Experimental Investigations in Vibration & Noise Control on Forging Machines at M/s Bill Forge

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***Abstract*:- The purpose of our project is to reduce vibration and noise on industrial forging machine. Our project is based on industrial orientated project. By reducing the vibration on 1 Ton & 2 Ton forging machine the company can manufacture more number of component. Since, we are doing the industrial project the company we approach is M/s. BLL FORGE PVT LTD. The forging machine will produce vibration and noise when punching and forging the work piece. Noise transmitted directly through the air is called primary noise, which is usually treated by a sound insulation room or a sound barrier. Another kind of noise is that the vibration is transmitted to the surroundings through the equipment foundation, which causes the vibration of the floor and the wall of the building, and produces structural noise, which we call secondary noise, to control this kind of noise, it is necessary to install vibration absorber or elastic vibration absorb foundation.**

Keywords: This project was based on the controlling of vibration in friction drop forging machine.

I. INTRODUCTION:

Noise is commonly described as unwanted sound. This definition implies a strong element in any assessment of the effects of noise. Since the level of sound may be tolerated by one person may be intolerable to another. Noise is by no means a recent phenomenon; it is only with the rapid industrialization of the last century and the accelerated development of powerful high-speed machinery that it has become a

Forging process is an experience-oriented technology with a great know-how for many years. These processes produce the complex configuration from simple geometry with minimum waste of materials and energy. Therefore, hammer forging process and tool design were developed mainly by trial-and- error. The advantages of a forging process such as higher strength to weight ratio, acceptable dimensional and superior micro structure of products are highly attractive for a lot of engineering parts. Faster processing and high material output of forging technologies reduce the costs of forged parts with complex geometry. A forging technique was improved to manufacture the thick-walled pipes without the use of a mandrel

II. LITERATURE SURVEY:

Many small scale production business owners do the process of weighing and packaging their product manually. Small and Medium scale production business owners who particularly produce items like 'Chide', etc. has to do the weighing, filling and packaging process manually. The sealing process is carried out with the help of candles. This process is very time and effort consuming and thus it limits their production as well as their business. It is observed that the cheapest machine which would automate this process of weighing and packaging costs and it is manufactured by 'All pack Engineers'. Automatic Weighing and Packaging which is priced at the rate mentioned is not affordable for small scale and medium scale businesses. This project aims to develop such a machine which automatically weighs and packs the seed with the help of microcontroller. The idea is to manually place the bag, then weighing, filling and packaging is done. The purpose of doing this project is to reduce human efforts and time consumption. Decreasing machine cost is the major advantage of project. The machine design is based on simple mechanisms and it can be installed easily. The speed of packaging is increased thus resulting in more production and business. It will eradicate the traditional packing and sealing method. This process will reduce the number of paid workers.

III. MODELING AND INVESTIGATION OF ACTIVE NOISE CONTROL SYSTEM

The results of modeling and investigation of experimental head set with active noise control system are presented. On results of simulation the rated step size of adaptive algorithm was choose. The structure of experiment equipment and measurement results of the passive insertion loss, total insertion loss, active insertion loss, dependence of total insertion loss on the angle of experimental headsets rotation and dependence of total insertion loss on the sound pressure level of environment noise are presented. For the protection of the auditory organs from the harmful effect of loud sound signals it is using passive and active means of protection. Passive protection is very effective against mid- and high- frequency noise, but low-frequency noise generated by engines, motors, and fans is more challenging. Low- frequency noise waves, prevalent in many industrial environments, are longer, can travel great distances, and can penetrate passive barriers. Active Noise Control (ANC) is the only effective method of attenuating low-frequency noise. ANC is achieved by electronically coupling a noise wave with its exact mirror image, thereby canceling the noise.

