EXPERIMENTAL INVESTIGATION OF DIFFERENT DAMPING MATERIALS

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ABSTRACT

The basic purpose of a damper is to reduce the vibration and to have better comfort and safety. The characteristic of the damping system has an important influence on its design and overall performance of the system. Modeling of the damping of a structure constituted of these different materials is established considering finite element analysis based on FFT analyzer Experimental investigation of the damping of the different materials is implemented using motor fix rpm. Modeling applied to the experimental results allows us to obtain the damping parameters of the materials and constituents. Next, modeling is applied to the analysis of the damping of a simple shape structure constituted of the different materials. The results obtained are compared with the experimental results of the frequency response of the structure.

Keyword: - *iron tank top, wooden block, a metal block, polymer plate, motor, vibration analyzer, etc….*

I. INTRODUCTION

Much has been written about vibration over the years. This includes many papers and books on vibration in general and a number of papers on vibration in induction motors in particular. This is an ongoing subject, continually extended by advances in analytical and diagnostic tools and methods. For this reason, and because this is an important and complex subject, it is worthwhile periodically to both present any new knowledge and experience as well as to review prior knowledge and concepts. Vibration problems can occur at any time in the installation or operation of a motor. When they occur it is normally critical that one reacts quickly to solve the problem. If not solved quickly, one could either expect long term damage to the motor or immediate failure, which would result in immediate loss of production. The loss of production is oftentimes the most critical concern. To solve a vibration problem one must differentiate between cause and effect. For this to happen, one must first understand the root cause of the vibration. In other words: where does the force come from Is the vibratory force the cause of the high levels of vibration or is there a resonance that amplifies the vibratory response. Perhaps the support structure is just not stiff enough to minimize the displacement. In this paper, the various sources of electrical and mechanical forces will be explained. Additionally, how the motor reacts or transmits this force and how this force can be amplified or minimized will be explained as well. When a vibration problem occurs it is important that one use a good systematic, analytical approach in resolving the problem. This includes performing the proper diagnostic tests. The process starts by listing all the possible causes for the particular identified frequency of vibration and any variations under different operating conditions. Then eliminate the incorrect causes one by one until all that remains is the true source of the problem, and now this can be efficiently eliminated.

II. SOURCES OF VIBRATION

There are many electrical and mechanical forces present in induction motors that can cause vibrations. Additionally, the interaction of these various forces makes identification of the root cause elusive. In subsequent sections, the major mechanisms are discussed. For a more comprehensive list of electrically and, mechanically induced vibrations should be referenced.

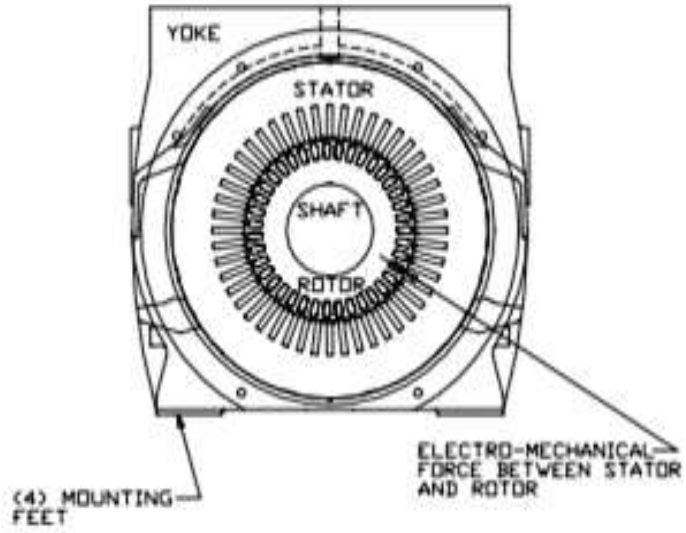

Fig -1: stator & rotor

For rotor currents to be induced, the speed of the physical rotor must be lower than that of the stator's rotating magnetic field, otherwise, the magnetic field would not be moving relative to the rotor conductors and no currents would be induced. As the speed of the rotor drops below synchronous speed, the rotation rate of the magnetic field in the rotor increases, inducing more current in the windings and creating more torque. The ratio between the rotation rate of the magnetic field induced in the rotor and the rotation rate of the stator's rotating field is called "slip". Under load, the speed drops and the slip increases enough to create sufficient torque to turn the load.

3. RESULTS AND DISCUSSION

Table -1: Results of using a different damper

Sr. No.	X(m/s) RMS	Y(m/s) RMS	Z(m/s) RMS
On Table Point 1	0.012528	0.006086	0.004955
On Table Point 2	0.027264	0.007891	0.018339
On Metal block 1	0.015002	0.012089	0.012783
On Metal block 2	0.012484	0.009721	0.009112
On Wooden block 1	0.002004	0.002900	0.002064
On Wooden block 2	0.001842	0.002882	0.003795
On Polymer block 1	0.02382	0.011296	0.007759
On Polymer block 2	0.019512	0.004866	0.010012

