Unit 1:

Introduction

- A belt conveyor is one of the most versatile types of bulk handling equipment avaiable. It is suited for handling a variety of bulk materials over wide range of capacities.

- It provides an economical and practical means for transporting bulk materials over long distances and over terrains requiring a wide range of paths of travel.

Introduction

- The belt conveyor is esentially an endless belt operating between two or more pulleys. The belt and its load are usually supported on idlers.

- Belt conveyors have a high mechaincal eficiency since, in larger installations, all the load is carried on antifriction bearings.

Introduction

- Damage to the product being transported is slight since there is little or no relative motion between the product being carried and the belt.
- The carying capacity is high since relatively high belt speed are possible.
- Materials can be conveyed long distances, but there is a limit to the angle of elevation.

Introduction

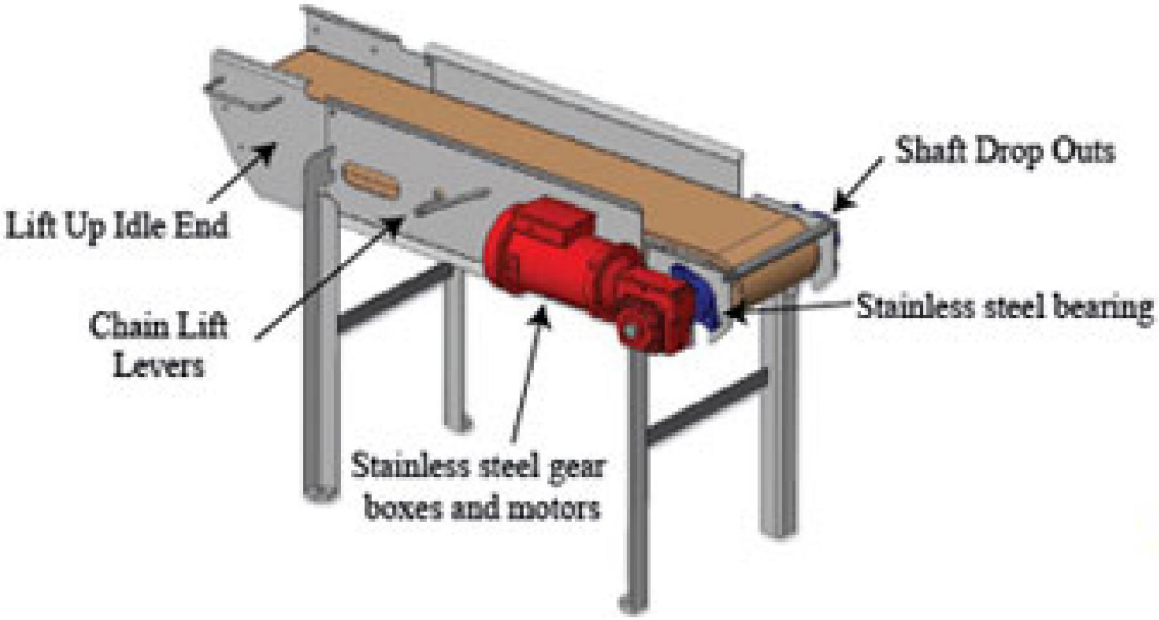
- A properly designed and maintained belt system has a long service life, but the initial cost is usually high.

- Installation is advisable only when amortization of the high initial cost be assured.

Typical Materials Handled by Belt Conveyors

Material Characteristics	Example
Maximum size lumps, sized or unsized	
Mildly abrasive	Coal, earth
Very abrasive, not sharp	Bank gravel
Very abrasive, sharp and jagged	Stone, ore
Half max. lumps, sized or unsized	
Mildly abrasive	Coal, earth
Very abrasive	Slag, coke, ore, stone, cullet
Flakes	Wood chips, bark, pulp
Granular, 1/8 – 1/2 in lumps	Grain, coal, cottonseed, sand
Fines	
Light, fluffy, dry, dusty	Soda ash, pulverized coal
Heavy	Cement, flue dust
Fragile, where degradation is harmful	Coke, coal – Soap chips

Types:



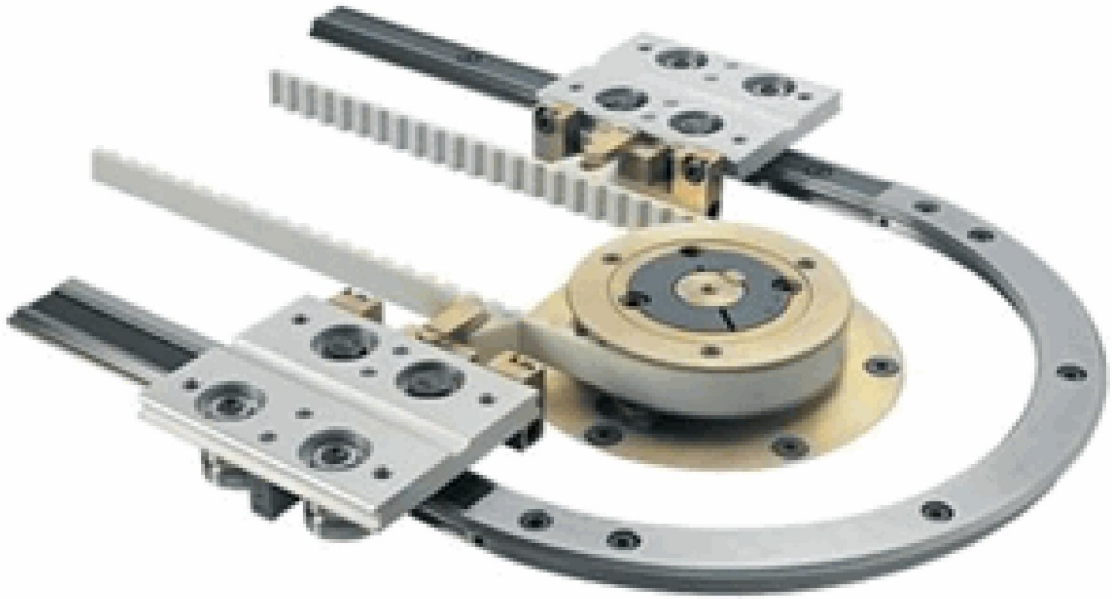
Permanent

Portable

- **Construction :**

Types:

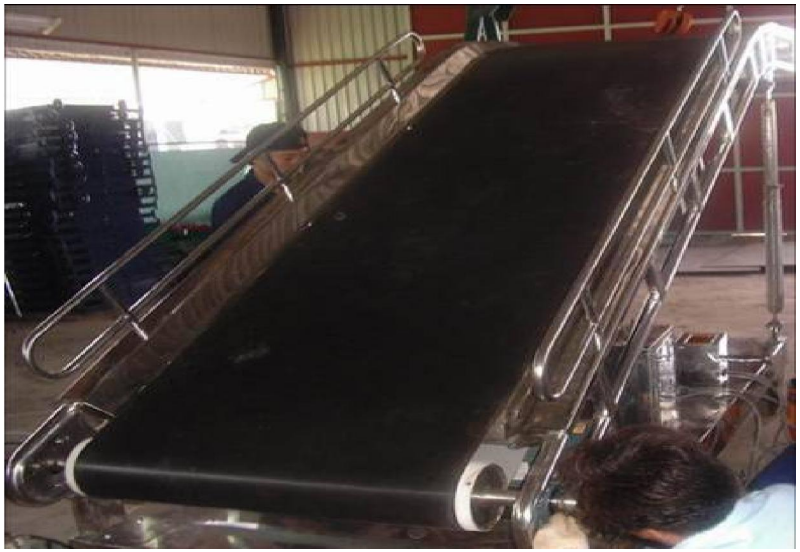
- Purpose: all purpose and single-purpose.



