

JOURNAL OF TRANSPORT



ISSUE 2, 2025 vol. 2

E-ISSN: 2181-2438

ISSN: 3060-5164



RESEARCH, INNOVATION, RESULTS



**TOSHKENT DAVLAT
TRANSPORT UNIVERSITETI**

Tashkent state
transport university



JOURNAL OF TRANSPORT

RESEARCH, INNOVATION, RESULTS

E-ISSN: 2181-2438

ISSN: 3060-5164

VOLUME 2, ISSUE 2

JUNE, 2025



jot.tstu.uz

TASHKENT STATE TRANSPORT UNIVERSITY

JOURNAL OF TRANSPORT

SCIENTIFIC-TECHNICAL AND SCIENTIFIC INNOVATION JOURNAL

VOLUME 2, ISSUE 2 JUNE, 2025

EDITOR-IN-CHIEF

SAID S. SHAUMAROV

Professor, Doctor of Sciences in Technics, Tashkent State Transport University

Deputy Chief Editor

Miraziz M. Talipov

Doctor of Philosophy in Technical Sciences, Tashkent State Transport University

The “**Journal of Transport**” established by Tashkent State Transport University (TSTU), is a prestigious scientific-technical and innovation-focused publication aimed at disseminating cutting-edge research and applied studies in the field of transport and related disciplines. Located at Temiryo‘lchilar Street, 1, office 465, Tashkent, Uzbekistan (100167), the journal operates as a dynamic platform for both national and international academic and professional communities. Submissions and inquiries can be directed to the editorial office via email at jot@tstu.uz.

The Journal of Transport showcases groundbreaking scientific and applied research conducted by transport-oriented universities, higher educational institutions, research centers, and institutes both within the Republic of Uzbekistan and globally. Recognized for its academic rigor, the journal is included in the prestigious list of scientific publications endorsed by the decree of the Presidium of the Higher Attestation Commission No. 353/3 dated April 6, 2024. This inclusion signifies its role as a vital repository for publishing primary scientific findings from doctoral dissertations, including Doctor of Philosophy (PhD) and Doctor of Science (DSc) candidates in the technical and economic sciences.

Published quarterly, the journal provides a broad spectrum of high-quality research articles across diverse areas, including but not limited to:

- Economics of Transport
- Transport Process Organization and Logistics
- Rolling Stock and Train Traction
- Research, Design, and Construction of Railways, Highways, and Airfields, including Technology
- Technosphere Safety
- Power Supply, Electric Rolling Stock, Automation and Telemechanics, Radio Engineering and Communications
- Technological Machinery and Equipment
- Geodesy and Geoinformatics
- Automotive Service
- Air Traffic Control and Aircraft Maintenance
- Traffic Organization
- Railway and Road Operations

The journal benefits from its official recognition under Certificate No. 1150 issued by the Information and Mass Communications Agency, functioning under the Administration of the President of the Republic of Uzbekistan. With its E-ISSN 2181-2438, ISSN 3060-5164 the publication upholds international standards of quality and accessibility.

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.

Experimental research on protecting the slope of the land line from the process of erosion using geosynthetic materials

K.S. Lesov¹^a, A.Sh. Uralov¹^b, J.B. Yuldashaliyev¹^c

¹Tashkent state transport university, Tashkent, Uzbekistan

Abstract: The ground surface is simultaneously affected by various forces and natural processes. One of these processes is erosion. During the erosion process, the ground surface may experience varying degrees of washing away due to the effects of wind and water, leading to the formation of small rivulets and moderate-sized gullies. This phenomenon depends on several factors, such as soil type, terrain slope, the amount of precipitation in the area, and wind speed. There are numerous methods used worldwide to protect the ground surface from erosion. This article examines the application of geosynthetic materials, which are widely used globally, and the planting of desert vegetation (a biological method) to protect the railway embankment from erosion in the desert regions of the Bukhara-Misken railway, a crucial section of Uzbekistan Railways. The results of experimental research demonstrated the effectiveness of these measures in protecting the railway embankment slopes from erosion.

