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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.

Functional dependence of warehouse and transport processes in the supply chain

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Abstract: The article examines the functional interdependence of warehouse and transport processes in the cargo delivery chain and their impact on the efficiency of the logistics system. During the transportation process, the interaction of each link, various modes of transport, and the warehouse was analyzed. It is shown that in the "door-to-door" delivery of goods, work is carried out to identify not only one link, but also a "weak link" in a systematic approach and increase the processing capacity or throughput capacity of this system element. The interaction of warehouse operations (receipt, storage, assembly, and dispatch) with transport processes that drive material flows between supply chain participants and the main influencing factors are considered.

Keywords: unitized and packaged goods, covered warehouse, racking layout, efficiency, forklift truck, pallets, cargo placement, cargo parameters, AnyLogic, warehouse operation

Yuklarni yetkazib berish zanjirida ombor va transport jarayonlarining funksional bog'liqligi

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Annotatsiya: Maqolada yuklarni yetkazib berish zanjirida ombor va transport jarayonlarining funksional o'zaro bog'liqligi hamda ularning logistika tizimi samaradorligiga ta'siri ko'rib chiqilgan. Tashish jarayonida xar bitta bo'g'in turli transportlar va omborning hamkorligi tahlil qilingan. Yuklarni "eshikdan eshikkacha" yetkazib berishda faqatgina bitta bo'g'inni emas balki tizimli yondashuvda "zaif bo'g'in"ni aniqlash va ushbu tizim elementini qayta ishlash qobiliyatini yoki o'tkazuvchanlik qobiliyatini oshirish ishlari amalga oshirilishi ko'rsatilgan. Ombor operatsiyalarining (qabul qilish, saqlash, yig'ish va jo'natish) ta'minot zanjiri ishtirokchilari o'rtasida moddiy oqimlarni harakatlantiruvchi transport jarayonlari bilan o'zaro hamkorligi va asosiy ta'sir qiluvchi omillar ko'rib chiqilgan.

Kalit so'zlar: unifikatsiyalangan va qadoqlangan tovarlar, yopiq ombor, stellaj sxemasi, samaradorlik, avtoyuklagich, tagliklar, yuklarni joylashtirish, yuk parametrlari, AnyLogic, ombor operatsiyasi

1. Kirish

An'anaviy yuklarni yetkazib berish zanjirining faoliyati ombor va yuk tashish jarayonlarining bevosita hamkorligiga asoslanadi. Ushbu hamorlik moddiy oqimlarni jo'natuvchi punktdan yakuniy iste'molchigacha bo'lgan harakatining yagona logistik jarayon sxemasini shakllantiradi[1,2].

Yuklarni etkazib berish tizimda ombor va yuk tashish jarayoni alohida elementlar sifatida emas, balki logistik jarayonlarning uzluksizligi, muntazamligini ta'minlovchi o'zaro bog'lik va to'ldiruvchi funktsional elementlar sifatida namoyan bo'ladi.

2. Tadqiqot metodologiyasi

Ombor va transport jarayonlarining funktsional o'zaro bog'liqligi, moddiy oqim harakatlanish barcha bo'g'inlarida ya'ni yukning omborga kelib tushishidan boshlab uni iste'molchiga etkazib berish bog'liq bo'lgan jarayonda texnologik jarayonni aks etadi.

Xalqaro yoki mahalliy tashishlardan qat'iy nazar yuk tashishlarda transport turini o'zgartiradigan xar qanday tashishlarga yuk turidan kelib chiqqan holda turli xil omborlardan foydalaniladi. Yuk tashishlarda yuk jo'natuvchidan qabul qiluvchiga faqat avtomobil transportida amalga oshirilgandagina faqat kam masofalarga 500-700 km masofada qayta ortish omborlaridan foydalanilmasligi mumkin, lekin ushbu tashish sxemasida xam dastlabki va yakuniy punktlarda omborlardan foydalaniladi. Yuqoridagi tashish usulidan tashqari barcha tashishlarda bu esa yuk tashishlarni o'rtacha 80% transport turini o'zgartirgan xolda yuklarni qayta ortish amalga oshiriladi[3].

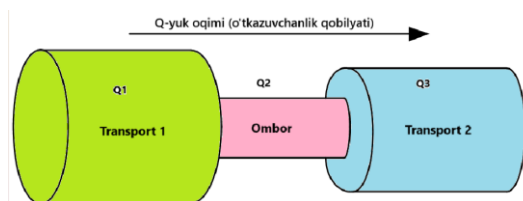
Omborlarning funktsional vazifalariga asosan yuklarni (moddiy oqimlarni) qabul qilish, ortish-tushirish, saralash-joylashtirish, muddatli saqlash, vaqtincha saqlash, buyurtmalar moddiy oqimlar sifatida shakllantirish amallari o'z ichiga oladi.

