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Parametric Analysis of Linear Motion Drive Elements

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ABSTRACT: In machines, very difficult to check parallelism in ball screw, because of intricate shapes such like pitch. so that it takes more time and not give exact values. To overcome these problems, we had designed a new setup. It is very easy to fix in machines and it will reduce the time and it will improve the accuracy.

KEYWORDS: ball screw, LM rail, accuracy, parallelism.

I. INTRODUCTION

Ball screw is a mechanical component that used for convert the objects into rotational motion to linear motion with a less friction. Due to the ball between the nut and the shaft, the friction effect is less compared to the trapezoidal shaft. The reason for using this trapezoidal shaft is the high efficiency. A linear rail or linear motion guide is used for to support the moment and load of an equipment in a linear way vertically or horizontally.

Dial gauge is a measuring instruments and it is used to measure the flatness of an objects. The dial indicators are used as the essential part of any system for comparison. Linear motion is the basic of all the movements, according to the newton first law of motion, objects that do not experience net force move continuously in a straight line with constant velocity until they are subjected to net force. In everyday situations, external forces such as gravity and friction can change the direction of an object motion. so that its motion cannot be described as linear. one can compare linear motion with general motion.

In general motion the position and velocity of a particle are described by vectors, which have size and direction. In linear motion direction of all the vectors describing the system are equal and constant, meaning that objects move on the same axis and do not change direction. Therefore, the analysis of such systems can be simplified by ignoring the directional components of the vectors involved and dealing only with the scale.

II. RELATED WORK

Ball screw and LM rail is system which is designed to support the movement and load a piece of equipment in linear way, either horizontal or vertical way. LM rail and ball screw are in friction alignment for the movement of equipment.

So, we use dial gauge to check the alignment of LM rail and ball screw. Because of its intricate shape of ball screw, it's difficult to check the alignment and it takes more time to dial. so our intention is to reduce the duration of the ball screw dialing and check the alignment of ball screw with more accuracy.

For that we planned to fix the block which is located in middle of the ball screw. so than we able to check the alignment with more accuracy than we reduce the time duration of dialing. we design a setup with help of 2 side plates, 1 top plate, 1 bottom plate, 4 rods and Springs, 2 pushes and adjustable plates to fix the block of the ball screw. The use of bottom plate is to hold the block of the ball screw.

Then top plate and side plates are used to withstand the force of springs. If the size of the ball screw is varied then bottom plate adjust according to it with the help of rods and springs deflection the spring was attached with top plate.

Then we use adjustable plate to adjust the LM rail alignment. By this we able to easily dial the intricate shape of the ball screw with less duration.

