Design Modification of Failure Mode Effect Analysis of Vibrating Feeder used in Crushing Industries

Prashant Salat[1] Amit Anakiya[2]
[1]P.G. Student [2]Assistant Professor
[1,2]Department of Mechanical Engineering
[1]Gujarat Technological University, India [2]Veerayatan Group of Institutions, India

Abstract— Vibratin feeder technology is common in material handling applications in numerous industries. This review paper examines a problem with fatigue in the support structure of a specific type of vibrating feeder. It also reviews the theory behind vibrating feeder technology and considerations that engineers who design them need to be aware of. The finite element method is used to replicate a fatigue problem in the support structure and various design configurations are then analyzed to reduce the risk of the conditions that caused the fatigue. The results are reviewed and recommendations are made to improve the design and modify the component dimensional parameters vibrating feeder.

Key words: Vibrating feeder, Ansys, Goodman diagram, FEMA

I. INTRODUCTION

The power, or motivating source, is attached to the feeder screen at a prescribed angle. This angle will vary due to the physical characteristics of the product. the entire feeder, being either suspended or on isolation mounts, is moved forward and upward, which also moves the material forward and upward .the screen then returns back to its original position. However, the material does not move backward due to the slower action of gravity.

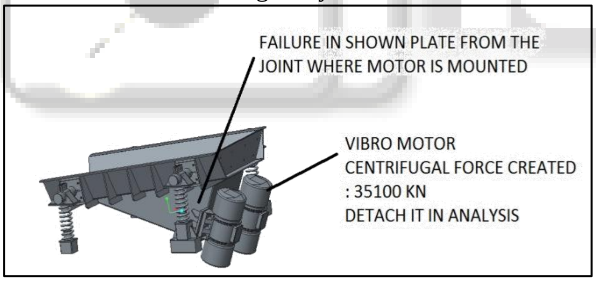

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Fig 1: Box type vibrating feeder

In above fig vibrating feeder shown.in that fig also shown that where the failure occurred in plate the joint where Motor is mounted

The case study by Dr. Bhavesh P. Patel et al. [1].and shown that the design of the vibratory screen used in coal mining industry. The life of the vibrating screen is more the six month but its fails half of design life because loading bending stress is more the design available bending stress so its fails, by changing supports in slot direction and support height is change in such a way that the bending stresses reduces within the limiting value.

Guo Sheng et al.[2] present paper they got that the model established by finite element method using ansys softwere. Vibrating screen box is fails due to the resonance of working frequency and natural frequency so the stress distributions and deformation in various parts of the screen box under rated load like cracks of the bottom screen frame and side panels, for improving the vibrating screening by changing working frequency is beyond 10% of the natural frequency for reducing resonance also modify structure sieve box by connect flange to connect the bottom screen frame with the side panels.

Su Ronghua ex al.[4] Using ANSYS, static analysis and dynamic analysis were made for a certain large-scale linear vibrating screen structure, weak links were found out in structural design. The improved schemes were proposed for vibrating screen structure. The static and dynamics analysis's results of each schemes were compared, the optimal improved scheme was obtained. It is shown that, in the vibrating screen structure, dynamic stress is oversize at the positions of crossbeam, discharging beam and in-material beam, the values are much larger than static stress, and these are caused by notched specimen in beam components .Optimal improved scheme of beam section is finalized by computer simulation analysis, after substituting it for original design, stress distribution of the vibrating screen is ameliorated in working process, and the fatigue life is increased.

Frantis'ek Novy et al.[5**],** in that ,a study of the fatigue behavior of the bearing steel 100Cr6 and austempered ductile iron tested between 10^3 and 10^{10} cycles. Substance fatigue crack initiation related to microstructure in VHC region (very high cycle). Subsurface fatigue crack initiation is associated with internal structural heterogeneities such as inclusions, micro pores, micro-shrinkages, big graphite particles, long grain boundaries suitably oriented to loading direction, small grains. and found that fatigue crack in all 100cr6 bearing steel between 3.5×10^3 and 10^8 and also in ADI fatigue crack initiation $5\times10^3$and 10^{10}.so observed that the s-n diagram depend on type loading.