Types:

- **Conveyable Direction:**

Horizontal



Incline

Combination

Construction:

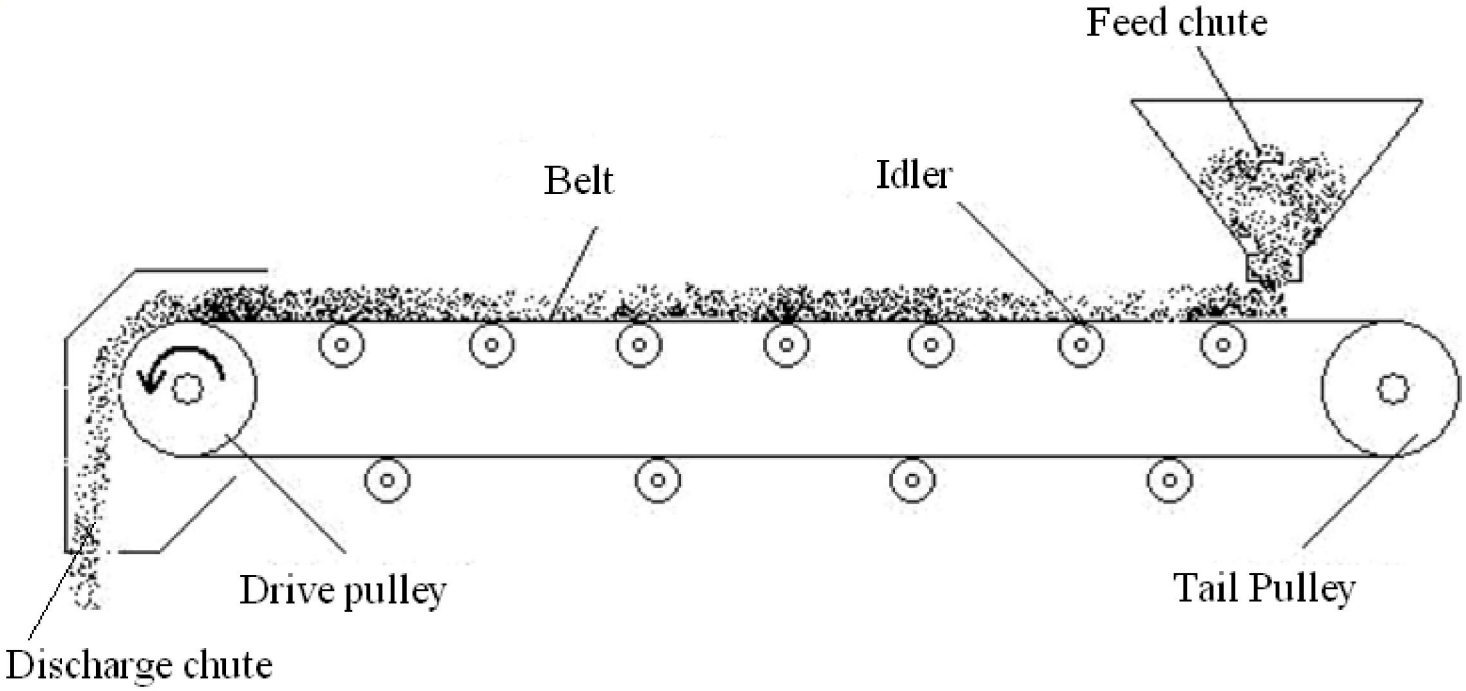
Belt conveyors belong to a class of non-self-contained equipment. Unlike self-contained units such as pumps and compressors the effeciency or effectiveness of a belt conveyor depends on a skillful choice of five essential elements that make up a particular conveyor, coupled with the unit's proper integration into a system.

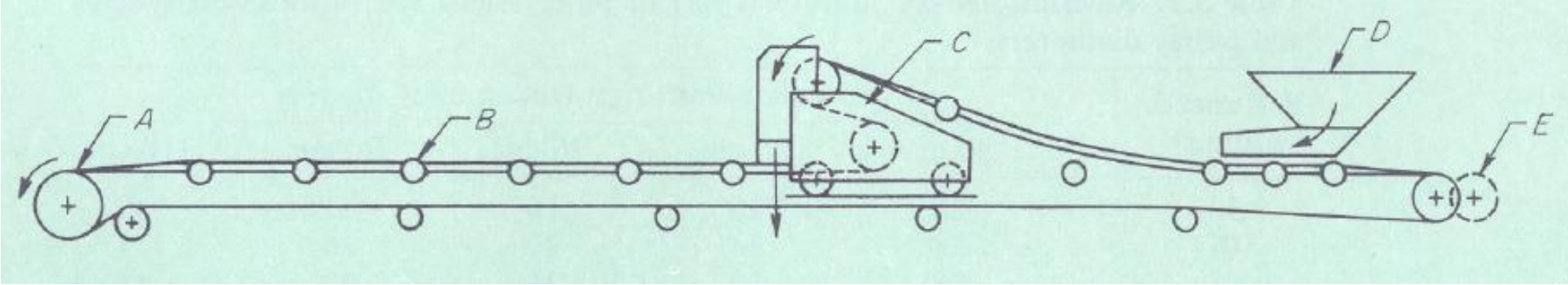
Construction:

The essential elements of typical belt conveyors are:

1. The *belt,* which forms the moving and supporting surface on which the conveyed material rides.
2. The *idlers*, which form the supports for the troughed carrying strand of the belt and the flat return strand.
3. The *pulleys*, which support and direct the belt and control its tensions.
4. The *drive*, which impacts power through one or more pulleys to move belt and its load.
5. The *structure*, which the supports and maintains alignment of idlers, pulleys, and drive.

Construction:





Typical belt conveyor profiles

Horizontal belt

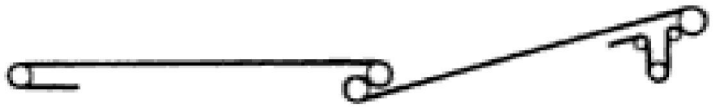
Horizontal and ascending path, when space will permit vertical curve and belt strength will permit one belt.

Ascending and horizontal path, when belt tensions will permit one belt and space will permit vertical curve.

Ascending and horizontal path; or horizontal and descending path, when space will not permit vertical curve but one belt can be used.

Possible horizontal and ascending path, when space will not permit a vertical curve or when the conveyor belt strength requires two belts.

Ascending and horizontal path, when advisable to use two conveyor belts.

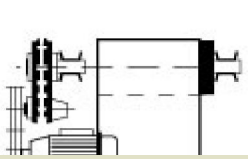


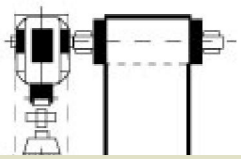
Possible horizontal and ascending path, when space will not permit vertical curve belt strength will permit one belt.

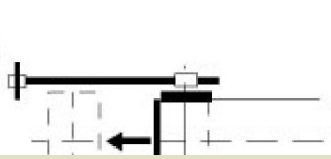
Compound path with declines, horizontal portions, vertical curves, and incline.

Loading can be accomplished, as shown, on minor inclines or declines.

