International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 6 Issue 4 Ver. I ǁ 2018 ǁ PP. 88-90

Research on Wear Based On MMS-2A Friction Tester

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Abstract: According to the results of various types of wear tests, the degree of attenuation of the friction pair caused by wear and tear can be evaluated to predict the life expectancy of the friction pair which may continue to work normally, organize maintenance in time, or provide early warning. This is really important for the actual parts. To this end, the important large-scale equipment for wear monitoring, timely and accurate understanding of the degree of wear and tear wear and development of the site. Avoid major equipment failure. If the impact of various factors can be considered in the design stage of friction system, it is of great practical significance to accurately predict the development of wear and predict the wear life.

Key Word: MMS-2A-type machine,Friction Tester, Orthogonal test

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Date of Submission: 02-04-2018 Date of acceptance: 17-04-2018

I. Mms-2a-Type Machine Introduced

MMS-2A-type sports wear tester for the work around the temperature requirements of 10 ℃ ~ 35 ℃, and the relative humidity of the exercise device operating environment is less than or equal to 80% of the actual working conditions; This type of friction and wear testing machine mainly consists of the host part, the circuit control cabinet, servo motor, the sensor speed detection, load detection sensors and other components. Can be made of metal materials made of components in the friction pair rolling and sliding composite friction and wear tests. The friction and wear test is used in the ring block friction pair.

II. Test Sample Introduction

In the friction and wear test of the moving parts, 45 steel was selected as the experimental object, different heat treatment was adopted on the friction surface, different friction and wear testing machines adopted different lubrication methods, and 40 oil was selected as the lubricating oil required for the test.The size of pin block and dial of the test piece to be tested is:
Φ4.8 × 12.7mm, (inner diameter) Φ38mm × (outer diameter) Φ54mm × 10mm,Friction and wear test block and test ring size size:6 × 7 × 30mm, (inner diameter) Φ20mm × (outer diameter) Φ40mm × 10mm.Friction and wear tests to determine the friction coefficient, torque resistance, temperature and other changes can be read directly from the friction and wear test prototype display screen.

III. Experimental Design

In order to more detailed study of friction and wear changes in the process, we have to conduct three tests:① the use of MMW-1A test machine to observe the load and velocity on the contact surface friction coefficient of motion devices;Under the same load and speed, observing and analyzing the influence of the contact surface of the moving parts on the coefficient of friction and wear;③ Design orthogonal test of friction and wear to find out the order of influence under different load, speed and time length.After the observation and analysis of friction and wear data measurement test is divided into A, B two groups, each test variable is divided into four different gradient values.Group A: set the axial friction and wear test loads were:100N, 150N,Fixed shaft rotation speed is set to:60r / min, 120r / min, 200r / min, 240r / min,The rotation speed is converted to linear speed is:0.14 m / s, 0.28 m / s, 0.48 m / s, 0.57 m / s,Friction and wear lasting time set to 3 minutes.Group B: set the axial friction and wear test loads were: 100N, 150N,Pin block rotation speed is set to:60 r / min, 100 r / min,Axial friction and wear test load is set to: 60N, 80N, 100N, 200N,Friction and wear lasting time set to 3 minutes.

Table1 the horizontal table of each factor in the orthogonal experiment of friction and wear

Factor	A	B	C
Level	F/N	S/r/min	T/min
1	100	60	3
2	200	100	5
3	300	200	8

In the orthogonal test of the friction and wear test data, the horizontal combinations of all the factors affecting the friction and wear are uniform. Therefore, it is necessary to ensure that the number of tests can not be overdue without affecting the measurement of the friction and wear test data. The friction and wear test is three levels of three factors, so choose L9 (34) orthogonal table friction and wear tests. According to the above factors and the number of levels with the arrangement of 9 tests, take the average of each test results.Orthogonal test nine trials arrangements, as shown in Table2.

