ISSN : 2455-9679
Impact Factor : 1.389

IJRTSM

INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

"A STUDY ON FATIGUE FAILURE OF FLANGE IN SCREW CONVEYER WITH NON-NEWTANION MATERIAL GREASE"

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ABSTRACT

This paper reviews recent work on screw conveyors performance evaluation during handling process, especially in the case of agricultural grains and bulk materials. However, each of these techniques is limited in its application. Difficulties in representing vortex motion and interactions among conveying grains and between the particles and screw rotating flight have so far limited the success of advanced modeling. Further work is needed to be conducted on screw augers performance to understand and improve the non newtanion fluid like grease and bulk materials handling process. Screw Conveyors are compact and easily adapted to congested locations, versatile and can be employed in horizontal, inclined and vertical installations can be used as a mixer or agitator to blend dry or fluid ingredients, provide crystallization or coagulant action, or to maintain solutions in suspension. Problem associated with screw conveyer is fatigue failure of flange during work. Flange joints are common in screw conveyor. Flange connects the gearbox of motor with casing of screw conveyor. To find the reasons of the fatigue failure a review is to be taken from the literatures.

Keyword: *Screw conveyor, flange, fatigue failure, grease*

I. INTRODUCTION

In industry there are various requirement of motion for which the prime movers are used like Motors or Engines. Motors are widely used as prime movers as it gives uniform motion and control of speed and direction is easy as compared to engines. Requirement of torque and revolution is done by gear box. In most of the industries, Screw conveyors are popular devices for conveying farm products, cement etc. Thousands of portable units have been used to move or elevate grains into and out of storage bins. As one aspect of increased mining mechanization, many auger conveyors are being installed as integral parts of continuous-flow systems. The screw conveyor is one of the oldest methods of conveying materials known to mankind with the original design dating back to more than two thousand years. Since the screw conveyor came into general use a little over a century ago for moving grains, fine coal and other bulk material of the times, it has come to occupy a unique place in a growing area of material handling processing. Today, modern technology has made the screw conveyor one of the most efficient and economical methods of moving bulk material. They are very effective conveying devices for free flowing or relatively free flowing bulk solids, giving good throughput control and providing environmentally clean solutions to process handling problems because of their simple structure, high efficiency, low cost and maintenance requirement. Flange joints are common in screw conveyor. Flange connects the gearbox of motor with casing of screw conveyor. These flanges are included for support the

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connection and strength the joint also for it helps to attach many other components. The main problem in the joint assembly and disassembly connection so, bolt and nuts are used. Problem associated with connection is breakage of flange to overcome the problem the connection must be analyzed in static and dynamic condition. The present work is "stress analysis of flange for screw conveyor"

A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Rigid flange coupling are designed for heavy loads or industrial equipment. When joining shafts within a machine, mechanics can choose between flexible and rigid couplings. The connecting methods for flange couplings are usually very strong because of either the pressure of the material or the sometimes hazardous nature of materials passed through many industrial piping systems. The screw conveyor is one of the oldest methods of conveying materials known to mankind with the original design dating back to more than two thousand years. Since the screw conveyor came into general use a little over a century ago for moving grains, fine coal and other bulk material of the times, it has come to occupy a unique place in a growing area of material handling processing. Today, modern technology has made the screw conveyor one of the most efficient and economical methods of moving bulk material. Stresses produced in the hub and the maximum stress developed in bolts were analyzed and verified with experimental results. All real physical structures, when subjected to loads or displacements, behave dynamically. The additional inertia forces, from Newton's second law, are equal to the mass times the acceleration. If the loads or displacements are applied very slowly then the inertia forces can be neglected and a static load analysis can be justified. Hence, dynamic analysis is a simple extension of static analysis. The basic principle of material along the trough is similar to the sliding motion of a nut along a rotating screw when the nut is not allowed to rotate. The weight of material and the friction of the material against the wall present the load from rotating with the screw. The critical angle was considerably smaller than that predicted from static force equilibrium because of the spherical shape of modeled particles. The particles are likely to rotate rather than slip on the screw conveyor components. The transfer velocity of particles was almost equal to the advance velocity of the screw. The overall power is larger by about 15% than that derived from static force equilibrium using calculated results of the critical angle and the center of gravity.

