



White Paper

Optimum Gear Units aid Conveyor Belt Systems - Drive Solutions with Gear Units for Belt Conveyors in the Mining Industry

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In the mining industry, drive technology has a decisive influence on conveyor performance and system availability. Three-phase asynchronous motors plus gear units have proved a robust, quick-to-install, low-maintenance variant here.

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For large conveyor belts required to carry heavy loads, drive systems incorporating suitably designed gear units are an excellent solution.

(Pictures: © Siemens)

In mining there are typical areas of application where the axiom “Fit and forget!” applies. That means that all the technology used serves to maximise profit direct and just for this reason has to be favourably priced, long-lived, powerful and robust. Belt conveyors are also subject to these demands by mine operators. In this respect there is a number of important aspects that ultimately result in the perfect conveyor belt drive. Siemens has decades of experience in bulk material

conveyor technology. High availability, proven technology and low costs are the advantages of the drive solutions for these applications.

Gear Units with highly efficient Axial Cooling Fans

What exactly are the advantages of this gear unit solution? Whereas for lower outputs standard gear units are frequently used, individually adapted solutions are needed for conveyor belts that shift especially heavy loads – in some cases over many kilometres. Here thermal capacity is regarded as the decisive factor in the selection of the right gear unit. In practice, the required output and desired rotary speed are specified by the operator as design parameters, which determine the heat to be dissipated, which in turn may correspondingly strongly influence the dimensioning process. This may partly result in operating conditions that make a gear unit advisable that is larger than the output originally necessitates.



In gear unit operation thermal capacity determines what climatic conditions including temperature fluctuations a gear unit can still be operated in.

So, if conveyor belts operate in climatic zones which are particularly warm or are even prone to extreme heat-cold fluctuations, a lot of attention has to be paid to cooling. Here the Siemens electrical group has invested a great deal in development and fitted its gear units with highly efficient axial cooling fans. These direct the air over the housing and ensure that the heat is drawn off from the housing. Specially designed air guidance hoods distribute the air evenly over the entire surface - that is, over all four sides. For operators this has the advantage that they can manage with outputs of up to approx. 2000 kW without the need for an additional oil cooling unit. Optimum cooling is particularly decisive for the components and materials used, such as seals and gear oil. The cooling system ensures that the lubricating capacity of the oil is not impaired and the optimum carrying capacity of the gear teeth is maintained. For this reason Siemens has developed correspondingly efficient cooling solutions for its three gear-unit series, which comprise a total of 46 conveyor belt drive sizes. So in many cases a smaller gear unit may prove to be sufficient. The high flexibility resulting from the wide range of gear units offered means that the gear unit solution can be tailored to fit the customer's precise requirements. That is an important reason why this solution proves economical.

Compact Unit featuring easy Assembly and Installation



Drive systems with gear units are cost-effective and simple for purposes of project planning and maintenance.

Particularly the extremely compact gear units featuring the patented self-aligning system offer even more advantages appreciated by mine operators. On these units the motor and the gear unit are fixed together by what is known as a bell housing, which contains the coupling as well. This means that the system operator no longer has the job of aligning the individual component assemblies, a process which normally calls for special knowledge and skills. At the same time the firm connection between the components gives markedly increased operational reliability. Another special feature of these drive units is that they can

be installed as right hand and as left hand versions without the need to be converted. The important thing is that users have to expend as little effort and money as possible on engineering, start up and operation. That naturally also applies to the drive, which Siemens delivers complete as a single unit. The manufacturer calls this system concept an Integrated Drive System (IDS) and delivers ready-to-fit complete systems, from the control system, through the different starter solutions to the gear unit, the coupling and the motor. This also makes customer service, which can be provided by a worldwide network, easier. Furthermore the manufacturer offers Condition Monitoring Systems (CMS), which enable continuous monitoring and can prevent potential problems. After all, large conveyor belts often run for many kilometres in remote areas in an environment which mining personnel seldom venture into. Incipient faults can therefore be identified more easily with the help of the Siplus CMS equipment.

Drive with Energy Feedback to the Grid



On inclined conveyor sections there is the possibility of energy recovery via the frequency inverter.

Depending on economic and engineering design details, drive solutions with a gear unit prove to be interesting solutions even on large conveyor belts. This is because, particularly in a mining environment, there are no specially qualified specialists necessary to operate them, thus keeping down operating costs. As for maintenance, this is merely a matter of checking the oil level, topping up the oil, if necessary, or changing the oil, as required. Compared with a direct drive, acquisition costs are markedly lower and pay for themselves correspondingly earlier. Furthermore, these drive solutions are insensitive to vibration of the kind