Table 2 The Orthogonal design

factor	1	2	3
NO.	A	B	C
1	1	1	1
2	1	2	2
3	1	3	3
4	2	1	2
5	2	2	3
6	2	3	1
7	3	1	3
8	3	2	1
9	3	3	2

IV. Abrasion Test Results

According to the statistical analysis of friction and wear test data, the friction and wear data of moving parts under different conditions were measured.The measured data are plotted as a fitted trend graph, which can clearly and concisely see the influence of the friction coefficient change caused by the friction and wear changes and the parameter factors under different friction pairs.Test a friction and wear data measurement and processing analysis

Group A, friction and wear test data Test load forces are:100N, 150N,The coefficient of friction of the friction surfaces of the moving parts at different rotational speeds was tested.

Group B, friction and wear test data Test rotation speed is:60r / min, 100r / min,The coefficient of friction of the surface of the friction device of the moving parts under different load is tested.The friction pair surface of the movement device is under the action of the lubricant, the range of the friction coefficient variation area on the friction pair surface is relatively small, and the variation tendency of the friction coefficient is not obvious.After the test data measured by statistical analysis, the conclusion of the chart: Table 3-5 is the test data and friction coefficient data records,Figure 3-6 shows the measurement results of friction and wear test data of group A, and observes the actual situation of friction and wear by observing the contact surface of the friction-worn moving device with a scanning electron microscope.

Table3-5 The data of test force and friction coefficient

F(N)	Friction coefficient	F(N)	Friction coefficient
60	0.0235	60	0.0223
80	0.0221	80	0.0210
100	0.0216	100	0.0215
200	0.0184	200	0.0192

According to the observation and analysis of the microscopic images 3 -10 and 3-11 of the friction pair obtained by the scanning electron microscope examination of the friction and wear test, it is known that as the rotational speed of the rotating shaft gradually increases, the work at the friction and wear contact surface of the moving device per unit time gradually increases , The temperature of the friction surface of the moving parts increases, resulting in certain changes of the material and chemical physical properties of the contact surfaces under the friction and wear of the moving parts.However, the friction and wear of the surface of the friction wear is relatively low, resulting friction coefficient friction coefficient decreases with increasing speed.From the external observation of the friction and wear test, the friction debris generated during the friction and wear of the contact surface of the moving device will reduce the friction of the system. That is, the friction debris acts as a lubricant. Under the external conditions of the parameter setting, the friction coefficient Will decrease .With the gradual acceleration of the moving speed of the moving parts, the material on the contact surfaces of the moving parts softens due to the gradual increase of the temperature, resulting in the failure of the movement. The breaking of the friction and wear contact points and the generation of indirect contact points on the contact surfaces of the new moving parts Is hindered, in this case the movement continues, friction and wear will contact the surface layer structure, the friction will become viscous friction.Friction and wear increased, this time need to take the necessary measures to reduce friction and wear.

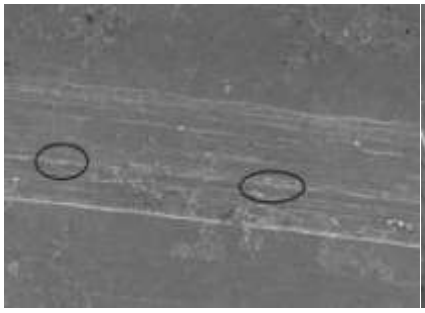

Figure 3-10 adhesive wear

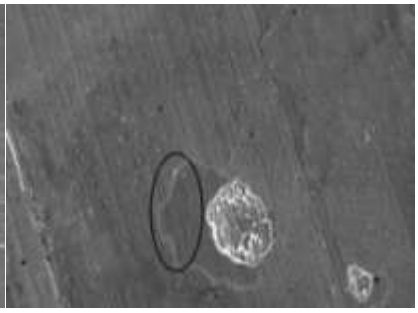

Fig. 3-11 lamellar structure

From the above analysis shows that the contact surface of the friction and wear under electron microscopy, the wear form is mainly based on the adhesive friction, friction and wear of a variety of other parallel friction.