Keywords: ground surface, slope, erosion process, wind and water erosion, geosynthetic materials, biological method, desert vegetation

Geosintetik materiallarni qo'llagan holda yer polotnosi qiyaliklarini eroziya jarayonidan himoyalash bo'yicha eksperimental tadqiqotlar

Lesov K.S.¹^a, O'ralov A.Sh.¹^b, Yuldashaliyev J.B.¹^c

¹Tashkent davlat transport universiteti, Toshkent, O'zbekiston

Annotatsiya: Yer polotnosiga bir vaqtning o'zida turli kuchlar va tabiiy jarayonlar ta'sir qiladi. Ulardan biri esa eroziya jarayonidir. Eroziya jarayonida yer polotnosiga shamol va suv ta'siridan turli darajada yuvilib ketishlar, mayda irmoqchalar va o'rta darajada jarliklar yuzaga kelishi mumkin, bu grunt turi, joy nishabligi, hududdagi yog'ingarchilik miqdori va shamol tezligi kabi ko'plab omillarga bog'liq. Yer poltnosini eroziya jarayonidan himoyalashning dunyo bo'ylab qo'llanilib kelinayotgan ko'plab usullari mavjud. Ushbu maqolada O'zbekiston temir yo'llarida muhim qismi hisoblangan Buxoro-Misken cho'l hududlarida joylashgan temir yo'llar yer polotnosini eroziya jarayonidan himoyalashda butun dunyo amaliyotida keng qo'llanilayotgan geosintetik materiallarni qo'llash va cho'l o'simliklarini ekish (biologik) usullari ko'rilgan. Eksperimental tadqiqot natijalari temir yo'l yer polotnosi qiyaligini eroziya jarayonidan himoyalashda ijobiy samarasini ko'rsatdi.

Kalit so'zlar: yer polotnosi, qiyalik, eroziya jarayoni, shamol va suv eroziyasi, geosintetik materiallar, biologik usul, cho'l o'simliklari

1. Kirish

Bugungi kunda "O'zbekiston Temir yo'llari" AJ da Buxoro va Urganch shaharlari o'rtasida poyezdlar harakatlanish tezligini oshirish, buning natijasida umumiy harakatlanish vaqtini qisqartirgan holda yuk va yo'lovchi tashish hajmini oshirish hamda ushbu qadimiy shaharlarga turistlar sonini oshirish hamda xizmat ko'rsatish sifatini oshirish dolzarb vazifa bo'lib kelmoqda. Bu esa temir yo'l infratuzilmasi zamonaviy talablarga to'liq javob berishi zaruratini keltirib chiqaradi.

So'nggi yillarda butun dunyo qurilish amaliyotida zamonaviy qurilish materiallaridan foydalanilmoqda. Bu

materiallar ichida geosintetik materiallar alohida o'rin tutadi.

Geosintetik materiallar – bu qurilishning turli sohalarida, jumladan, yo'l qurilishida qo'llaniladigan barcha turdagi sintetik materiallar uchun umumiy tasnifiy atamadir. Ushbu tushuncha quyidagilarni o'z ichiga oladi: geotekstillar, geopanjalar, geosetkalar, geomembranalar, geomatlar va geokompozitlar.

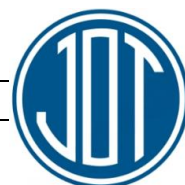
Geosintetik materiallar quyidagi noyob xususiyatlarga ega [1-4]:

Yuqori mustahkamlik; kimyoviy ta'sirlarga chidamlilik; uzoq xizmat muddati (foydalanish muddati 100 yilgacha); yuqori haroratga chidamlilik; kam material sarfi; yengillik (kichik og'irlik).

