"A review paper on Ansys Analysis on Screw Conveyor EmployingDiverse Coating Material"

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Abstract — Screw conveying system can be used in various type construction work and in various industries across the globe where the goods and products are hauled or pushed with the Screw's rotational effect. The perpetual undertaking of the screw sometimes governs to the failure which is extensively fatal for the industries, as per the production point of view.

Key Words: conveying system, electrical equipment, fly ash, vibratory conveyor ,waste water treatment

In auger mostly the flight of the screw get eroded due to continual operation and mostly in the industries where the abrasive material bring conveying with the help of screw conveyor. This encourage to more evolution in the screw conveying system in order to expand the vitality of the equipment. Numerous enforcement are heading to reduce the shortcoming in the auger unit under different operating conditions. Many publication proposed to change the unit's material of the finished screw, which is ample expensive hence it is essential to acquire such method which can reinforce the vitality of the conveyor with low expense and in limited time. The main purpose of the model is to evaluate the torque,Axial force and Power required for the scroll to haul the material. The model is presented in a non-dimensional form and the process for implementing the model is involved. The model is distinguished to test data from an exist publication; there was good agreement between the model and data. Outcomes are presented in the form of graphs to illustrate the significance of key parameters. The 3D model is created in CATIA software and this model is imported for simulation in ANSYS. There are four type of material used Titanium Nitride (TIN), Zinc SS440,and Zirkonium Nitride.Comparable inspection is conducted for all the four materials for total deformation, directional deformation and equivalent stress. Moreover the results calculated in this research work are analyzed with the outcomes of researches obtained in the prior years are examined for further use in future.

Keywords- Screw conveying, ANSYS, CATIA, SS440, Titanium Nitride (TIN), Zinc, Zirkonium Nitride

I. INTRODUCTION

It is the system which is operate for handling the material with the help of helical component used in it. The indispensable key requirement of the conveying system, item braces the kind of conveyor, it's configuration length, pitch of the screw and the all other electrical equipment. The main application of the conveying system is to transmit the food material, concrete, fly ash, chemicals etc. The foremost two design of the screw conveying system embraces of the paddle design as well as the ribbon design which depend on the variation of application for which they are employed. The main drive nit in screw conveyor is involves of motor stuck with the gearbox and the gearbox output get united with screw conveyor input through coupling or other organization of drive unit entitled chain and sprocket arrangement.

Conveyors are defines as equipment which can transport material or goods from one plane to another place without any effort allying to it. The structure of the conveyors are mostly based on frame, supporting roller or conveying roller or belt and the driven. The conveyors are used for transmitting the gravel material other aggregate, cement concrete paste, and cement slurry, for building construction work and also used for conveying solid or semi-solid waste during the raw wateras well as waste water treatment. In industries it is largely usedto substitute the coal, fly ash and the output product to the final destination of the plant. There are various category of conveyors utilize as the area and the type of work such as belt conveyor, roller conveyor, vibratory conveyor, bucket conveyor etc.

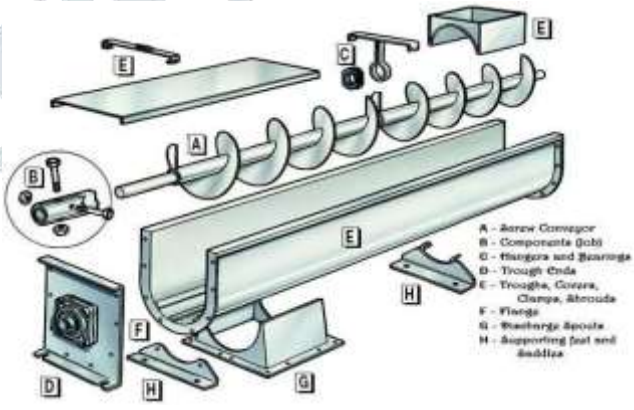

Fig. 1.1 Screw Conveyor

II. LITRETURE REVIEW

Bepariya Keyur et al 2018 performed investigation on new machine rather than old machinefor material handling purpose. The main purpose of the author in the present study is to utilize the land and it space in such a way that it can full fill the all requirement of the manufacturing process in which the material such as soaps biscuits waferscan be transfer frommanufacturing area to storage area at higher level with efficientout by using the screw conveyor as a material handling system.

Panchal Prit et al 2017 investigated about the present scenario of the industries and its drainage system such that it is the major problem which cause the pollution and leads to bad impact on biological life and this leads to the enhancement of the global warming. Author also explained the drawbacks of drainage pipe as it sometimes result as loss of human life. To overcome all the related problem author investigated the automated system using screw conveyor which can clean the waste named as "Automatic waste Cleaning System by screw conveyor" and also constructed the prototype of the present suggested system.

Amudha.K 2017 representedthe experimental analysis of the screw conveyor and performed a review on the performance of the screw conveyor under various operating conditions. In the investigation the author found that with different flow rates and feedrate there was no change in mass flow of the material. It was also observed the nodule output about 8.6 kg/rotation. In the study screw feeder operation took place for 150meter depth with mass loss of 14% due wash away of finer particles. It was concludedthat the design was validated in trials in sea for higher depth about 6000 meter depth.

lanrewaju T. O. et al 2017 performed experimental analysis on the screw conveyor for grains with inclination of 0°, 30° and 45° respectively. In the experimental analysis he found that for maize the average capacity of the screw conveyor was 407.05, 282.4 and 263.1 kg h-1 in case of gari the capacity of the screw conveyor was 460.0, 365.3, 310.0 kg h-1 and in case of sorghum the average capacity of the screw conveyor was, 450.2, 350.5, 263.0 kg h-1.With al, the output author concluded that screw conveyor with inclination provided 99.95% efficiency in case of handling the granules.