II. LITERATURE SURVEY

V.G.Vijaya et. al [2013] did the stress analysis of rigid flange couplings subjected to torsion using ansys. The theory related to the title will be studied from 'FUNDAMENTALS OF MACHINE DESIGN by T.J.PRABHU Analytical solution will be obtained.[1]

Herum et. al [1960] investigated the performance of auger conveyors for farm feed materials at restricted delivery rates. His tests substantiated field observations that at less than capacity less power would be required than for capacity of an auger conveyor. He indicated that the relationship between delivery rate and power was generally linear. He also reported that if the desired delivery rate could be obtained at a number of different auger speeds, selection of the lowest auger speed results in the least power requirement. An exception to this generalization was noted as the conveyor reached its maximum capacity at any specific speed. At that point small increases in delivery rate lead to an exceptionally large increase in power requirements. He concluded that at conveyor inclinations of approximately 30° or less from horizontal with a given feed material and speed, the relationship between power and rate of delivery was usually linear throughout the range tested. He reported this result implied that a particle of feed material moves steadily through the conveyor from intake to discharge as a function of auger speed only. He observed that at conveyor inclinations of approximately 45 or greater (depending upon speed and feed material), a full-pitch screw conveyor was entirely filled at all delivery rates above zero. Also, if initially full, the conveyor would remain full even when the input rate was zero.[2]

Konig et. al [1960] examined the influence of inlet screw diameter on screw conveyor capacity and reported a nearly linear increase in capacity with increased inlet screw diameter up to a maximum point. After reaching to the point, capacity decreased. However, power required continued to increase with inlet-screw diameter after the optimum diameter for capacity was reached. Stevens [9] tested the performance of several auger conveyors. He indicated that less than 50 % of the power was used in moving grain along the tube. Some of the extra power required must be consumed at the intake hopper, where considerable circulation of grain was observed.[3]

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Impact Factor : 1.389

Rehkugler et. al [1962] proposed the application of dimensional analysis as a tool to develop a comprehensive prediction model for screw conveyor performance. [4]

O'Callaghan et. al [1962] studied the influence of intake length on power requirements for vertical screw conveyors operating at different speeds.[5]

Bouse et al. [1964] analyzed damage to castor beans in screw conveyors. They found that increasing rotational speed caused greater damage, and that clearance between conveyor casing and screw flight was important in reducing the amount of seed damaged by the screw conveyor.[6]

Burkhardt et. al [1967] tested the effects of pitch (distance between adjacent screw flighting), radial clearance, hopper exposure and hopper level on the performance of screw feeders. [7]

Peart et al. [1967] developed a performance-test procedure for screw conveyors which characterizes capacity, volumetric efficiency and power requirement.[8]

Bates et. al [1969] provided detailed analysis of mechanics and entrained patterns of screw feeders, especially those combined with hoppers.[9]

Brusewitz et. al [1969] reported that the screw clearance affects the volumetric efficiency. They indicated that the diametrical clearances up to 5 to 7 % have little effect on the volumetric efficiency, but a drop in efficiency of 0.7 % per 1 % increase in clearance can be expected. [10]

McFate et. al [1971] investigated the power-capacity relationships of nominal 20 cm screw conveyors when handling shelled corn. They reported higher volumetric efficiencies and power requirements with larger diameter conveyors.[11]

Sands et. al [1971] studied shelled corn damage during transport in a screw conveyor. They found that the conveyor caused a small amount of damage to dry corn when operated at full capacity, but the level of damage increased greatly when the conveyor was operated at 1/4 capacity. If corn had been dried at a high temperature, the level of damage was higher. As screw speed increased, the level of damage increased. Inclination angle had little effect on the amount of damage to shelled corn in a screw conveyor. They reported that damage to ambient-air dried corn was 1.2 % and high-temperature dried corn was 2.5 % when grain (13 % moisture) was conveyed through a 30 m long, 15 cm diameter screw conveyor operated at 50° incline angle and 550 rpm. [12]

Rademacher et. al [1974] developed a theory based on a physical model to describe the behavior of non-cohesive granular material inside a vertical screw conveyor. By use of this theory, relationships were derived between dimensionless numbers for capacity, power consumption and efficiency. These relationships were compared with the results of experiments carried out with two models of vertical screw conveyors, one of 50.8 mm and the other of 162.0 mm diameter. He reported that the agreement between the calculated and the measured values of capacity and power consumption was within 5 and 9 % respectively.[13]

III. FINDING OF THE REVIEW

Screw conveyor is one of the materials handling equipment used in the industry. Minimum time for material handling is required. As well as material handling should require cost for the equipments or machines handling the same. Also it should reduce the fatigue of the workers. Thus material handling plays important role in the industries. If the cost of material handling is more, it will lead to increase in the overall cost of the product which will increase the price of the product. To be competitive, every company tries to keep the material handling cost to the minimum. Thus it is one of the major areas in the industries where improvements can be made.

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Impact Factor : 1.389

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