

Manure Removal System Using Lead Screw Mechanism

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Abstract: Dairy manure management systems ought to account for the fate of excreted nutrients that will be of environmental concern. Currently, restrictive oversight is directed primarily at the reassurance of water quality. Land application of manure at acceptable chemical levels to crops created on the farm by truck age or by pumping flushed manure effluent through irrigation systems is that the basis Nutrient losses to surface and groundwaters are often avoided, and vital amount are often obtained from manure as chemical if adequate crop production is feasible. Manure solids combined with wastes from alternative sources could have potential if a marketable product is often created or if spare grant is received for process supplementary wastes. Solutions to odor issues square measure required. In the previous methodology ancient cable wire rope has been used for the movement of manure removal in advance, and it provides less and also the main objective of the tactic is to induce additional accuracy of cleansing the manure within the oxen alleys. And also, the final output of the merchandise can scale back the time consumption, and require less quantity of employee to done employment. Potency of the system is 6 June 1944 quite ancient system.

1. INTRODUCTION

In recent years, there has been a rise within the use of confined buildings for artiodactyl farming altogether over the planet. owing to the high animal densities in these confined environments waste excreted from the pigs and residual feed accumulate inside resulting in poor indoor air quality. As a result, animals and employee's area unit exposed to massive quantities of volatile odorous compounds and a range of bioaerosols that will impact their health. Nutrients in manure applied once there's no growing crop or at rates that greatly exceed crop fertilizer necessities area unit additional doubtless to leach into spring water or be over Excessive manure application may end in minimized crop yields. Manure management issues will arise once placental mammal area unit supplementary to a farm while not increasing the land base. this might end in excessive manure production in respect to the nutrient desires of the land utilized for crops. Farmers WHO purchase a high proportion of their placental mammal feed area unit additional doubtless to possess meager land to utilize the manure safely and effectively. In some instances, it's going to be easier or additional economical to scale back inputs. In general, farmers WHO grow all or most of the feed consumed by their animals most likely have comfortable cropland for well managed manure application. If manure production exceeds crop necessities, arrangements should be created to maneuver excess manure to alternative cropland or use it for alternative helpful functions. every farmer is answerable for providing a sound manure management system that has adequate protection for the setting. Sound management involves correct style, construction, maintenance and operation of the manure handling system.

2 LITERATURE REVIEW

Brown N.J et al (2007) [1] Manure will have worth in many respects. the primary obvious one is that the direct nutrient worth. the worth depends on the site-specific soil nutrient levels and nutrient concentrations of manure. In some square measure as of Gopher State soil levels of phosphorus and K and most micronutrients are already at adequate levels. Therefore, the worth of those constituents in sure cases is also questionable. Manure conjointly imparts biological and physical properties to the soil that create it a lot of productive and fewer erosive. it's tough to place a greenback figure on this profit. the price of manure includes those related to storage, handling, and application. There will be conjointly AN environmental price. Kumari P et al(2015) [2] If manure is over-applied, applied at the incorrect time within the growth cycle, applied inconsistently, allowed to expertise losses in storage, handling, and application, then counting on the manure supply, varied levels of a part of its N will be gift during a) slow unharness type that's very helpful environmentally. a part of the N is analogous to industrial plant food during a soil system. It will be applied terribly uniformly, precisely, and at ideal times to maximize crop uptake. In distinction, manure can usually behave like alternative organic nutrient sources like biodegradable pollution sludge and compost in soil. Marlin S.J et al(1998) [3] the foremost sensitive environmental regions in Gopher State square measure the deep glacial outwash sands within the central a part of the state with layer formations and also the karst space in southeastern Gopher State wherever broken rock bedrock provides for entry of N and alternative mobile contaminants directly into the aquifer. The comparatively imperviable glacial until and glacial lakebed sediments cause a risk of nitrate loss to surface waters through tile emptying. These landscapes conjointly cause the best risk of losses of pollutants from runoff. Surface runoff losses of phosphorus, and chemical element exacting materials square measure a significant concern in Gopher State. Manure applications close to water bodies, surface applied while not incorporation, applied at excessive rates, and applied on frozen or snow coated ground cause a bigger risk. The erosion potential of the positioning is a vital thought. The use of conservation tillage has been shown to cut back total P losses. raised P concentration close to the soil surface and contributions from plant residues with these systems wants any analysis. Setbacks, buffer strips, and sand filters at surface tile inlets conjointly would like any analysis. Most N