^a <https://orcid.org/0000-0002-9434-0713>

^b <https://orcid.org/0000-0002-6124-5250>

^c <https://orcid.org/0000-0001-5366-1775>



Tuzilishiga ko'ra, geosintetik materiallar quyidagi turlarga bo'linadi:

Geotekstillar, geopanjalar, geosetkalar, geomembranalar, geomatlar va geokompozitlar.

O'tkazuvchanligiga ko'ra, geosintetik materiallar 5 toifaga ajratiladi:

Izolyatsion, namlik o'tkazmaydigan, filtrlovchi, drenajli, gaz o'tkazmaydigan.

Shakli va tarkibiga ko'ra, geosintetik materiallar quyidagi turlarga bo'linadi:

Quruq (sochiluvchi), rulon shaklidagi, geopenalar.

Yuklama ta'sirida deformatsiyalanish darajasiga ko'ra, geosintetik materiallar quyidagicha tasniflanadi:

Cho'zilmaydigan, cho'ziluvchi, super cho'ziluvchan.

Geosintetik materiallardan malakali foydalanish yo'l konstruksiyalarini loyihalashda ba'zi an'anaviy yondashuvlarni tubdan o'zgartiradi, ayniqsa, murakkab grunt-gidrologik sharoitlarda. Shu bilan birga, geosintetik materiallarning tannarxi ularning qo'llanishidan olinadigan natijalarga nisbatan juda past. Chunki ular qurilish hajmini va muddatini qisqartirish, shuningdek, yo'l konstruksiyalarining xizmat muddatini uzaytirish imkonini beradi [3].

2. Tadqiqot metodologiyasi

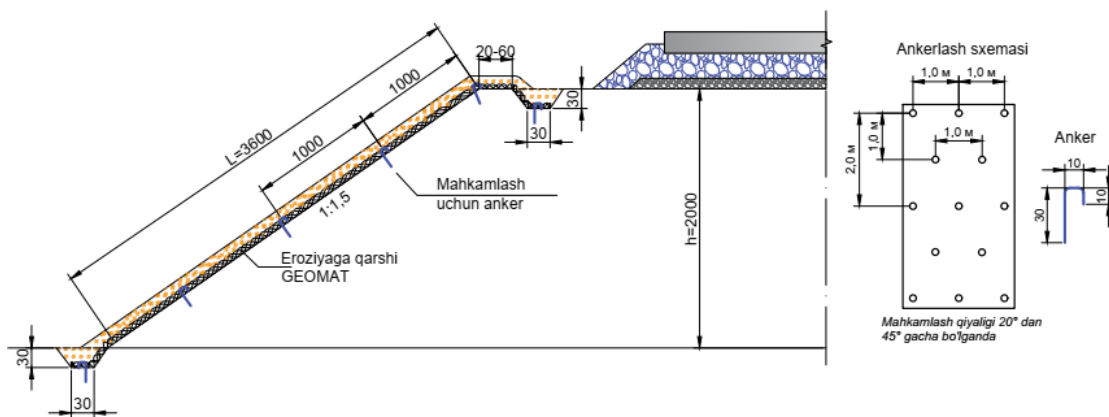
Yer polotnosiga bir vaqtning o'zida turli kuchlar va tabiiy jarayonlar ta'sir qiladi. Ulardan biri esa eroziya jarayonidir. Eroziya jarayonida yer polotnosiga shamol va suv ta'siridan turli darajada yuvilib ketishlar, mayda irmoqchalar va o'rta darajada jarliklar yuzaga kelishi mumkin, bu grunt turi, joy nishabligi, hududdagi yog'ingarchilik miqdori va shamol tezligi kabi ko'plab omillarga bog'liq [12,13]. Temir yo'llar yer polotnosi qiyaligini eroziya jarayonidan himoyalashda geosintetik materiallardan hajmli geopanjara va geomatlardan foydalaniladi.

