

Screw Conveyor for Manure Transportation: A proposal to Eliminate Manual Scavenging

Abstract: Manual scavenging, fetching and transporting manure and waste soil has been a long undesirable practice in agricultural and household purposes result to painful lifestyle and asthmatic problems. Manure fetching and transportation used to be a manual process and these days it's becoming an unsolved issue for common farmers as well as to the households. In context of Ladakh, sources of manure are generally from farms, cattle sheds and local soil-based toilets which are challenging task for common people to fetch and transport it to the fields as its mostly fetched manually leading to severe consequence for the health of persons involved in such practice, along with these undesirable practices negate the dignity of livelihood of people and unhealthy lifestyle.

To eliminate the practices of manual scavenging and to promote waste to worth schemes, screw conveyors can be a promising solution against such inhuman hateful practice and a giant step towards organic farming, waste to worth, open defecation, up bringing of socio-economic of farmers & eradicate waste.

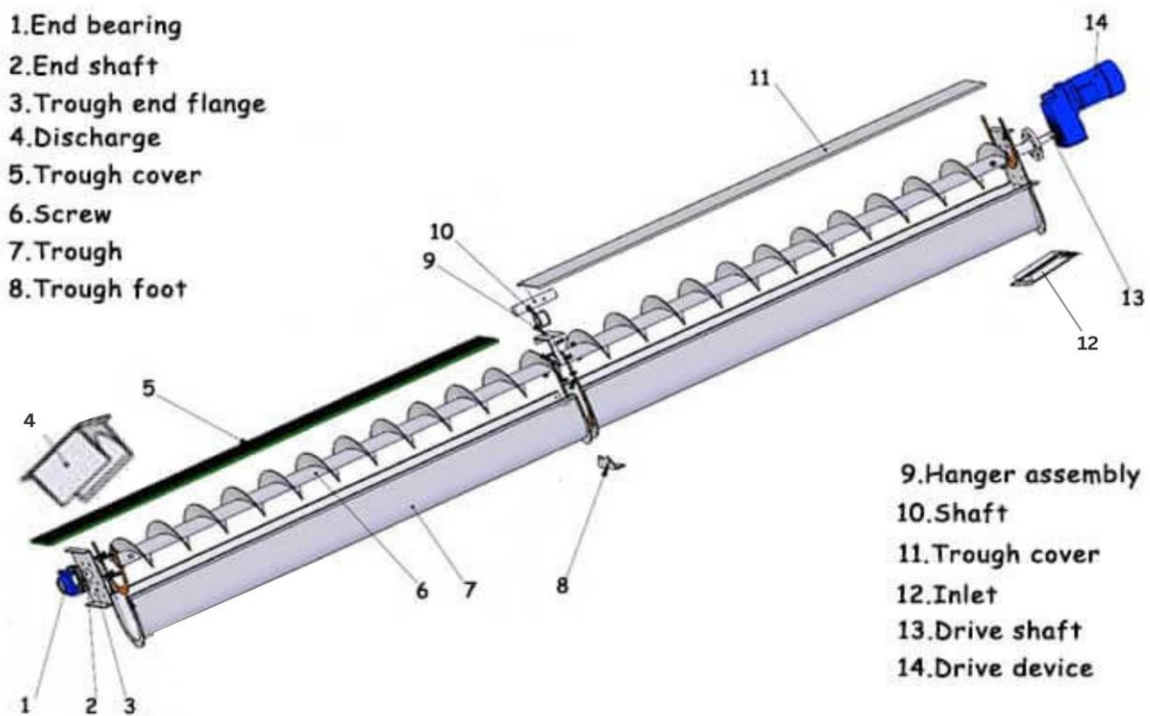
Background and gap: In high altitudes like Ladakh, agricultural activities practiced by common people are laborious due to limited means of conveying and transportation. Commonly means of conveying materials like manure, fertilizers, grains and fodder are fetched and carried on animals and even manually. These used to be the only way out to carry out the agricultural activities restricting the lifestyle of common people towards laborious activities of agriculture and household related works. One of the major challenging is fetching of manure and waste soil from cattle farms, soil based dry toilets etc. due to unawareness about user friendly machine for conveying and transporting them. Though in industrialized region usage of conveyors have been playing a great role for industrial and agriculture gains and are being developed as state of art in terms of efficiency, operation, automation and portability.

In high altitude regions, the agricultural automations are a rarest of rare case due to which getting customizable machines for conveying materials as per requirement of hilly region are rarely proposed. These constrains are peculiar in terms of physical terrain and remoteness of hilly region. Thus for screw conveyors for conveying materials like manure and waste soil are need of the time to address the challenges related manual scavenging, unhealthy practices and uplifting dignity of people engaging in sanitation and agricultural activities.

Objective: To design a screw conveyor for conveying manure and waste soil.

Working principle: The working principle of the screw conveyor is based on the combination of the gravity of the material and the frictional force between the material and the machine wall. As the screw rotates, the blade generates thrust, pushing the material to move reciprocally along the bottom of the conveyor. The material at the mid-axis point is pushed by the material from behind, while the non-rotating nut moves in the direction of the screw. The screw propels the material and ensures uniform distribution over the entire conveyor.

Pictorial representative of proposed screw conveyor



Technical Specifications and considerations

The below specifications have been discussed with industries to manufacture a desired screw conveyor of light weight portable, suitable for conveying waste soil, manure and waste sand for common agricultural utilities, portability for farmers and loading conveniences:

s.no	Items	
1	Over all weight of Conveyor	≤ 90 Kg
2	Thickness of screw blades	3mm
3	Thickness of screw casing	3mm
4	Shaft thickness (hollow)	50 to 60 mm
5	Diameter of casing	7 Inches
6	Diameter of screw blades	6 Inches
7	Length of screw conveyor	8 to 10 Ft (optional)
8	Motor power	HP

Societal Benefits:

- 1) Minimize manual scavenging.
- 2) Open defecation (Swatch Bharat).
- 3) Waste to Worth for promoting organic farming.
- 4) Portable and compact.
- 5) Suitable for single phase power supply

6) It can be used for snow extraction from narrow spaces.

Expected deliverable:

- i. Expected around 1tons per hour.
- ii. Dust free while operation.
- iii. Smooth functioning upto 45° inclination.
- iv. Suitable for conveying gradual particles upto 4-5 mm.
- v. Suitable for moist as well as dry material.

References:

1. Santanu Chakarbothy, Anshuman Mehta. 'Product design of semi-flexible screw conveyor IOSR Journal of mechanic and civil engineering, Vol:11'.
2. Uematsu T, Nakamura S., Hino, Y and Suyama. 'A study of the screw conveyor' Trans. JSME, 26(162), 180–186. (1960)'.
3. Chris Rorres. 'The turn of the screw: Optimal design of an Archimedes Screw', Page: 72-80, Journal of Hydraulic Engineering / January 2000'.
4. Alan W. Roberts. 'Design considerations and performance evaluation of screw conveyors'.
5. Don McGlinchey. 'Bulk solids handling, equipment selection and operation Blackwell Publishing Ltd '.
6. Sonam Spalgais, Dipti Gothi, Anand Jaiswall and Kumud Gupta. 'Nonoccupational anthracofibrosis/anthracosilicosis from Ladakh in Jammu and Kashmir, India: A case series'.