International Journal of Advance Engineering and Research Development
Scientific Journal of Impact Factor (SJIF): 4.72
Special Issue SIEICON-2017,April -2017
e-ISSN : 2348-4470 p-ISSN : 2348-6406

A review paper on separation of solid waste by screw conveyor

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Abstract — *The present review paper considers about the screw conveyor and its application in different industries. The statically data on clear indication of day by day increasing pollution level of the water, which is creating negative environmental impact on biological life of the rivers and increasing global warming which leads melting of glacier. Now-a-days even though automation plays a vital role in all industrial applications in the proper disposal of wastage from industries and commercials are still a challenging task. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. Before that screw conveyor is use for the food industries, for carrying the load and other purposes. To overcome this problem we implement a design "Automatic waste Cleaning System by screw conveyor". In this paper we are going to design and construct automated prototype so it can save human loss.*

Keywords*-screw conveyor, automatic drainage cleaning, manual work, waste collector, drainage pipe*

I. INTRODUCTION

Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. In this project the proposed concept is to replace the manual work in drainage cleaning by automated system. Now-a-days even though automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still a challenging task.Screw conveyors are a very efficient method for elevating a variety of bulk materials at very steep inclines or completely vertical. The compact design allows for the vertical screw conveyor to fit into almost any plant layout. With a minimum number of moving parts, the vertical screw conveyor is a cost-effective and dependable component of any bulk material handling process.Screw conveyors to meet the needs of many industries, such as Chemical, Minerals Processing, Food, Wood Products and Wastewater Treatment. For example, our unique shaft less vertical screw conveyor design is used in many Wastewater treatment facilities for elevating dewatered biosolids.

II. LITERATURE REVIEW

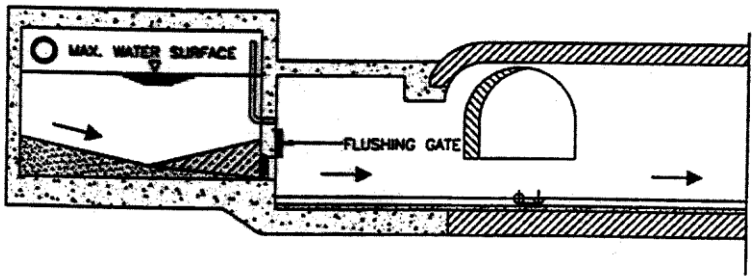
Alan W. Roberts[1] has found that the screw conveyors with fully enclosed tubular casings its torque and power are majorly affect by the vortex motion of the material that is lifted. The eddy motion, together with the degree of fill, rule the volumetric efficiency and, hence, the throughput. This, in turn, manipulates the torque, power and conveying efficiency. A theory is presented to predict the functioning of screw conveyors of any specified geometry. The influence of the flow properties of the bulk material on the conveyor performance is exemplified. The performance of screw conveyors is significantly affected by the eddy motion of the bulk solid being pass on. The eddy motion, composed with the grade of fill, rule the volumetric competence and, from now, the throughput. This, in turn, manipulates the torque, power and conveying efficiency. The flow characteristics of the bulk material being conveyed are demonstrated to have a considerable manipulate on the functioning.

Philip J. OWEN and Paul W. CLEARY[2] exposed that The Discrete Element Method (DEM) has been used to look at the effect of bit shape and particle-particle and bit-boundary resistance on convey functioning in a screw conveyor. They also found that upsurge in non-sphericity have insignificant appearance on the bit flow patterns. The bit velocities and their axial and swirl components were invariant to changes of bit shape and particle–particle and bit–wall friction. Though, there were two significant exceptions. The first exemption is the tangential velocity for the blockiest particles (case SQD), which was an outlier when associate to all other cases. As the blockiest bit is probable to be a additional radical form than that of the Japanese millet seed used in the trial, They can bring about that all bit speed components are invariant to reasonable variations in bit shape. The second exemption is that the swirl speed in a horizontal screw conveyor, which upsurge modestly with increasing bit–boundary resistance.

Alma Kurjak[3] suggests that it is examine of how fine particle characteristics and screw conveyor design influence the flow properties of a vertical screw conveyor. Examine report show that various bit properties like bit size, bulk density and bit form have a significant manipulate on screw ability. Bit with a circular shape have lower interior

resistance that consequences in a better screw capacity. It was also shown that the Hausner ratio, assessed from tapped and seeming density and angle of repose are operative approach to find the free-flowing properties of the bit. Examination also shows that the clearance and the free length of the intake have a big manipulate on screw capacity. No correlation between conveying length and conveyor capacity was found. and also states that fine particles with unrefined particles will flow into a screw easier than powder with fine particles. This results in a better mass flow. The screw capacity will also be higher if dense powder is used. Round powder, have lower internal friction that results in a greater screw capacity. Hausner Ratio and angle of repose are most likely efficient methods to measure if powder is free flowing or not. The clearance and the free length of intake have a large manipulate on screw capacity. No association was found between conveying length and conveyor capacity.

