tractor drivers, for example, Fatigue Risk Management System (FRMS), which formulate provisions for the organization of preventive measures to prevent the development of fatigue and accordingly, the occurrence of various incidents and accidents.

It is advisable to deepen the study of the combined effect of microclimate parameters and noise on fatigue, reaction speed and attentiveness of elderly tractor drivers in order to develop requirements for their work and rest modes and clarify the requirements for the device of tractor cabins and mobile agricultural machines.

#### REFERENCES:

1. Shirokov Yu.A. Risk assessment in the field of occupational safety in connection with the increase in the retirement age// *Bezopasnost' truda v promyshlennosti*. 2020 No. 6. pp. 29-34. DOI: 10.24000/0409-2961-2020-6-29-34. (In russ).
2. Shirokov Yu.A. Analysis of opportunities for managing the cost of crop production// *Agrarnay Rossia*. 2020. No. 2. pp. 32-39. DOI: 10.30906/1999-5636-2020-2-32-39. (In russ).
3. Shirokov Y., Tikhnenko V. Analysis Of Environmental Problems Of Crop Production And Ways To Solve Them // *E3S Web of Conferences*. 14th International Scientific and Practical Conference on State and Prospects for the Development of Agribusiness, Interagromash 2021. Rostov-on-Don, 2021. DOI: 10.1051/e3sconf/202127308066.
4. Hsiao H., Chang J. and Simeonov P. (2018). Preventing emergency vehicle crashes: status and challenges of human factors issues// *Hum. Fact.* 60, 1048–1072. doi: 10.1177/0018720818786132.
5. Koski A. and Summanen H. (2019). The risk factors Finnish paramedics recognize when performing emergency response driving// *Accid. Anal. Prev.* 125, 40–48. doi: 10.1016/j.aap.2019.01.021 PubMed Abstract |
6. Komackova L. 2016) Factors Affecting the Road Safety// *J. of Communication and Computer*. 13. (3). pp. 146-152. DOI:10.17265/1548-7709/2016.03.006.
7. Scott-Parker B. and O. Oviedo, (2017), Trespalacios, “Young driver risky behaviour and predictors of crash risk in Australia, New Zealand and Colombia: same but different?// *Accident Analysis & Prevention*, vol. 99, pp. 30-38, DOI: 10.1016/j.aap.2016.11.001.
8. Shirokov Yu.A. On improving the effectiveness of training in the field of occupational safety and health// *Bezopasnost' truda v promyshlennosti*. 2020. No. 11. pp. 89-94. DOI: 10.24000/0409-2961-2020-11-89-94. (In Russian).
9. Van de Vijfeijke H., Leijten Fenna R. M., Ybema, Jan Fekke et al, (2013), Differential Effects of Mental and Physical Health and Coping Style on Work Ability A 1-Year Follow-Up Study Among Aging Workers// *Journal of Occupational and Environmental Medicine*. № 10. P. 1238–1243. doi: 10.1097/JOM.0b013e3182a2a5e1.
10. Alavinia S.M., Molenaar D., Burdorf A. (2009), Productivity loss in the workforce: associations with health, work demands, and individual characteristics // *Work*. № 1. P 49–56. doi: 10.1002/ajim.20648.
11. Oakman J., Neupane S., Proper K.I, et al, (2018), Workplace interventions to improve work ability: A systematic review and meta-analysis of their effectiveness // *Scand J Work Environ Health*. № 2. P. 134–146. doi: 10.5271/sjweh.3685.
12. Shirokov Yu., Tikhnenko V., Ivakina E., Imamzade A. (2022), Analysis of the possible impact of the age of employees on occupational safety// *The Scientific Heritage*. No. 83-1 (83). p. 52. DOI: 10.24412/9215-0365-2022-83-1-52-55.
13. Shirokov Yu.A., Ivakina E.G. (2021), Productivity and working conditions: communication and prospects for improvement// *Ekonomika truda*. № 3. C. 251–260. Doi: 10.18334/et.8.3.111812. (In russ.)
14. Grant, P. (2017). The human factors associated with responding to emergency vehicles (Doctoral thesis), Edith Cowan University. Available online at: <https://ro.ecu.edu.au/theses/2044>.



15. Abdelwanis, N. (2014). Characteristics and contributing factors of emergency vehicle crashes (Doctoral thesis), UMI number 3609750.
16. Aertsson, P., Iband Sundström, A. (2011). Evaluation of insight training of ambulance drivers in Sweden using DART, a new e-learning tool//Traffic Inj. Prev. 12, 621–629. doi: 10.1080/15389588.2011.620660
17. Alonso, F., Esteban, C., Montoro, L., and Useche, S. A. (2017). Knowledge, perceived effectiveness and qualification of traffic rules, police supervision, sanctions and justice // Cogn. Soc. Sci. 3:1393855. doi: 10.1080/23311886.2017.1393855.
18. Lidestam B. Thorslund, H.(2020), Selander et all. In-Car Warnings of Emergency Vehicles App ustain. Cities, 29 May 2020 | <https://doi.org/10.3389/frsc.2020.00019> / H.roaching: Effects on B. Car Drivers' Propensity to Give Way//Front. S.
19. Prat F., Planes M., Grass M. E., and Sulman M. J. M., (2015)"An observational study of driving distractions on urban roads in Spain," // Accident Analysis & Prevention, vol. 74, pp. 8-16. doi: 10.1016/j.aap.2014.10.003.
20. Mcdowd J. M. and M. Craik F. I.,(1988) "Effects of aging and task difficulty on divided attention performance,"//Journal of Experimental Psychology: Human Perception and Performance, vol. 14, no. 2, pp. 267–280, doi: 10.1037/0096-1523.14.2.267.
21. Shirokov Yu.A., Smirnov G.N., (2019), Organization of the workplace and labor process of a tractor driver in modern mobile machines for agriculture//Vestnik Federal'nogo gosudarstvennogo obrazovatel'nogo učreždeniâ vysšego professional'nogo obrazovaniâ "Moskovskij gosudarstvennyj agroinženernyj universitet imeni V.P. Gorâčkina. No. 6 (94). pp. 28-34. DOI: 10.34677/1728-7936-2019-6-28-34. (In russ.)
22. Terekhin A.T. (2009). Cognitive benefits of the third age: a neural network model of brain aging//Žurnal vysšej nervnoj deâtel'nosti im. I.P. Pavlova. Volume: 59. Number: 2. pp. 252-256. (In russ.)
23. Vasiliev, A.V. The influence of microclimate on the productivity of workers in the RMC //Text: direct//Molodoj učenyj. 2016. 1 (105). Pp. 138-141.-URL: <https://moluch.ru/archive/105/24773> / (accessed: 08.02.2022). (In russ.)
24. Shirokov Yu.A. De-chemization of crop production due to organosilicon compoundS.//Agrarian Russia. 2008. No. 2. pp. 33-36. The identification number of the electronic library: 23181273. (In Russian.)