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Tashkent state transport university

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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.

Issues of rational organization local wagon-flows in rail transport

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Abstract: This article devoted to the problem of rational organization of the movement of local wagon-flows. The article also carried out a systematic analysis of local wagon-flows, shows the factors influencing the plan of their rational organization and developed mathematical solutions to accelerate the movement of local wagon-flows.

Keywords: local wagon-flows, mathematical approach, multi-group trains, optimization, intermediate stations, shunting operations

Temir yo‘l transportida mahalliy vagonlar oqimini ratsional tashkil etish masalalari

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Annotatsiya: Ushbu maqola mahalliy vagonlar oqimini ratsional tashkil etish masalalariga bag‘ishlangan. Shuningdek, maqolada mahalliy vagonlar oqimi tizimli ravishda tahlil qilingan, ularni ratsional tashkil etish rejasiga ta’sir etuvchi omillar ko‘rsatilgan va mahalliy vagonlar harakatini tezlashtirish bo‘yicha matematik yechimlar ishlab chiqilgan.

Kalit so‘zlar: mahalliy vagonlar oqimi, matematik yondashuv, ko‘p guruhli poyezdlar, optimallashtirish, oraliq stansiya, manyovr ishlari

1. Kirish

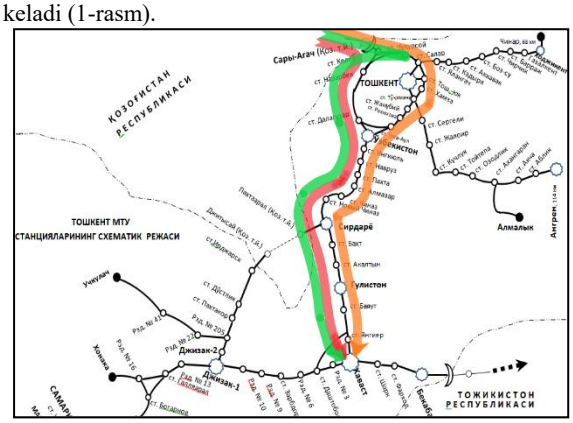
Bugungi kunda yuklarni tashishda transportning tezligi va tashish sifati har qanday transport turining raqobatbardoshligini ta’minlashda eng muhim omil hisoblanadi. Yuklarni etkazib berish vaqtining qisqarishi temir yo‘l mijozlarining talablarini to‘liq qondirilishiga asos bo‘ladi. Bozor iqtisodiyoti sharoitida, mijozlar va tashuvchi o‘rtasidagi mustahkam aloqalar, ikki tomon o‘rtasida tuzilgan shartnomaga to‘liq amal qilingan holatdagina bardavom bo‘ladi.

Temir yo‘l transportida yuklarni o‘z vaqtida etkazib berish vaqti tashish ishlaridagi asosiy ko‘rsatkichlardan biridir. Shuningdek, vagonlar oqimining tezlashishi temir yo‘l transportida yuklarni etkazib berish vaqtining qisqarishiga sabab bo‘ladi. Yuklarni o‘z manzillariga etkazib berish vaqtini qisqartirish uchun, vagonlar oqimini ratsional tashkil etish hamda ularning harakatini tezlashtirishga ta’sir etuvchi omillarni tahlil qilish va mazkur omillarni takomillashtirish bo‘yicha chora-tadbirlar ishlab chiqish maqsadga muvofiq.

Hozirgi kunda “O‘zbekiston temir yo‘llari” Aksiyadorlik Jamiyati (bundan keyin “O‘TY” AJ)ning deyarli barcha texnik stansiyalarida ko‘p guruhli poyezdlarni qayta ishlash qamrovi ortib bormoqda. Shuningdek, yuklarni o‘z vaqtida etkazib berish tamoyilini inobatga olgan holda, ushbu turdagi poyezdlar orqali tashilayotgan yuklarni tashish vaqtini qisqartirish va yuk sifatini saqlab qolish masalariga jiddiy e’tibor qaratilmoqda. Temir yo‘l sohasida, ko‘p guruhli poyezdlar bilan texnik stansiyalarda bajariladigan jarayonlar uchun saflanadigan vaqtlarni optimallashtirish va mazkur turdagi poyezdlar harakatlanuvchi uchastkalarda mahalliy vagonlar harakatini ratsional tashkil etish dolzarb muammolardan biri bo‘lmoqda.

