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Articles are published in Uzbek, Russian, and English, ensuring a wide-reaching audience and fostering cross-cultural academic exchange. As a beacon of academic excellence, the "Journal of Transport" continues to serve as a vital conduit for knowledge dissemination, collaboration, and innovation in the transport sector and related fields.

Sanitary and hygienic requirements for improving working conditions of train drivers

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Abstract: The article presents a systematic analysis of the work activities of train driver workers at railway stations and the hazardous and harmful occupational factors affecting them. The activities of train shunting workers within the “Human–Production Environment” system are examined, including the effects of meteorological conditions, noise, vibration, static and dynamic physical loads, and psycho-emotional factors on the human body, as well as the risk of developing occupational diseases. In addition, the “Three-Point Support” (Three-Point Contact) safety rule, aimed at preventing falls from height and injuries during shunting operations, is considered. Comprehensive practical recommendations and solutions have also been developed to improve sanitary and hygienic working conditions.

Keywords: train driver, work environment, sanitary-hygienic requirements, three-point contact, occupational diseases, microclimate, noise, vibration, occupational safety

Poyezd tuzuvchilari mehnat sharoitini yaxshilashga oid sanitar-gigiyenik talablar

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Annotatsiya: Maqolada temir yo‘l stansiyalarida poyezd tuzuvchilarning mehnat faoliyati va ularga ta’sir etuvchi xavfli hamda zararli ishlab chiqarish omillari asosida tizimli tahlil qilingan. Poyezd tuzuvchilarning “Inson – ishlab chiqarish muhiti” tizimi doirasidagi faoliyati, meteorologik sharoitlar, shovqin, tebranish, statik va dinamik yuklamalar hamda psixosotsional omillarning inson organizmiga ta’siri va kasb kasalliklari rivojlanish xavfi baholangan. Shuningdek, manyovr ishlarini bajarishda balandlikdan tushib ketish va jarohatlanishlarning oldini oluvchi “Uch nuqtali tayanch” (Uch nuqtali kontakt) xavfsizlik qoidasi hamda sanitar-gigiyenik sharoitlarni yaxshilashga qaratilgan kompleks amaliy takliflar va yechimlar ishlab chiqilgan.

Kalit so‘zlar: poyezd tuzuvchi, mehnat muhiti, sanitar-gigiyenik talablar, uch nuqtali tayanch, kasb kasalliklari, mikroiklim, shovqin, tebranish, mehnat xavfsizligi

1. Kirish

Temir yo‘l transportida poyezd tuzuvchilarining mehnat faoliyati ochiq havoda, stansiyalarning xavfli zonalarida va harakatlanuvchi tarkiblar bilan bevosita aloqada olib boriladi. Shuning uchun ularning mehnat sharoiti ishlab chiqarish muhitidagi fizik, kimyoviy, biologik va axborot omillarining murakkab kombinatsiyasidan iborat. Poyezd tuzuvchilar “Inson – ishlab chiqarish muhiti” tizimi doirasida mehnat qiladi. Ushbu tizim elementlari orasida modda, energiya va axborot oqimlarining uzluksiz almashinuvi yuzaga keladi [82].

Manyovr ishlarini olib borish davomida poyezd tuzuvchilarga noqulay meteorologik sharoitlar, shovqin, tebranish, yetarsiz yoritilganlik kabi omillar bilan birga katta statik va dinamik yuklamalar ta’sir ko’rsatadi. Xususan, vagon zinapoyasida harakatlanish vaqtida tutqichni ushlab

tana og’irligini ushlab hamda avtotirkamalarni ajratishda katta kuch sarflanadi [1]. Noto’g’ri tanlangan ergonomik tavsiflar va ish o’rinlaridagi xatoliklar tayanch-harakat apparatida zo’riqish hosil qilib, vaqt o’tishi bilan turli kasb kasalliklarini keltirib chiqaradi [83; 38-40-b, 84; 24-31-b.]. Ushbu tadqiqotning maqsadi poyezd tuzuvchilarining mehnat sharoitini sanitar-gigiyenik va ergonomik talablar asosida baholash hamda xavfsizlik va salomatlikni muhofaza qilish bo’yicha samarali chora-tadbirlarni ishlab chiqishdan iborat.

