

PERFORMANCE TESTS AND DESIGN OUTPUTS OF DIESEL FORKLIFTS

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Abstract: -

In order to improve the characteristics of the 3000 kg capacity diesel forklifts we are working on, KFD30 Forklift was developed with the aim of increasing performance. After the design and denge assembly stages of this prototype model, stability tests and performance tests were performed in accordance with TSE ISO Standards. In order to find the maximum performance outputs of the diesel forklift we developed, the test results were taken into consideration and adaptations were made on our prototype model. Surface slopes and velocities that our model could work with and without load were determined. The center of gravity of our model was found to ensure that the load center does not go outside the balance triangle during operation. It is very important that the test results also confirm our original values.

Keywords: *Performance outputs, balance triangle, stability, load center*



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1. INTRODUCTION

A literature review was performed and similar studies were evaluated[1,2,3], (4,5), Stability tests were performed on 2% 4% 6% 18% slope surfaces in accordance with ISO22915 standards[6]. In our study, performance tests were performed on 25%, 28%, 30%, 32% and 31.5% slope surfaces in order to see the limit points that our prototype model can reach on these different sloped surfaces and to make changes on the design considering the results. It was observed that our prototype model was stable in the inclination direction outputs. On these slopes, it was observed that the slopes were unstable. 760mm printed steel platform was used as test platform. In addition, to determine the tipping point of our model loaded and unloaded, the tipping test was performed. In order to determine the maximum speed of our model on inclined flat ground, speed tests were performed on a selected special road with and without load. Fig. 1 shows our prototype forklift model.



Figure 1. Performance tests of our prototype model forklift.

2. Performance tests and examination

TSE ISO 22915 standartlarına göre stabilite testlerine göre sınır noktalarını yakalamak için performans testleri yapılmıştır. Bu amaçla, performans testlerini ikiye bölmek mümkündür. Bunlar eğimli yüzeylerde statik ve dinamik testler ile, düz yüzeylerde test olarak sınıflandırılabilir.

2.1 Tests on sloping surfaces:

It is possible to carry out these tests according to various inclination angles. A part of the tests in our model was made on the printed steel platform which is 760x220 cm². These tests are, respectively, 18%, 25%, 28%, 30%, 32% and 30% and 31.5% tilting tests performed on the slope surface[7,8,9].

2.1.1. 18% sloping surface

KFD30 model with a length of 760mm on this test, the following mathematical model has been utilized. Fig. 2 shows the platform sizes.

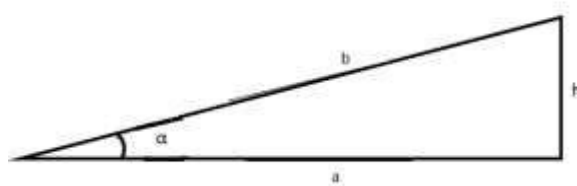


Figure 2. Platforms and sizes used

$$\alpha \text{ To find the angle of inclination, } \operatorname{tg} \alpha = \frac{h}{a} \quad (1)$$

$$\operatorname{tg} \alpha = \frac{18}{100}$$

From this equation, it is written on an inclined surface of 18% to find the α angle. Here, $\alpha = 10^{\circ}.2$ is found.

$$\text{platform height: } \cos \alpha = \frac{h}{760} \quad (2)$$

The phrase,

The test was repeated 5 times, with 3000kg loaded and unloaded. Our prototype model was successfully climbed to the inclined surface of 18%.

2.1.2 25% Curved surface

Working speed of our prototype model on 25% inclined surface, From ISO 22915 standards, the relationship between forklift speed and surface slope was expressed by equation (3) below.

$$15 + 1.4v = 25^0 \quad (3)$$

This expression is $v = 7.4 \text{ km/h}$. With this speed, our model should climb to the platform. It was observed that our model successfully loaded onto this platform with this speed.

