



Hardness and Stiffness Testing

Method : Shock Damage (Free-fall Impact) Test

Purpose

During daily operation, the loader will operate within the maximum loading. The maximum loading on each of the roller can be calculated. The purpose of this test is not only to verify the roller's performance under normal conditions but also under exceptional conditions, such as unbalanced loading during manual handling, falling of the cargo boxes due to height difference of the loader and platform. The test is to ensure that the composite nylon roller can withstand these extreme conditions.

Procedures

Fix the composite nylon roller in the designated location of the test device as indicated in Figure with red circle. A 5kg weight hinged with a 1 m long spindle is allowed to free fall and hit the roller body. This is equivalent to a colliding speed of 4.43 m/s or 16 kph or a momentum of 22 kg•m/s (neglecting all frictional forces). The test was repeated at least 6 times.



Test Result

No visual cracks on the Composite Nylon Roller after standard inspection for 6 impacts. But it is actually more than 30 impacts with any visual cracks.

Test	Result (Visual Cracks)	Test	Result (Visual Cracks)
1st Impact	No	16th Impact	No
2ns Impact	No	17th Impact	No
3rd Impact	No	18th Impact	No
4th Impact	No	19th Impact	No
5th Impact	No	20th Impact	No
6th Impact	No	21st Impact	No
7th Impact	No	22nd Impact	No
8th Impact	No	23rd Impact	No
9th Impact	No	24th Impact	No
10th Impact	No	25th Impact	No
11th Impact	No	26th Impact	No
12th Impact	No	27th Impact	No
13rd Impact	No	28th Impact	No
14th Impact	No	29th Impact	No
15th Impact	No	30th Impact	No





Wear Resistance Testing

Method : Simulation Test

Purpose

In daily operation, loaders only work for 1 to 2 hours every time an airplane stops and the cargos loaded. However, in busy airports such as Hong Kong, New York, London, Singapore, Shanghai and Beijing, loaders may operate 8 to 10 hours per day. Under this high utilization environment, the wear and tear of the rollers will be accelerated and this is the main reason for replacement of the rollers. Through this test, it can be proved that the new composite nylon roller is better than the traditional aluminum roller in resistance to wear.

Test Procedure

A Loader Platform Simulator should be constructed using the FMC Loader as reference. Four clusters roller assembly should be installed in the simulator. The clusters are divided into A & B group, for group A cluster installed 12 nos. of original FMC aluminum rollers, while group B installed 12 nos. of composite nylon rollers.

