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## COMPARATIVE ANALYSIS OF LOADS FROM THE TRAVELLING CRANES OF DIFFERENT PRODUCERS

*The comparative analysis of travelling cranes of national and foreign producers is given in the paper. The travelling cranes of concern Demag were taken into consideration among the foreign cranes. The operation conditions of cranes were analyzed according to different codes of practice. The geometrical parameters, load and weight characteristics of overhead cranes were also compared. For the calculation the horizontal and vertical loads of cranes the most unfavorable schemes of location of travelling cranes on the structures of a production building were defined. According to these schemes, the maximum loads on the frame of the building were calculated and the maximum efforts in the crane beams were determined. Using obtained internal efforts the cross sections of crane girders with a span of 6 and 12 m were calculated. The results of the comparison showed the advantages of the modern cranes in materials saving of steel structures of industrial buildings.*

**Keywords:** *Overhead travelling cranes; operation conditions; crane loads; internal forces, crane girders; columns.*

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## ПОРІВНЯЛЬНИЙ АНАЛІЗ НАВАНТАЖЕНЬМОСТОВИХ КРАНІВ РІЗНИХ ВИРОБНИКІВ

*Наведено порівняльний аналіз мостових кранів вітчизняного та закордонного виробництва. Серед закордонних кранів до розгляду були прийняту крани концерну Demag. Було проаналізовано режими експлуатації кранів відповідно до різних норм. Також проведено порівняння геометричних параметрів, навантажень та вагових характеристик мостових кранів. Для розрахунку горизонтальних і вертикальних навантажень були визначені найбільш несприятливі схеми розташування мостових кранів на спорудах виробничої будівлі. Відповідно до цих схем, були розраховані максимальні навантаження на каркас будівлі та визначені максимальні зусилля у конструкціях. Із урахуванням отриманих внутрішніх зусиль, розраховані перерізи підкранових балок прольотом 6 і 12 м. Результати порівняння показали переваги сучасних кранів, які дозволяють знизити матеріалоємність сталевих конструкцій промислових будівель.*

**Ключові слова:** *мостові крани; режими роботи; кранові навантаження; внутрішні зусилля, кранові балки; колони.*

The question of studying the nature of crane influences and the problems of normalizing the travelling cranes loads are covered in the works [1–3, 7]. Analysis of the values of crane loads regulated by various design requirements are considered in work [8]. The problems of buildings reliability with crane equipment are determined in [4].

The use of overhead travelling cranes determines the efficiency of modern production, and the level of mechanization of technical production – the degree of excellence and productivity of the enterprise. Recently, enterprises of our country have started the use of modern crane equipment, including the company Demag, which is one of the largest German enterprises and has sales offices on all continents. Travelling cranes Demag are characterized

by high technological and lightweight structures, which allows to reduce materials of load-bearing structures of one-story production buildings (OSPB).

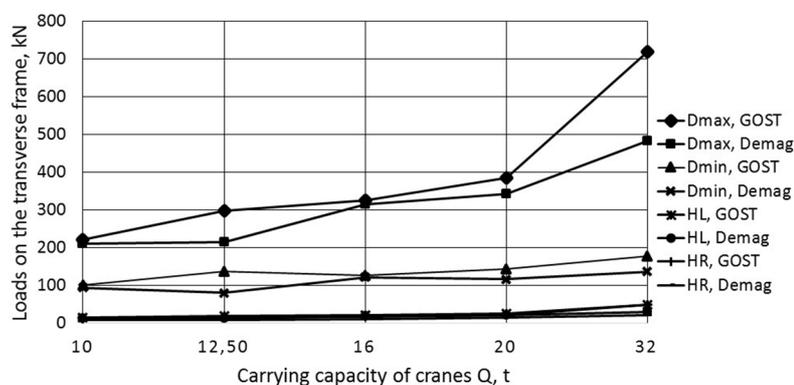
The four-wheel travelling cranes with average operation mode were considered in this work (Fig. 1). Parameters of national cranes are taken in accordance with GOST 25711-83 [5] and characteristics of travelling cranes ZKKE by the documentation given by Demag company.



**Figure 1 – Demag travelling crane with a carrying capacity of 32 t**

The influences of travelling cranes with load carrying capacity from 10 to 32 t were analyzed. For the comparison of the modern and national cranes, the cranes with the same span and carrying capacity were chosen [5] and the loads on the transverse frame and on the crane beams were calculated according to [6]. The results are presented in Fig. 2.

It was determined that the maximum vertical loads on the column ( $D_{max}$ ) of modern cranes are 1,1 ... 1,5 times smaller than the loads from the national cranes by [5] (Fig. 1). Minimum loads ( $D_{min}$ ) are 1,1 ... 1,7 times smaller than the loads from cranes by GOST. The analysis of horizontal loads showed that the load on the column of the transverse frame is 1,3 ... 2,2 times lower compared with the loads by GOST.



**Figure 2 – Loads on the transverse frame of the building**

In order to calculate bending moments on OSPB structures, travelling cranes were placed in the most unfavorable way. Bending moments from vertical loads modern cranes were 1,1 ... 1,7 times less than the moments of cranes by [5], and 1,1 ... 1,8 times for the horizontal loads, respectively.

The bending moments in the left column of the OSPB transverse frame from the loads of the foreign cranes were 1,1 ... 1,8 times smaller than the loads from the cranes according to GOST. The comparative analysis of loads and internal forces in OSPB structures from travelling cranes of different producers showed a significant reduction of the influences from the modern highly effective and technological travelling cranes compared to cranes according to GOST [5].

**Conclusion.** The comparison of the effects of travelling cranes on the OSPB design was performed. The analysis of the load and weight parameters of national cranes according to the norms [5] and the international travelling cranes of the Demag concern showed high technology and advantages of light foreign cranes. The use of lightweight travelling cranes in existing buildings will allow the use of crane equipment with a higher load capacity. In the design of new buildings, the installation of foreign cranes will give economical effect from reducing the material content of bearing structures of buildings.

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