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Bulk Solids Conveying for Heavy Industry

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Förderbandtransport in der Schwerindustrie
Convoyeur à courroie dans l'industrie lourde
Transporte de materiales a granel en la industria pesada

重工業用粉体運搬

重工业散庄固体输送装置

نقل المواد الصلبة السائبة اللازمة للصناعات الثقيلة

Summary

The advantages of the Cable Belt conveying system as compared with conventional belts is highlighted, indicating that a belt conveying system where the belt itself is not required to transmit the driving force is more efficient as this allows each component of the design to fulfil its particular function more effectively.

1. Introduction

There can be no doubt that the bulk solids handling requirements of the coal and minerals processing industry rate amongst the most exacting of any in the world. To meet the needs of individual quarries, mines and plants, their overall responsibilities to the public and their employees, the conveyor systems that manufacturers install must be safe, economical, versatile and durable.

Cable Belt Ltd., Camberley, England, designs, manufacturers and installs heavy duty conveyors for the long distance transportation of coal, mineral ores and similar materials.

In the UK the company's main customer is the National Coal Board (NCB) which over the years has repeatedly chosen the Cable Belt system for the solution of both overland and underground transportation problems.

The unique feature of Cable Belt conveyors is that, in use, the carrying and drive functions of the system are separate. The belt sits on, but is not attached to the drive cables (Fig. 1). This naturally means that the belt is not required, by design or construction, to transmit the driving force and the cables are therefore used solely for support and drive. Consequently each component can be more efficiently used for its particular single function.

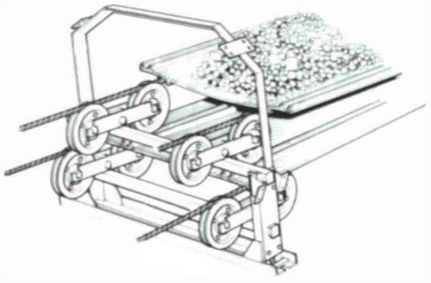

Fig. 1: Schematic representation showing the belting resting on the drive cables

2. Cable Belt Design

The standard Cable Belt consists of a laterally rigid but longitudinally flexible belt, supported at or near its edges on two parallel loops of drive cables which are, in turn supported by pulleys and a powered drive unit, usually located at the discharge point.

The separation of the drive and the carrying medium, together with a number of recent modifications to the system make the conveyors economical, durable and flexible.

The trough shape to provide carrying capacity is inherent in the belt when laden and is not imposed upon by external forces such as idlers. Thus, there is a substantial reduction in the power required to overcome friction and hence a resultant low energy and power consumption.

When loaded, the belt resting on the cables, becomes parabola shaped, in which configuration the belt has a greater carrying capacity per metre than comparable conventional conveyors (Fig. 2). Purpose designed Cable Belt

Fig. 2: Cross-section showing the belts parabola shape

conveyors can transport even fluid-like materials as shoe-form edges, which grip the cables on the return cycle, provide a substantial barrier to spillage and the absence of idlers minimises agitation (Fig. 3).

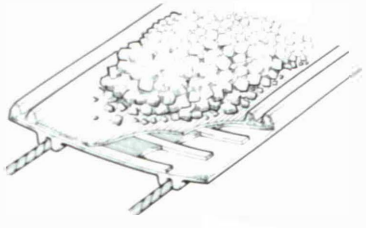

Fig. 3: Belt construction and the function of the shoe-form edges

The positive tracking of the belt, the smooth ride and the fact that the troughing is caused by the load make these conveyors ideal for manriding and man-conveyance.

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To improve cable wear the cable support pulleys were modified some years ago to incorporate polyurethane rims, which cushion the impact between the cable and the pulley. This greatly increased the life of the drive cables and such cables are currently in service capable of handling over 30 million tonnes before replacement.

Further research and development work in this area include projects set up to investigate the optimum cable structure which is a specially covered core reinforcement and a synthetic outer cover.

The cable modifications also make splicing easier, facilitate conveyor extension and decrease maintenance costs.

2.1 System Application

The versatility of the system is such that Cable Belt conveyors with specially adapted belts have been able to run on slopes where the overall gradient is 1:2.6, with sections running at 1:1.88, without belt slippage.