V. Summary

This paper introduces a variety of methods for testing the friction and wear of moving parts and the experimental apparatus for testing wear and tear, as well as the experimental measuring equipment used in the friction and wear test of the moving parts, the design of the wear test and the analysis of the experimental measurement results. several data measurement methods of the friction and wear test design are demonstrated to determine the data measurement scheme of this wear test design:(1) The influence of the relative speed and the applied load on the friction coefficient of the moving parts was detected by pin-plate type friction pair wear.The contact of the pin-plate type and the ring-block surface of wear test test prototype, the change of the friction coefficient of the moving parts under the same moving speed and applied load was observed.③ Orthogonal test method for wear test, through the scanning electron microscope to get the worn surface wear information on the measured experimental data processing analysis.

References

[1]. Kalin M, Kogovšek J, Remškar M. Mechanisms and improvements in the friction and wear behavior using MoS 2, nanotubes as potential oil additives[J]. Wear, 2012, s 280–281(11):36-45.

[2]. Kovalchenko A, Ajayi O, Erdemir A, et al. Friction and wear behavior of laser textured surface under lubricated initial point contact[J]. Wear, 2011, 271(9–10):1719-1725.

[3]. C.S. Ramesh, R. Keshavamurthy, B.H. Channabasappa, et al. Friction and wear behavior of Ni–P coated Si 3 N 4, reinforced Al6061 composites[J]. Tribology International, 2011, 43(3):623-634.

[4]. Konicek A R, Grierson D S, Sumant A V, et al. Influence of surface passivation on the friction and wear behavior of ultrananocrystalline diamond and tetrahedral amorphous carbon thin films[J]. Physical Review B Condensed Matter, 2012, 85(15):543-548.

[5]. Wang Q, Zhang X, Pei X. Study on the synergistic effect of carbon fiber and graphite and nanoparticle on the friction and wear behavior of polyimide composites[J]. Materials & Design, 2010, 31(8):3761-3768.

[6]. Jia Z, Xia Y, Li J, et al. Friction and wear behavior of diamond-like carbon coating on plasma nitrided mild steel under boundary lubrication[J]. Tribology International, 2010, 43(1):474-482.

[7]. Ding T, Chen G X, Wang X, et al. Friction and wear behavior of pure carbon strip sliding against copper contact wire under AC passage at high speeds[J]. Tribology International, 2011, 44(4):437-444.

[8]. 8] Ulutan M, Celik O N, Gasan H, et al. Effect of Different Surface Treatment Methods on the Friction and Wear Behavior of AISI 4140 Steel[J]. Journal of Materials Science & Technology, 2010, 26(3):251-257.

[9]. Casstevens J M, Rylander H G, Eliezer Z. Influence of high velocities and high current densities on the friction and wear behavior of copper-graphite brushes[J]. Wear, 2012, 48(1):121-130.

[10]. Mangam V, Bhattacharya S, Das K, et al. Friction and wear behavior of Cu–CeO 2, nanocomposite coatings synthesized by pulsed electrodeposition[J]. Surface & Coatings Technology, 2010, 205(3):801-805.

[11]. JüriPirso, Mart Viljus, Sergei Letunovitš, et al. Three-body abrasive wear of cermets[J]. Wear,2011,271(11-12):2868-2878.

[12]. Idriss El-Thalji, ErkkiJantunen. A descriptive model of wear evolution in rolling bearings [J]. Engineering Failure Analysis,2014, 45:204-224.

[13]. Dag Lukkassen, Annette Meidell, Peter Wall. Homogenization of some variational problems connected to the theory of lubrication [J]. International Journal of Engineering Science,2009, 47(1):153-162.

Amarbat1,Jinxiaoyi." Research on Wear Based On MMS-2A Friction Tester." International Journal of Research in Engineering and Science (IJRES), vol. 06, no. 04, 2018, pp. 88–90.