3.1.3. 28%, 30%, 32% Inclined surfaces:

These three different curved surfaces were examined together. Below, the inclined surfaces 16,17,18 are shown in fig.3

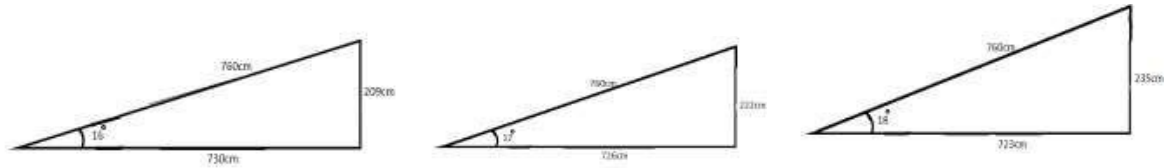


Figure 3. Platform sizes are seen on 28%, 30%, 32% slope surfaces respectively. Seen.

The following results were obtained respectively on these inclined surfaces. 28% inclined surface, 3000kg load to the platform forward output stable, rear output unstable, 30% inclined surface, with 3000kg load, platform forward output stable, rearward output unstable. On an inclined surface of 32%, with a load of 3000kg, it was observed that the output to the platform was stable, the rear outputs were unstable[10,11].

2.1.4 31.5% Tilting test on sloping surface

On this inclined surface, our truck is positioned below the ground and one edge of the triangle with the center of gravity parallel to the floor. For this purpose, the distance of the lateral edge of the triangle between the front wheel axle center and the axle centers of the rear wheels to the ground is taken as 460 mm. At the end of the platform output of our model, as shown below, it was observed that it dived stably with 3000kg load. Fig. 4 below shows the distance of the balance triangle from the ground.

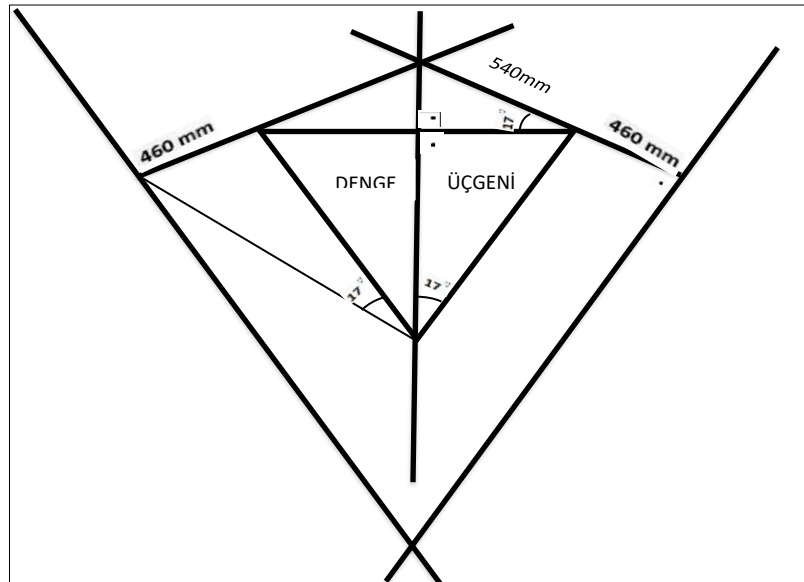


Figure 4. The distance from the balance triangle is seen.

Our model climbed to the platform at 11.4km / h and was able to stand steadily in the position shown above. This position on a slope of 31⁰,5% is called the tipping point. Düz zeminde yapılma zorunluluğu olan, modelimizin hız performans deneyleri yapıldı.

2.2. Tests on flat surfaces:

With our prototype model, speed tests were performed on flat ground.

2.2.1 Speed tests

Speed tests with the KFD30 model were performed with 3000kg load and no load. Below is the speed track in Fig. 5.



Figure 5. Speed test track

10 m long path was selected for the speed test. The transition time of our prototype model was determined by the stopwatch. Speed = According to the road / time formula, the speed of our model was determined as 19.5 km / h, and 20km / h, with without load of 3000kg.

4. Conclusions

After the standard test we have done with the diesel forklift model with a capacity of 3000kg, we have successfully completed the stability tests shown in the performance limits of our model. These test results also showed at which road slopes and at what speed our prototype model can be used with and without load. During the operation of our model, the limit values in our performance tests were determined in order to keep the load center within the balance triangle. With our forklift model, the required speeds were determined according to the slope of the ground in order to operate safely. Then, considering the performance outputs, necessary design and construction changes were made in our model. At the end of these studies, the necessary changes were made on our prototype model and the production phase was started.

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