Adabiyotlar tahlili

Mehnat muhiti omillarining inson organizmiga ta’sirini gigiyenik baholash natijalariga ko’ra, mehnat sharoiti xavfli va zararli omillarning son hamda sifat ko’rsatkichlariga qarab komfort, yo‘l qo’yilgan, xavfli (zararli) va o’ta xavfli sinflarga bo’linadi. Mikroiklim ko’rsatkichlari (havo harorati, namligi, harakat tezligi) organizmning issiqlik almashinuviga va funksional holatiga bevosita ta’sir

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ko'rsatadi [90; 32-34-b, 91; 72-73-b.]. Havo haroratining me'yordan pasayishi qon tomirlarining torayishi, charchoq va metabolismning susayishiga olib kelsa, namlikning yuqoriligi immunitetni zaiflashtiradi [92; 611-614-b, 93; 600-601-b.].

Shovqin va tebranish omillari markaziy asab tizimi hamda eshitish analizatorlariga salbiy ta'sir ko'rsatib, qonda stress gormonlari (kortizol, adrenalini) darajasini oshiradi. Tadqiqotlar shuni ko'rsatadiki, shovqin foni yuqori bo'lgan ish joylarida mehnat unumdorligi 10 foizga pasayadi, kasallanish ko'rsatkichi esa 37 foizga ortadi [96; 14-15-b, 97; 38-40-b, 98; 36-39-b.]. Ish vaqtida yuqori psixosotsional yuklama va vaqt tanqisligi sharoitida ishlash asab tizimi buzilishlariga va stressli holatlarga sabab bo'ladi [85; 41-43-b.].

2. Tadqiqot metodologiyasi

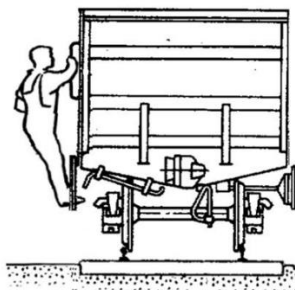
Tadqiqotda poyezd tuzuvchilarning ish o'rinlaridagi ishlab chiqarish muhiti omillari kompleks sanitar-gigiyenik va ergonomik usullar yordamida o'rganildi. Metodologiya quyidagi bosqichlarni o'z ichiga oladi:

- *Ishlab chiqarish muhitini gigiyenik baholash:* Mikroiklim parametrlarining (harorat, namlik, havo harakati tezligi), shovqin va tebranish darajalarining hamda yoritilganlik ko'rsatkichlarining sanitariya me'yorlari va qoidalarga muvofiqligi tahlil qilindi.

- *Ergonomik va biomexanik baholash:* Poyezd tuzuvchisining vagon zinapoyasida joylashishi, harakat davomidagi tana holati (postura) va tayanch nuqtalari tahlil qilindi.

- *Kasbiy xavflarni tahlil qilish:* Tana mushaklarining statik zo'riqishi, umurtqa pog'onasiga tushadigan yuklamalar hamda balandlikdan qulash xavfi modellashirildi.

Umuman olganda poyezd tuzuvchisining ishi bir qator kasbiy omillarning (noqulay meteorologik sharoitlar, shovqin, tebranish, past yorug'lik, jismoniy og'irlik, ruhiy zo'riqish va boshqalar) ta'siri bilan bog'liq. Poyezd tuzuvchisining mehnat jarayoni davomida olib boradigan ish faoliyati og'ir mehnatga kiradi. Ular smena davomida tik turgan holatda poyezdlarni shakllantirishda ko'plab masofani (shu bilan birga qishda kiyim kechak va jihozlarning og'irligi bilan) bosib o'tadilar, balandligi 0,7-1,0 metrgacha bo'lgan vagon zinapoyasiga smena davomida juda ko'p marotaba chiqib tushadi. Dinamik ishdan tashqari ularning faoliyatida katta statik yuklama ham mavjud. Bunga vagon zinapoyasida manyovr ishlarini bajarayotganda tutqichni ushlab tik turgan holatdagi tana og'irligini ushlab turishi va avtotirkamalarni ajratishda kuch sarflashi kiradi [1] (1-rasm).