Mic**hael Rackl 2016** investigated the design parameters of the screw conveyor mass flow and driving torque for three grades of wood chips and two blends of wood chips. As a result it was found that one of the chip grade recoded high torque rate ie twice of the another and one get jammed. The result concluded that the blending of the wood chips can reduce the jamming to desirable rate.

Marianna Tomašková 2014 explained the complete working of the screw conveyor and the various design of the system which are utilized across the world for getting the best efficiency in material handling purpose. In the research paper also discussed about the various risks and drawbacks associated with use of screw conveyor for material handling purpose.

Jigar N. Patel 2013 represented the modification of the Auger in order to attain same output with small size and less power consumption. In the investigation author proposed the screw conveyor without shaft for conveying the cement with capacity of 2t/h. As a result it was found that screw conveyor are capable of conveying the material in inclination but its capacity decrease with increase in inclination angle.

III. OBJECTIVE

The objectives of the thesis are as follows:

(1) Reduction in the deformation in auger under various operating conditions through analysis of stresses and modification in the design.

(2) Minimizing stress generation under the above operated condition in order to increase the production as well as life of the equipment.

(3) To increase the life of conveyor blades by surface coating treat

IV. THEORETICAL METHOD AND REVIEW

A. SCREW CONVEYORS THEORETICAL FORMULA

The theoretical volumetric capacity of a screw auger is expressed as:

$$Q_t = \frac{\pi}{4}\left(D_{sf}^2 - D_{ss}^2\right) l_p n,$$

Where,

Qt = theoretical volumetric capacity, m3 s -1

Dsf = screw flighting diameter, m

Dss = screw shaft diameter, m

lp = pitch length, m n = screw rotational speed, rev s -1

In reality the actual capacity of an auger is considerably less than the theoretical capacity. This results in loss of volumetric efficiency. The volumetric efficiency is defined as:

$$\eta_v = \frac{Q_a}{Q_t},$$

Where,

ηv = volumetric efficiency

Qa = actual volumetric capacity, m3 s -1

Generally, the throughput rate in terms of mass (or weight) per unit of time, for example t h-1 or kg min-1 , is specified. The volumetric capacity is obtained by dividing the throughput rate by the bulk density of the material. The power requirement of an auger is

expressed by the specific power, defined as:

Where,

$$P_s = \frac{P/L}{Q_a \rho_b},$$

Ps = specific power, W s kg-1 m-1

P = power requirement, W

L = screw length, m ρb = material bulk density, kg m-

B. SCREW CONVEYOR PERFORMANCE

The performance of a screw conveyor, as characterized by its capacity, volumetric efficiency, and power requirements, is affected by the conveyor geometry and size,the properties of the material being conveyed, and the conveyor operating parameters such as the screw speed and the angle of inclination. The screw conveyors performance could be also specified considering the extent of grains damage when handling by the helical flighting.

C. MODELING

Modeling generally refers to a process in design which employs mathematical representation of model for 3D Surface of a model. There are various tools used for the modeling purpose in design industry, CATIA V5 R20 whichis one of them is used for the modeling screw conveyor in this research work.

D. FINITE ELEMENT ANALYSIS

The finite element analysis is a numerical method for solving problems of engineering. It is traditionally a branch of Solid Mechanics. Most common areas of interest are,Structural Analysis, and Mass Transport. For the designed Pistons it is a must to compare the performance of both pistons and for this purpose ANSYS 15 is used as FEA tool. ANSYS 15 is software used for solving a number of mathematical problems.

Finite Element method divides the structure into am number of finite elements and these elements are bridged with the help of nodes. The elements are chosen after study of the response and geometry of analyzed component. The results which are obtained by post analysis procedure dependon the mesh size. ANSYS Workbench provides potent, practical applications which simplifies the process of mesh generation, decreases the design cycle time, reduces the number of prototype production and testing, thus helpsproviding an optimum design.

The Process of Analysis is divided in following steps;

1. Pre-Processing
2. Solver
3. Post-Processing

V. EXPECTED OUTCOME

The literature survey shows, that most of the problemis present in screw conveyor's material. So it will be easily identified the best suited material which can bear maximum stress and lower deformations.

VI. COUNCLUSION

Where screw augers performance has been studied in conveying and transport of agricultural materials, the efforts have focused on agricultural grains (e.g., corn, wheat, oats), free-flowing and fibrous materials. Performance characteristics, e.g., screw rotational speed, transport angle and conveyor diameter, have been investigated, both forinclined and horizontal conveying.

From above study we found that the main issue concerned in all explanations is the flow pattern of a moving material and power consumption at different speed and pitch and diameter ratio. When material is transferred from the inlet to the outlet, the flow pattern of material particles is very difficult to examine. Clear understanding of the material particles flow pattern inside the screw coil is required for further investigation. So from above survey it is possible to predict performance of screw conveyor using finite element method (FEM). So for further, investigation on performance and flow pattern of stress and deformation does use Finite Element Analysis to get better understands.

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