ROHINI
COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3601 POST- HARVEST TECHNOLOGY

Mr. VENKATESHAN P

ASSISTANT PROFESSOR

Belt Conveyor

A belt conveyor is an endless belt operation between two pulleys with its load supported on idlers. The belt may be flat for transporting bagged (packed) material or V – shaped or some other enclosed shape for moving bulk grains.

The belt conveyor consists of a belt, drive mechanism and end pulleys, idlers and loading and discharge devices. Belt conveyors have antifriction bearing, therefore, these have a high mechanical efficiency. Material carried by belt conveyor lie still on the surface of belt or there is no relative motion between the product and belt. This results in generally no damage to material. Belt can be run at highest speeds, so large carrying capacities are possible. Horizontally the material can be transported to longer distance but there is a limit to carry the material on elevation. A properly designed belt conveyor has long life and low operating costs. Compared to other types of horizontal conveying system, the initial cost of belt conveying system is competitive. For these reasons belt conveyors are used to carry grains in processing plants. Grains are mostly fed at start pulley and discharge from the conveyor at any point along the conveyor or at the end pulley using scraper plough/stripper. While leaving the belt over the end pulley, product will describe the path of parabola. Belt conveyor can be discharged at various locations by means of a movable tripper.

Design consideration for Belt conveyor

The design of belt conveyor system is based on available space, horizontal conveying length and conveying lift, characteristics of the material to be conveyed and capacity requirement. On the basis of overall requirement and information, the following will be determined to design a belt conveyor, belt width, belt speed diameter of the pulleys and idlers and belt thickness.

The first step in the design of a belt conveyor with a specified conveying capacity is to determine the speed and width of the belt. The belt speed should be selected such that spillage of the material is minimized due to velocity of the belt. For transportation of grains, the belt speed of 2.5 to 2.8 m/s is recommended. The selection of belt width will depend upon the capacity requirement, speed of operation, angle of inclination of belt conveyor, trough angle and depth.

The capacity of belt conveyor can be determined by;

Volumetric Capacity = (area of cross-section) x (belt-speed) x 60

Mass Capacity = (bulk density x Volumetric capacity) / 1000

Where,

Capacity is in t/h

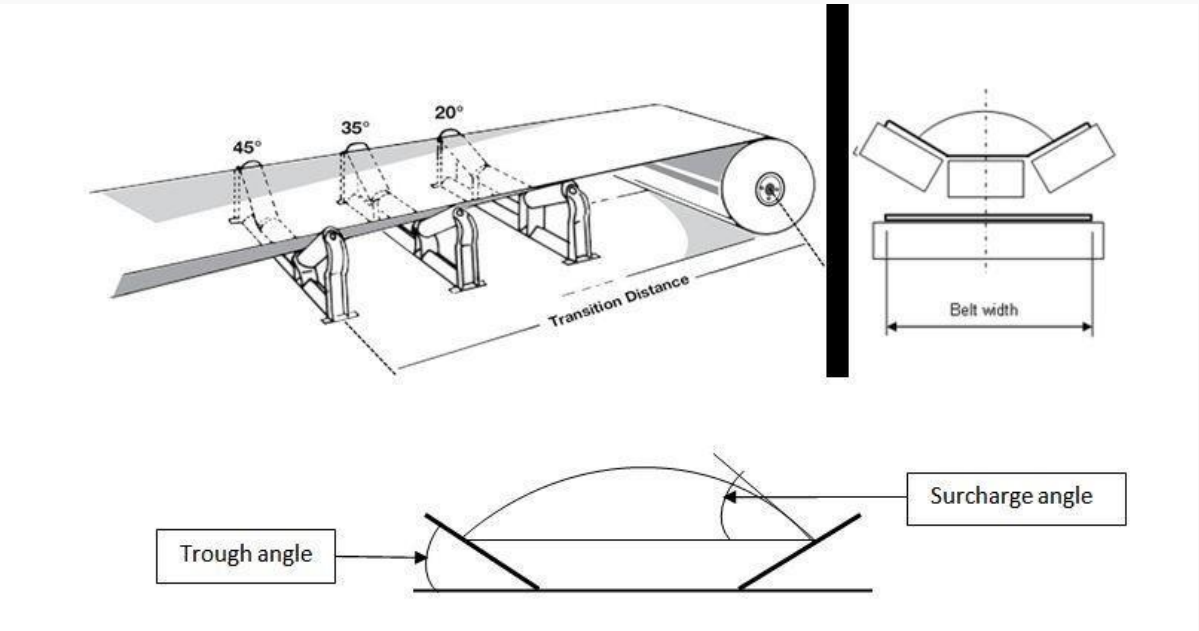
Bulk density is kg/m^3

Volumetric capacity is m^3/h

Cross sectional area in m^2

Belt speed in m/min

A trough angle of 20° is best suited for paddy as paddy forms a surcharge angle of 20° and most other grains also. Other common trough angles are 30° and 45°.



The majority of belt conveyors for transporting bulk material use some type of reinforced rubber conveyor belt made up of carcass.

Belt conveyor idlers

The efficiency of belt conveyor is mainly dependent on idlers. For higher efficiency of conveying systems, the idlers must be accurately made and provide a rigid framework. This will maintain a permanent, well balanced smooth running alignment.

There are, in general, three kinds of belt carrying idlers used in handling of bulk materials. The type of idlers affects the cross-sectional load on the belt.

1. Flat belt idlers: are used for granular materials having an angle of repose of not less than 35°. Flat belt idlers are preferred for low capacity requirements.

2. Toughing idlers with 20° through: are used for conveuying all kinds of bulk materials.

3. Troughing idlers with 35° and 45° through: are used for transportation of small particles and light weight materials like grain,cotton seed etc.

Idler Spacing

The spacing between the idlers influences the retention of correct toughing. The incorrect idler spacing may result in belt undulation. The pitch of idlers is determined by the idler load rating or the carrying capacity of each idler on the sag of the belt between the idlers, belt tension and belt speed. Ideally, the pace between the successive idlers should be approximately equal to the width of the belt (spacing should not exceed 1.2 m). The upper idlers and the return idlers are usually, placed at an equal distance from one another. Additional idlers are provided at

loading points to support the product load and to maintain the trough. This avoids spillage of materials. It may also be necessary to install shock absorbing idlers at the loading points.