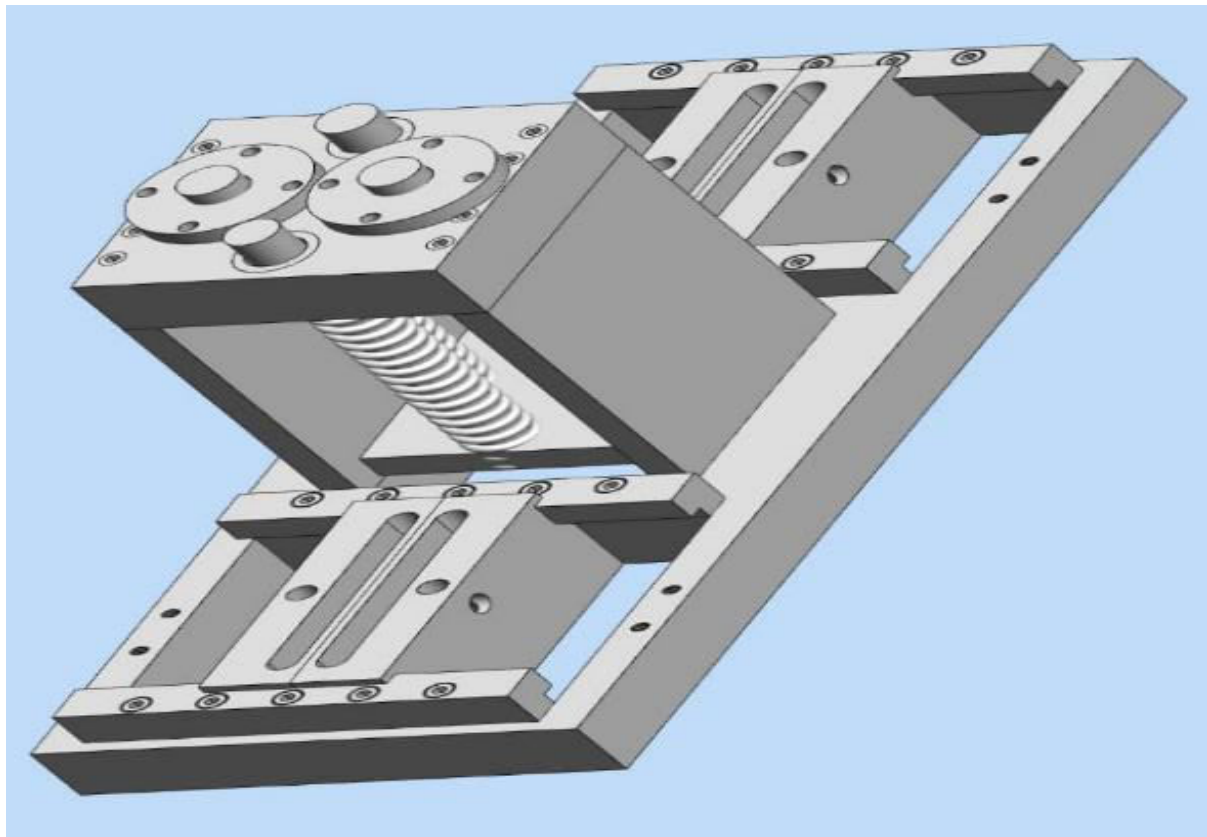
III. METHODOLOGY

In this project we study and discuss about a ballscrew and LM rail. Both are used to support the load and movement of equipment this are in various sizes. The dialing method used for the ball screw is complicate because of its shape and this method cause more time. To overcome this difficult we designed a 3D modelling setup which is called ball screw dial zig with a help of a solid works in ball screw dial zig set up we use spring to compress. This compress technique is used to fix a various sizes of ball screw. For that we analysis the equivalent stress of spring, equivalent elastic strain of spring, directional deformation of spring by using ANSYS software. After this analysis we define that our setup is cable to reduce the dialing timing and dialing difficulty and also increase the accuracy of dialing.

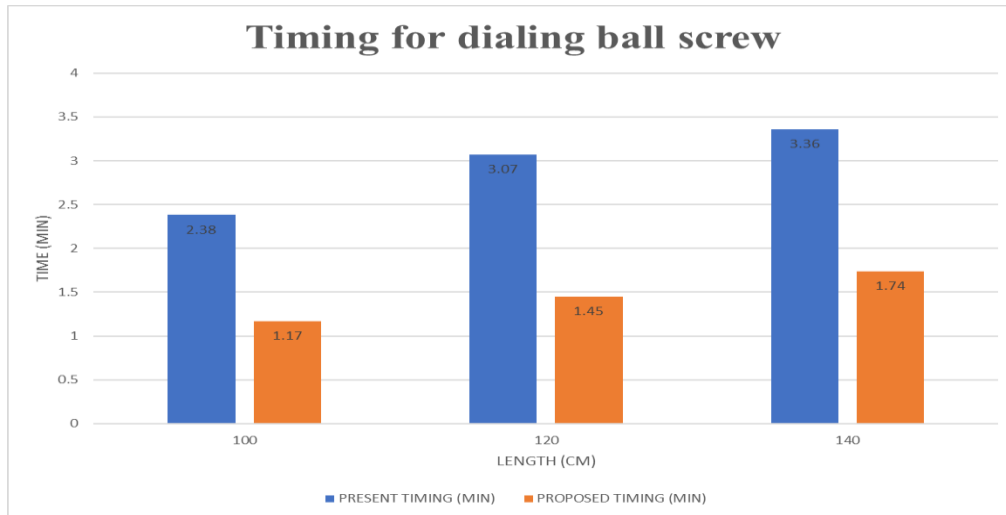
IV. EXPERIMENTAL RESULTS

We designed a setup which help to hold the block of the ball screw tightly and its is used for the various types of ball screw and LM rail. While using this setup we achieve the precision and reduces the dialing time.

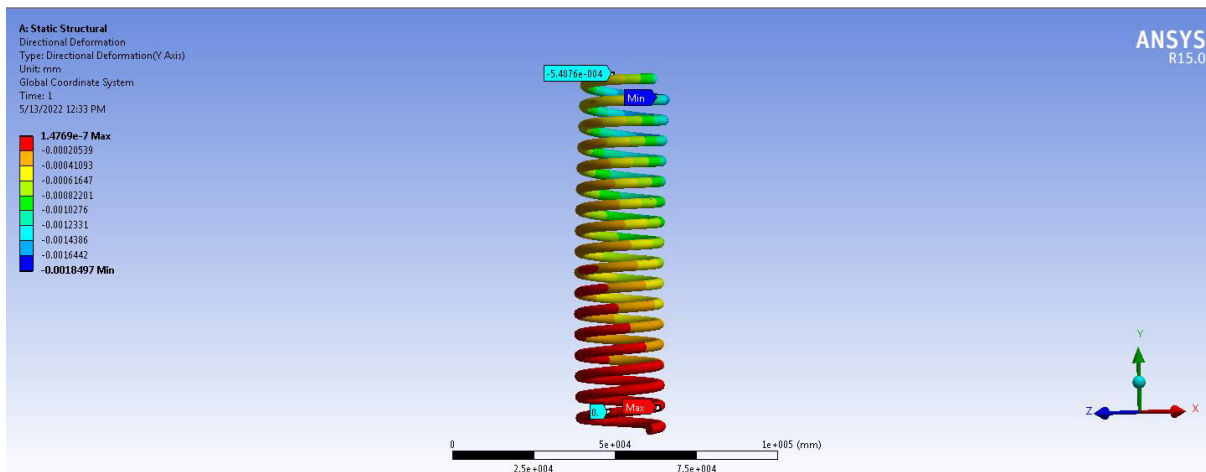
It's suited to various dimensions. So, we easily able to dial an intricate shape of the ball screws and also used to alignment the LM rail and ball screw. It was a simple method. So, this method is easy to handle for the workers.