VIBRATION MEASUREMENT TECHNOLOGY AND SIGNAL ANALYSIS

As it has been mentioned, vibration can be measured in terms of displacement, velocity or acceleration. The selection of one or another will depend mainly in the frequency of the signal being measured. As it illustrated in Figure 66, low frequency signals reflect better its amplitude in terms of displacement. This is below 10 Hz (600 cycles per minute CPM). In the case of high frequency signals, "acceleration values yield more significant values than velocity or displacement". For this reason acceleration is preferred for signals over 1000-1500 Hz (60-90 cpm). Finally velocity is preferred between 10 Hz and 100 Hz (Schaffer & Gerhard, 2004, pp. 21,22). For this reason, bearing damage generate high frequency vibration signals is often expressed using acceleration units. Figure 66 Relationship between displacement, velocity and acceleration at constant velocity.EU, engineering units.

Basic concepts of signal analysis

A periodic signal has different features which are convenient to introduce at this point. These features are not easily visible in vibration signal collected within condition monitoring, mainly because is composed a variety of signals with different frequency. For this reason it may not helpful to explain these features by showing a real signal. However a sinusoidal signal can illustrate better different features associated with the signal as it shown in the Figure .The figure shows a sinusoidal signal during an interval of time. The amplitude of the signal refers to magnitude of the vibration which because its periodicity, it will change over time. The maximum absolute value of amplitude detected is called peak. The difference between the maximum and minimum is called peak to peak value.

Aliasing and sampling frequency

When vibration data is collected in form of points (amplitude, time) it is important to know that this is just a representation of the "real" signal. This is because the analogue signal is sampled at a certain equal intervals of time. Thus using a certain sampling frequencies. The higher the sampling frequency, a more close copy of the real signal will be obtained. However this is often limited by capacity in the instruments used to acquire data. In fact it can result in a false representation of the signal with totally different period and characteristics. Observed and studied by the Swedish-American. However it is common practice to use as sampling frequency 2.56 times the highs frequency aimed to measure. Most of the modern acquisition systems guide the user to decide an appropriate sampling frequency based on these principles. In an early stage these signals appear in a range of 500 Hz-2 kHz. Therefore the sampling frequency should be at least 4 kHz. This is equivalent to 4000 samples per second. If data storage is not a limitation, oversampling is also a good option for ensuring robust data acquisition.

Equipment

The equipment used in the experimental part of this work is described below. It consists basically in three machine tool spindles, accelerometers used to collect vibration and auxiliary equipment for measuring vibration

Data Acquisition equipment

Two data acquisition equipment were used. The first was SEMA 600 (SEMA-TEC) which is a portable collector and analyzer of vibration measurement used in industry. This equipment is commonly used for maintenance proposes because gives a friendly user‟s interface. This collector/analyzer have a custom software named SEMALYST where allow to obtain rapidly key parameters when measuring vibration. It also has 6 channels in which four of them correspond to ICP cards for connecting accelerometers. ICP cards operate in a frequency range of 0.1 Hz to 25 kHz. Besides the cards allow a sampling frequency of up to 500 kS/s. this sampling frequency which is reduced to 65kS/s when the 6 channels collect in parallel. The second acquisition equipment used was SCADAS mobile unit SCM01 provided by LMS. In this case it corresponds only to a recorder unit. Therefore the data processing has to be carried out by an external Computer. SCM01 is used for laboratory but also industrial application because its compact dimension and low weight (2.5 kg).

MATERIALS USED IN FORGING MACHINE

There are s materials used in forging machine, they are

- *Steel*
- *Aluminium*
- *Stainless steel*
- *Titanium*
- *Carbon steel*
- *Brass*
- *Alloy*
- *Alloy steel*
- *Nickel*

METHODS OF MANUFACTURING

The component was comes under various methods to get finish component.

1. Billet cutting
2. Billet heating
3. Hot forging
4. Hot Trimming
5. Heat Treatment
6. Fettling (Grinding process)
7. Shot Blasting

8. Coining

9. Parting off (only for yokes)

BILLET CUTTING:

Machine (billet shearing machine) is **a kind of cold shearing machine, which is used to cut steel bar for the closed die forging production line**. With PLC control, automatic feeding, automatic cutting, automatic counting, automatic lubrication and overloading protection .

