Research Paper Engineering

Magnetic Levitation System in Sliding Unit

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ABSTRACT

This paper deals with the magnetic levitation system in a sliding unit, which is interesting and visually impressive equipment for demonstrating no contact between two tribo pairs with the help of permanent magnetic strips. In order to stimulate future research, after short description of the system operation, several open problems in areas of permanent magnetic bearings are offered. The aim of the present research is to study the effect on wear rate of sliding part.

Keywords:

INTRODUCTION:-

Loss of material removal by wear is a universal phenomenon and has attracted the attention of many a scientist, engineer and technologist owing to its importance. Adhesive wear occurs in a wide variety of plain bearing materials. Friction and wear are of considerable importance in most of the structural components, particularly in bearing applications. The chief objective of research in this area is to minimize loss due to wear at all levels. Wear is due to "friction forces". In elementary physics we discuss the friction force as it occurs between two objects whose surfaces are in contact and which slide against one another.

If in such a situation, a body is not moving while an applied force F acts on it, then static friction forces are opposing the applied force, resulting in zero net force. Empirically, One finds that this force can have a maximum value given by: F (max) s= μsN Where μs is the coefficient of static friction for the two surfaces and N is the normal (Perpendicular) force between the two surfaces.

If one object is in motion relative to the other one (i.e.) it is sliding on the surface) then there is a force of kinetic friction between the two objects. The direction of this force is such as to oppose the sliding motion and its magnitude is given by: fk = μkN Where again N is the normal force between the two objects and μk is the coefficient of Kinetic friction for the two surfaces.

To calculate this frictional force, spring balance method is applicable, Pull a spring balance connected to the block and slowly increase the force until the block begins to slide. Make sure the spring balance is parallel to the surface. The reading on the spring balance scale when the load begins to slide is a measure for the static friction, while the reading when the block continues to slide is a measure of dynamic friction. The coefficient of friction is simply T

$$\mu = F_{spring} / F_{normal} = F_{spring} / (m_{block} \cdot g),$$

$g = 9.81\ m/s^2$

Serviceable engineering components not only rely on their bulk material properties but also on the design and characteristics of their surface. This is especially true in wear resistant components, as their surface must perform many engineering functions in a variety of complex environments. The behavior of a material is therefore greatly dependent on the surface of a material, surface contact area and the environment under which the material must operate. The surface of a metallic material is made up of a matrix of individual grains, which vary in size and bond strength depending on the means by which the material was manufactured and on the elements used to form those grains.

PRINCIPLE:- Use of Magnetism principle which states that like poles repel and unlike poles attracts each other (Maglev trains use these basic principles to force the train upwards above the track surface).

Use of permanent magnetic strips instead of electromagnets, by avoiding the control system along with the electricity for power. Magnet strips are using in sliding unit as contact-free between two surface, no need of lubricantion and maintenance is required.

The Strength of magnetic strips is about 5mT composed of a high-ferromagnetic compound (usually ferric oxide) mixed with a plastic binder.

No electromagnetism is used to generate these magnets. These magnets are arranged in a stack with alternating magnetic poles, the pole-pole distance is on the order of 5mm.

EXPERIMENTAL SETUP & DETAILS

1. Selection of a sliding unit in which magnetic strips are fixed in internal splines, as shown in Fig.1

2. Strips are fixed such that both the upper faces are like poles.
3. There should be close fit in splines and strips.

CONCLUSION

The sliding unit weighing 0.4kg with permanent magnets shows the gap of about 0.98mm.this is a significant amount of gap with for no contact and frictionless motion. Further this may be implemented on bearings, as control system is eliminated here, in this magnetic levitation system.

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