STUDY OF ALUMINIUM ROD USING PORTABLE WEAR TESTING MACHINE

[1]Udhaya Chandran R M, [2]Umesh B, [3]Parthiban S, [4]Saranraj N, [5]Ram Kumar C
[1][2] Assistant professor, Department of Mechanical Engineering
[3][4][5] UG Scholar, Department of Mechanical Engineering
Adithya Institute of Technology, Coimbatore

Abstract - Pin on disc is still the most common method used to test wear of material products in most areas. However, the coast of product is high and the machine is large and products may have adverse economic effects on domestic and international markets. Our project has made more portable and used in all industries and in small scale industry and convenient to travel and the various readings are digitalized.

Keywords: - Wear Testing Machine, Fabricated Design, Testing Material, Calculations,

1. WEAR TESTING

Research conducted by Glaeser and Ruff reported that pin-on-disc were the most widely used wear test processes, followed by pin-on-flat. Other applications of pin-on-disc include material wear and friction properties at elevated temperatures and in controlled atmospheres.

2. SELECTION OF WEAR TESTER

LABORATORY TEST

- Abrasive wear tester
- Rolling sliding wear tester
- Pin-on-disc-machine

3. DESCRIPTION OF EQUIPMENTS

The wear testing machine consist of motor, base frame, load cell, rotating disc, tachometer, sample holder, weight slots

4. LOAD CELL (SINGLE POINT TYPE)

A Load Cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being Measured.

Fig. 1 Load Cell

A Load Cell is a sensor or a transducer that converts a load or Force acting on it into an electronic signal. This electronic signal can be a voltage change, current change or frequency change depending on the type of load cell and circuitry used. There are many different kinds of load cells. We used resistive load cells.

5. LOAD CELL DESCRIPTION

SPECIFICATION	RANGE
Load	10kg
Make	Hbm / Nova tech
Type	Tension And Compression Mode
Accuracy	Class 0.1 Or Better
Cable, 6 Wire	PVC Insulated Cable Along With Voltage Sensing And Mating Binder Socket
Nominal Sensitivity	2mv/V
Linearity Deviation	+ 0.1 % Or Better
Operating Temperature Range	-30 To +85°C
Warranty	Minimum One Year

Table.1 Load Cell Description

6. STRUCTURAL FRAME

Structural Frame Are Used To Support Mechanical Equipment And Provide Rigid Platforms For Attachment Of Vibration Isolators, Without Allowing Excessive Differential Movement Between Driving And Driven Members. The Bases Provide A Means By Which The Equipment Can Be Stabilized And Motion Reduced By Lowering The Equipment Center Of Gravity.

Fig.2 Structural Frame

FRAME DESCRIPTION

SPECIFICATION	RANGE
TYPE	L-TYPE
MATERIAL	MILD STEEL
LENGTH/WIDTH	AS REQUIRED
WEIGHT	10 KG

Table.2 Frame Description

7. ROTATING DISC

In Geometry, A Disk (Also Spelled Disc) Is The Region In A Plane Bounded By A Circle. A Disk Is Said To Be Closed Or Open According To Whether It Contains The Circle That Constitutes Its Boundary.

Fig.3 Rotating Disc

DISC DESCRIPTION

SPECIFICATION	RANGE
TYPE	CIRCULAR
DIAMETER	16CM
WIDTH	4MM
MATERIAL	MS

Table.3 Disc Description

8. MOTOR

An Electric Motor Is An Electrical Machine That Converts Electrical Energy Into Mechanical Energy. In Normal Motoring Mode, Most Electric Motors Operate Through The Interaction Between An Electric Motor's Magnetic Field And Winding Currents To Generate Force Within The Motor. In Certain Applications, Such As In The Transportation Industry With Traction Motors, Electric Motors Can Operate In Both Motoring And Generating Or Braking Modes To Also Produce Electrical Energy From Mechanical Energy.

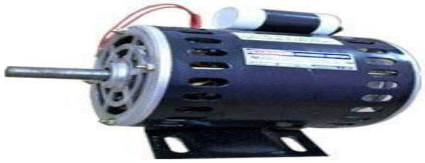

Fig.4 Electric Motor

MOTOR DESCRIPTION

SPECIFICATION	RANGE
TYPE	AC
SPEED	1440 RPM
RATING	0.25 HP
VOLTAGE	230V/50HZ

Table.4 Motor Description

9. SENSORE SETUP

The signal from the load cell was transferred to the amplifying board circuit controlled and the controller sends the electrical signal to digital signal

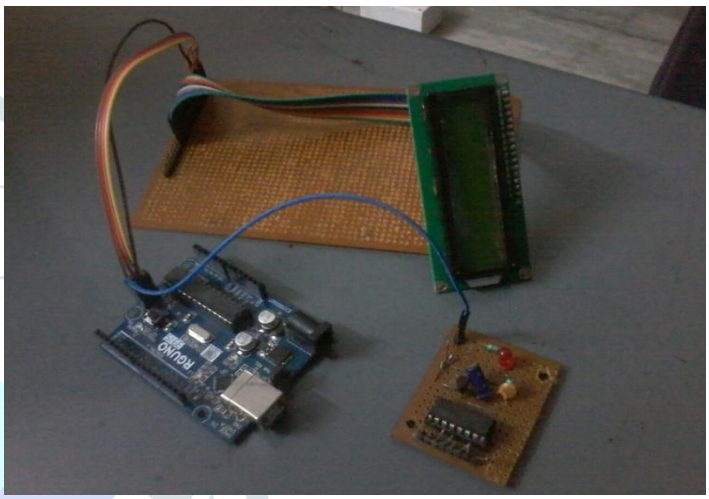

Fig.5 Sensor ADRIANO RUGINO (controller ATMEUA 328P)

10. MACHINE BASE

The machine base is of L Type angle pipe made of mild steel material and the various legs are of jointed by welding process.