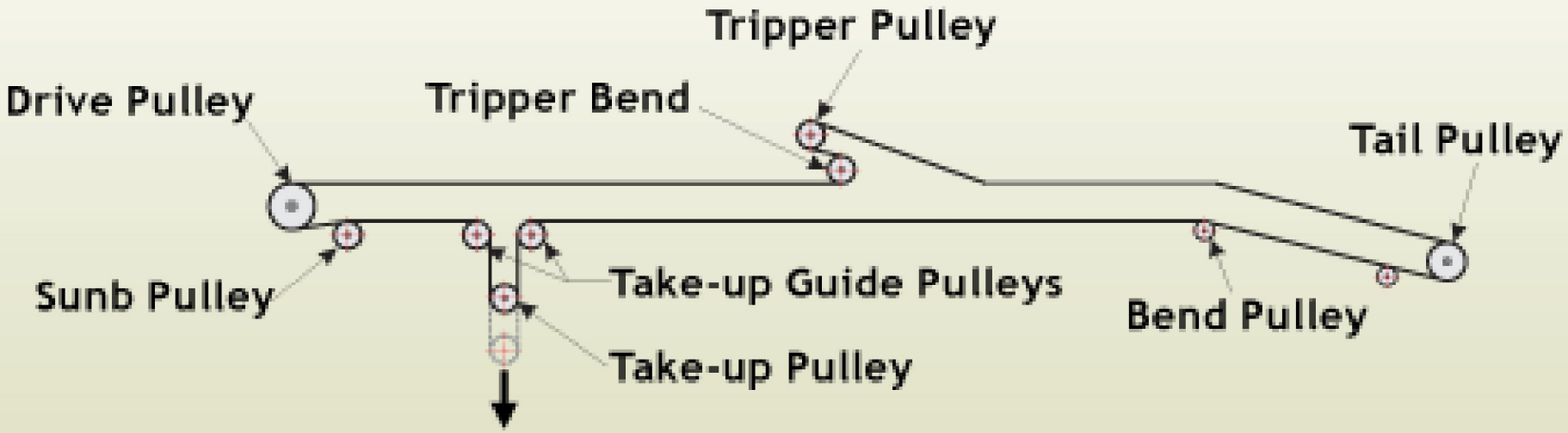
Traveling loading chute to receive materials as a number of points along conveyor.

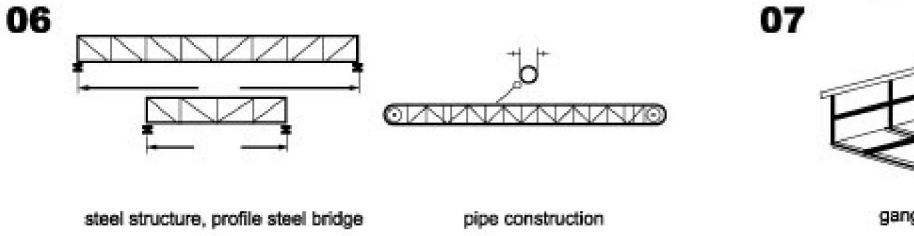






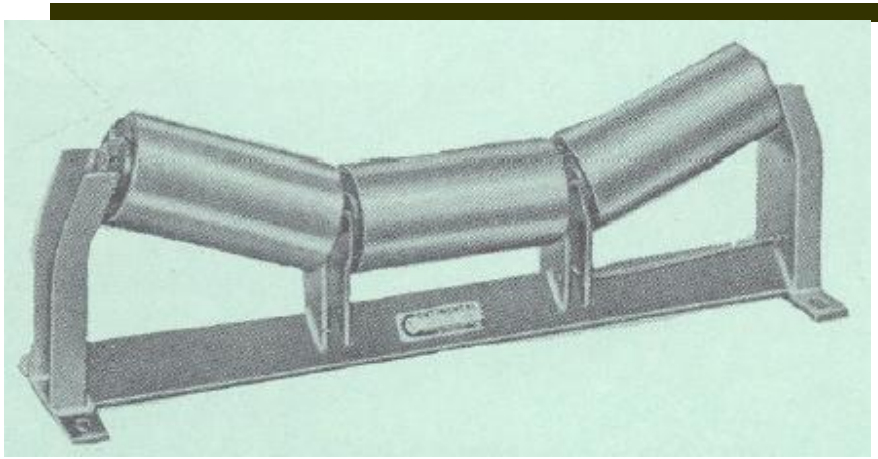
The type of pulley for belt conveyor

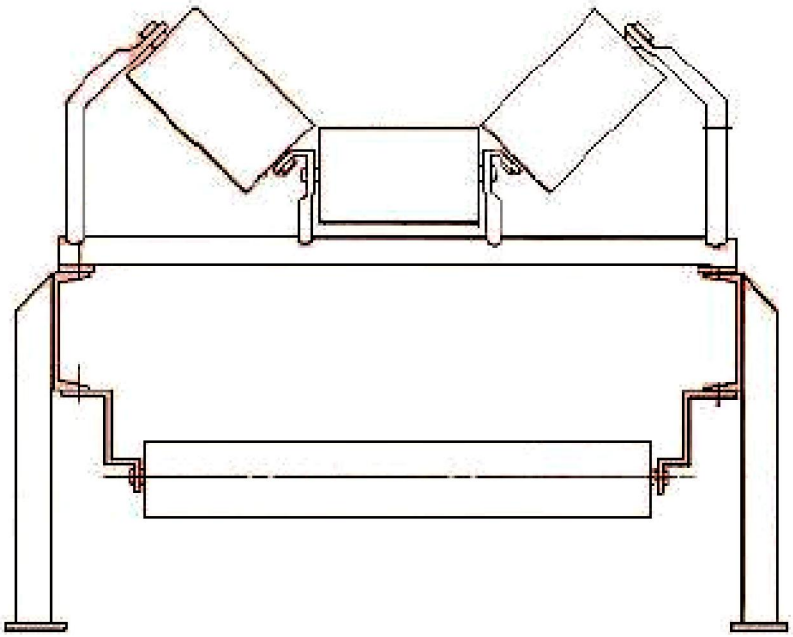


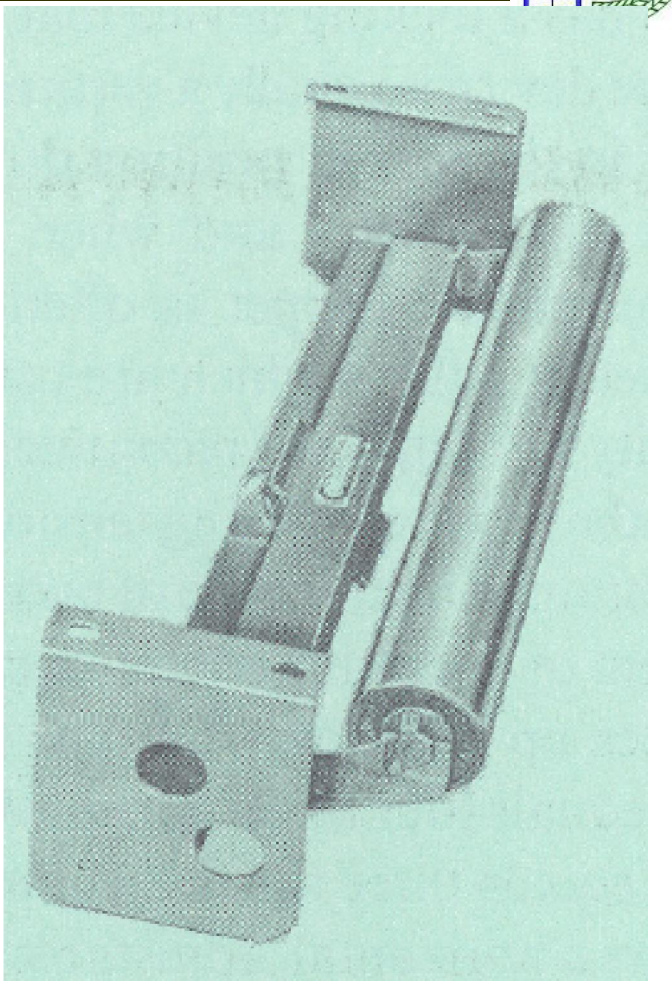


Idlers

Idlers







Idlers

- Diameter of idler:
  - 108mm when B = 400 – 800 mm.
  - 159mm when B = 800 – 1600mm.
- Bước trên nhánh không tải bằng 2 lần bước trên nhánh tải.
- Bước được xác định theo bề rộng băng và chủng loại vật liệu.
- Trục có xoay hoặc không xoay.

