A Review Paper on Flexible Spring Conveyor System for Material Handling System.

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ABSTRACT

Now days in industries it is very necessary to use material handling system for to move material from one place to another place continuously to minimize operation time. Various conventional conveyor systems like belt conveyors, bucket elevators, screw conveyors, pneumatic and vibratory conveyors, and roller conveyor system are use in industry, like food, chemical, plastic, material processing industry. In our case, selected industry being run on small scale certainly have limitations to adopt these conventional material handling systems to convey the powders economically and precisely. In this paper the suitability of flexible spring conveyor system is studied critically and compared with other conventional systems the manual material handling.

Keyword: *Flexible conveyors, spring conveyors, powdered material conveying*

1.INTRODUCTION

Industries handling powders or bulk materials like pharmaceutical, chemical, food, plastic industries have been see to exactly understand exactly the need of proper conveyor system to bulk material handling industry.[2]

Now a day's demand of quality products from customer, precision and accuracy in final output from the material handling is very important manual material handling is certain limitation and the needed for best material handling system arise.

It was found that so many industries are currently employing manual handling which results in inaccuracy in powder proportions at end use, delay in operation due to manual errors and other parameters.

Exactly the need of proper conveyor system to bulk material handling it is observed that manual handling of materials is having limitations in terms of quality, precision and optimum use of raw material. Material properties play an important role while selecting the proper conveyor system[1].

2. LITERATURE REVIEW

Mr. Santanu Chakarborthy et. al. says about study and create an adaptive design of semi-flexible screw conveyor using conventional specifications and standards. In this paper as stated above Screw Conveyors are used in a variety of situations. Some of these situations require material to be transported over a large distance or at considerable heights. Till date various concepts have been developed to satisfy the need of a flexible screw conveyor. Like, in April 1958, Inventors Marion H Fennimore and Ivan J Stephenson invented a Flexible Screw Auger for Conveying grain. One of the most difficult problems encountered with conveyors having flexible sections therein is that of bunching or folding of the flexible tubing at the inside of a bend. Such folding4 tends to restrict the flow of material within the tube. He has chosen to develop a Screw Conveyor model with three stages connected by universal joints. The universal joint allows power transmission at deflected angle in turn allowing each stage of the conveyor a certain degree of flexibility[3].

Mr. Vidhyadhar P. Kshirsaga says about "Modeling and Analysis of Belt Conveyer System used in various industries". Belt conveyor is the transportation of material from one location to another. Belt conveyor is a commonly used equipment of continuous transport; it has a high efficiency and large conveying capacity, high load carrying capacity, large length of conveying path, simple design, easy maintenance and high reliability of operation. That can be achieved at different distances, different materials transportation and also widely used in coal handling system in thermal power plant and other projects[5].
Mr. Ravindra Gandhe say that study and analysis of roller conveyor in material handling. A wide variety of related conveying machines are available, different as regards principle of operation, means and direction of conveyance, including screw conveyors, vibrating conveyors, pneumatic conveyors, the moving floor system, which uses reciprocating slats to move cargo, and roller conveyor system, which uses. A series of powered rollers to convey boxes or pallets on his work, an attempt is made to test the feasibility of a fiber composite material with optimum properties with an idea towards replacing the existing stainless steel material in industrial conveyor application[4].

3. WORKING

The flexible spring conveyor consists of minimum components as compared to other conventional conveyors systems, namely a spring made up of steel which is enclosed in a tubular casing or a flexible pipe of plastic[1].
While rotating; the spring automatically self-centers within the tube due to a phenomenon resulting from loose fit of a rotating spring within the tube completely.
Filled by the material to be conveyed. This in turn provides sufficient clearance between spring and the tube wall. This affords sufficient space for the particle to flow in the tube depending upon the particle size, angle of repose and flow ability of material. The one end of the spring is floating freely in the charging adaptor trough and does not require any bearing. As the discharge end is coupled to the motor drive above or beyond the discharge chute the seals or bearings not to come in direct contact with the powder .the flexible spring and enclosed tube are the only parts which come in contact with material directly. There are two forces acting on the material to be conveyed within the enclosed tube area an axial force that acts to convey the material along the tube and a radial force that presses the material against the tube. This radial force provides the barrier between the spring and the tube and remains in the centre of the tube. This phenomenon allows the flexible spring to be 'self-centering'[1].

Fig. Conceptual Small Scale Working Model Developed

Fig.Conceptual Model Working

4. COMPARISON OF PROPOSED SYSTEM WITH MANUAL AND CONVENTIONAL MATERIAL HANDLING

A) SPACE REQUIRMENT

Due to its wide flexibility, Flexible Spring Conveyor will be very useful in workplaces having space constraints. The flexible tube and spring can be easily carried and taken away to any position or place as and when required[1] .

B) ACCURACY AND PRECISION IN DISCHARGE

The output in this conveyor system being controlled by rotational speed of the spring, just by varying rpm of the drive we can achieve great control over the flow of material. In other systems metering has to be done at feeder end, controls are ineffective sometimes at the discharge end. Various new programming techniques can be employed to control the output at discharge end for spring conveyor system.

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D) DUST CONTROL

Dust control is the most common and challenging task in industries like food, chemical, agricultural etc as dust threatens safety of the human being directly exposed in the plant or indirectly involved end users of the product. In conventional conveyors dust control is not only economical but also is a skilled task which needs expensive and precise components to control.

E) WORKING AT DIFFERENT ANGLES OF ELEVATION

Conventional screw conveyors are restricted to lower angles of inclination. However other systems like bucket elevators are limited to vertical elevations and not effective much in horizontal conveying. The Flexible Spring conveyor can achieve the best between horizontal and vertical distances due to its flexibility.[3]

5. CONCLUSION

Keeping flow properties of bulk solids like bulk density, angle of repose and particle shape and size in mind, Flexible Spring Conveyor system can be a good substitute to manual material handling in small scale industries.

In economic point of view this system can be greatly useful and concept is highly appreciated by industries as far as its other advantages like accuracy in discharge end, adaptability in existing plant layout, overall cost and easy maintenance over conventional conveyors is considered.

6. FUTURE SCOPE

The mathematical model as well as a prototype is under development for future purpose to calculate and compare actual and theoretical performance parameters of the spring conveyor system.

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