Gregory J et al.[6]. in that they shows that a study of the apparent that the support structure of the existing configuration was not adequate due to field failures stainless steel fails below its yield strength. design changes in the support structure components dimensional variables can significantly lower stresses during operation. Simply increasing the thickness of the support tube wall and increasing the length of the bracket leg reduced stress in the support tube where the cracking had occurred by a substantial amount.

Dejan Momcˇilovic´a et al.[7] in this paper they got that the analysis of load carrying capacity of the shaft and its metallurgy failures of material and failure analysis done by finite element method. they got that 20GSL material not satisfied quality of shaft material. The shaft is fails due to the corrosion of shaft found by finite element method.

S.K. Allah Karan et al.[8]. In that they show, the Extensive fractographic and metallurgical analyses were done by using a scanning electron microscope (SEM) equipped with energy dispersive spectroscopy (EDS). Analytical and mechanical testing results revealed that the failure was due to the propagation of radial and vertical cracks caused by fretting fatigue crack initiation at the bolted joints where the side plate was connected to the sieve housing. The crack initiate near bolted two different materials.

J. P. Karthik et al.[9]. in this they are using different approaches like marrow, Goodman, Gerber. they found the when the loading sequences is predominately tensile in a nature, the life of the more sensitive by Goodman approaches is conservative but in loading is predominantly tensile in nature, the life of the component in morrow approach is more sensitive and is therefore recommended. when using the time histories has zero mean base, all three methods have been given approximately the same results.

P. J. Tavner ex al.[10].in this paper they using failure mode effect analysis method for wind turbine. The RPN(risk priority number) data calculated from the FMEA has been compared with field failure rate data for assemblies of wind turbine.by FEMA ranked in assembly order giving a clear picture of the unreliability of assemblies, subassemblies and parts. This could be a useful tool for designers to identify weak points in the wind turbine design.

Robert Stone et al.[11].he shown that The purpose of this paper is to review the proper methods by which spring manufacturers should estimate the fatigue life of a helical compression springs during the design phase. The paper will begin with a working definition of fatigue and a brief discussion of fatigue characteristics. A short history will be presented as to how fatigue test data has been evaluated historically(e.g., S-N curves, Weibull-distribution, modified Goodman diagrams,etc.) Spring-specific Modified Goodman diagrams, presented in the new SMI Encyclopedia of Spring Design, will be discussed. These Modified Goodman diagrams have been sufficiently characterized to facilitate direct calculation of predicted life. These calculations will be presented along with a comparison to the results of traditional graphical methods.

Mahmood Shafiee.[12].he shown Failure mode and effects analysis (FMEA) has been extensively used by wind turbine assembly manufacturers for analyzing, evaluating and prioritizing potential known failure modes. However, several limitations are associated with its practical implementation in wind farms. The proposed FMEA methodology provides an organized framework to combine the qualitative (expert experience) and quantitative (SCADA field data) knowledge for use in an FMEA study. The building blocks of RPN method are discrete, and therefore cannot represent effectively the strength of criticality. But, the CPN method is based on the cost consequences of failures which are expressed in monetary unit. So, it makes the proposed FMEA methodology more understandable, realistic and practical for wind farm managers

II. CONCLUSION

From review of above literature we can conclude the following points:

- Inclined deck Vibrating feeder is more screened compare to liner deck screened.
- Goodman, soderberg, Gerber, approaches are give different values for total reversed cycle loading but if zero base cycle it's give similar values for each approaches. .
- FEMA method is the best method for finding weakest part in the assemblies.
- The fatigue crack initiation depends on micro-structure material like metal or alloy, micro-pores, micro-shrinkages, of alloy, micro-pores, micro-shrinkages, long grain boundary.
- The best design modifition in vibrating feeder box plate by increasing thickness of plate, or by proper welding done at plate where it fasted with the side beam of the box of feeder.

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