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fertilizers square measure created by combining N from the air with fossil fuel. the worth of N plant food is joined to energy costs. Schloss P.D et al (2009) [4] the basic reason for input of nutrients into agroecosystems is that the got to turn out high crop yields, whether or not the crop have comparatively low worth and low marginal come back. In fashionable cropping systems crop nutrient wants square measure achieved through addition of inorganic and organic nutrient sources. Inorganic nutrient sources, like fertilizers, square measure glorious sources of crop nutrients and square measure typically without delay offered. Organic nutrient sources like animal manures, biosolids and varied agricultural and industrial byproducts, can also effectively offer crop nutrients. Essential parts in manure are shown to contribute to the consequences of economic ammonium-nitrate on corn yield (Durieux, et al., 1995).

3 METHODOLOGY

Analysis of Problem identification and literature review. selection of motor based on calculation. selection of other components based on requirement. finalized design in 3d. procurement of materials. fabrication of project. result and discussion.

4 DESIGN CALCULATION

Torque, moment, moment of force or "turning effect" is that the move equivalent of linear force.[1] The idea originated with the studies of Archimedes on the usage of levers. even as a linear force may be a push or a pull, a torsion is thought of as a twist to Associate in Nursing object. The image for torsion is usually, the minuscule Greek letter alphabetic character. once being named as moment of force, it's normally denoted by M. In 3 dimensions, the torsion may be a pseudovector; for purpose particles, it's given by the vector of the position vector (distance vector) and therefore the force vector. The magnitude of torsion of a rigid body depends on 3 quantities: the force applied, the lever arm vector connecting the origin to the purpose of force application, and therefore the angle between the force and lever arm vectors.