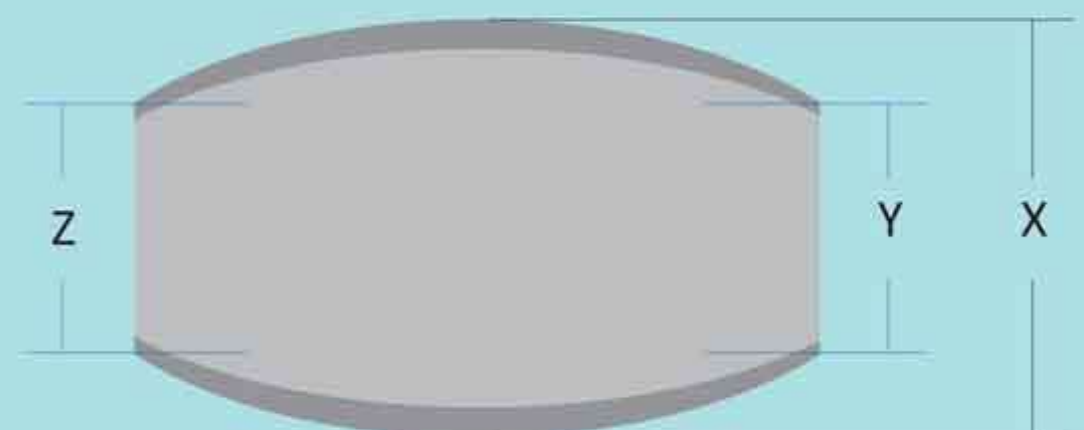
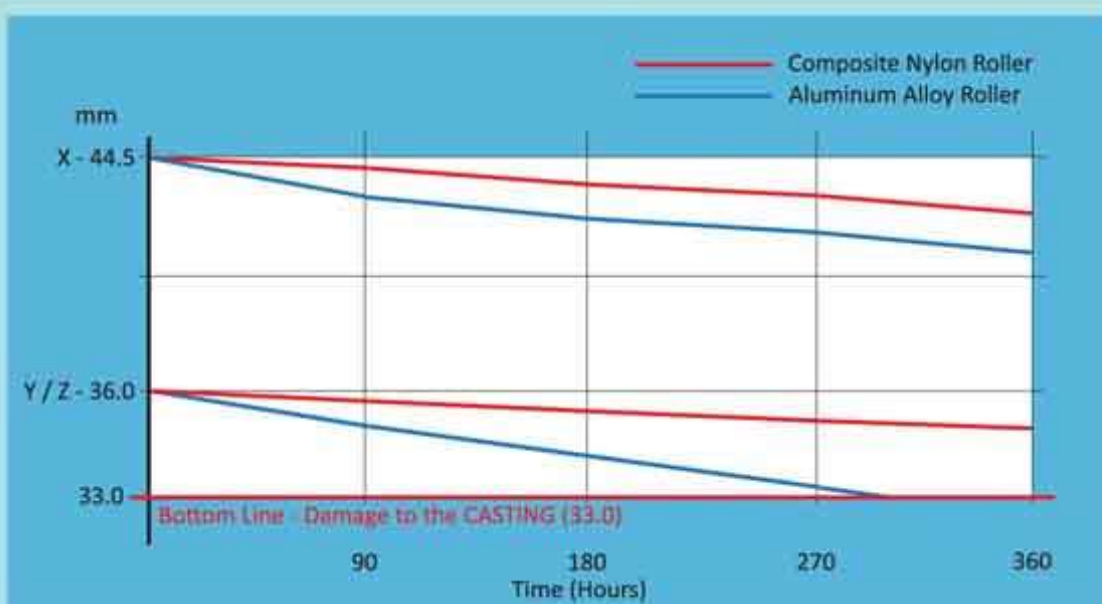
A 70 cm x 70cm steel plate with its bottom fitted with a metal plate, the same type of metal (American Standard # 7050) as per the cargo box bottom plate. This is to simulate the actual metal / roller contact condition. The test is carried out by putting a 400 Kg metal weight on the circular plate, i.e. each roller shares a load of 100 Kg, 10 Kg more than the standard maximum loading of 90 Kg per roller.

The simulator rotates at 160 rpm which is 4 times of standard rotation. The test is conducted for 24 hours per day for 15 days, i.e. a total of 360 hours. Every 12 hours, the rollers are measured to record the wear occurred. The roller diameters at the centre and at both ends are measured. The smallest diameter over the circumference obtained is recorded. After each 12 hour operation and measurement, the device is started again running in reverse direction.



Test Result

The wear on the new composite nylon rollers is much less than on the traditional aluminum roller. There is not any serious loss of material at the surface and two ends after 360-hour test. It also allows another 360-hour test again. It is further discovered that the two ends of aluminum rollers nearly hit and get damaged to the Casting at 294 hours.





Skid Resistance Testing

Method : On-site Water Simulation Test

Purpose

In daily operation, it is common that condensed water is found on the surface of the cargo box when they are unloaded from the airplane. This is due to the temperature difference between the airplane flying height and at ground level, and the quick descent of the airplane. Water at the loader platform causes skidding easily. Hence during rainy weather, skidding is very common. In fact, skidding is one of the major problems of metal rollers. This test is to prove that the composite nylon roller is more resistant to skidding and is more efficient in rainy weathers.

Test Procedure

Install the composite nylon rollers to FMC Loader for the on-site test than place the cargo box with standard weight inside on to the Loader. Operate the Loader to move the cargo box forward, backward, to the left, to the right, and turn it clockwise and anti-clockwise. When the cargo box is moving or rotating, spray water to the cargo box and the rollers for 10 to 15 minutes.

Put a pallet plate under the cargo box. Repeat the testing, moving and turning the cargo box in different directions. When the cargo box is moving, spray water to the cargo box and the pallet plate for 10 to 15 minutes.



Test Result

There is not any visible skidding detected during the test. The composite nylon roller passed the test and proved that during rainy weather there is not any skidding occur and the loaders function normally.

* - Video is also available.