

DESIGN AND FABRICATION OF PIN- ON-DISC WEAR TESTER

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ABSTRACT

The sliding of metal parts when they are non-lubricated is important in many mechanical devices covering a wide range of velocities, but the sliding velocity of the non-lubricated metals which are tribological in behavior. A tribometer is an instrument that measures the tribological properties such as coefficient of friction, wear volume between two surfaces. There are various types of tribometer four-ball, pin on a disc, block on a ring, bouncing a ball and twin disc. In this paper, we have focused on taken aluminum (Al) disc and another mating part is of high-speed steel (H.S.S) pin which makes point contact. In this paper, we calculate the deformation rate by considering the obtained graph with respect to the sliding speed and volume loss. These deformation testers are generally used in light truck brake pads, railway tracks, etc.

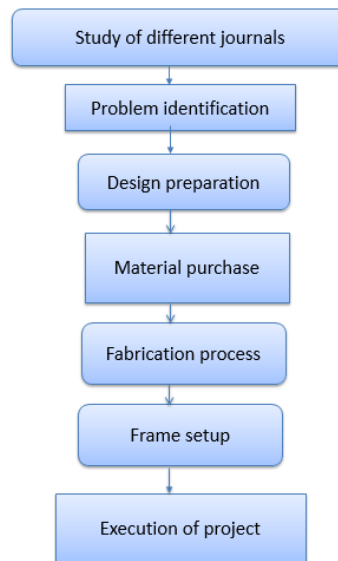
Keywords: Wear in a plate, Motorised machine, Surface testing, Deformation in a plate, Pin test, Steel plate, Cast iron pin material, Laboratory device.

1.INTRODUCTION

Wear testing is a method for assessing erosion or sideways displacement of material from its "derivative" and original position on a solid surface performed by the action of another surface. This test is commonly used as a simple measure of workability of material in service. Materials behave differently in friction state so it may be important to perform mechanical tests which simulate the condition the material will experience in actual use. Wear testing is typically carried out on the A356 alloy. Wear tests of the selected alloy is a critical parameter for determining the quality of these materials. The loads and forces acting on these materials while in service are compressive in nature and their ability to withstand such loads and forces without failure is a measure of their reliability. The availability of a wear testing machine for materials is the first step to effective quality control and good manufacturing practice. The establishment of quality control facilities by manufacturers for continuous assessment of product quality is a necessary requirement for ensuring compliance with the relevant standard and maintaining product quality that will continue to meet the needs of the uninformed users.

Pin on disc wear tests is carried out by applying a constant normal load in the contact while rotating the disc at a constant speed. The weight loss is continuously measured and stored to calculate the wear rate. The aim of this study was to evaluate the effect of changing the load on the rate of wear, by design a device to find out the rate of material removed under the effect of different loads.

III. PROPOSED METHODOLOGY



IV. Single Phase Induction Motors

As mentioned above that, due to the rotating magnetic field of the stator, the induction motor becomes self starting. There are many methods of making a single phase induction motor as self starting one. Based on the starting method, single phase induction motors are basically classified into the following types. Split-phase motor, Capacitor start motor, Permanent capacitor run motor, Capacitor start capacitor run motor and Shaded pole motor. The rotating magnetic field is produced when there are minimum two alternating fluxes, having a phase difference between them. The resultant of these two fluxes produces a rotating flux which rotates in space in one particular direction. So in all the above methods or say types of induction motors, the additional flux other than main flux should have a certain phase difference with respect to main or stator flux.

If the phase difference is more, starting torque will be more. So the starting torque of the motor depends on the rotating magnetic field and thereby, additional means (whether it is an auxiliary winding or anything). Once the motor picks up the speed, this additional winding is removed from the supply. This is the basic principle followed by all these types of single phase induction motors.

A belt is a loop of flexible material used to mechanically link two or more rotating shafts, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys and the shafts need not be parallel. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts) or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to continuously carry a load between two points. A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and more.

V.PULLEY

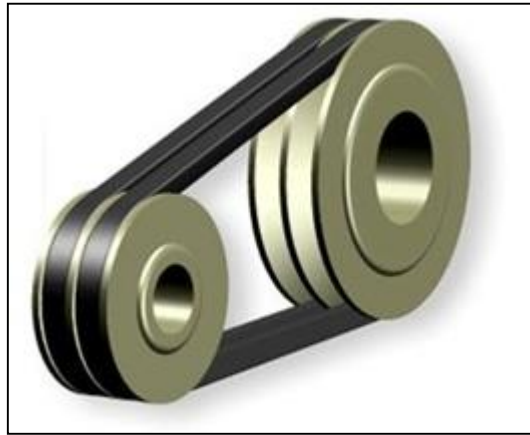
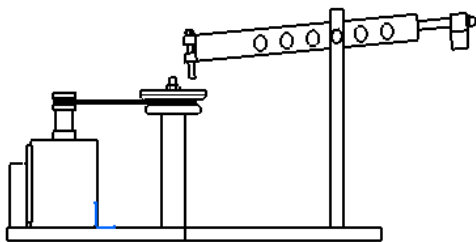


