PRACTICAL BELT CONVEYING – PART I
FUNDAMENTALS OF CONVEYOR DESIGN AND REVIEW OF THE PRIMARY COMPONENTS

Conveyor Design
Consultants of WA

COURSE INFORMATION

This four day course is suitable for engineers employed in the design, operation and maintenance of belt conveyor systems, from graduates with a few years experience, through to engineering and maintenance managers. The objective of the course is to give engineers a full understanding of the conveyor design and equipment selection process, together with features of belt conveyors that should be avoided. This knowledge can then be used, not only in the design of new conveyor systems, but also by project engineers involved with new conveyors or existing conveyor upgrades and by those involved with the operation or maintenance of conveyor systems.

This course is suitable for Continuing Professional Development purposes. (32 hours credit)

Course numbers are restricted to a small group which gives each delegate ample opportunity to ask questions and to have any aspect of the course explained in additional detail. Each delegate to the course will receive a copy of the 300 page Practical Belt Conveying Manual. This manual was written by CDC's Principal, David Beckley and is based on his 40 years experience in the bulk materials handling industry.

The course covers the fundamentals of belt conveyor engineering including: belt width and velocity selection, conveyor power demand, belt sag, drive traction, drive types, brakes and holdbacks, information on conveyor arrangements, vertical curves and transitions, material trajectory calculations etc. plus belt, idler and pulley selection. In many of these topics, outdated conventional design methods are challenged and alternative solutions provided. While some people may feel that they already have an adequate understanding of these topics, the real value of this course comes from the fact that it is packed with practical information that is not available in other texts.

The following is a list of some of the important points that delegates will learn:

- Why 45° trough idlers may not be the best choice.
- Why steep troughing angles, particularly when used with a short centre roller, should not be used on some conveyors.
- Why steep troughing angles may result in serious spillage problems at tripper approach curves or at the head end transition.
- What are the pros and cons of three roll v four roll idlers.
- Why the burden surcharge angle can be very different on several conveyors handling the same material.
- What affect horizontal curves can have on conveyor capacity.
- What factors, other than capacity, need to be considered in the selection of belt width.
- How belt conveyor design programs work and what is the difference between rigid body and flexible body belt tension analysis.
- Why 2% belt sag may be excessive.
- How belt sag theory compares with measured sag values.
- Why a drive snub pulley offers no real benefit in reducing belt costs.
- What actually occurs at the belt/drive pulley interface.
- What are the potential problems of using ceramic lagging on drive pulleys.
- Why load sharing problems can occur on dual pulley drives.
- What coefficient of friction values will give reasonably conservative results in determining slack side belt tension requirements.
- Why belt slip may occur at the drive pulley during braked deceleration.
- What are the benefits of low speed brakes.
- What is the best ratio of motor power for a dual drive pulley arrangement.
- What bend pulley arrangements to avoid.
- Why high tension bend pulleys wear unevenly and why this problem can be detrimental to the belt splice.
- Why space should be provided between

- Why ground mounted drives may not be the best choice.
- What drive pulley arrangements to avoid.
- The pros and cons of head end take-ups and tail end take-ups.
- Why vertical gravity take-ups invariably cause belt drift problems.
- Why winch take-ups can result in high belt tensions.
- The pros and cons of various head end shuttle designs.
- Why edge buckling can be a serious problem in tripper approach curves.
- Why pulleys fail.
- What are the limitations of pulley locking elements.

adjacent pulleys.

- Why standard pulley face widths are inadequate for steel cord belts.
- The pros and cons of dead shaft v live shaft pulleys.
- The benefits of large idler diameters in reducing power demand.
- The relative merits of fixed frame v catenary idlers.
- The relative merits of inline v offset idler rollers.
- What type of return idler support brackets to avoid.
- Why 'V' return idlers may not be the best choice.
- Why idler mounted wind boards may increase dust problems.

Having completed the course, delegates will have been given the knowledge and skills necessary to carry out the following engineering tasks:

- How to conveniently and accurately determine the burden cross sectional area and the idler bearing loads for any burden surcharge angle, burden edge distance or troughing angle.
- How to determine the approximate burden surcharge angle, not only for different material types but also to suit the belt velocity, the angle of the conveyor at the loading point and the transfer chute design.
- How to carry out reliable field measurements of burden surcharge angle.
- How to assess the burden surges that may occur from different types of feed equipment and how they will affect conveyor capacity.
- How to align idlers and what idler installation tolerances should be specified.
- How to determine the chute volume required to absorb the quantity of material that will be discharged into the chute if there is an overlapping stopping situation.
- How to determine the length of flooded belt that will occur if there is an overlapping stopping situation.
- How to prevent overlapping stopping times.
- How to apply Euler's equation to both single pulley and dual pulley drives.
- How to design successful trippers.
- How to calculate the power demand of a conveyor from first principles.
- How to determine the power required to restart a conveyor with a bogged chute.
- How to determine material trajectory.
- How a one page spreadsheet can be used to calculate the power requirement of a belt conveyor allowing for the following variables:
    - Idler diameter
    - Belt velocity
    - Ambient temperature
    - Idler troughing angle
    - Belt sag and burden pressure
- How to design vertical curves and transitions.
- How to select belt cover materials.
- How to choose belt cover thickness.
- How to minimise belt wear.
- How to determine the troughability of a steel cord belt.
- How to select belt safety factors based on the stress raising features and operating conditions of individual conveyors.
- How to conveniently determine minimum pulley diameters based on the pressure between the belt and the pulley, carcass flexing and top cover extension.
- How to determine pulley shaft deflection at the pulley locking elements.
- How to select pulley bearings and seals.
- How to correctly support pulley bearings.
- How to align pulleys.
- How to select idler bearings and shafts.
- How to determine dynamic load factors.
- How to determine belt deviation loads acting on idlers.