Normal conveyors can be designed with curves in the system where space allows a gradual change in direction. Where changes in direction are too sudden to allow curving, angle stations can be installed (Fig. 4). These transfer the load, horizontally or vertically, from one belt to another using a pulley system to reeve the continuous drive cables which are powered by a single remote drive unit common to both belts. Several angle stations can be used on particularly difficult routes.

Cable Belt's most recent UK contract was awarded by the National Coal Board (NCB) in August 1980 for an installation at its massive new Selby complex. The order is for the supply and installation of the main trunk conveyor in the Gascoigne Wood north drift and is valued at £ 13 million.

The conveyor will have an eventual completed total length of 15 km and a total vertical lift of 990 m, driven by a single power unit with two 4,375 kW DC motors.

Among the numerous existing installations for the NCB are a 9 km conveyor at the Longannet complex in Scotland, a 6.5 km underground conveyor at Horden Colliery in Northern England, installations at Betwys in Wales, Prince of Wales Colliery in North Yorkshire, England and at Trentham Drift in Staffordshire, England.

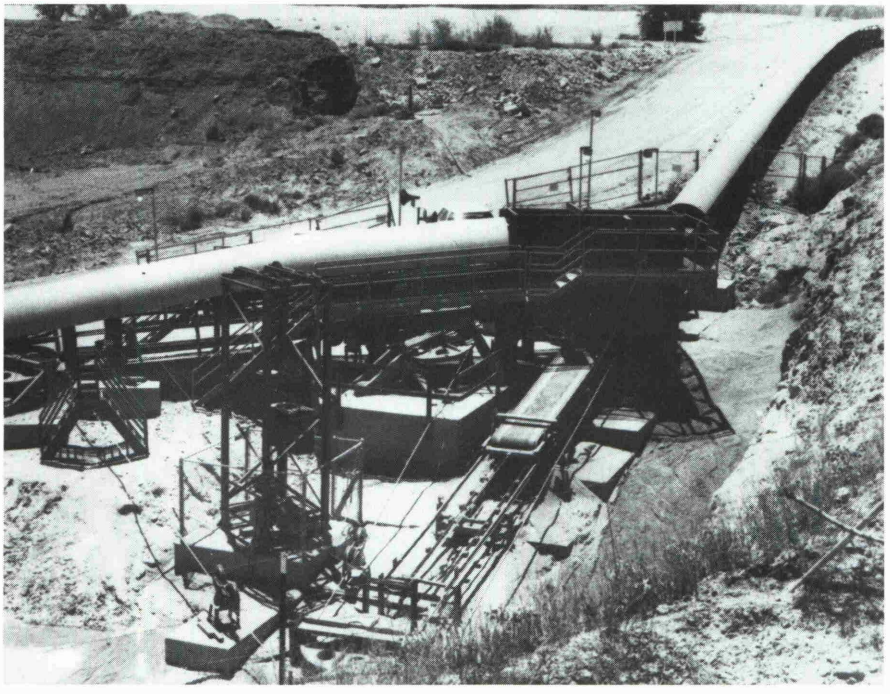

Fig. 4: Material transfer angle station

Other UK contracts include a 6.1 km conveyor for the British Steel Corporation (BSC), Scunthorpe, two others for BSC at Llanwern, a ship-to-shore conveyor, incorporating angle stations, for British Aluminium Ltd., at Invergorden, Scotland which handles 1,500 t/h and a lesser capacity conveyor for Anglesey Aluminium Metal Ltd., which carries alumina under the harbour at Holyhead.

3. Further Research

Part of the success of the Cable Belt system, which holds five world records for single drive/single flight conveying, lies in the company's commitment to research and development.

The company has also invested heavily in the creation of an integrated computer-aided design and production system, enabling the entire manufacturing process from the raw rubber to the finished product to be undertaken on one production site.

One of the main components of the rubber making complex is a processing unit supplied by Werner & Pfleiderer which produces the various grades of rubber pellets to meet the specifications required for the different parts of the system.

The belting itself is composed of rubber, nylon and steel. The steel cabling is supplied by specialist manufacture but the core and protective fire-resistant cover on the modified cable under development are sleeved at the company's own plant.

Cable Belt's commitment to research and development to keep abreast of advances in mining engineering and industrial technology has recently paid off. In August 1980, against strong international competition, Cable Belt, through its Australian subsidiary, was awarded a letter of intent worth £ 29.4 million for a 51 km two-leg conveyor system for the giant Worsley alumina project near Perth in Western Australia.