Fig.6 Machine Base

CALCULATION &TABULATION

CALCULATION-1

POWER (P) =2ΠNT/60

T=P*60/2ΠN

T = 180*60/2Π*1440

TORQUE (T)= 1.31 NM

PRESSURE (P) =F/A

AREA (A) = (Π * D² / 4)

$$A = (\Pi * 0.008^2 / 4)$$

$$A = 0.000052\ M^2$$

$$FORCE\ (F) = m * g$$

$$F = 3 * 9.81$$

$$F = 29.43\ N$$

$$PRESSURE\ (P) = 29.43 / 0.000052$$

$$P = 565.96*10^3\ N / M^2$$

11. METHODS OF FABRICATION

The top of the cutter is moved by using the motor. The moving cutter is placed inside the cutter stand, which is placed above the base of the cutter. The fixed blade is place above the L-angle. It is fixed by welded or tightened by screw. So that the movable blade is moved up and down motion.

The movable blade is connected at one end of the connected rod another end of the connected rod is connected to the plate. The plate is connected to the spindle of the motor. The motor is fixed at the top of the sheet cutter by tightening the screw. The plate is screwed to the spindle.

12. WORKING PRINCIPLE

A pin on disc consists of a stationary "pin" under an applied load in contact with a rotating disc. The pin can have circular shape to simulate a specific contact, and so are often used to simplify the contact geometry. Coefficient of friction is determined by the ratio of the frictional force to the loading force on the pin. The loading is measured using load cell and loading is of manual.

BILL OF MATERIAL

COMPONENTS	QUANTITY
Motor	1
Load Cell	1
Aurdino Board	1
Others	As Required
Rotating Disc	1
Frame	As Required
Work Shop Jobs	As Required

Table.5 Bill of Material

13. CONCLUSION

The project carried out by us made a portable task in the field of small scale industries and automobile maintenance shops. It is very useful for the workers to work with wear tester in the small scale industries.

This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available.

REFERANCE

[1] Francis E. Kennedy, Y.L.A.I.B., Contact Temperatures And Their Influence On Wear During Pin-On-Disk Tribotesting. Tribology International, 2015. Vol. 82, Part B: P. Pages 534-542.

[2] D. Baykal, R.S.S., H. Haider, V. Saikko, T. AhlroosAnd S.M. Kurtz, Advances In Tribological Testing Of Artificial Joint Biomaterials Using Multidirectional Pin-On-Disk Testers. Journal Of The Mechanical Behavior Of Biomedical Materials, 2014. Vol. 31: P. Pages 117-134.

[3] XinminLi, M.S.A.U.O., A Pin-On-Disc Study Of The Tribology Characteristics Of Sintered Versus Standard Steel Gear Materials. Wear, 2015. Vol. 340-341: P. Pages 31-40.

[4] Askari, M., Khorsand, H., Aghamiri, MS.: Journal of Alloys and Compounds, vol. 509, no. 24, p. 680

[5] Larson, M., Berg, S., Maroli, B.: Technical Report 2005. Höganäs Comp., p.1-9 Presented at PTECH 2003 in Guarajá, Sao Paolo, Brazil, http://www.hoganas.com/en/News-Center/Published-Articles/Properties-of-Cr-Alloyed-PM-Materials/

[6] Lewenhagen, J.: Materials Science Forum, vol. 416-418, 2003, p. 241

[7] Bidulský, R., Actis Grande, M., Kabátová, M., Bidulská, J.: Journal of Materials Science and Technology, vol. 25, 2009, no. 5, p. 607

[8] Wang, J., Danninger, H.: Wear, vol. 222, 1998, p. 49

[9] Hu, B., Klekovkin, A., Milligan, D., Engström, U., Berg, S., Maroli, B.: Technical Report 2004 – Höganäs Comp., p. 1-13. Present at PM²TEC 2004, Chicago, USA, 2004, http://www.hoganas.com/en/News-Center/Published-Articles/Properties-of- High-Density Cr-Mo-Pre-Alloyed-Materials-High-Temperature-Sintered/

[10] Frykholm, R., Bergman, O.: Technical Report 2005 – Höganäs Comp., p. 1-14. Presented at PM²TEC2005, in Montreal, June 22, 2005, http://www.hoganas.com/en/News Center/Published-Articles/Chromium-Pre-Alloyed- PM-Steels-Suitable-for-High -Performance-Applications/