Experimental study on torsional load of grid coupling

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ABSTRACT

The coupling connects the drive shaft and the driven shaft, and the shaft is used in the industrial field by the power transmission device.
The main functions of the coupling are largely divided into the function of transmitting the power and the function of protecting the mechanical system when the coupling member of the coupling is destroyed when an overload occurs between the driving shaft and the driven shaft. Grid coupling, which is one of the mechanical power transmission parts, is composed of hub, grid, seal, cover, etc. and has the characteristic of transmitting power at high speed and high torque.
In general use conditions, elasticity of the grid has flexibility to twist generated in misalignment state such as impact load, axis error, parallel error, angular error caused in normal rotation or reverse rotation, and to reduce vibration and impact load to be.
In addition, when the overload occurs, the grid is cut off and the transmission power is cut off to protect the equipment connected to the driving shaft and the driven shaft.

1. INTRODUCTION

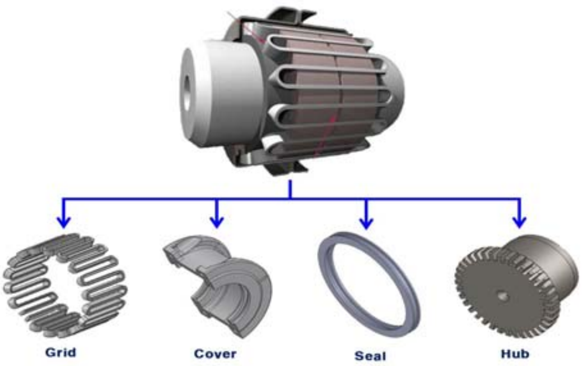

Figure 1. Main components of taper grid coupling

The major components of the grid coupling consist of a grid that connects power hubs to two hubs and hubs that are sandwiched between the drive shaft and driven shaft, and a seal and cover to prevent leakage of lubricant grease inside the coupling.

The characteristics of the grid coupling are that the grid has the misalignment state caused by the mechanical displacement, setup, and rotation, and the power point of the grid is moved within the surface of the tooth so that the power can be transmitted by reducing vibration and impact load to be. In addition, when an overload occurs during use, the grid is cut off and the power is interrupted to extend and protect the life of the equipment against impact load and excessive load.

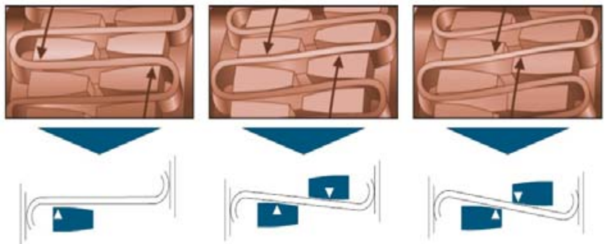

Figure 2. Classification according to load

Figure 3. Accommodating shaft misalignment

When the power is transmitted through the grid coupling, the flexibility of the grid causes it to bend depending on the applied load. If the fatigue accumulation or bending stress of the grid and hub is generated, the grid breakage type as shown in Fig.4

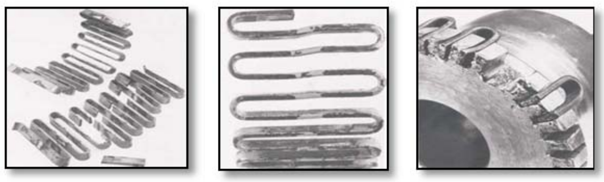

Figure 4. Fracture case of taper grid coupling

In this study, the torsional load, angle, and shape when the grid is broken by applying a torsional load to the grid coupling with these characteristics are experimentally confirmed and the experimental results are presented. results and discussion.

1.1. Test specimen specification

Table 1. Grid coupling sample Specification

Division	Specifications	
Hub bore	Minimum(mm)	19.1
	Maximum(mm)	56
Basic torque	625 N.m	
Max speed	4,350 r/min	

Table 1 shows the specifications of the grid coupling used in the experiment. A small size grid coupling with a maximum torque of 625 Nm was selected and tested. Test equipment

Table 2 Test equipment specification

Division	Specifications
Static torque	13,800 N.m
Dynamic torque	11,000 N.m
Static stroke	±130°
Dynamic stroke	±125°
Operation pressure	350 kgf/㎠
Torque sensor	Max 11,300 N.m

The test equipment used for the torsion test of the grid coupling is a torsion test system consisting of a hydraulic rotary actuator. One side of the coupling is fixed so as not to be rotated by the jig, the other side is connected to the shaft of the hydraulic rotary actuator, and a torque sensor is provided to measure the torsional load applied to the coupling. The test equipment used in this study is shown in Fig.5

