



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE and affiliated to Anna University, (An ISO Certified Institution)

Accredited by NAAC with A+ Grade

DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3601 POST- HARVEST TECHNOLOGY

Dr. A. ARUL MARCEL MOSHI,
ASSOCIATE PROFESSOR / MECH.



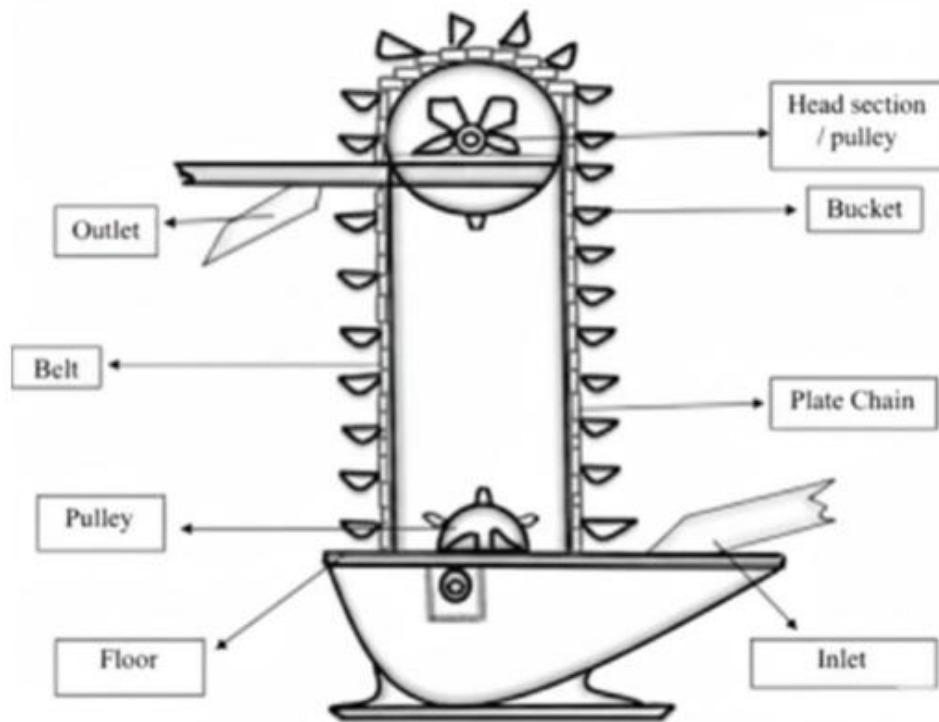
UNIT IV: SHELLING AND HANDLING

CO4: To understand the operation of post-harvest equipment like shellers and conveyors.

Bucket Elevator

A bucket elevator is a continuous conveyor system used to transport bulk materials such as grains, pulses, seeds, and meals in a vertical or steeply inclined direction. It is the most common and efficient solution for vertical lifting in post-harvest systems, used for loading grain into silos, feeding dryers, and transferring material between floors in processing plants.

Major components and their functions:



- **Buckets:** Containers that hold the material (steel or plastic).
- **Belt or chain:** The carrying medium that holds the buckets (belt for lighter loads, chain for heavy/abrasive materials).
- **Head pulley / sprocket:** Top rotating component (driven by motor).
- **Boot pulley / sprocket:** Bottom rotating component (idler, with take-up adjustment for tension).
- **Casing / Housing:** Encloses the entire system for dust control and safety.
- **Feed hopper (Inlet):** Located in the boot section where material enters.

- **Discharge spout (Outlet):** Located at the head section where material exits.

Working principle:

- ❖ **Loading (Pick-up):** Material (grain) is fed into the boot section at the bottom. Buckets moving upward scoop the material.
- ❖ **Elevation (Conveying):** The buckets carry the material vertically as the belt/chain rotates.
- ❖ **Discharge (Centrifugal / Gravity):** At the head pulley/sprocket, the material is thrown out of the buckets by centrifugal force or falls out by gravity into the discharge chute.
- ❖ **Return:** Empty buckets continue down the return side to collect more material.

Types of discharge mechanisms:

- Centrifugal discharge:**
 - Buckets are spaced apart.
 - High speed operation.
 - Material is thrown out by centrifugal force into the discharge chute.
 - Application: Free-flowing materials like dry grains (paddy, wheat, corn).
- Gravity discharge:**
 - Buckets are mounted close together (continuous).
 - Slow speed operation.
 - Material falls out by gravity as buckets invert over the head pulley.
 - Application: Fragile materials, sticky materials, or materials that need gentle handling.

Types of Bucket Elevators:

Based on construction,

- Belt type:**
 - Buckets mounted on rubber belt.
 - Quieter operation, higher speeds, less power consumption.
 - Suitable for most grains (paddy, wheat, maize).
- Chain type:**
 - Buckets mounted on one or two chains.
 - More robust, handles heavier and abrasive materials.

- Suitable for seeds, fertilizers, and heavy feeds.
- iii. **Positive discharge type:**
 - Buckets are turned over by sprockets at the head to ensure complete discharge.
 - Used for sticky or difficult-to-discharge materials.

Advantages of bucket elevators:

- **Space saving:** Occupies very little floor space while achieving significant vertical lift.
- **High capacity:** Can handle large tonnages per hour.
- **Versatile:** Handles a wide range of materials (grains, pulses, seeds, meals).
- **Totally enclosed:** Dust-tight operation, prevents contamination and losses.
- **Low maintenance:** Relatively simple construction with few moving parts.

Limitations of bucket elevators:

- **Product damage:** High-speed centrifugal discharge can cause grain cracking (especially for fragile grains like maize or legumes).
- **Dust explosion risk:** Enclosed dust can be explosive; requires proper venting and safety measures.
- **Backlegging:** Material falling back down the boot instead of discharging, reducing efficiency (caused by incorrect speed or bucket design).
- **Not suitable for long horizontal runs:** Designed primarily for vertical lift.
- **Belt tracking:** Belt must be properly tracked to prevent rubbing against casing.

Applications of bucket elevators:

- **Grain silos:** Filling silos from the top.
- **Rice mills:** Lifting paddy between cleaning, husking, and polishing sections (multi-floor operations).
- **Feed mills:** Elevating grains and meals to mixers and grinders.
- **Seed processing plants:** Gentle vertical transport of valuable seeds.
- **Dryer inlet:** Feeding grain into the top of continuous flow dryers.