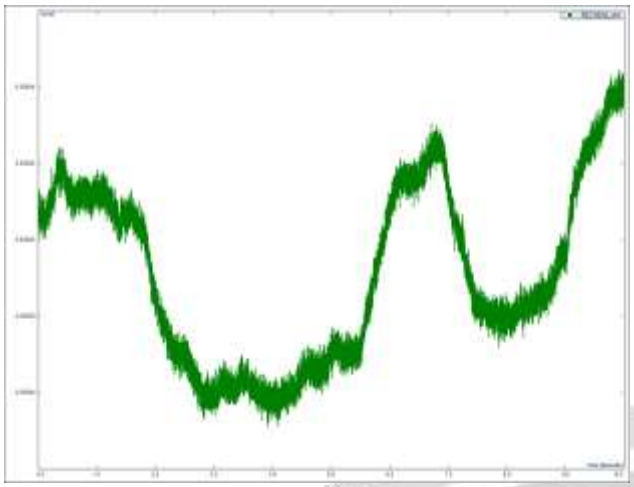

Fig. 2 -Signal Property in m/s without damper

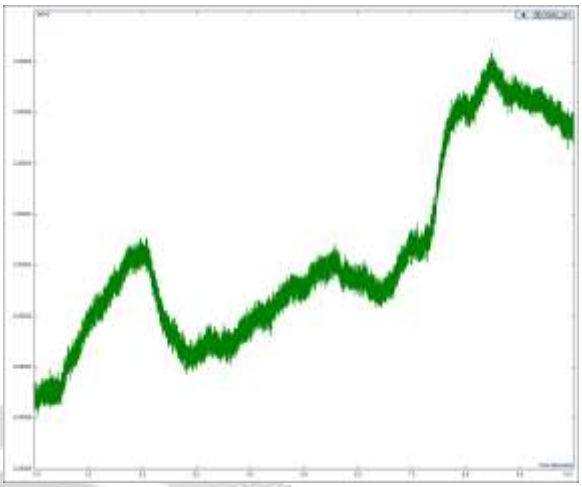

Fig.3 - Signal Property in m/s with damper

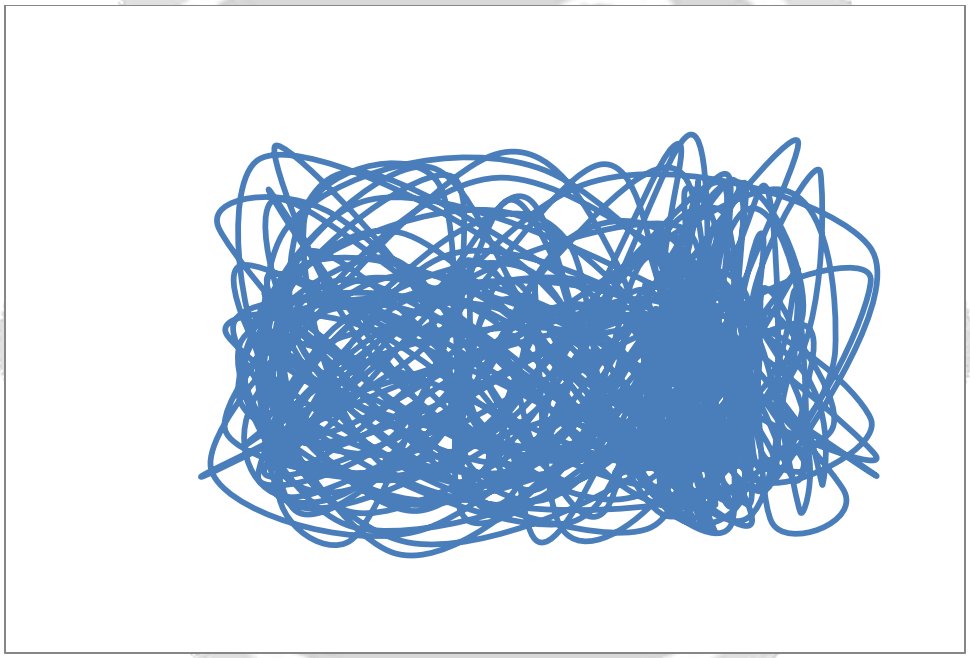

Fig. 4 –Orbit plot for both Channels

Above result shows that in Table 1 for different damping material use different data find and positive results for wooden & metal block uses. Fig 2 & 3 shows signal property in m/s without & with a damper so amplitude value shoes and fig 4 shoes orbit plot for both channels.

A vibration damper takes energy out of the system. When you increase the damping in a mechanism or structure there will be a reduction in vibration and noise and the dynamic stresses applied will be reduced with a resulting benefit to the fatigue life among many other benefits.

These types of vibration damping are the most common, and they can all be accomplished with Sorbothane. This substance can be formed in any way you want, and it doesn't break down with absorbing repeated vibrations, which makes it great for long-term use. If you're looking to control vibration in a fine engine system or a larger machine, this is a great substance that you might consider using.

Fig. 5- Experimental setup

4. CONCLUSIONS

In the present research work, four types of damping materials have investigated at a laboratory. It has observed that amplitude of vibration was reduced by 79.3% in the vertical axis and 63.48% along the table axis with a combination of wooden & metal block combination as a damping material. While applying nonmetallic damper such as polymer had magnified the amplitude of vibration instead of reducing it. Thus it is concluded that a combination of wooden block & metal block may produce a better damping effect as compared to individual material. This paper leads to conclude the significant information for maintenance engineers.

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