Belts

- Practically all belt conveyors for bulk materials use rubber-covered conveyor belt, made of a woven carcass having strength enough to pull and support the load and protected from damage by rubber covers which vary in thickness for different applications:

  - Conventional Belting: has plies of fabric made of cotton, cotton-nylon, rayon, rayon-nylon, and others. Tension rating from 140 – 500 pounds per inchs of belt width for cotton-nylon combinations and up to 1500 piw.

Belts

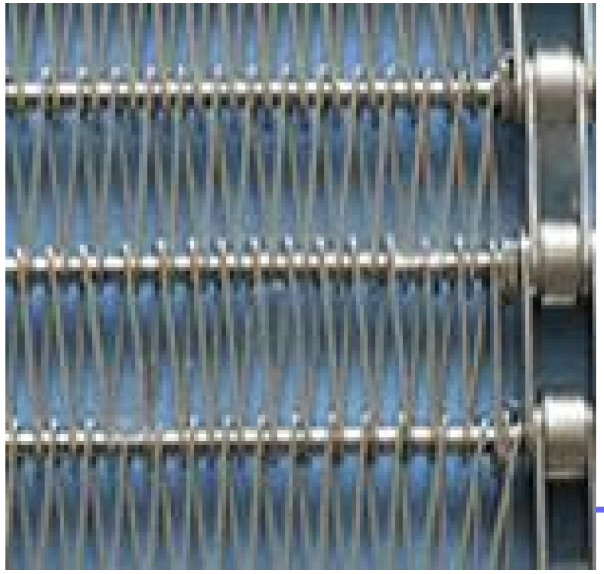
- **Steel Cable belt: made up of spaced steel cables suspended in rubber and wrapped in a fabric envelope, is used where very high strengths and minimum stretch are required. Ratings up to 6000 piw.**

- **Heat Service Belts: Special belts are available for jobs where hot materials must be handled. They must retain their physical properties at temperatures up to 250^{o}F and resist abrasion by the conveyed material. The belts utilize carcasses of nylon, polyester, cotton, nylon, or glass. Covers are usually butyl, chloro-butyl, or EPDM (ethylence-propylence-dipolymer).**

Belts

- Applications for belt conveyors range from a few pounds per minute to thousands of tons per hour, and a great variety of materials can be handled.
- Actual belt selection is dependent on an analysis of a variery of factors:
  - Required belt tension requirements
  - Length and speed of conveyor
  - Abrasiveness of material handled
  - Size of lumps and their tendency to cut or tear the cover
  - Characteristic of material being handled
  - Method of loading conveyor
  - Type of take-up (kéo căng).

Belts



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Conveyor Drives:

✓ All belt conveyor installations involve the proper application of conveyor drive equipment including speed reduction, electric motors and controls, and safety devices.

✓ The preferred drive location for a belt conveyor is that which results in the least maximum belt tension.

✓ For simple horizontal and inclined conveyors this is usually at the discharge end.

Conveyor Drives:

✓ For decline conveyors the preferred location is usually at the load end.

✓ Special conditions and requirements can require that the drive be located eslewhere.

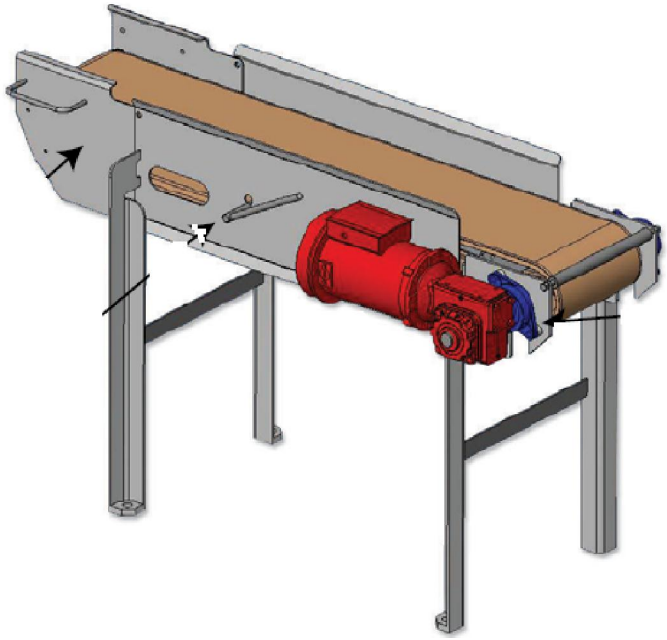
✓ Often internal drives are utilized on longer conveyors and inclined boom conveyors for reasons of economy, accessibility, or maintenance.

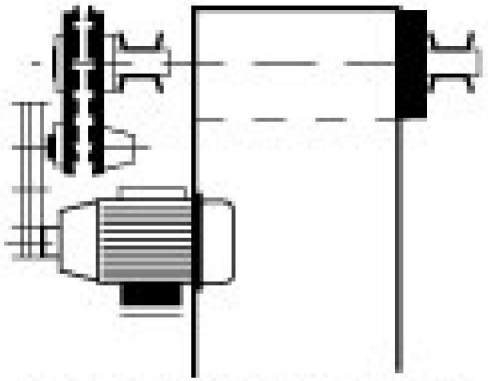
Conveyor Drives:

✓ Belt conveyor drive equipment normally consists of a motor, speed reducer, drive shaft, and necessary machinery to transmit power from one item to another; the simplest arrangement using the least number of components is the best.

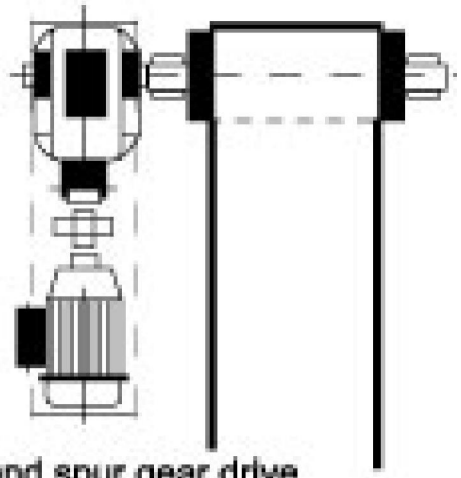
✓ Often however, special-purpose components must be provided to modify starting and stopping, provide for a hold-back, or vary belt speed.

Conveyor Drives:



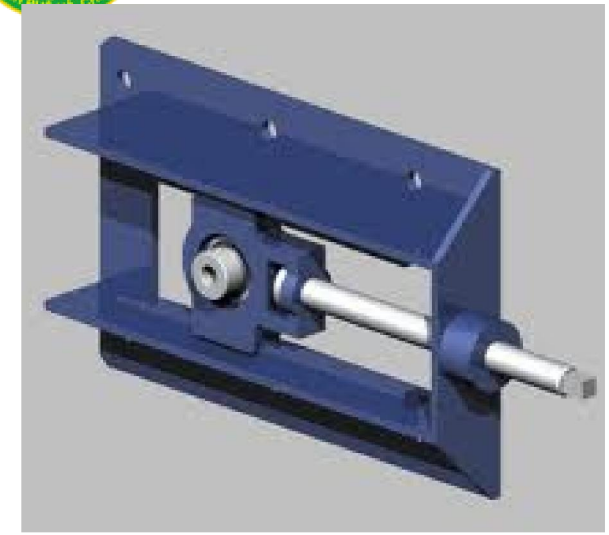


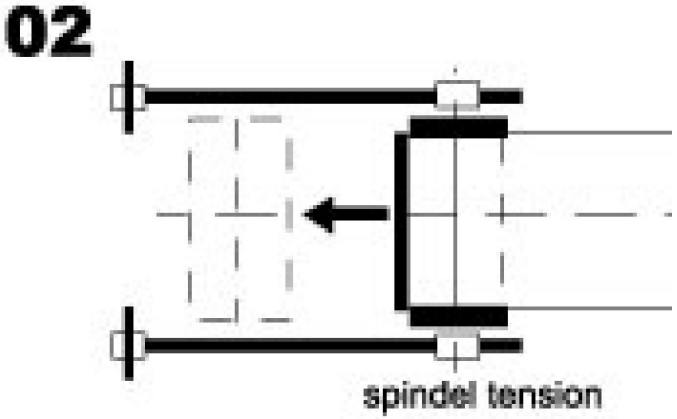
Flat gear with V-belt transmission

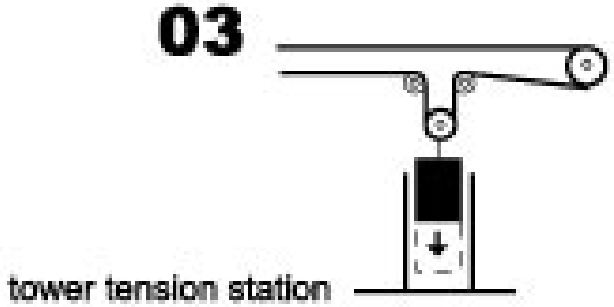


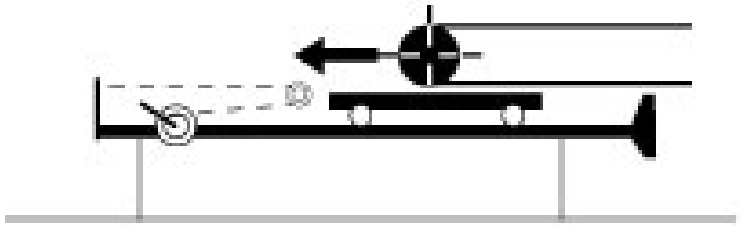
bevel and spur gear drive

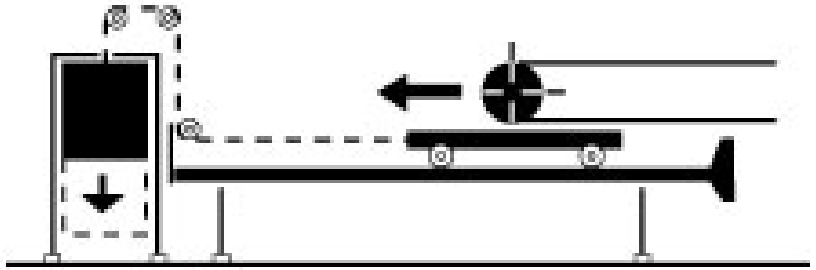
Take-ups







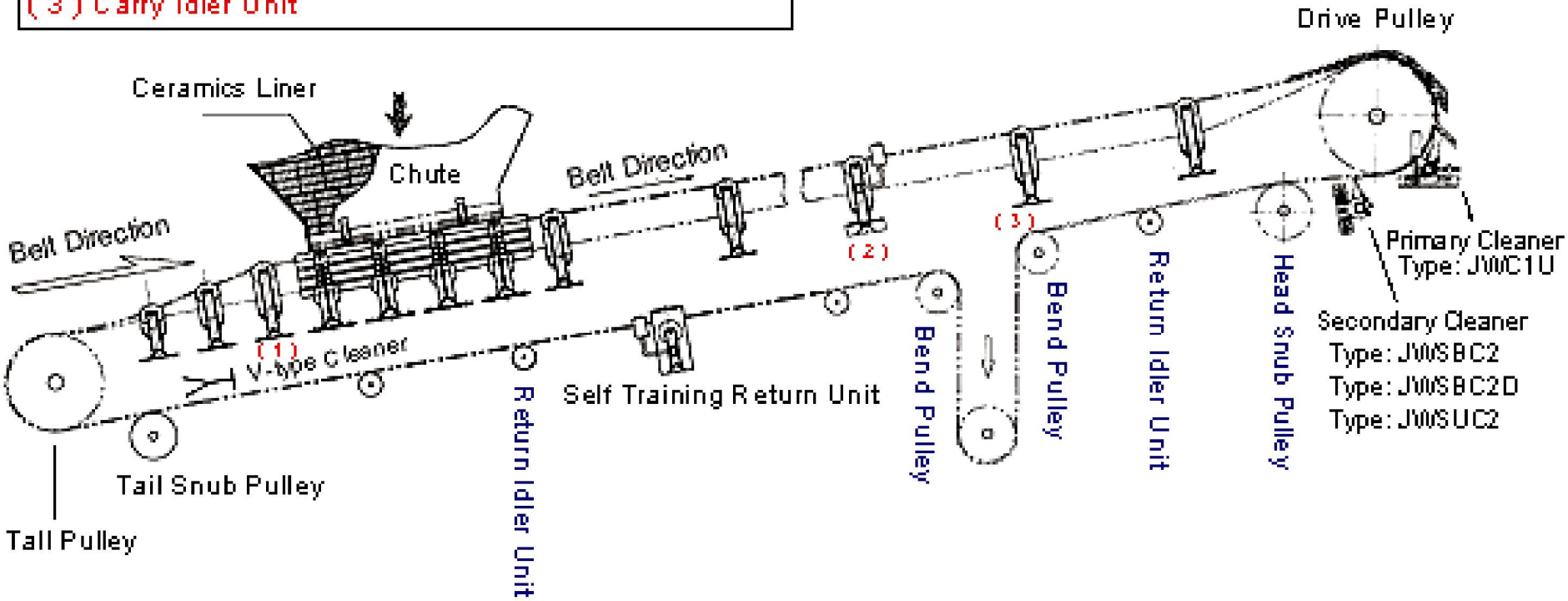

tow tension


weight tension

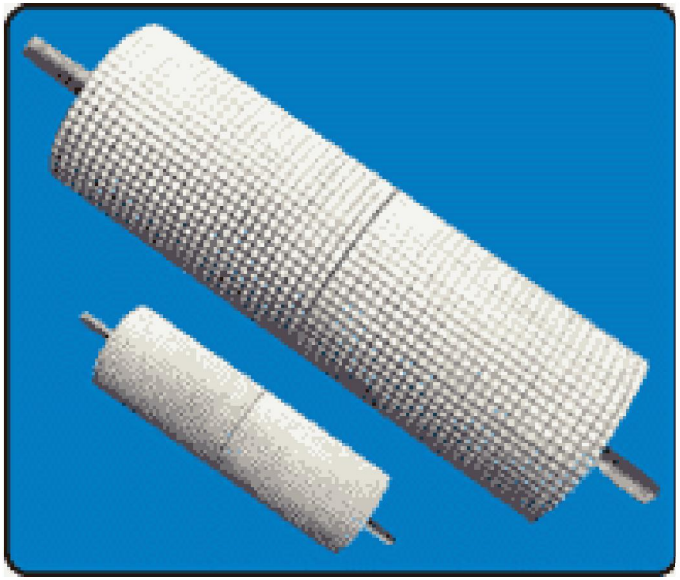
Take-ups and bend pulleys

(1) Impact Cradle Reduce Spill And For Transfer Point
(2) Self-Training Carry Unit
(3) Carry Idler Unit