Geomat – bu tekis yoki hajmli element bo'lib, u termik (erish orqali), mexanik (to'r yoki shtapellar yordamida) yoki kimyoviy (yopishtiruvchi moddalar orqali) usullarda birlashtirilgan tartibsiz joylashgan polimer mononitlar, shuningdek, o'simlik tolalari va poyalaridan tayyorlanadi. Geomatlar rulon yoki qatlam holatida (bir-birining ustiga joylangan matlar) yetkazib beriladi. Ularning asosiy vazifasi qiyaliklarni mustahkamlash hisoblanadi.

Hajmli polimer geomatlar qiyaliklarga yotqizilib, bir vaqtning o'zida o'simlikli tuproq bilan to'ldiriladi va o't ekiladi. Boshqa bir usulda esa qo'pol tolali tekis matlardan qoplama sifatida foydalaniladi, bu matlarning teshiklarida asta-sekin tuproq zarrachalari yig'ilib, o't o'sib chiqadi. Ayrim hollarda esa o't urug'lari bevosita geomat ishlab chiqarish jarayonida material tarkibiga kiritiladi [3].

Geomatlarni qiyalik yuzasiga mahkamlab uning ustiga urug' sepish yoki urug' sepmasdan qo'llash mumkin. Bu usul o't ildiz tizimining geomat orqali o'sishi hisobiga zichroq chim qoplamasini yaratish, o't qoplamasining shakllanishi uchun qulay sharoit yaratish (namlik rejimini barqarorlashtirish, geomatlar urug' bilan qo'llanganda – urug'larni unib chiqish davrida himoya qilish) imkonini beradi [5].

Tabiat eroziyaga qarshi kurash vositalariga ega bo'lsada, samarali sun'iy yechim sifatida polimer asosidagi geomatlardan foydalanish tavsiya etiladi. Hajmli geomati ildiz tizimini mustahkamlash orqali qiyalik va yon bag'irlarni uzoq muddatli himoya qiladi. Uning ochiq tuzilishi tuproq bilan to'liq to'ldirilishiga va o'simlik ildizlarining erkin o'sishiga imkon beradi. Geomat kimyoviy, biologik ta'sirlarga va ultrabinafsha nurlanishga chidamli bo'lib, uzoq xizmat qilish muddatiga ega. U yengil, egiluvchan va ekologik toza bo'lib, og'ir beton yoki asfalt konstruksiyalarga muqobil hisoblanadi. Uch o'lchovli tuzilishi tuproqni mustahkamlaydi, yomg'ir oqimiga va tuproqning siljishiga qarshi yuqori chidamlilikni ta'minlaydi. Geomat murakkab hududlarda ham eroziyaning oldini oladi va o'rnatish uchun maxsus malakaga ehtiyoj sezilmaydi [6].



1-rasm. Yer polotnosi ko'ndalang kesimi va ankerlarni o'rnatish tartibi

3. Natija va muhokamalar

Geomatlarni yer polotnosi qiyaliklariga eroziya jarayonidan himoyalash uchun o'rnatishning texnologiyasi bo'yicha bir nechta manbalarni ko'rib chiqdik hamda quyidagilarni xulosa qilishimiz mumkin:

-dastlab yer polotnosi qiyaligini rejalashtirish yoki ortiqcha kattalikdagi turli materiallar, toshlar va o'simlik poyalaridan tozalash hamda tekis holatga keltirish;

