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The smart solution for materials handling technology

The right drive for reduced engineering complexity and improved energy efficiency

Requirements such as torque, energy efficiency and starting torque cannot be simultaneously optimised using conventional technology. Smart drives for horizontal conveying systems solve this dilemma, while reducing the number of variants and engineering effort required in control cabinets and for cabling.

The market for materials handling technology is in a state of flux. The trend towards defined start-stop ramps and international energy efficiency regulations for 400V technology are placing greater demands on modern drives. For the foreseeable future, therefore, conveyor drives will mainly be electronically controlled, but many of the solutions currently available cannot meet the specific requirements of materials handling technology. At the same time, their increasing complexity contradicts the requirements of OEMs, who want to reduce the time and effort required for dimensioning, design and installation in order to shorten project times.

Challenge of horizontal conveying

Conveyor applications have to perform three diverse tasks, each of which places entirely different demands on the drive technology. At the start, a high breakaway torque must be generated to accelerate the load. Once the nominal conveyor speed has been achieved, only the friction of the mechanical design needs to be overcome. Much lower torques are sufficient for this. This changes again for pallet alignment, namely when they are pushed against the limit stop and the rollers or chains are forced to slide briefly underneath the pallet, creating high frictional resistance.

The energy required for this accounts for 95 to 97 percent of the overall costs during the service life of a drive. Common geared motors, which are operated directly on the 50/60-Hz using contactors and/or motor-starter combinations, are not particularly efficient in this case. This is because they need to be configured to suit the starting torque – and are then overdimensioned during the phase of normal conveyor speed. Even the use of frequency inverters, which typically provide up to twice the overload (180 to 200 percent) during the start-up process, cannot fully resolve this problem. They result in additional costs and increased engineering effort, as well as providing a complex functional range that needs to be paid for by the OEM and end customer, but is essentially useless for their horizontal conveyor technology.

Smart response

One alternative that gets around these problems is the Lenze Smart Motor m300. As a fully-integrated solution with a dedicated electronic control unit, it provides up to four times the nominal torque during acceleration and alignment. Accordingly, it can be sized based on the required power during constant operation and runs at almost optimum performance in this mode and not in the less efficient partial load range. This provides plant operators with an energy-efficient alternative for many applications.

Dramatic reduction in variants

So far, machine builders have been forced to manage numerous variants of materials handling technology, even when they modularise their solutions. 50 and 60 Hz mains need to be included in the equation for global distribution, with voltages ranging between 400 and 480V. Suitable geared motors must be installed in these systems to achieve different speeds – creating a great deal of administrative effort that runs through the entire product lifecycle: from engineering, materials handling and logistics (orders, warehousing), to operation and maintenance (training, spare parts warehousing, documentation).

The electronic control unit in the Lenze Smart Motor produces several real benefits here. It allows the input speed to be adjusted while maintaining a constant gearbox ratio. The consistent, uniform sizing of the drives for all standard conveyor elements therefore leads to a reduction in variant diversity of up to 70%. The electronics of the Smart Motor work with all voltages between 400 and 480V.

Reduced engineering complexity

With five adjustable speed levels – and the infinite selection of rotating direction – definable start and stop ramps, as well as an electronic contactor and motor protection function, the Smart Motor's integrated electronics eliminate the components, reversing contactor and motor protection circuits, as well as the polarity reversal required for mains motors. This enables space savings of up to two thirds if these components were previously installed in a control cabinet. In the Smart Motor, speed levels are switched independently of the fieldbus using 24V signals. The 400-480V cabling can be implemented with a stub so that entire drive trains can be built on a single supply line. The control unit is also prepared for such a design: in this case, entire units with several drives can easily be

integrated. Wireless technology can be used to transmit predefined speeds and acceleration ramps, as well as to optimise speed levels, by smartphone – without the need for expert knowledge or extensive staff training. Braking is also controlled electronically. This ensures that a constant braking distance is maintained at all times, regardless of the load.

Conclusion

Very specific demands are placed on drives when used in horizontal conveying. This will inevitably mean that mains-operated and controlled motors will represent compromises. For most of these applications, the Lenze Smart Motor offers consistent dimensioning that enables energy-efficient operation in the optimum speed range – a crucial factor when considering total cost of ownership (TCO).

The drive realises its full potential when its design features are also reflected in the engineering. The OEM benefits from the simpler, less complex control and regulation technology, as well as from the fewer variants, which allow improved modularisation and considerably reduces their time-2-market.

About Lenze

Lenze is a leading automation company for mechanical engineering. With 70 years of experience in providing solutions, Lenze is a strong partner that stands side by side with its customers. The company portfolio includes high-quality mechatronic products and packages, efficient systems consisting of hardware and software for machine automation and digitisation services in the areas of big data management, cloud and mobile solutions as well as software within the context of the Internet of Things (IoT).

Lenze employs around 3,700 people worldwide and is represented in more than 60 countries. As part of its growth strategy, Lenze intends to continue investing strongly in Industry 4.0 sectors in the upcoming years – with the aim of further increasing revenues and profitability.

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