MAJOR TEST
Bulk Materials Handling ITL 752

Time Allowed: Two Hours **Max. Marks: 40**
Date: 29.11.2006

Answer All Questions

1. (a) Discuss the constructional and operational features of two basic types of bucket elevators in accordance with the discharge arrangement. (4)

(b) If the required angle of discharge (measured from the vertical) is between 40^0 and 60^0, determine the range of bucket speed to meet this requirement. The radial distance of the centre of the mass of load in the bucket from the head wheel centre is 300 mm. Make all necessary assumptions to simplify the model and explain them. (4)

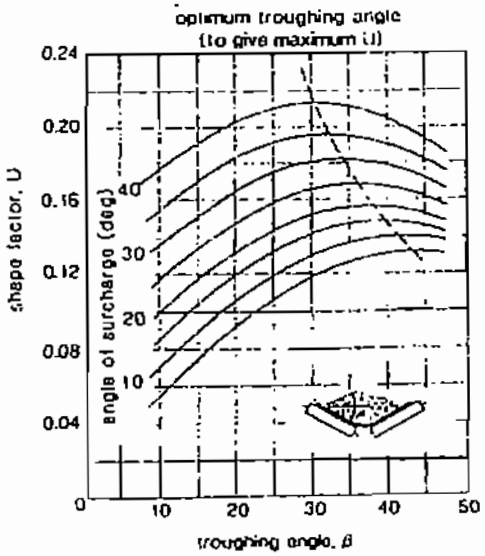
2. Make a sketch of a horizontal belt conveyor for the transport of pulverised fuel ash (pfa). Initial design parameters are:

- dual drive arrangement
- both powered drums are in contact with the clean side of the a belt
- total angle of wrap is approx. 420^0
- angle of repose of pfa 45^0, surcharge angle of pfa $\delta = 30^0$
- bulk density of pfa is 950 kg/m^3

Explain the role of each feature of the initial design. What will be the maximum possible increase of pfa throughput if a two - roll idler system is used instead of a flat belt? The following expressions and a diagram may be of use. (8)

$$m_s = \rho_b k_s U b^2 v$$

$$\beta = 0: \quad U = 1/6 \tan \delta$$



3 (a) Make a sketch of the Auger Conveyor and label its parts. (4)

(b) What are the principal differences between an Auger Conveyor and U-Trough Conveyor? List the major advantages and disadvantages of the screw conveyors. (4)

4 (a) Discuss the influence of impact angle on product degradation. (4)

(b) Sketch a typical blow tank cycle for product flow rate against time. Explain why a single blow tank system has to be designed for a higher conveying rate than is required on a time averaged mean basis. (4)

5. (a) Explain why stepped pipelines are generally recommended for high pressure conveying systems, and discuss the problems associated with the reliable design of such pipelines. (4)

(b) What do you understand by Fluidisation? With the help of a suitable sketch, explain the relationship between the fluidising velocity and pressure drop. (4)