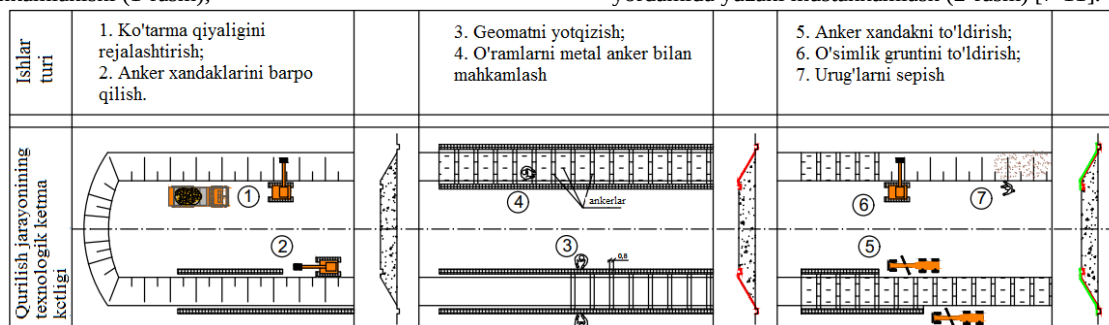
-yer polotnosi qirrasi (brovka) dan 300 mm masofada hamda yer polotnosining quyi qismida geomat tortilib ketmasligi uchun mahkamlashga chuqurligi 300 mm bo'lgan anker transheya (xandak) ni barpo etish;

-geomatni joyga to'g'ri yotqizish hamda transheyalarda anker bilan mustahkamlash;

- ankerlar o'lchami joydagi grunt holatidan kelib chiqib 6-10 mm diametrda va 300-700 mm uzunlikda bo'lishi kerak;

- o'ramlar bo'yлама va ko'ndalang bir-biriga ulanganda ular ustma-ust holatda (vertikal 150 mm va gorizontal 200 mm) ankerlar ketma ketligi 500-1000 mm bo'lgan holda mustahkamlanishi (1-rasm);

- anker transheya (xandak) ni to'ldirish;
- o'simlik urug'ining 2/3 qismini sepish, bunda har 1 m² uchun 40-60 gramm;
- o'simlik qatlami gruntini to'ldirish 50-100 mm;
- o'simlik urug'ining 1/3 qismini sepish;
- 20-30 kg li qo'l katogi yoki zichlash moslamalari yordamida yuzani mustahkamlash (2-rasm) [7-11].



2-rasm. Geomatlarni qiyalikka mustahkamlashning texnologik sxemasi



Qiyalikning dastlabki ko'rinishi



Qiyalikni tekislash jarayoni



Transheya qazish jarayoni



O'simlik urug'ining 2/3 qismini sepish



Materialni yotqizish jarayoni



Anker bilan mahkamlash



O'simlik urug'ining 1/3 qismini sepish



Yuzani grunt bilan yopish

3-rasm. Geomatlarni qiyalikka mustahkamlash jarayoni

Ushbu tadqiqotda geomatni yotqizishda unga qo'shimcha tarzda cho'l o'simliklari urug'lari ham ekildi. Bu urug'lar uch o'lchovli geomatning bo'sh qismlarida yaxshi rivojlanadi va bu o'simliklar ildizi grunt bilan chim xosil qilib qo'shimcha mustahkamlik beradi. Bu eroziyaga qarshi kurash usullari ichida eng samarali xisoblanadi.

Zamonaviy geosintetik materiallarni va ular bilan birgalikda biologik usulni qo'llash, texnologiyaning qulayligi hamda kam mexnat sarfi talab etishi hamda yer polotnosini eroziya jarayonidan himoya qilish ko'rsatkichlari yuqoriligi bilan ajralib turadi.

4. Xulosa

Buxoro – Misken temir yo'lida geosintetik materiallardan foydalanish yer polotnosining barqarorligini ta'minlash va eroziyadan himoyalashda muhim rol o'ynaydi. Ushbu usul quyidagi jihatlari bilan dolzarb ahamiyat kasb etadi:

Eroziyaga qarshi himoya – geosintetik materiallar grunt qatlamlarini mustahkamlash orqali shamol va suv ta'sirida yuvilishning oldini oladi, natijada yo'l barqarorligi oshadi.

Gruntning barqarorligini ta'minlash – geosintetik materiallar gruntning siljishini kamaytirib, sirpanish va o'pirilish xavfini pasaytiradi.