2. Tadqiqot metodologiyasi

Tadqiqot ob’ekti va tahlili. Bugungi kunda “O‘TY” AJga Qozog‘iston temir yo‘llari orqali poyezdlar oqimi asosan Sari-Agach xalqaro kesishish punkti orqali kirib keladi (1-rasm).



1-rasm. “Qozog‘iston temir yo‘llari” AJdan “O‘TY” AJ ga kirib keluvchi vagonlar oqimi (poyezdlar oqimi) yo‘nalishlari

Xronometrik kuzatuvlar davomida, ushbu tuzilgan poyezdlar oqimi “Qozog‘iston temir yo‘llari” AJning eng katta saralash stansiyalaridan biri bo‘lgan “Aris”

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stansiyasidan amalga oshirilishi aniqlandi. Mazkur stansiyadan “O‘TY” AJning stansiyalariga 3 xil yo‘nalishlarda poyezdlar tuziladi. Bular:

1-yo‘nalish. Aris – Chuqursoy stansiyalari (1-rasmda yashil rang bilan belgilangan oqim);

2-yo‘nalish. Aris – Xavast stansiyalari (Nazarbek stansiyasi orqali harakatlanadigan poyezdlar oqimi bo‘lib, 1-rasmda qizil rang bilan belgilangan oqim);

3-yo‘nalish. Aris – Chuqursoy – Xavast stansiyalari (Toshkent-yuk stansiyasi orqali harakatlanadigan poyezdlar oqimi bo‘lib, 1-rasmda sariq rang bilan belgilangan oqim).

Birinchi yo‘nalishda, poyezdlar Chuqursoy stansiyasiga qabul qilinadi hamda ushbu poyezdlar stansiyalar bo‘yicha qayta ishlanadi [1] (jumladan, “Janubiy” yo‘nalishi (asosan, Xavast stansiyasi) bo‘yicha ham poyezdlar qayta tuziladi).

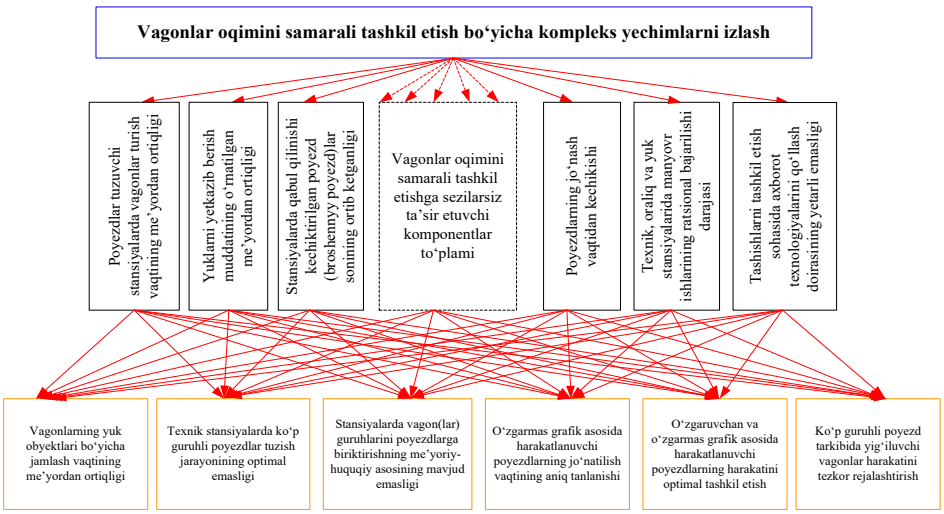
Ikkinchi yo‘nalishda, poyezdlar Keles stansiyasiga qabul qilinadi hamda Nazarbek stansiyasi orqali o‘tkazilib, asosan Xavast stansiyasigacha (“Janubiy” yo‘nalishi bo‘yicha) yetkaziladi.

Uchinchi yo‘nalishda, poyezdlar Chuqursoy stansiyasiga qabul qilinadi hamda ushbu poyezdlar stansiyada qayta ishlanadi va asosan Xavast stansiyasi (“Janubiy” yo‘nalishi)ga bo‘yicha poyezdlar qayta tuziladi. Chuqursoy- Keles peregoni poyezdlar bilan banda bo‘lish vaqtining ko‘pligini inobatga olib, mazkur poyezdlar Toshkent-yuk stansiyasi orqali o‘tkaziladi.

