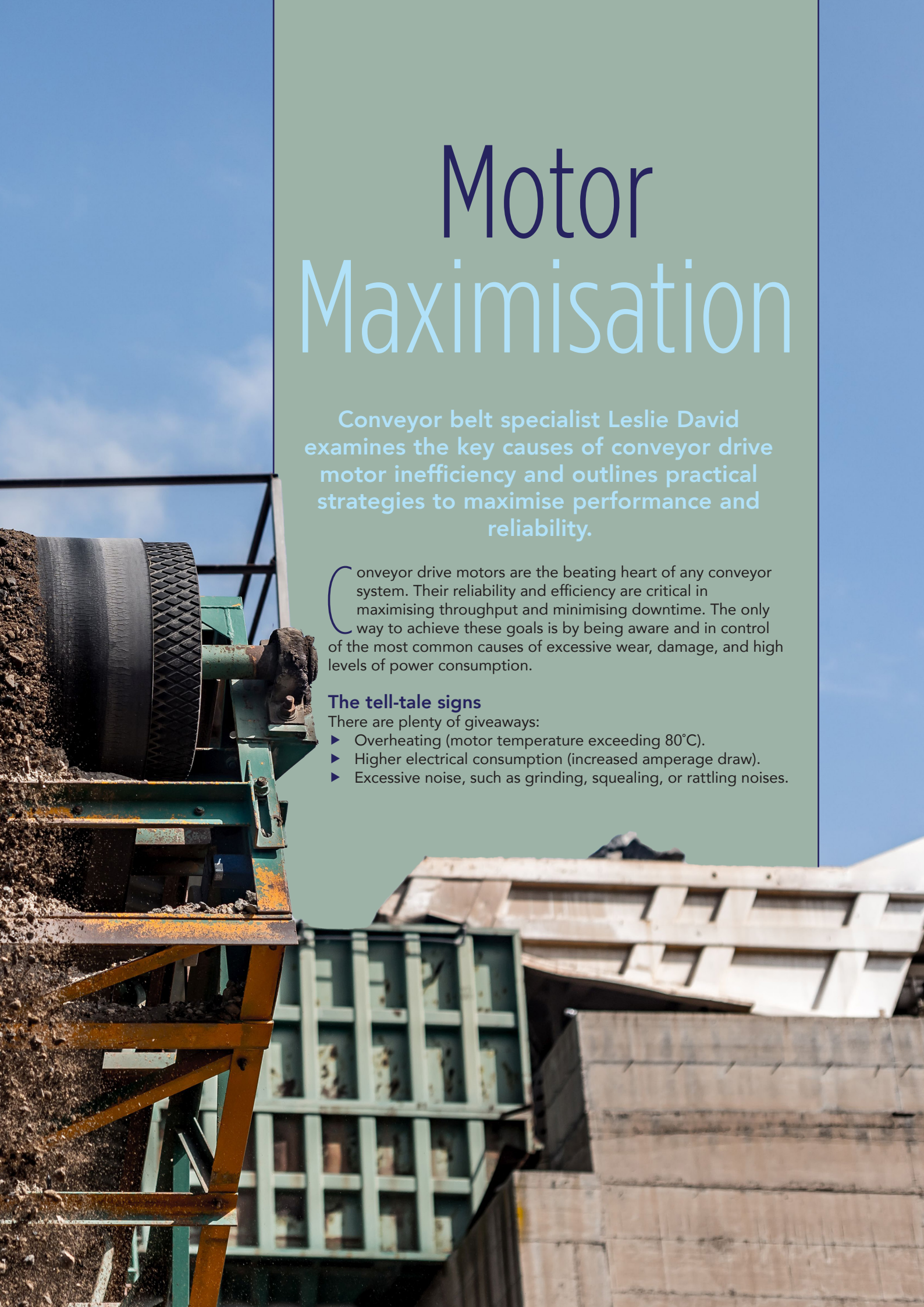






Motor Maximisation

Conveyor belt specialist Leslie David examines the key causes of conveyor drive motor inefficiency and outlines practical strategies to maximise performance and reliability.

Conveyor drive motors are the beating heart of any conveyor system. Their reliability and efficiency are critical in maximising throughput and minimising downtime. The only way to achieve these goals is by being aware and in control of the most common causes of excessive wear, damage, and high levels of power consumption.