Gidroteknik samaradorlik – maxsus geosintetik qatlamlar tuproqning suv o'tkazuvchanligini tartibga solib, ortiqcha nam to'planishining oldini oladi. Bu esa gruntning yumshab, deformatsiyaga uchrash xavfini kamaytiradi.

Xizmat muddati va ekspluatatsiya xarajatlarini kamaytirish – geosintetik materiallar gruntning mustahkamligini oshirish orqali yo'l infratuzilmasining uzoq muddat xizmat qilishini ta'minlaydi va ta'mirlash xarajatlarini kamaytiradi.

Ekologik jihatdan samaradorlik – geosintetik materiallar tabiiy resurslardan oqilona foydalanish imkonini berib, atrof-muhitga salbiy ta'sirni kamaytiradi.

Umuman olganda, Buxoro – Misken temir yo'lida geosintetik materiallardan foydalanish temir yo'l infratuzilmasining ishonchligini oshirib, transport tarmoqlarining uzluksiz va xavfsiz ishlashiga zamin yaratadi

Foydalangan adabiyotlar / References

[1] Агушева А. А. Геосинтетические материалы в дорожном строительстве. Вестник магистратуры. 2018. №12-4 (87). URL:



<https://cyberleninka.ru/article/n/geosinteticheskie-materialy-v-dorozhnom-stroitelstve> (дата обращения: 21.02.2025).

[2] С.А. Матвеев. Инновационные материалы, технологии и конструкции: теория и практика применения. Техника и технологии строительства. Геосинтетические материалы. Спецвыпуск. Выпуск 2(2) ноябрь 2015 г. 41.

[3] Штабинский, В. В. О применении геосинтетических материалов в строительстве / Геотехника Беларуси: наука и практика : материалы Международной научно-технической конференции, посвященной 60-летию кафедры оснований, фундаментов и инженерной геологии и 90-летию со дня рождения профессора Юрия Александровича Соболевского (Минск, 23–25 октября 2013 г.). В 2 ч. Ч. 2 / редкол.: М. И. Никитенко, Д. Ю. Соболевский, Т. М. Уласик. – Минск : БНТУ, 2013. – С. 333-340.

[4] ОДМ 218.5.003-2010. Рекомендации по применению геосинтетических материалов при строительстве и ремонте автомобильных дорог. Федеральное дорожное агентство (Росавтодор). Москва 2010.

[5] ОДМ 218.2.078-2016. Методические рекомендации по выбору конструкции укрепления откосов земляного полотна автомобильных дорог общего пользования. федеральное дорожное агентство. (Росавтодор). Москва 2016.

[6] Медведев Н. В. Рекомендации по применению противозрозионных геосинтетических материалов – СПб.: МИАКОМ, 2013. – 51 с., ил.

[7] Lesov K.S., O'ralov A.Sh. Yer polotnosi qiyaliklarini eroziyadan himoyalashda geosintetik materiallarni yotqizish texnologiyasi. Qurilish va ta'lim ilmiy jurnali. 2024-yil. Maxsus son-1. 193-b.

[8] АО «Ўзбекистон темир йўллари» Ташкентский институт инженеров железнодорожного транспорта. Научно-исследовательская лаборатория «Путь и путевое хозяйство». Программе и методике экспериментальных исследований по укреплению откосов земляного полотна железных дорог. Ташкент – 2019.

[9] Жукова Татьяна Юрьевна, Еремеев Андрей Викторович, Ханов Нартмир Владимирович, Зборовская Марина Ильинична, Новиченко Антон Игоревич Исследование возможности применения инженерно-экологического противозрозионного покрытия – геомата с грунтом и посевом трав // Экономика строительства. 2022. №11. URL: <https://cyberleninka.ru/article/n/issledovanie-vozmozhnosti-primeneniya-inzhenerno-ekologicheskogo->

protivoerozionnogo-pokrytiya-geomata-s-gruntom-i-posevom-trav (дата обращения: 11.09.2024).