1-rasm. Poyezd tuzuvchisining mehnat jarayonini olib borishdagi holati

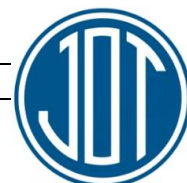
3. Natija va muhokamalar

Poyezd tuzuvchilar va ishlab chiqarish muhiti munosabati mehnat faoliyati davridagi moddalar va ularning birikmalari, turli fizik tabiatga ega energiyalar va axborotlar oqimlarini uzluksiz mavjudligiga asoslangan. Salbiy ta'sir etuvchi oqimlar (ma'lumotlar, energiyalar, axborotlar) tizimning har bir elementiga nisbatan tashqi oqimlardir. Gigiyenik baholash natijalariga ko'ra, mehnat sharoiti xavfli (shikastlovchi va zararli) omillarning son va sifat ko'rsatkichlari qiymatlari asosida komfort, yo'l qo'yilgan, xavfli (zararli) va o'ta xavfli sinflarga bo'linadi. Poyezd tuzuvchilarining mehnat faoliyati ko'p harakatlilik bilan bog'liq, shu bois ular mehnat jarayoni ish joyining xususiyati, iqlim omillari, jismoniy og'irlik va zo'riqish, zararli moddalar va chang, shovqin va tebranish, yoritishning yetarli emasligi hamda psixosotsional yuklamalar ta'sirida olib boriladi. Lekin bu holat inson tanasiga majburiy hamda yoqimsiz vaziyatni yuzaga keltiradi, ya'ni oyoq, quloq, ko'z, bosh, bo'yin, yelka va qo'l mushaklarining zo'riqishi hamda umurtqa pog'onasining yuklanishiga sababchi bo'lib, eshitish a'zolari bilan bog'liq bo'lgan kasalliklar (Masalan: tinnitus, koxlear nevit), pnevmoniya kasalligi osteoxondroz, shuningdek vagon zinapoyasi va inson tanasi o'rtasida ya'ni poyezd tuzuvchisi uchun eng muhim jihat - bu doimiy ravishda "Uch nuqtali kontakt" qoidasiga rioya qilishdir. Bu qoidaga ko'ra, xodim ko'tarilish yoki tushish paytida doimo ikki qo'l va bir oyoq yoki ikki oyoq va bir qo'l bilan zinapoya yoki tutqichga tayanishi shart. Zinapoya konstruksiyasi aynan shu qoidani bajarishga imkon berishi uchun tutqichlar bilan birgalikda loyihalashtirilishi kerak. Aks holda "Uch nuqtali kontakt" qoidasiga rioya qilmasdan harakat qilish balandlikdan qulashi, shamol bo'lganda yoki harakat tarkibi qo'zg'alga vagondan tushib ketishi muvozanatni yo'qotishi natijasida, uning natijasida bosh miya jarohati yoki umurtqa pog'onasi sinishi (2-rasm).



A) To'g'ri usul - 3 nuqtali tayanch:

- ✓ 2 qo'l - zinapoya tutqichlarini mustahkam ushlab turibdi
- ✓ 1 oyoq - zinapoya pog'onasida
- ✓ 1 oyoq - keyingi pog'onaga ko'tarilmoqda



= Jami: 3 nuqta (xavfsiz!)



2-rasm. “Uch nuqtali kontakt” qoidasi

B) Noto'g'ri usul -faqat 2 ta tayanch nuqtasi:

- ✗ 1 qo'l - zinapoyani ushlab turibdi
- ✗ 1 oyoq - zinapoya pog'onasida
- ✗ 1 qo'l – bo'sh (lekin zinapoyada emas)
- ✗ 1 oyoq - pastda
- ✗ = Jami: 2 nuqta (xavfli!)

Noto'g'ri tanlangan ish joyida tik holatda uzoq muddatli mehnat jarayonini olib borish, umurtqa pog'onasining egriligini yuzaga keltirishi mumkin. Ushbu kasallik (patologiya) umurtqa pog'onasi orasidagi disk churrasini yuzaga keltirishi mumkin, bu o'z navbatida, asab tolalarining siqilishiga va radikulitning paydo bo'lishiga olib keladi. Umurtqa pog'onasi kasalligi rivojlanishining asosiy sababi ish joyidagi noto'g'ri ishlash holatidir.