Tadqiqot ishlari shuni ko‘rsatdiki, Sari-Agach xalqaro kesishish punkt orqali kirib kelayotgan yuk poyezdlari oqimining asosiy qismi (odatda 80%) Chuqursoy saralash stansiyasiga qabul qilinadi [2], ya’ni 1-rasm asosida mazkur oqim Aris – Chuqursoy stansiyalari va Aris – Chuqursoy – Xavast stansiyalari yo‘nalishlari bo‘yicha tuziluvchi poyezdlar hisoblanadi. Nazarbek stansiyasi orqali o‘tkaziladigan Aris– Xavast yo‘nalishdagi poyezdlar oqimi, ushbu punktdan “O‘TY”AJ ga kirib keluvchi umumiy poyezdlar oqimining o‘rtacha 10 % ini tashkil etadi. Bundan shuni xulosa mumkinki, Aris stansiyasi “O‘TY” AJning Xavast stansiyasiga umumiy poyezdlarning 10 % ulushida o‘tkinchi poyezdlar tuzishi rejalashtirilgan. Demak, vagonlar oqimi harakatini tezlashtirish rejalashtirilayotgan “Janubiy” yo‘nalishi bo‘yicha, Chuqursoy stansiyasi asosiy vagonlar oqimini qayta ishlovchi texnik stansiyalardan biridir.

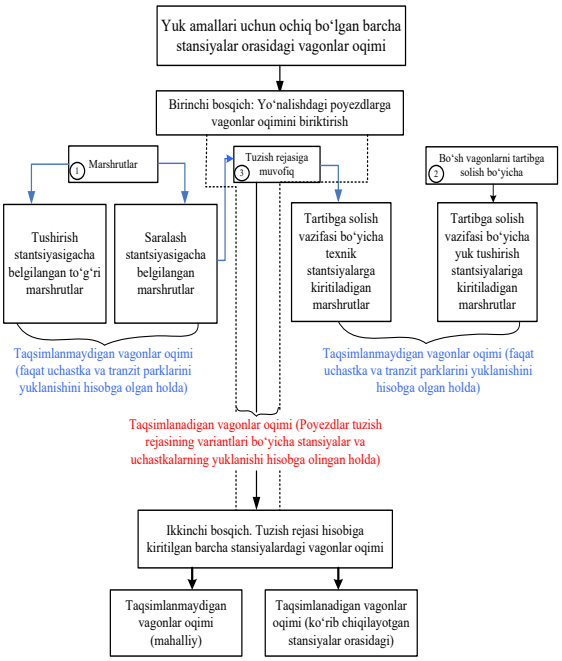
Shuningdek, tadqiqot davomida Chuqursoy stansiyaning qabul qilish parkida qayta ishlanadigan tranzit vagonlarining me’yoriy vaqtdan ortiqcha turib qolayotganligi aniqlandi. Vagonlarining me’yoriy vaqtdan ortiqcha turib qolayotganligiga asosiy sabab, ushbu stansiyaga qabul qilinayotgan va tuziladigan yuk poyezdlarining 60% dan ortig‘i ko‘p guruhli poyezdlar ulushiga to‘g‘ri keladi. Ko‘p guruhli poyezdlar ulushi ortib ketganligi sababli, hozirgi kunda ushbu turdagi poyezdlarni tarqatish va yig‘ish jarayoniga ko‘p vaqt sarflanmoqda [3, 4]. Amaldagi saralash tepaligi ish texnologiyasi bo‘yicha ko‘p guruhli poyezdlarni tuzish mobaynida, saralash tepaligidan boshqa poyezd tarkiblarini tarqatish to‘xtatiladi. Demak, stansiyada ko‘p guruhli poyezdlar ulushining oshishi qabul qilish parkida vagonlarning me’yordan ortiq kutishiga va o‘z o‘rnida bu mazkur uchastkadagi mahalliy vagonlar oqimi harakatini sekinlashishiga olib keladi.

Vagonlar oqimiga ta’sir etuvchi omillar. Zamonaviy texnologiyalar rivojlanib borayotgan sharoitda, vagonlar oqimini tashkil etish tizimining asosiy mezonlaridan biri – vagonlar aylanmasi vaqtini qisqartirishdir. Olib borilgan tadqiqotlar yuklarni yetkazib berish muddatini hisobga olgan holda, “O‘TY” AJda yuklarni tashish nomutanosibligi sharoitida vagonlar oqimini samarali tashkil etish bo‘yicha kompleks echimlarni izlash yo‘nalishlarini belgilash zaruratini ko‘rsatdi (2-rasm).