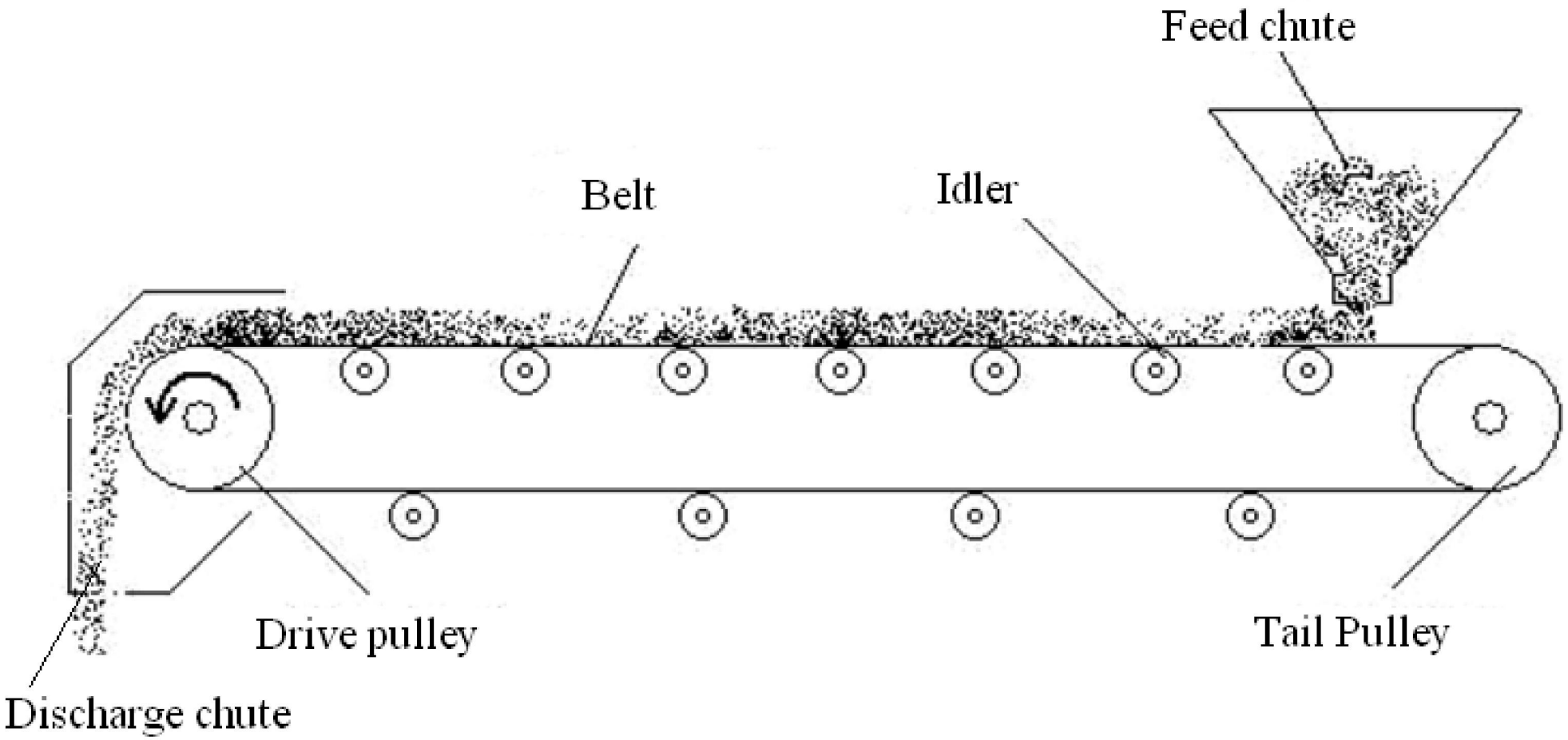
****
Impact Slide Bar
****



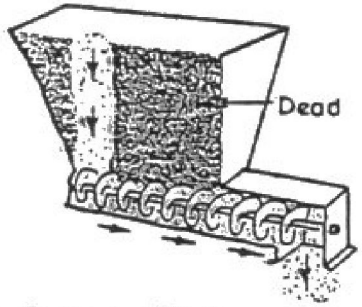
Bend pulleys



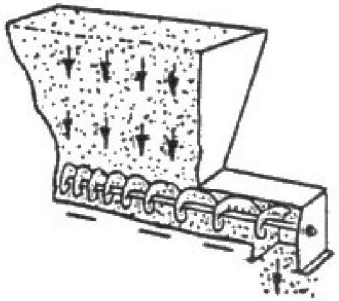
Feed chute and Discharge chute



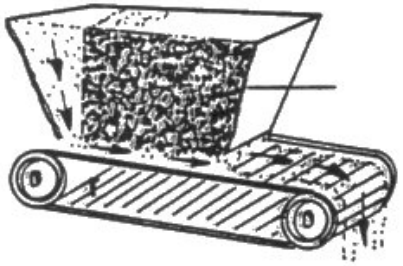
Feed chute:



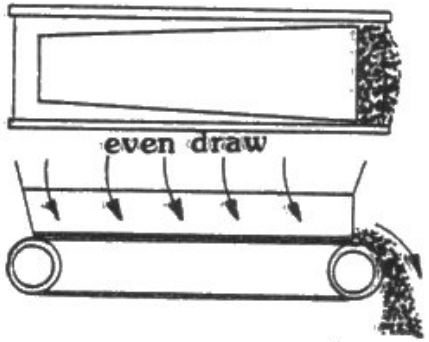
(a) Constant Pitch



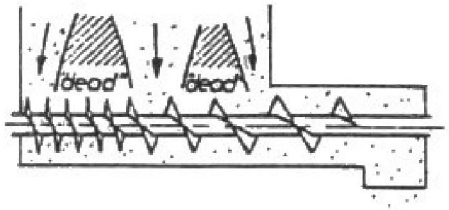
(b) Variable Pitch



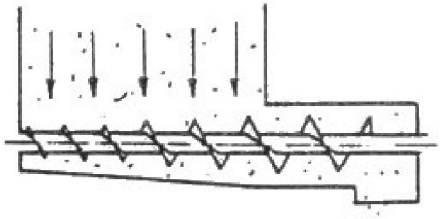
(a)
Parallel Outlet



(b)
Tapered Outlet

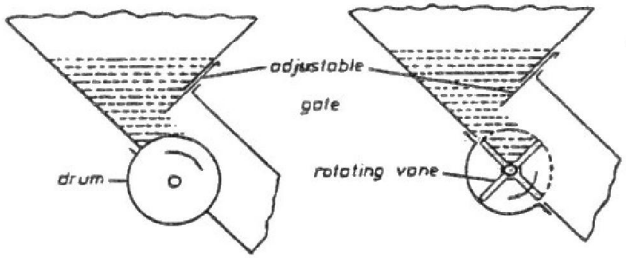


(c) Stepped Pitch

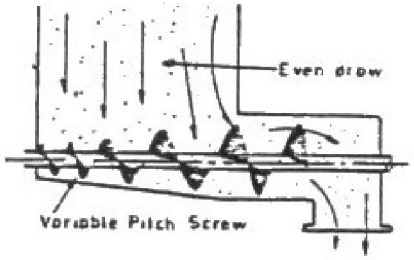


(d) Variable Diameter

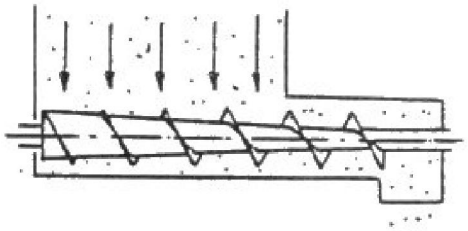
APRON FEEDER



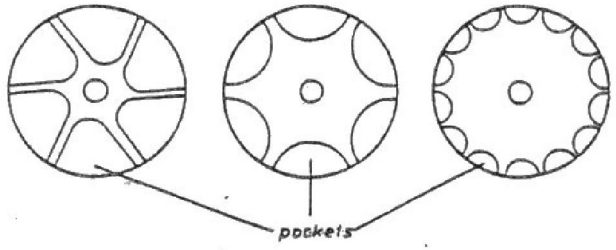
(a) (b)



(e) Variable Pitch and Diam.