William C. Pisano, Owen C. O'Riordan, Frank J. Ayotte, James R. Barsanti and Dennis L. Carr[4] took investigated on drainage system of Cambridge and they discover that the design of inert automatic wash out systems installed in the City of Cambridge's storm and hygienic sewer system tributary to the Alewife Brook as part of a $75 million sewer parting program. Gravel and debris deposition is severe in the alive combined drain, storm drains, and hygienic trunk sewers due to the flat scenery of the area. This condition is make worse by hydraulic oblige intrude on the system's outlet by the Alewife Brook ~shallow stream! And downstream sanitary siphons ~again because of the Alewife Brook! The expenditure of pumps to lift flows from sewers and drains to permit self-scouring velocities is prohibitively expensive. To overcome this problem, five automated flushing systems using fast opening ~hydraulic operated! Gates discharging collected storm water were constructed in combination with downstream collector grit pits. Then they conclude that Deposition of solids within flat drainage and sewerage conveyance pipes can result in difficult hydraulic limits, potential odour and corrosion conditions, and the initial flush of pollutants and solids to receiving waters. This paper reviews approach and equipment for cleansing and flushing deposited sediments in pipe inverts.



Balachandra.G, Karthikeyan.S, Elangovan.K and Divya. N[5] employ the PLC and SCADA approach for automatic cleaning of drainage system. The PLC and SCADA were the emerging tools for resolve real time difficulties and they designed their project to use this in efficient way to manage the removal of wastages and with regular filtration of wastages, clearance of gaseous cores by means of soak up and put in storage in the separate way where the poisonous and non- poisonous gases are treated separately and observe the removal in recurrent manner. Automatic drainage water pump monitoring and control system consists of compressor, gas exhauster, pressure valve, stepper motor, level sensors. This system is utilized in industries, hospitals, etc. The gas sensor is a device that detects the presence of gases in the drainage pipe area, often as a part of a safety system. The toxic and non-toxic gases were separated. Using the gas exhauster the gases were exhausted. The pressure sensor and the level sensor activated simultaneously to check the water level and the pressure created inside the pipe. When the pressure goes beyond the particular limit the pressure valve opens. If the water level is high the compressor operates with least pressure. When it activates at the radical level the compressor operates in maximum pressure. Sledges present in the drainage water can be removed by filtration process. Aluminium or the metal plates are the two plates which are placed which are in the filtration process. The plates are arranged in the reverse manner. The controlling action of the plates is done with the help of the stepper motor.

Berna Bolat and Muharrem E. Boğoçlu[6] had took research for upsurge the capacity of screw conveyor. And they discovered that The rotational speed of screw shaft is directly related to the transmission capacity. It leads to serious balancing and vibration problems in conveyor because of the increasing rotational speed of screw shaft. The transmission capacity of materials depends on three factors. They use this formula for finding its efficiency

$$Q=\pi/4.(D^2 - d^2).S.n.\rho.\varphi.k$$

Where,

- Q : the theoretical of mass efficiency
- D : screw Diameter (m)
- d : shaft Diameter (m)
- S : screw pitch (m)

- n : rotational speed (rpm)
- ρ : bulk density (kg.m^{-3})

The rotational speed depends on a natural frequency of conveyor. It needs to increase the diameter of shaft to obtain a higher natural frequency. The critical rotation speed for different diameters of shaft depending on the values natural frequencies were calculated by FEM method. And also took analysis on radial clearance. The radial clearance found by

Q_L=x=(ΔP* A^(2* ρ))/(β* π* μ*L)
Where,
Q : the leakage (kg.s^(-1))
ΔP : the difference of pressure (Pa)
A : the area of clearance (m^2)
μ : the dynamic viscosity(Pas)
L : the length of conveyor (m)

By this they found that it was determined by the experiment studies that the leakage flow rates were very high value for fluent materials in conveyors which have a big clearance. Additionally, the incline factor should be ascertained experimentally depending on materials. The second factor effect on the capacity is the speed of conveyor. This value depends on the natural frequency of conveyor. In this case it is possible to increase the speed of transmission. The flow rate significant increases when the speed of transmission increases.

III. CONCLUSION

From the above literature we found that the screw conveyor has been used for the carrying the material from one place to another place, and there has been lots of analysis done on it for improve its efficiency and also improve its capacity. For drainage cleaning before today there is PLC and SCADA is used and also they use manual work. So here we are going to make automated drainage cleaning system which will clean the drainage automatically by using of screw conveyor. So, the device is place across drain so that only water flows through lower grids. Waste like bottle, etc. floating in drain are lifted by screw conveyor, which is connected to shaft. This shaft is attached to motor. When motor runs the conveyor starts to circulate making revolution and try to lift up the waste. The waste materials are lifted by conveyor and stored in waste storage tank.

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