2-rasm. Yuklarni tashish nomutanosibligi sharoitida vagonlar oqimini samarali tashkil etish bo‘yicha kompleks yechimlarni izlash yo‘nalishlari

2-rasmda ko‘rsatilgan yo‘nalishlar bo‘yicha transport jarayonlari texnologiyasini takomillashtirish vagonlar oqimini ratsional tashkil etish rejasini ishlab chiqish va temir yo‘l uchastkalaridagi mahalliy vagonlar oqimi harakatini tezlashishiga zamin yaratadi. Vagonlar oqimini ratsional tashkil etish jarayonining umumiy sxemasidan (3-rasm) kelib chiqqan holda vagonlar oqimi harakatining sekinlashishiga ta’sir ko‘rsatuvchi barcha omillarni (4-rasm) tahlil etish zarur.

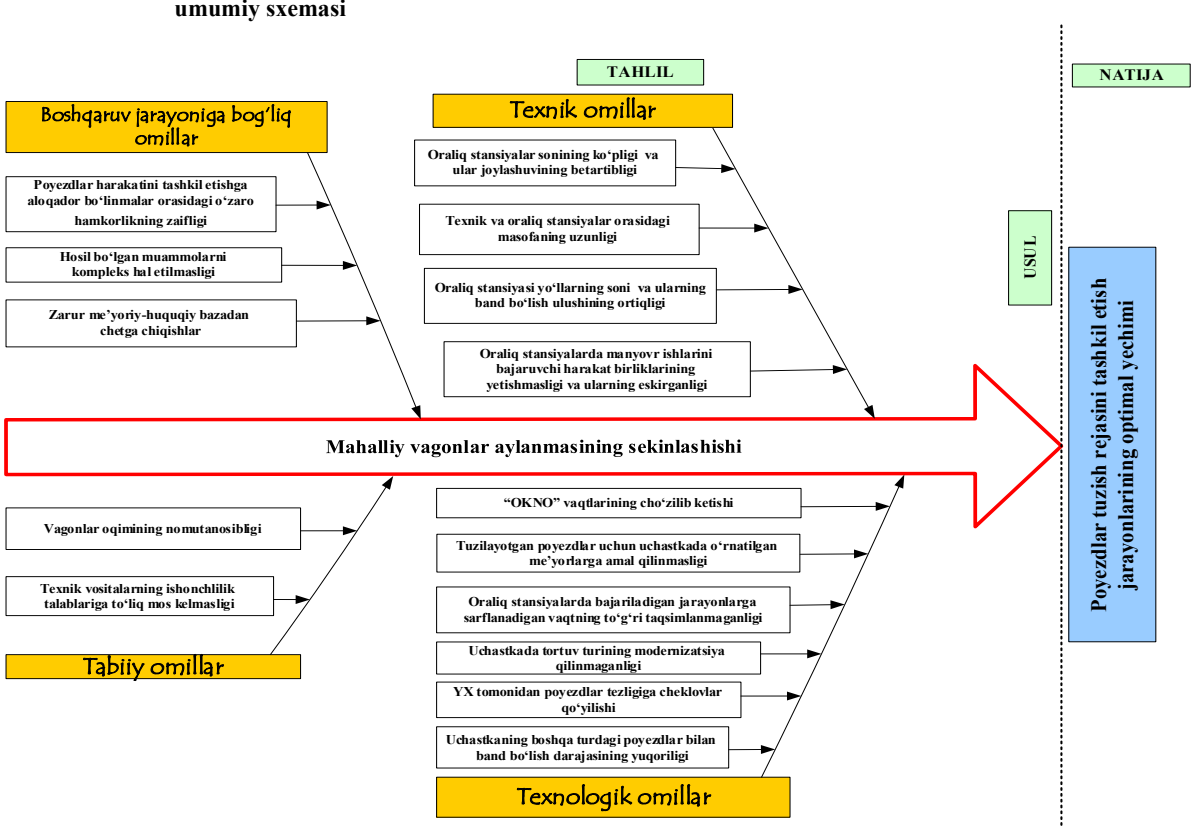


3-rasm. Vagonlar oqimini ishlab chiqish jarayonining umumiy sxemasi

Rasmiy statistik ma’lumotlar asosida aniqlanishicha, Yevropaning o‘rganilgan 13 mamlakatida SWL (yakka vagonli yuk tashish) harakati tranzit tashuvlarini hisobga olmagan holda taxminan 75 milliard tonna-kilometrni tashkil etadi. Agar tranzit tashuvlari va qolgan Yevropa Ittifoqi a’zolari ham hisobga olinsa, YI va Shveysariya (EU+CH) bo‘yicha ushbu ko‘rsatkich 80–85 milliard tonna-kilometr atrofida bo‘ladi. Ushbu natija Xrail tomonidan 2010-yilda taqdim etilgan, ehtimol 2009-yil ma’lumotlariga asoslangan oldingi hisob-kitoblarga nisbatan 15–20 foiz pastdir [5].

Vagonlar oqimining harakat yo‘nalishlarini inobatga olgan holda, mahalliy vagonlar oqimi (temir yo‘l ichki qatnovlaridagi vagonlar oqimi)ning harakatini sekinlashishiga ta’sir etuvchi asosiy omillar quyidagi 4 turga ajratiladi (4-rasm):

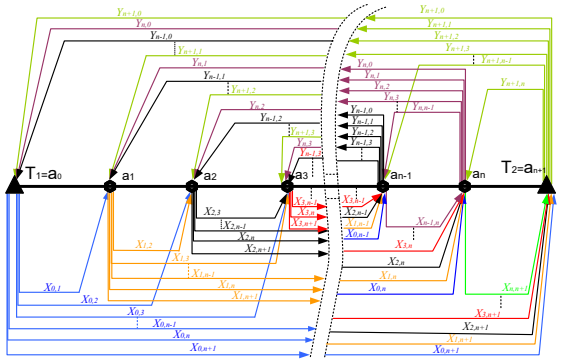
- texnik omillar;
- texnologik omillar;
- boshqaruv jarayoniga bog‘liq omillar;
- tabiiy omillar.



4-rasm. Mahalliy vagonlar oqimini sekinlashishiga ta’sir etuvchi omillarni o‘rganish sxemasi