Yuqoridagi asosiy kasb kasalliklaridan tashqari, poyezd tuzuvchilarda yuqori psixoemotsional yuklama, tungi smenalar va noto'g'ri ovqatlanish oqibatida yurak-qon tomir tizimi xastalıkları (masalan, gipertoniya), shuningdek, oshqozon-ichak tizimi kasalliklari rivojlanish xavfi ham mavjud.

Aytish joizki, ushbu kasalliklarning aksariyatini muntazam tibbiy ko'riklar, sifatli shaxsiy himoya vositalaridan foydalanish va mehnat hamda dam olish tartibiga qat'iy rioya qilish orqali oldini olish yoki jiddiy asoratlarni kamaytirish mumkin.

Poyezd tuzuvchilar faoliyatida uchraydigan asosiy salbiy omillar va ularning inson organizmiga ta'siri hamda ularni kamaytirish bo'yicha profilaktik chora-tadbirlar tizimlashtirildi (2-jadval).

1-jadval

Ishlab chiqarish muhiti omillari va uning oldini olish chora-tadbirlari

Poyezd tuzuvchisiga ta'sir qiluvchi omillar turi	Salbiy ta'siri va oqibatlari	Tavsiya etiladigan kompleks yechimlar
Noqulay mikroiklim (Yuqori/past harorat, namlik, havo harakati)	Suvsizlanish, gipertoniya, qon tomirlar torayishi, immunitet susayishi, pnevmoniya.	Mavsumga mos, issiq va suv o'tkazmaydigan shaxsiy himoya vositalari (SHHV) bilan ta'minlash, isitish/salqinlatish xonalarini tashkil etish.
Shovqin va tebranish	Eshitish qobiliyati pasayishi (tinnitus, koxlear nevrin), stress gormonlari ortishi, unumdorlik 10% ga pasayishi.	Sifatli quloqchin vositalaridan foydalanish, shovqin darajasini doimiy nazorat qilish.
Statik va dinamik yuklama (Jismoniy og'irlik)	Mushak zo'riqishi, umurtqa pog'onasi egriligi, disk churasi, radikulit.	Ergonomik tutqich va zinapoyalarni loyihalash, “Uch nuqtali tayanch” qoidasiga qat'iy rioya qilish, mehnat va dam olish rejimini me'yorlashtirish.
Psixoemotsional va yoritilganlik omillari	Ko'z zo'riqishi, bosh og'rig'i, diqqat bo'linishi, gipertoniya, asab tizimi buzilishi.	Stansiya hududini me'yoriy yoritish, tungi smenalarni to'g'ri taqsimlash, muntazam tibbiy ko'rikni o'tkazish.

4. Xulosa

Poyezd tuzuvchilarning mehnat faoliyatida uchraydigan xavfli va zararli omillar ularning salomatligi hamda ish qobiliyatiga bevosita salbiy ta'sir ko'rsatadi. Tadqiqot natijalariga ko'ra quyidagi xulosalar shakllantirildi:

1. Poyezd tuzuvchilarining mehnat sharoitlari sanitariya me'yorlari va qoidalari asosida doimiy nazorat qilinishi hamda belgilangan ko'rsatkichlar bo'yicha mehnat sharoiti sinflari aniqlanishi shart.

2. Manyovr ishlarini olib borishda jarohatlanishlarning oldini olish uchun poyezd tuzuvchilar doimiy ravishda “Uch nuqtali tayanch” qoidasiga (ikki qo'l va bir oyoq yoki ikki oyoq va bir qo'l) rioya qilishlari shart. Vagon va lokomotiv zinapoyalari ushbu qoidani bajarishga imkon beradigan ergonomik tutqichlar bilan jihozlanishi lozim.

3. Kasb kasalliklari (osteoxondroz, radikulit, koxlear nevrit, gipertoniya) xavfini kamaytirish uchun muntazam tibbiy ko'rik larni tashkil etish, zamonaviy shaxsiy himoya vositalaridan foydalanish hamda smena davomida mehnat va dam olish tartibiga qat'iy rioya qilish talab etiladi.

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