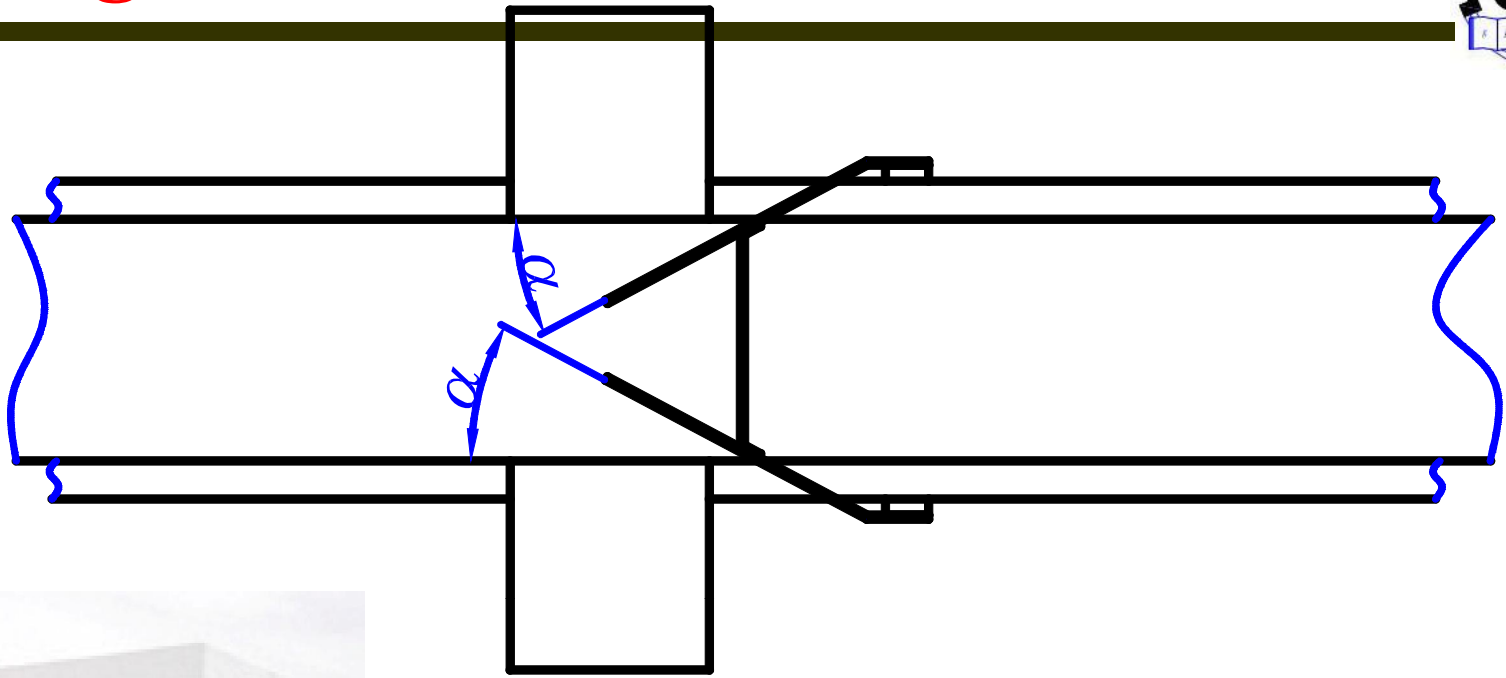


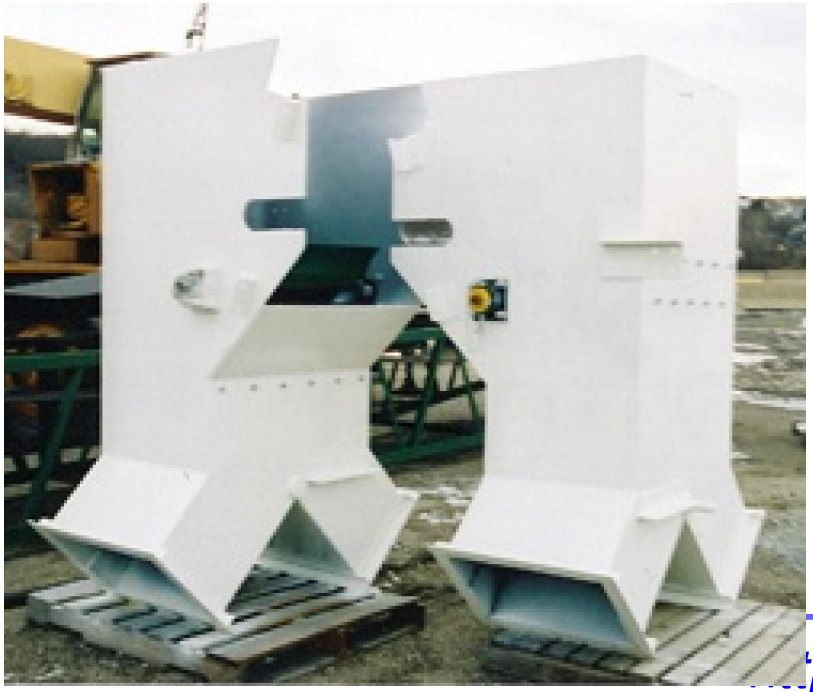
(f) Variable Shaft Diameter



(c)

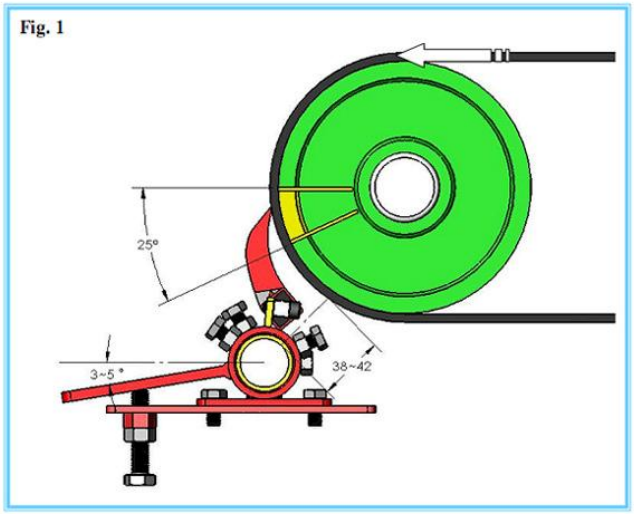
Discharge chute

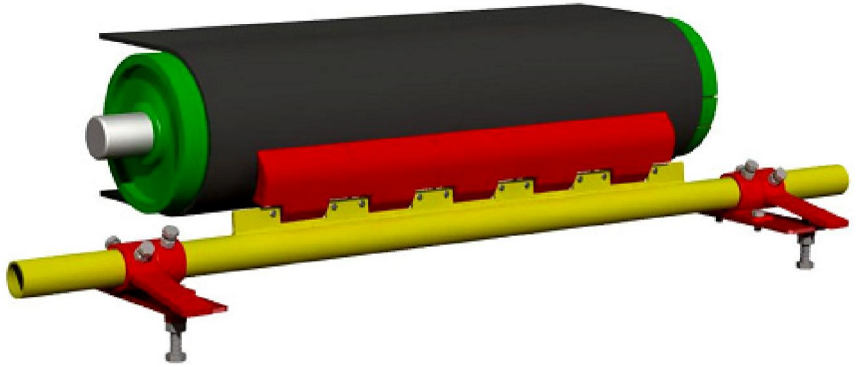


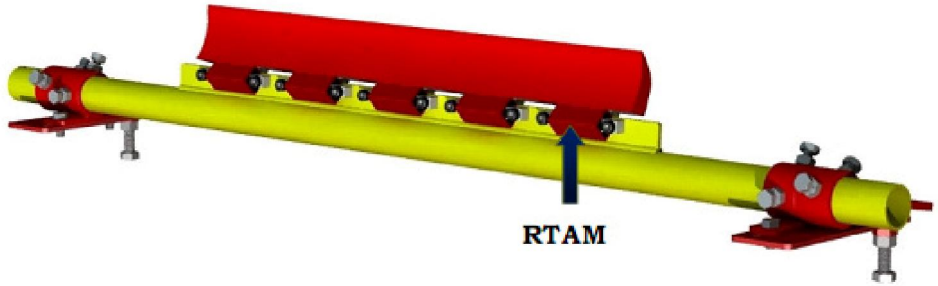


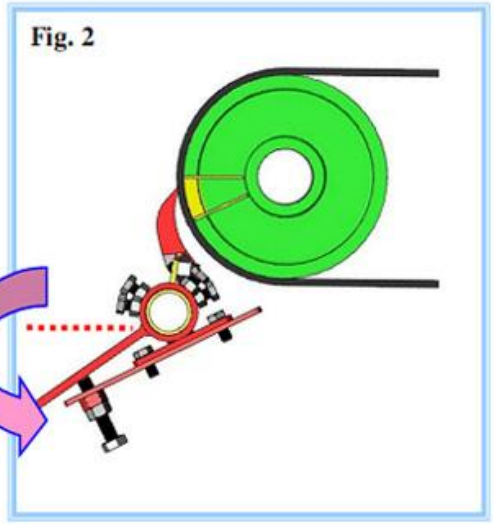
Belt cleaner:

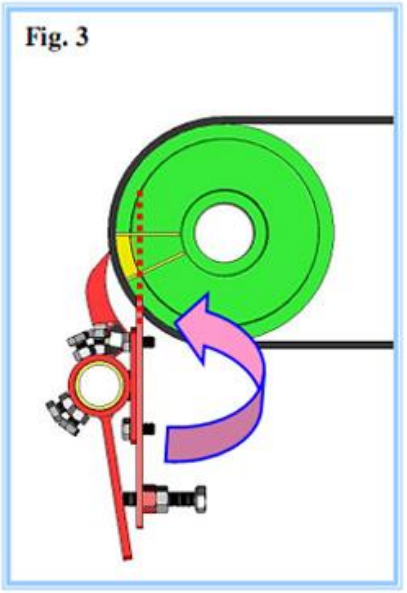
Belt cleaner:











Design:

Cần biết và xác định các thông số sau:

- Đặc tính vật liệu vận chuyển
- Năng suất vận chuyển (T/h hoặc m^3/h)
- Sơ đồ đường vận chuyển với các kích thước cơ bản
- Đặc điểm bộ phận nạp và dỡ liệu,
- Điều kiện sử dụng
- Yêu cầu đặc biệt khác,….

Design:

- **Capacity:**

$$Q = 3,6.q_v.v; \text{ (T/h)}$$

$$q_v = 1000.\ F.\ g.\gamma$$

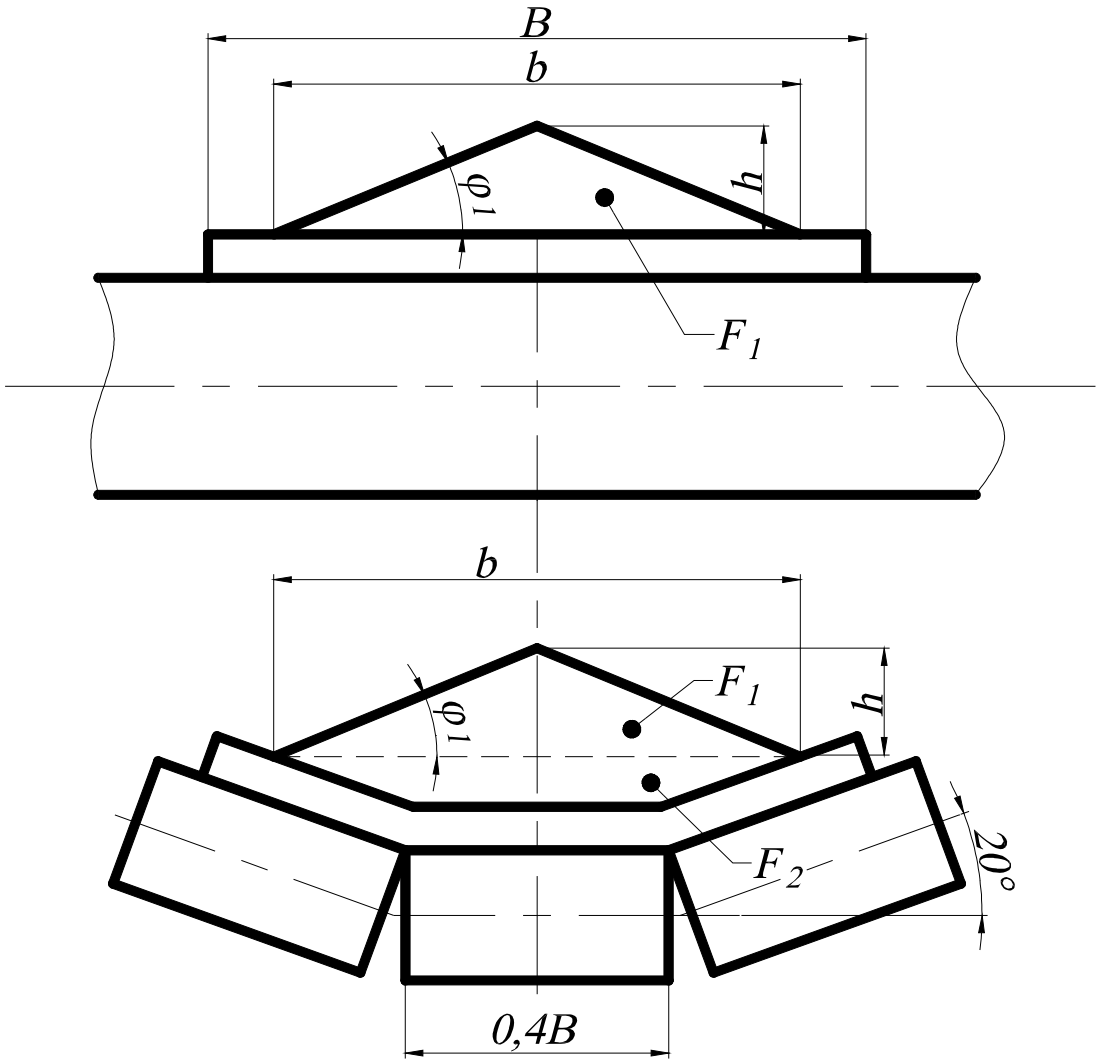
- **Power requirement (HP):**

$$N_đ = \frac{Q.H}{270.\eta}$$

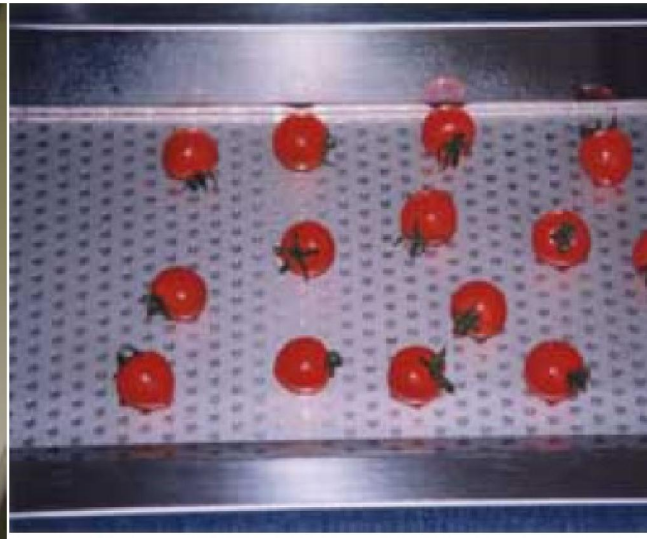
- **Resistance on fixed bearings:**
  - $W_1 = (q_{vl} + q_b + q_{cl}^c)L_{ng} .\omega \ (q_{ct} + q_b)H$
  - $W_{kt} = (q_b + q_{ct}^0)L_{ng} .\omega\ q_b .H$

Design:

- Cross sectional area of loaded F



Belt conveyors on practical.



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Bài tập

- BT01: Đọc Page: 65 – 74 : Belt Conveyor. Tóm tắt, đặt 2 câu hỏi.
- BT02. Đọc bài giảng, đặt 4 câu hỏi kèm trả lời.