[10] Лесов К. С., Таджибаев Ш., Кенжалиев М. К. Технология укрепление откосов земляного полотна железных дорог из песчаных грунтов с применением геосинтетических материалов Проблемы архитектуры и строительства (научно-технический журнал). № 4, 2019 //Самарканд, СамГАСИ. – 2019. - С. 15-18

[11] К. Лесов, Ш. Таджибаев, А. Мавланов, М. Кенжалиев. Расчет устойчивости насыпи и укрепление откосов земляного полотна с использованием геосинтетических материалов. Транспорт шёлкового пути (научнотехнический журнал). №1, 2021. Ташкент, С. 78-83.

[12] Бахтиёр Рамазонович Рамазонов. "ПРОЦЕССЫ ЭРОЗИИ, ОПУСТЫНИВАНИЕ В ПРИРОДЕ И ИХ ОСНОВНЫЕ ХАРАКТЕРИСТИКИ" Academic research in educational sciences, vol. 2, no. 5, 2021, pp. 386-396. doi:10.24411/2181-1385-2021-00903

[13] Абдусаламова Р. Р., Баламирзоева З. М. МЕТОДЫ ЗАЩИТЫ ПОЧВЫ ОТ ВОДНОЙ И ВЕТРОВОЙ ЭРОЗИИ // Вестник СПИ. 2021. №4 (40). URL: <https://cyberleninka.ru/article/n/metody-zaschity-pochvy-ot-vodnoy-i-vetrovoy-erozii> (дата обращения: 20.02.2025).

Mualliflar to'g'risida ma'lumot/ Information about the authors

Lesov Kuvandik Saginovich	Toshkent davlat transport universiteti "Temir yo'l muhandisligi" kafedrası mudiri, t.f.n., professor E-mail: kuvandik@mail.ru Tel.: +99899 876-19-63 https://orcid.org/0000-0002-9434-0713
O'ralov Akmal Shakar o'g'li / Uralov Akmal Shakar ugli	Toshkent davlat transport universiteti "Temir yo'l muhandisligi" kafedrası doktoranti E-mail: akmaljonorlov1928@gmail.com Tel.: +99899 817-43-12 https://orcid.org/0000-0002-6124-5250
Yuldashaliyev Jamshid Baxodir o'g'li / Yuldashaliyev Jamshid Bakhodir ugli	Toshkent davlat transport universiteti "Temir yo'l muhandisligi" kafedrası assistenti E-mail: jamshidyuldashaliyev601@mail.com Tel.: +99890 131-32-02 https://orcid.org/0000-0001-5366-1775



K. Lesov, A. Uralov, J. Yuldashaliev

Experimental research on protecting the slope of the land line from the process of erosion using geosynthetic materials.....5

B. Kasimov

Assessment of indicators for detecting electric vehicle malfunctions and improving their service.....9

B. Turakulov

Effect of operating temperature of hydraulic fluid on the service life of automatic transmission.....14

D. Butunov, Ch. Jonuzokov, J. Juraboev, D. Kengesbaeva

Factors affecting the throughput and processing capabilities of railway stations.....22

M. Juraev, M. Ikromov

Improving models for ensuring the regularity of city bus traffic....27

M. Rasulmuhamedov, M. Shomurova

The personal work plan of a teacher: Problems and the necessity of automation.....31

U. Shaozimova, A. Ibadullaev, A. Djumabaev,**E. Rakhmatov, J. Ziyamukhamedov**

Ensuring interchangeability in the Elting system of oil and gas products with targeted application of multifunctional composite polymer materials based on special materials and secondary resources.....35

R. Aliev, M. Aliev, G. Talipova, M. Yuldasheva

Mathematical model for studying the danger zone of train approach on sections of the roads of JSC "Uzbekistan Railways"41

B. Abdullaev

Development of a passenger flow forecasting model46