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Ask Joe! Column

Operating Considerations for Belt Conveyors

Guest article by Dr Harold Wright, Alan Jackson and Ray Hodgkinson

Similar problems occur within both the quarrying and the mining industry when the correct selection of belt conveyors is being considered, namely the environmental and physical constraints under which the unit is expected to operate. Both of these have an impact upon the final selection of appropriate equipment - some of the constraints that these cause are looked at below:

Motor Power Selection

Within the basic conveyor calculation correct selection of friction factor is crucial to ensure that the conveyor is adequately powered - in selecting the friction factor full regard must be taken of the anticipated operating condition of the conveyor taking into account such factors as:

- Expected accuracy of alignment (IE, is the conveyor a permanent installation or will it be periodically re-sited?)
- are the idler rolls selected of highest industry standard? - is there internal rotation friction as low as practical? - is there eccentricity at minimum values? - are they forward tilted?
- is the conveyor to run in a dusty atmosphere?
- will the unit operate at low temperature? (note that special grease may be required in very low or high temperature conditions)
- does the material to be conveyed have a high internal friction? (highly angular lumps can create this as well as the material itself)
- will the conveyor always be operating at low belt-tension? (low tension creates more belt sag and higher pulling effort); and
- full account should be taken of all special and secondary resistances - these include items such as: acceleration of the load at the transfer point (this is usually allowed for within the length correction factor for longer center conveyors); effect of belt ploughs and scraper; effect of belt tripper units and bunker drag out effect.

It is generally thought that these last elements are those that caused the discrepancies noted in one of Dr H Wright's paper "Current UK Drive Formulae for Belt Conveyors - Fact or Friction"

Drive Format Selection

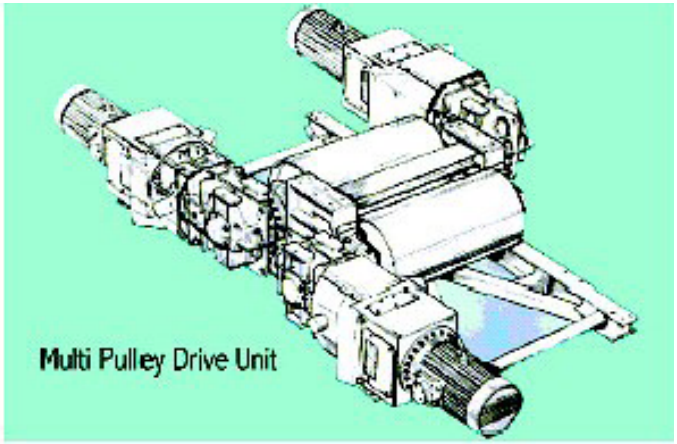
Differing conditions call for differing drive formats - such cases can be:

- Will the selection of belt grade reduce if a dual drive pulley arrangement is used? - will this reduction pay for the extra complication of the drive?

- can the discharge pulley also be the drive pulley? (this is usually the most cost effective but consideration has to be given to the ease of support of the transmission gear and the potential that it is operating within the dust generated by the material discharge).

Care has to be used in the selection of transmission equipment - will the conveyor be subject to run-back forces?, will it need braking to prevent overrun or reduce stopping time to acceptable limits? If the required drive power is high (particularly in relation to the power required to turn the empty belt) then a gradual start-up will benefit the life of the belting and the conveyor pulleys - this can be achieved by either use of fluid or powder coupling or by electronic control of the motor run up time.

Tensioning Arrangements



Arguably the easiest and the one that in the majority of cases produces the least stress impact into the conveyor belt is the gravity operated system - either directly formed by having a vertically-moving pulley, to which is attached the gravity weight or indirectly by means of a horizontally-moving pulley with the effort of the gravity weight being applied through a rope system. Where the conveyor length is relatively short (say less than 200m) and the conveyor configuration does not lend itself to a direct gravity system, then a tensioning device may be used at the tail pulley (usually by adjustment to the tail pulley position by a screw or similar method).

More complex arrangements are possible, utilizing moving pulleys tensioned by rope systems with tension being applied by electric winch or by hydraulic system or similar - these being more usually applied to long centered or complex conveyors.

Conveyor Structure Selection

Selection of the general structure (and indeed the design of the other major elements of the conveyor) is affected by the ground upon which the unit is to operate. Ground with low bearing capability could require pontoon mounted drive etc; with the structure being carried on sleepers.

Conveyors that are to be repositioned periodically can also have the same design to facilitate ease of movement. Idler rolls need to be selected, taking into account the speed of the conveyor and the nature of the material and tonnage rate to be conveyed, whilst producing an acceptable life rating of the bearings (usually no less than 50,000 hours B10 rating).

Special Conveyors

Engineers today have the benefit of being able to select proven conveyor types that offer solutions to previously difficult problems. For example:

- Steep angle conveyors can now can provide high angles of lift, giving potential for conveying out of pit/quarry without having to follow a shallow angle grade route
- where required, conveyors can totally enclose the material (by the use of pipe or the new Kawasaki Flow Dynamic Conveyor* (FDC), similar conveyor construction); and
- conventional conveyors can now be engineered to run around horizontal curves (indeed pipe type systems can operate around very sharp curves) enabling the most effective conveyor route to be chosen whilst minimizing conveyor transfer points.

Conclusion

Conveyors operating within the mine and quarry industry have their own particular problems but if both the basic conveyor calculations and equipment selection are carried out, taking into account all the known factors, then these can prove to be reliable cost-effective solutions to material transportation problems.

Editor's Note: This article by Dr. Wright's was first published in the Mine & Quarries 2002 Yearbook, by McMillan-Scott plc UK

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Welcome to Ask Joe!, a monthly column by our resident materials handling guru, Joe Marinelli of Solids Handling Technologies. Joe addresses the issues that bug you the most. And Joe knows!! Formerly with Jenike & Johanson, Solids Flow and Peabody TecTank, Joe is an expert on materials handling.

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Guest articles for the **Ask Joe!** Column are always welcome, for more information please contact Joe Marinelli directly at his email address: joe@solidshandlingtech.com.