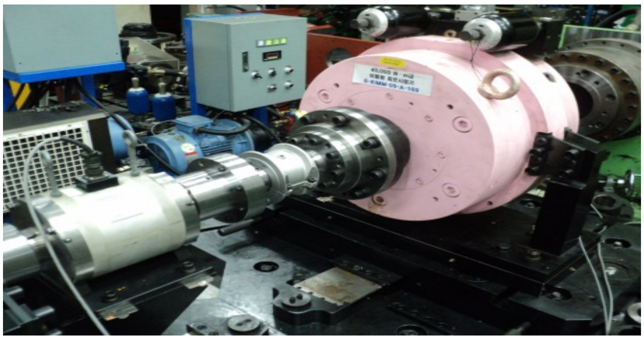

Figure 5. Hydraulic torsion test equipment

2. TEST RESULT

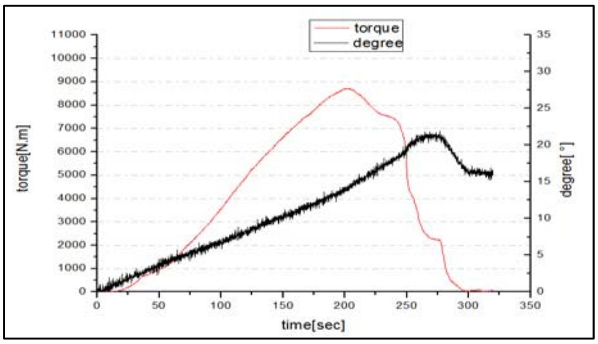

Figure 6. Torsion load test graph [Sample #1]

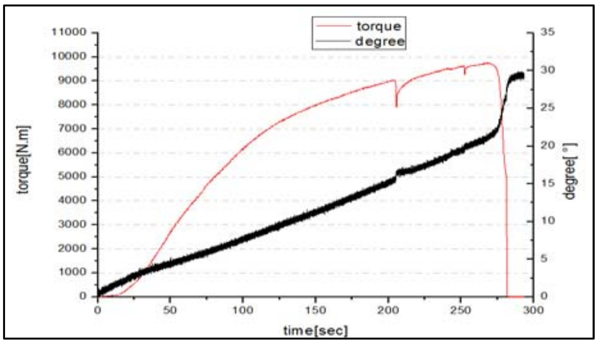

Figure 7. Torsion load test graph [Sample #2]

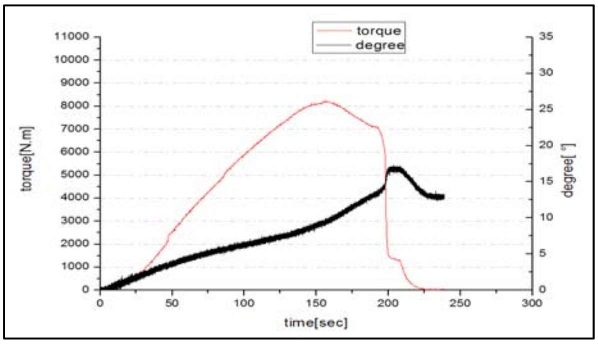

Figure 8. Torsion load test graph [Sample #3]

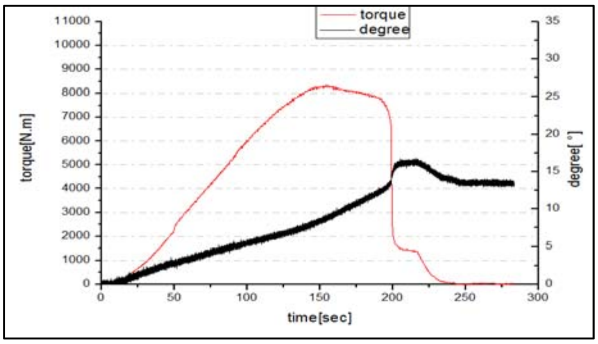

Figure 9. Torsion load test graph [Sample #4]

Figure 10. Sample image after torsion test

The test result when the torsional load is gradually applied to the grid coupling is shown in Fig. 6, 7, 8, and 9. Table 4 summarizes the torque, angle, and rupture time for the four grid coupling specimens due to torsional load. Table 3 Torsion test result.

Table 3 Torsion test result

No.	Fracture torque (N.m)	Fracture angle (°)	Fracture Time (sec)
# 1	9,000	28	200
# 2	8,300	26	150
# 3	8,250	25.8	165
# 4	8,700	27.7	210

3. CONCLUSION

In this study, grid fracture is experimented by applying torsional load to grid coupling and related experimental data are obtained. The influence of the torsional load on the hub and the grid was confirmed when the excessive torsional load, which may occur in actual use in the field, was applied. In the future, this study will be used as basic data by acquiring experimental data on power transmission system including grid coupling through additional study on impact load which is not performed.

ACKNOWLEDGEMENT

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BIOGRAPHIES

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