Mahalliy vagonlar oqimining sekinlashish holatlarini kamaytirish bo‘yicha chora-tadbirlarni ishlab chiqishda, uchastka tarkibidagi oraliq stansiyalar orqali vagonlar oqimini oqilona taqsimlash muhim omil hisoblanadi. Mahalliy vagonlar harakatini jadallashtirish jarayonida matematik modellar asosida optimal yechimlarni izlash hamda baholash mezonlarini to‘g‘ri tanlash samaradorlikni ta’minlaydigan asosiy usullardan biridir.

Vagonlar oqimini tezlashtirish bilan bog‘liq matematik tahlil vagonlarning o‘z manzillariga yetib borish imkonini beruvchi tashish sxemalarini aniqlashga tayanadi. Ushbu sxemalarning umumiy miqdori uchastkadagi oraliq stansiyalar soni, tashiladigan vagonlar hajmi, stansiyalarning joylashuv xususiyati va boshqa bir qator parametrlar bilan belgilanadi.



4-rasm. Mahalliy vagonlarni o‘z manzillariga yetkazib berishning matematik ehtimollik grafigi

3. Xulosa

Xulosa qilib aytganda, mahalliy vagonlar oqimi harakatini jadallashtirishda unga ta’sir ko‘rsatadigan omillarni kamaytirish yoki zarur hollarda ularning ta’sir darajasini oshirish, yuklarni o‘z vaqtida manzillariga yetkazib berish tizimini takomillashtirishning asosiy mezonlaridan biri sifatida qaraladi. Shu bilan birga, mahalliy vagonlar aylanmasi misolida vagonlarning manzillariga yetkazilish jarayonini ifodalovchi algebraik ehtimollik modeli ishlab chiqilishi, ularni texnik hamda oraliq stansiyalar o‘rtasida oqilona taqsimlash imkoniyatini yaratadi.

Mazkur stansiyalarda vagonlarning ortiqcha turib qolish vaqtini qisqartirish esa, butun tashish jarayonining samaradorligini oshirishda muhim omil bo‘lib xizmat qiladi. Matematik asoslangan yondashuvlar yordamida mahalliy vagonlar oqimini oqilona tashkil etish, kelgusida temir yo‘l transporti tizimi bilan uning mijozlari o‘rtasidagi hamkorlikni yanada mustahkamlash uchun mustahkam poydevor yaratadi.

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