Fig 1 : Pulley

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. In nautical contexts, the assembly of the wheel, axle and supporting shell is referred to as a "block." A pulley may also be called a sheave or drum and may have a groove between two flanges around its circumference. The drive element of a pulley system can be a rope, cable, belt, or chain that runs over the pulley inside the groove. Hero of Alexandria identified the pulley as one of six simple machines used to lift weights. Pulleys are assembled to form a block and tackle in order to provide mechanical advantage to apply large forces. Pulleys are also assembled as part of belt and chain drives in order to transmit power from one rotating shaft to another.

A belt and pulley system is characterized by two or more pulleys in common to a belt. This allows for mechanical power, torque and speed to be transmitted across axles. If the pulleys are of differing diameters, a mechanical advantage is realized. A belt drive is analogous to that of a chain drive, however, a belt sheave may be so that the mechanical advantage is approximately given by the ratio of the pitch diameter of the sheaves only, not fixed exactly by the ratio of teeth as with gears and sprockets. In the case of a drum-style pulley, without a groove or flanges, the pulley often is slightly convex to keep the flat belt centered. It is sometimes referred to as a crowned pulley. Though once widely used on factory line shafts, this type of pulley is still found driving the rotating brush in upright vacuum cleaners, in belt sanders and bandsaws. Just as the diameters of gears and, correspondingly, their number of teeth determine a gear ratio and thus the speed increases or reductions and the mechanical advantage that they can deliver, the diameters of pulleys determine those same factors. Cone pulleys and step pulleys (which operate on the same principle, although the names tend to be applied to flat belt versions and V belt versions, respectively) are a way to provide multiple drive ratios in a belt-and-pulley system that can be shifted as needed, just as a transmission provides this function with a gear train that can be shifted. V belt step pulleys are the most common way that drill presses deliver a range of spindle speeds

Fig 2 : 2D design of deformation testing machine



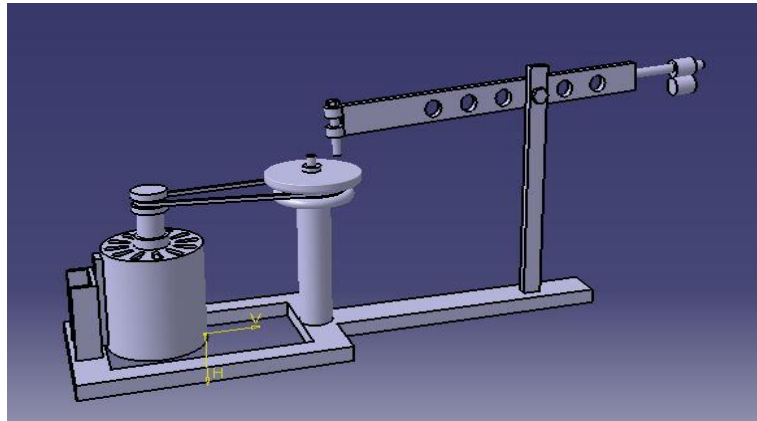


Fig 3 . 3D design using CATIA V5 R20

Having calculated the ideal angle of contact, force of impingement and the distance of fall for a Mild Steel, we would now be in a position to predict the condition that should be maintained to minimize wear. However it should be noted that wear being highly specific to geometry, physical properties, metallurgy and a host of other factors all our predictions will pertain to the samples used only. As such it cannot be generalized to all samples. This is one of the major impediments to wear studies. Also as indicated wear may occur due to various reasons and modes however we would be in a position to study only one mode i.e. erosion wears. Hence all our predictions will be made under the assumption that wear is occurring only due to erosion and no other factor or mode is coming into effect.

VI. CONCLUSION

A tribometer is an instrument that measures the tribological properties such as coefficient of friction, wear volume between two surfaces. There are various types of tribometer four-ball, pin on a disc, block on a ring, bouncing a ball and twin disc. In this paper, we have focused or taken aluminum (Al) disc and another mating part is of high-speed steel (H.S.S) pin which makes point contact. we calculated the deformation rate by considering the obtained graph with respect to the sliding speed and volume loss. These deformation testers are generally used in light truck brake pads, railway tracks, etc.

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