DOI: 10.34185/1991-7848.itmm.2024.01.020

RESEARCH OF FAILURE HOSE IN THE OPERATION OF FORKLIFTS IN SEAPORTS

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Abstract. *This study focuses on hydraulic hoses utilized in the hydraulic systems of forklifts. The investigation examined 8 forklifts, each with a loading capacity of 10 tons. The check took place every six months over a three-year span. Before and after each shift, the forklift operator performed visual checks and hydraulic system and brake a inspections.*

The research findings indicated that the most frequent hose malfunction was a result of a rupture. The failure rate noticeably increased during the winter, attributable to the low temperatures' adverse effect on the hoses' physical and mechanical properties. Another common area of hydraulic hose failure is due to substandard crimping and minimal fitting depth in the sleeves..

Keywords: *forklift, hydraulic hoses, failure, wear.*

Forklifts are commonly utilized for transferring cargo at seaports [1-6]. The hydraulic drive is an essential component that, if widely adopted, can greatly enhance the performance of loaders [1-5].

The performance of forklifts can be greatly enhanced by introducing hydraulic drives. The reason for its widespread use is because of several advantages, such as small size and weight, smooth operation, and shock load compensation by the working fluid [1-4].

The functionality of the hydraulic drive hoses, which power the lifting mechanism, is crucial for the proper operation of the boom. The primary condition that shows the functionality of these hoses is their undamaged state and lack of wear indications [1-4].

Nevertheless, while loaders are in operation at the port, unfavorable factors can negatively affect the performance of the hydraulic system. Specifically, a rise in the operating pressure, cuts on the surfaces, rubber layer delamination, and braid breaks cause a reduction in the longevity of the sleeves [1-6]. Even with improvements in machine reliability, the issue of unexpected hose failures has not been resolved. There are very few works that focus on predicting the condition of hoses [2-4].

During the research, 8 forklifts, each with a lifting capacity of 10 tons, were examined, which are operated in the seaport in summer and winter. The check took place every six months over a three-year span. Before and after each shift, the forklift operator performed visual checks and hydraulic system and brake a inspections. The majority of the malfunctions were discovered through a visual examination.

The fig.1 shows distribution of hose failures in summer and winter periods of operation of the forklift.

Based on extensive data analysis, it was determined that hose rupture is the predominant mode of failure. This is particularly evident during winter months, where the number of failures surpasses those in summer. This disparity can be attributed to the detrimental effects of colder temperatures on the physical and mechanical properties of the hoses. In-depth examination of failed hoses revealed that premature rupture often stems from substandard crimping techniques and insufficient insertion depth of the fittings into the hoses during manufacturing.

Subpar crimping techniques can lead to uneven distribution of stress and pressure across the hose, ultimately increasing the likelihood of rupture.

In addition to temperature fluctuations, environmental factors such as exposure to chemicals, and ozone can accelerate the degradation of hoses.

To mitigate the risk of hose failures and ensure optimal performance, the following preventive measures should be implemented:

a) Adhere to proper crimping techniques and specifications.

b) Ensure sufficient insertion depth of fittings during hose assembly.

c) Regularly inspect hoses for signs of wear and damage.

d) Store hoses in controlled environments, protected from extreme temperatures and other adverse conditions.

f) Select hoses with appropriate materials and specifications for the intended application.

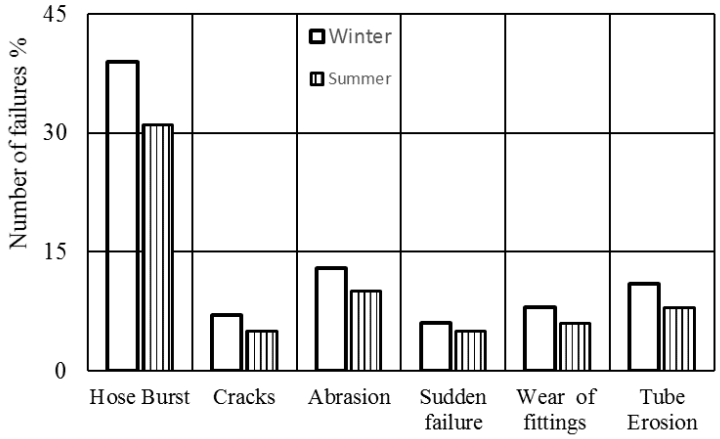

Figure 1 – Distribution of hose failures in summer and winter periods of operation of the forklift

When using hoses in low temperatures, their durability is notably reduced, as shown by experimental research findings.

By implementing these proactive measures, the longevity and reliability of hoses can be significantly enhanced, reducing the incidence of failures and potential safety hazards.

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ДОСЛІДЖЕННЯ НЕСПРАВНОСТЕЙ ГІДРАВЛІЧНИХ РУКАВІВ ПРИ ЕКСПЛУАТАЦІЇ ВИЛОЧНИХ НАВАНТАЖУВАЧІВ В МОРСЬКИХ ПОРТАХ

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Анотація: *У роботі досліджено ушкодження гідравлічних рукавів вилочних навантажувачів. Для обстежень обрано 8 навантажувачів вантажопідйомністю 10 тон. Перевірка проводилася кожні шість місяців протягом трьох років, перед початком і після кожної зміни оператор навантажувача проводив візуальний огляд, а також перевірку гідравлічної системи і гальм.*

Результати дослідження показали, що найчастіше рукави виходять з ладу внаслідок розриву. У зимовий період кількість відмов помітно зросла, що пов'язано з несприятливим впливом низьких температур на фізичні і механічні властивості рукавів. Крім того, передчасний вихід з ладу рукавів відбувається через неякісний обжим та мінімальну глибини установки фітингу у рукави.

Ключові слова: *вилочний навантажувач, гідравлічний рукав, несправність, знос.*

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