Yuqoridani inobatga olgan yuk tashishlarda bevosita ishtirok etadigan omborning texnologik ish jarayonini

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samarali tashkil etish muhim ahamiyat kasb etadi. Omborning texnologik ish jarayonini samarali tashkil etish orqali omborlarda yuklarni ortiqcha turib kolishini kamaytirish, yuklarni qayta ishlash vaqtini qisqartirish hamda omborda ishlaydigan transport vositalarini ekspluatatsion harajatlarini qisqartirishga erishiladi[5-7]. Omborning texnologik ish jarayonini samarali tashkil etish orqali faqat ombor ish jarayoniga ta'sir etmasdan yuklarni etkazib berish jarayoniga ta'sir qo'rsatadi hamda logistik harajatlarni qisqartirishga va yuklarni etkazib berish muddatiga ham o'z ijobiy ta'sirini o'tkazadi. Yuklarni etkazib berish zanjirida yuk tashishlarni muvofiqlashtirish, samarali tashkil etishda tashishning har bir bo'g'inini boshqarish va nazorat qilish zarur. Yuk tashish hajmining oshishi davrida har bitta bo'g'inning o'zining maksimal yuklarni qayta ishlash qobiliyati mavjud. Omborlarning maksimal qayta ishlash qobiliyati bir nechta asosiy parametrlarga bog'lik. Ushbu parametrlarga qayta ishlanadigan yuk turi va ombor turiga nisbatan omborning gabarit o'lchamlari, saqlash muddatlari, ish texnologiyasi, ortish-tushirish mashinalari va ishning to'g'ri rejalashtirishi kiradi[8-10]. Qo'yida keltirilgan 1.1-rasmda yuklarni etkazib berish zanjirining 3 ta bo'g'inida har bir bo'g'inning Q_1 , Q_3 maksimal yuklarni o'tkazish qobiliyati, Q_2 qayta ishlash qobiliyati ko'rsatilgan. "Transport 1" ning maksimal yuk o'tkazish qobiliyati Q_1 ga, "Transport 2" ning maksimal yuk o'tkazish qobiliyati Q_3 ga hamda "Ombor" ning maksimal yukni qayta ishlash qobiliyati Q_2 ga teng. Ushbu shartlar asosida $Q_2 < Q_3 < Q_1$ tenglik qanoatlantirilmoqda, ushbu tashish zanjirida eng "zaif nuqta" ombor hisoblanadi hamda yuk tashish zanjirining umumiy yuk o'tkazish qobiliyati eng kichigiga ya'ni Q_2 teng bo'ladi.



1-rasm. Yuk oqimlarining yuk tashish bo'g'inlaridagi harakatlanish sxemasi

Logistik tizimda yuk tashishlarda asosiy omillar (maqsad funktsiyalari) bu logistik harajatini qisqartirish, tashish muddat qisqartirish va yukning xavfsizligini yuqori darajaga ta'minlash hisoblanadi[11]. Ushbu maqsadlarga erishish uchun albatta yuk etkazib berish jarayonini "eshikdan eshikkacha" kompleks tashkil etish, nazorat qilish va boshqarishdan iborat. Bunda tashish jarayonining har bir bo'g'inini ishlash tamoyilini tahlil qilish orqali tashishning "eng zaif" nukatasini yoki bir nechta "eng zaif nuqta"larni aniqlash talab etiladi. Yuqoridagi maqsadlarga erishish uchun aniqlangan "zaif nuqtalar" ilmiy asoslangan zamonaviy yondashuvlarni joriy etish orqali bartaraf etish orqali amalga oshiriladi[12,13]. Logistik ta'minotda yuk tashishlarning "eng zaif nuqta" aniqlanmas ekan, ko'yilgan maqsadlarga erishishning deyarli imkonsiz. 1.1-rasm etibor qarata digan bo'lsak "eng zaif nuqta" bu omborligi aniqlangan, demak "Transport 1" va "Transport 2" bo'g'inlarni o'tkazuvchanlik qobiliyati oshirilganda ya'ni

riyojlantirilganda xam umumiy zanjirning o'tkazuvchanlik qobiliyati Q_2 miqdorda o'zgarishsiz qoladi[14-16].

Bir nechta transport turidan foydalangan xolda yuklarni tashish bir nechta bo'g'in orqali tashish jarayoni shakllantiriladi. Q_i - moddiy oqimning "eshikdan eshikkacha" yetkazib berishda ma'lum bir bo'g'inning yuk o'tkazish yoki yukni qayta ishlash qobiliyati.

$$q_{\min}\{Q_1, Q_2, Q_3, \dots, Q_i\}_{\min}, i = 1; n \quad (1)$$

$$q_{\max}\{Q_1, Q_2, Q_3, \dots, Q_i\}_{\max}, i = 1; n \quad (2)$$

q_{\min} - yuk tashish tizimining "eng zaif" bo'g'ini.

q_{\max} - yuk tashish tizimining eng ko'p miqdorda yukni o'tkaza oladigan yoki kayta ishlay oladigan bo'g'ini.

$$q_{\max_{\min}} \quad (3)$$

λ -yuk tashish oqimining nomuntazamlik koeffitsienti

[3] formula orqali yuk tashish tizimida "eng zaif" bo'g'ini miqdorini ushbu tashish tizimidagi "eng yaxshi" ko'p miqdordagi moddiy oqimni kelajakda oshishi mumkin bo'lgan yukning nomuntazalik koeffitsientini inobatga olgan xolda oshirish xamda eng yaxshi bo'g'in o'tkazuvchanlik qobiliyatiga tenglashtirish vazifasi qo'yiladi.

3. Xulosa

Tadqiqotlar shuni ko'rsatadiki yuk tashish tizimida ya'ni bir nechta transport turidan foydalangan xolda yuk tashishlarni amalga oshirilganda "eng zaif" bo'g'in bu turli hil omborlar (transport turlari hamkorlik punktlari) hisoblanadi. Hamda umumiy tashish takomillashtirishda ya'ni yuk oqimini o'tkazuvchanlik qobiliyatini oshirishda etiborni faqat bitta bo'g'inga emas balki tizimli hal etish zarur. Shu omillarni inobatga olgan xolda yuk tashish tizimida omborlarning texnik-texnologik parametrlarini optimal qiymatlarini tanlash va asoslash muhim ahamiyat kasb etadi.

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