# Belt conveying processes optimized for productivity and cost

The application of innovative torque sensing technology is bringing a new level of control to demanding belt conveying applications. This has the potential to revolutionize the dry bulk handling process, with vastly improved efficiency and cost-effectiveness.

Belt conveyors have long been vital components within bulk handling applications, and have transformed what was once a laborious manual operation. Optimization of the conveying process, however, is rarely considered or, if it is considered at all, is regarded as something of a 'black art'. However, this is all set to change, thanks to the application of non-contact digital torque monitoring, which has the potential to transform bulk materials conveying into a highly accurate and controlled procedure.

*TorqSense has been used in many bulk handling and conveying applications.*

When a belt conveyor is empty, it requires very little power from the drive shaft to keep it moving smoothly. As the conveyor load increases — with heavier material and/or a greater material density being conveyed, so more power is needed. Similarly, if the conveyor is run at a higher speed, so more power is needed.

Bulk handling operations in many applications such as ports and stockyards demand fast turnaround times to ensure costs are minimized. Conveyors, therefore, need to be run at optimal speed regardless of the load. If the belt conveyor slows down as more bulk is added, then this is adding time and cost to the bulk handling process.

In addition, the mechanical processes at the receiving end of the conveyor may well need a steady flow of material in order to operate efficiently — or indeed safely. If the conveyor speeds up as the load is gradually reduced, then there is potentially a costly mechanical failure waiting to happen.


*Mark Ingham: "Torque measurement is key to efficient control and management of conveyor systems"*


*TorqSense with separate control electronics.*

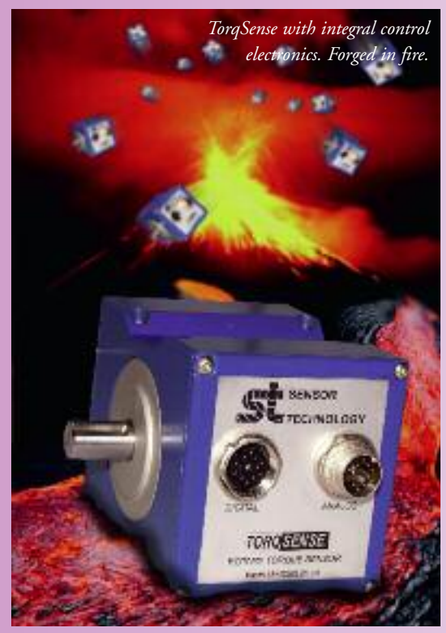
Accurate control of the conveyor comes from the ability to monitor accurately the power being used to drive the conveyor. This information can then be fed into computerized control systems to ensure the belt conveyor is always moving at optimum speed. Real-time data from the belt conveyor is collected by having sensors monitoring the critical variables — in this case the torque on the drive shaft, the speed of the motor, and the drive power — and fed back to the control system.

However, torque data can be hard to collect, with traditional technologies introducing as many problems as they solve. Because the shaft is rotating wires attached to it would wind up and snap, so a special way of monitoring it is required. The traditional solution is to use slip rings, but these are expensive, difficult to set up and far too delicate in use for most belt conveyor applications.

However, with over 20 years of research and development into digital non-contact torque monitoring, Sensor Technology Ltd is at the forefront of an important enabling technology. Mark Ingham one of the company's managers says: "Our TorqSense transducer is based on the patented technology of measuring the resonant frequency change of surface acoustic wave (SAW) devices. It's a proven technology that has solved torque measuring challenges in a host of industries."

TorqSense torque sensors use two tiny SAW devices or SAWs made of ceramic piezoelectric material containing frequency resonating combs. These are glued onto the drive shaft at 90° to one another. As the torque increases, the combs expand or contract proportionally to the torque being applied. In effect the combs act similarly to strain gauges but measure changes in resonant frequency.

*The wireless link from rotating shaft to signal processor puts TorqSense in a class of its own.*



*TorqSense with integral control electronics. Forged in fire.*

The adjacent RF pickup emits radio waves towards the SAWs, which are then reflected back. The change in frequency of the reflected waves identifies the current torque. This arrangement means there is no need to supply power to the SAWs, so the sensor is non-contact and wireless.

"TorqSense measurement together with the digital outputs it offers is often the only practical way to measure torque and integrate it into an industrial environment. And once you are collecting torque data this way, you are well on the way to sophisticated real-time control of complex process."

Born out of the need to solve a particular challenge in the automotive industry, TorqSense is now widely used throughout the spectrum of industries, including many liquid handling applications, in mixers, in the nuclear industry, for testing aerospace components, and running drug trials. It is applicable to all sizes of torque measurement tasks, from dispensing active pharmaceutical ingredients, through stirring industrial quantities of cook-chilled curries, to modelling storm and flood water flows

Now this innovative method of measuring torque is bringing distinct advantages to belt conveying of dry bulk products. A process that was once regarded as very difficult to monitor can now reap the same benefits as many other industrial processes, enabling dry bulk handling operations to be optimized for the highest levels of productivity with the lowest cost.