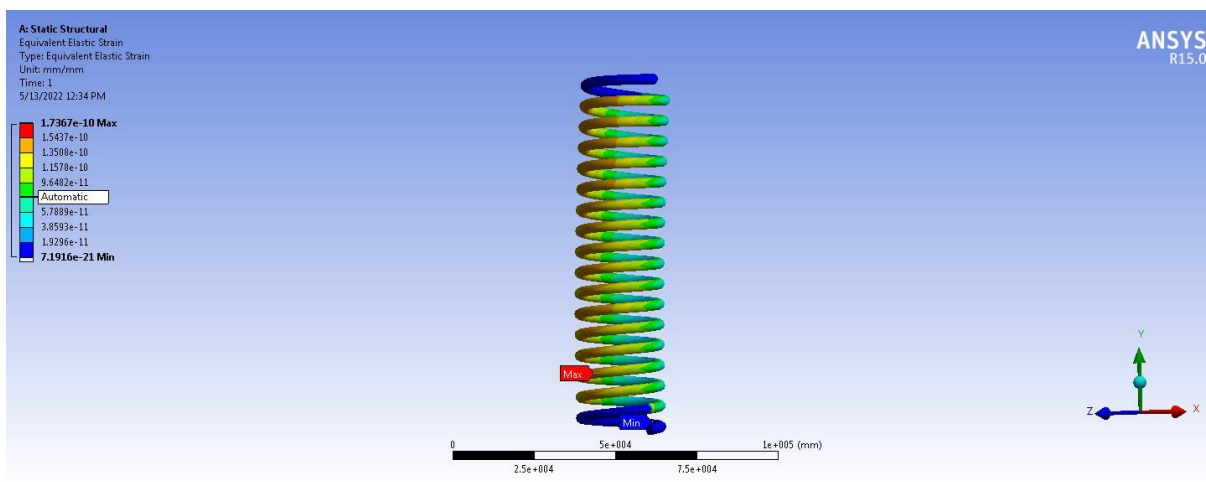
a) ASSEMBLY VIEW



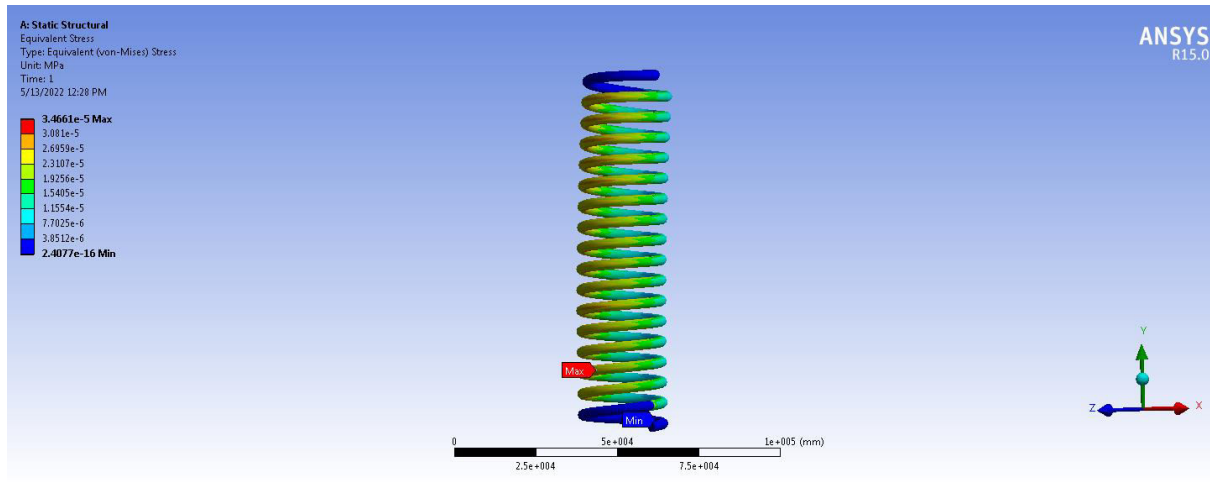
b) CHART



c) DIRECTIONAL DEFORMATION



d) EQUIVALENT ELASTIC STRAIN



e) EQUIVALENT STRESS

V. CONCLUSION

By using this setup, we can check the parallelism of the ball screw easily, accuracy and reduce the time. Firstly, it places the coil, which are the main sources of ball screw. The parametric study and linear motion analysis result about the feasibility of the ball screw. The finite element analysis is carried out to obtain the deflection of the coil.

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