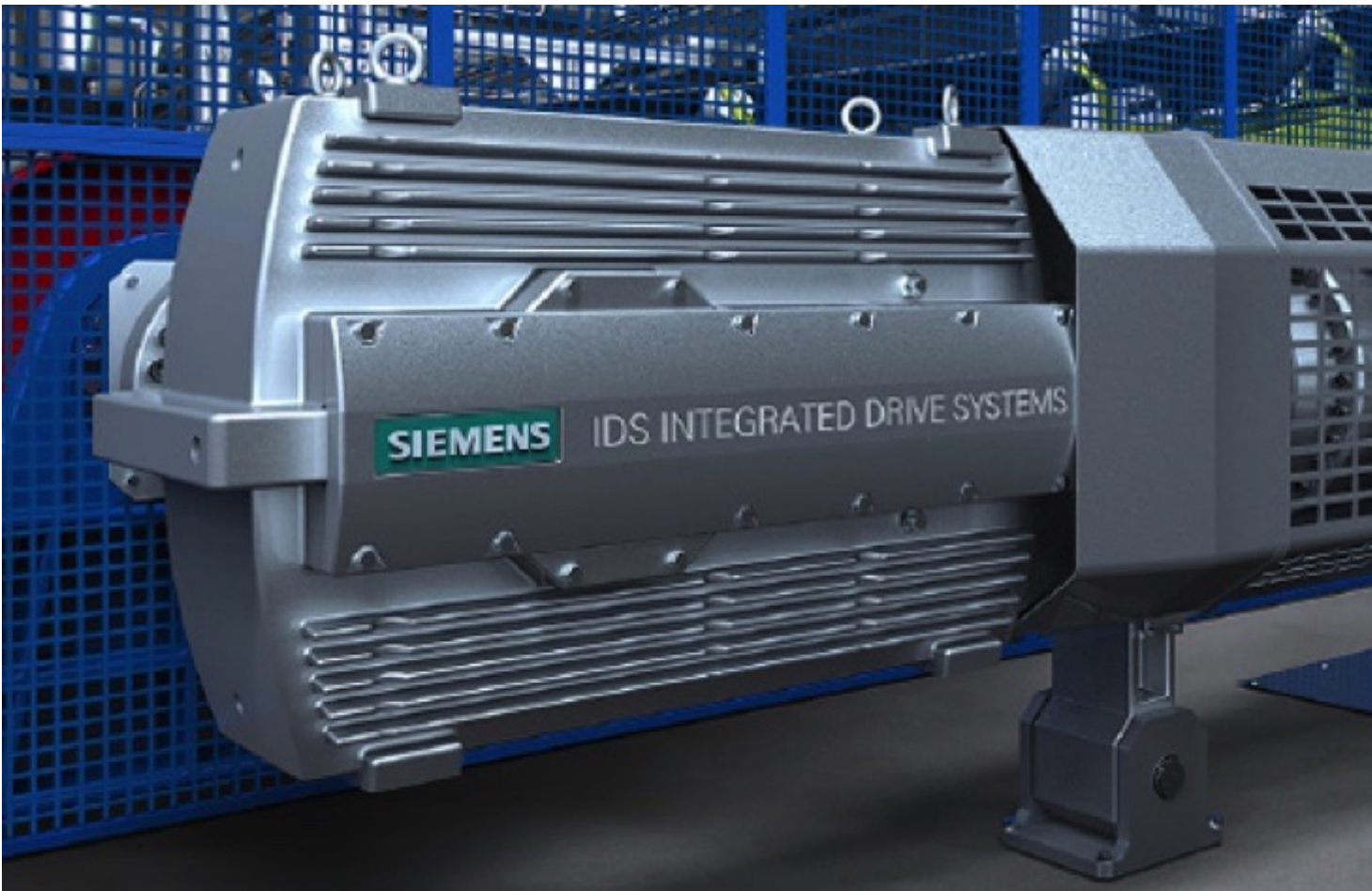
that can occur, for example, when the drives are mounted on stands several metres above ground. In addition, solutions with geared drives are always very quickly ready to operate, because they do not need any special fitting structure or elaborate foundation work. In combination with three-phase asynchronous motors the drive system can increase economic efficiency in entirely new ways. When belts run downhill they are decelerated in the overrun mode. During this operation electrical energy is generated which is fed into the grid via the frequency inverter. The resulting energy feedback reduces operating costs and so increases the efficiency of a total solution.

Active Redundancy with multiple Drives

If the power requirement of the material conveying system exceeds a range of between two and three megawatts, multiple drives are an excellent solution. With these there is the advantage of active redundancy. So, if one of the drives has to be shut down for service reasons, the material conveying system can continue to run with a reduced load without the risk of serious disruption to the operation of the mine. Because equipment availability is something that mine operators attach the greatest importance to.

Drive Technology with many Advantages

There are many reasons to choose geared drive solutions. The decisive ones are the tailored design, optimally coordinated solutions and the right partners. In detail this drive technology proves itself to be a cost-effective solution that stands out from other options both at the project planning and at the acquisition stage.



For especially compact geared-motor systems that can be easily installed Siemens offers variants incorporating the patented self-aligning system.

It also scores with regard to space requirement and installation friendliness. And, last but not least, its operation with only little maintenance needs is also highly beneficial in mine operation, and must be stressed as an additional advantage. In short, if you want to optimise, there are many possibilities for doing so.

A Note from the Editor

For all statements in this article that refer – directly or indirectly – to the time of publication (for example “new”, “now”, “present”, but also expressions such as “patent pending”), please keep in mind that this article was originally published in 2014.

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