4.1 Calculation of Torque

4.1.1 Linear distance

Linear distance = lead distance \times rotation

Rotation = 540 rev

Linear distance = 6 \times 540/360

Linear distance = 8 mm

4.1.2 Sliding speed

$V = 3.14 \times D \times n / \cos \alpha \times 10^3$

v- sliding speed

D- Effective diameter -mm

n- revolution per minute

R- lead

S- Feeding speed

α - Lead angle

$n = S/R \times 10^{-3}$

$n = 3/6 \times 10^{-3}$

$n = 500 \text{ min}^{-1}$

$v = 3.14 \times 28 \times 500 / \cos 30 \times 10^{-3}$

$v = 43.98 \text{ m/min}$

4.1.3 Total torque

Total torque = frictional torque + acceleration torque

a.) Frictional torque

$T_f = F/2 \times 3.14 \times p \times e$

T_f =Frictional Torque

P=Pitch

e=Efficiency

μ =Co-efficient of friction

$F = \mu w$

$\mu = 0.15$

$= 0.15 \times 294.3$

$F = 44.15 \text{ N}$

$T_f = 44.15/2 \times 3.14 \times 6 \times 0.65$

$= 1.80 \text{ N.mm}$

b.) Rotational inertia of leadscrew

$J_{\text{Load}} = m \times (1/2 \times 3.14 \times p)$

$= 30 \times (1/2 \times 3.14 \times 6)^2 = 0.795 \text{ kg/m}^2$

$J_{\text{Lead}} = 3.14 \times L R^4 \times S/2$

$= 3.14 \times 1400 \times (0.028)^4/2 = 1.351 \times 10^{-3} \text{ mm}^4$

T acceleration = 1/g (J load+J lead) + ω/t

$T_{\text{acc}} = 1/9.81(0.795 + 1.351 \times 10^{-3})52.35/0.1$

$= 42.49 \text{ N.mm}$

$T_{\text{total}} = 1.80 + 42.49$

$= 44.296 \text{ N.mm}$

5 EXPERIMENTAL INVESTIGATION

We have experimentally investigated the patterns in the influence of opening angle of the scraper unit, inclination angle of scrapers, and motion speed of the scraper unit, on specific energy. We have experimentally substantiated the hourly schedule of manure accumulation and a schedule for turning the scraper unit on; it is proposed to remove manure 5 times during 24 hours. Experimental study enabled determining the structural (opening angle of the scraper unit and inclination angle of the working surfaces of scrapers) and technological (motion speed of the scraper unit) parameters, at which the improved scraper unit would demonstrate minimum specific energy consumption. We have conducted comparative experimental study into operation of the developed scraper unit for manure removal and the prototype, commercially available scraper unit. In this system we replaced the lead screw mechanism in the place of cable winch pulley system. The scrapper unit has a capacity of removing the manure removal amount up to torque 50 N-m. The established rational parameters and operating modes of the scraper unit reduce energy consumption of the scraper unit required, while maintaining the required quality for cleaning a manure channel. The results also showed that the amount of biogas produced from sludge containing 3% solid waste was larger than the amount produced from sludge containing 6% solid waste.

6 EXPERIMENTAL SETUP

The bottom mounting device was freely placed on the support of the machine. It consists of square block which has square base made up of mild steel which is screwed to the lead screw. Lead screw is made up of mild steel and it is completely threaded by using threading operation. The scrapper is fitted to square block by means of square rod. In that scrubber is mounted on the scrapper by the slot provided in scrapper. Bearing is made to fix the lead screw and manure removal assembly. During the experiment, the square block fitted to lead screw is at the end. The motor was switched ON to get the movement of scrapper system. The force is applied on scrapper is used to remove the manure. The reaction force F together with the displacement was recorded to obtain the

load–displacement. Maximum Torque values were calculated from the results recorded.



7 EXPERIMENTAL RESULT

A hand tool assembly associate degreed methodology for clearing manure deposits from a manure assortment board related to an animal cage arrangement is provided. The hand tool assembly includes a primary hand tool blade extending during a usually diagonal direction with relevance a length of the gathering board, however solely part across a dimension of the gathering board, in a locality of most manure deposits. The hand tool assembly more includes a second hand tool blade extending during a well opposite usually diagonal direction with relevance the diagonal extension of the primary hand tool blade. The second hand tool blade, however, extends well across the complete dimension of the gathering board. the primary and second hand tool blades area unit supported by a support frame capable of maintaining the commonly diagonal opposite orientations of the 2 blades, and therefore the support frame is driven by a driver that at the start advances the hand tool blades during a forward direction on the length of the gathering board at which period the primary hand tool blade clears the world of most deposit on the board. the driving force afterwards moves the support frame and therefore the hand tool blades during a reverse direction throughout which period the second hand tool blade clears any remaining manure deposits from the complete dimension of the gathering board. a group interval throughout that the hand tool assembly travels within the forward direction is larger than another set interval throughout that the hand tool assembly travels within the reverse direction, thereby permitting the hand tool assembly to advance on its path of

travel.

8 RESULT OUTCOME

The manure removal system was successfully developed. The machine was able to produce a maximum Torque of 50 N-m. With this machine, it was possible to realize the weight of manure deposited on floor is successfully removed to the digester.

9 CONCLUSION

Based on the experiments of this work, the numerous outcomes associated with combatant system which can be used as manure removal within the floor. Intensification results in high inputs of nutrients within the type of mineral fertilizers and animal feed. vital elements of those inputs leak from the system within the type of nutrient natural process to groundwater and gaseous losses to the atmosphere. Pressure on the prevailing agricultural land could increase by growing demand for productive land and degradation of the prevailing agricultural land base. growth of agriculture typically results in huge deforestation. The study given during this report targeting the interactions between stock production, crop production and land use. The link between stock and crop production is thru the demand for animal feedstuffs. This report presents long-run situations describing these interactions and therefore the potential consequences for crop production and animal waste production.

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