Billet Cutting

It was the starting process in the manufacturing. The big rod metal was cut into various pieces. The process are done in the CNC machine. Only one person was operating the machine. Loading and unloading was fully automation. In this machine no vibration is there only cutting noise comes

BILLET HEATING:

Billet heating is also used for heating billets made out of copper, aluminium, or other non-ferrous metals and alloys. The induction billet heating furnace can heat the billet to temperatures ranging from room temperature to over 1500 degrees.

This was the second process in the company. Before forging process the metal is to heat for shaping up the metal. In this process the machine we use for heating is IBH induction billet heating. In this IBH metals are heated in 1200degree Celsius. The IBH machine uses 350 kW of power to heat the metals. Its is also automated process. No noise and vibration in this machine.

HOT FORGING:

Hot forging can be defined as "a metal shaping process in which a malleable metal part, known as a billet or work piece, is worked to a predetermined shape by one or more processes such as hammering, upsetting, pressing and so forth where the work piece is heated up to about 75% of its melting temperature".

Hot forging

HOT TRIMMING:

It is the next process after Hot forging. In this process the formed metal are trimmed by trimming machine. Here they remove the excess metals in the shaping process. Here the machine was trim the metal in vertical motions.

HEAT TREATMENT:

Heat treating is used to alter and improve the physical properties of a given material using a heat treat furnace. Typical heat treatment techniques applied to steel forgings include annealing, normalizing, quenching, and tempering. Precipitation hardening applies to super alloys, titanium and some PH stainless steels.

Fig. Heat Treatment

IMPLEMENTATION & RESULTS

By implementing the method for reduction of vibration and noise on FRICTION DROP FORGING MACHINE 1ton and 2 ton.

By using the rubber and polyurethane material we can reduce the vibration of forging machine. The two materials are mixed together and form a composite material called polyurethane rubber. **The ratio of mixture is 1:1**

ANALYSIS:

PROCESS	**MAN**	**MACHINE**	**METHOD**	**MATERIAL**
Billet cutting	One person	CNC	Material cutting in automation	Carbon steel
Billet heating	One person	IBH MACHINE	Heating the material	Carbon steel
Hot forging	Eight person	Friction drop forging machine	Drop method with using	Carbon steel
Hot trimming	Two person	Trimming process machine	Removing the excess part in the material	Carbon steel
Heat treatment	One person	Hardening and normalizing machine	Heating up the material again and dip into the oil.	Carbon steel
Fettling	One person/ machine	Grinding	Removing the burr particles	Carbon steel
Shot blasting	One person	Shot blasting	Removing small particles	Carbon steel
Coining	Two person	Photo sensor controller	Correct shaping of the work piece	Carbon steel
Parting off	One person	Lathe machine	Separation of solid mixture.	Carbon steel

CONCLUSION:

The mechanical vibrations of a Friction drop forging hammer machine were investigated in order to understand the influence of different control parameters on the forging efficiency. It was shown that for a constant value of mass ratio, the forging efficiency increases with a reduction of the restitution. Coefficient. The forging efficiency is independent of the mass ratio after exceeding a value of 50. The effect of the initial velocity of the anvil before contact between die and part on the forging efficiency was theoretically investigated. The forging efficiency increases about 4% for an initial velocity of the anvil of about 0.2 m/s. The free damped mechanical vibrations of the anvil are found to be depended on the machine mass. The aver-age value of the restitution coefficient k was obtained about 0.6 for all tests. The experimental results showed that the time setting or delay between two blows increases the forging efficiency up to
12%. The energy loss during the (hammer) fall was determined to be approximately 10% . Normal vibration on friction drop forging machine is 98 Hz. Vibration is measured using „vibrometer".On our project we have an idea to create a pit under the friction drop forging machine. The pit drilling was up to 4-5 feet depth hole and fill-up with "Vibration resisting materials" Vibration resisting materials are the materials which has a ability to absorb maximum level of vibration. Vibration resisting materials – "Rubber", "Polyurethane"

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