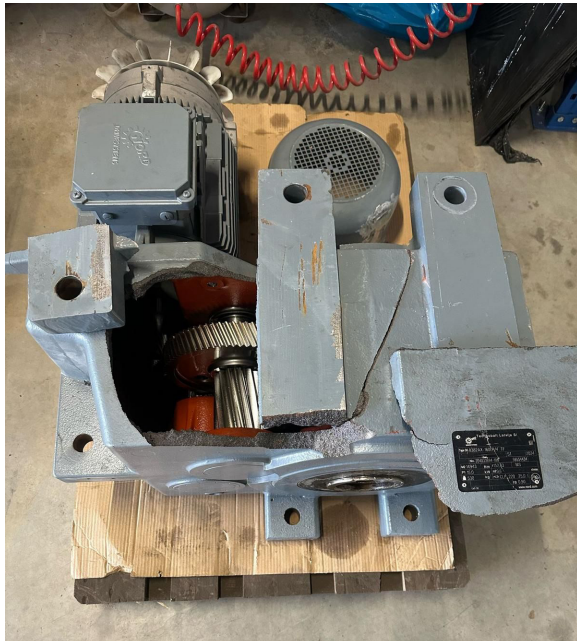
The tell-tale signs

There are plenty of giveaways:

- ▶ Overheating (motor temperature exceeding 80°C).
- ▶ Higher electrical consumption (increased amperage draw).
- ▶ Excessive noise, such as grinding, squealing, or rattling noises.

- Unexplained tripped breakers.

A healthy conveyor system produces a consistent, steady sound. Excessive or unusual



Exposed – an overloaded motor that has literally been ‘blown apart’.



An unclean working environment is often the cause of accelerated wear and damage.



Belt slippage caused by waste matter on the drum increases strain on the motor.

noises can indicate underlying mechanical issues that may lead to bigger problems if left unaddressed. Common causes include worn or loose components, lack of lubrication, and misalignment, all of which can increase friction and consequent heat and accelerated wear. Identifying and resolving these issues early is essential for maintaining a smooth and efficient operation.

Operational and mechanical causes

Overloading the system

If the conveyor's maximum weight capacity is consistently exceeded then the motor is forced to draw higher amperage, leading to overheating and potential burnout.

A conveyor can be overloaded in terms of volume and/or weight. Running a higher throughput at equal speed will fill the belt more and more, and greater volume also means more weight over the length of the belt, possibly exceeding the power that the motor can comfortably provide. Excess weight can also compromise the tensile strength of the belt and the strength of the splice joint.

To calculate the maximum load requires the belt width, the trough shape, the density of the material, and the typical tonnage per hour. From the tonnes per hour and speed (m/sec.) one can calculate kilos per metre and a volume density (m^3/m).

To establish this data, one can either ask the manufacturer's application engineering department (probably not possible with many low-end Asian manufacturers or trading houses) or perform the process independently by using easy-to-use modern technology such as the Fenner Dunlop Belt Buddy App – 'Capacity calculation for troughed conveyor' for the volumetric check and 'Motor power calculation for troughed conveyor' for the motor power and tensile.

Maintenance

The drive motor should be regularly inspected for any visible damage, loose or missing bolts (especially mounting bolts) or screws should be tightened or replaced as necessary. Inspection also needs to include checks for blocked ventilation systems, debris, or dust accumulation on the motor fan or radiator and worn components, all of which place excessive strain on the motor.

An unclean working environment is often the cause of accelerated wear and damage to conveyor components including, of course, the drive motor, so areas where product spillage occurs need to be actioned for more regular cleaning. Also watch out for worn drum linings

and corrosion from washdowns or exposure to chemical agents, which can damage electrical connections and motor casings.

Last but by no means least is the need to regularly lubricate bearings and gearboxes. Failure to do so increases internal friction, requiring higher motor current. Always ensure that the lubrication is free from contaminants.

Belt slippage

When a belt loses traction on the pulley it slips, often producing a high-pitched screeching sound. This creates extreme friction that heats up the pulley and strains the motor as it tries to move the load. The most common causes are inadequate belt tension, worn drum linings, waste matter between belt, and belt surfaces where the rubber has aged and become brittle.

Cracked and hardened rubber is often caused by heat exposure or, most frequently, because the rubber is not resistant to the effects of

ground-level ozone (O₃) and ultraviolet light (UV) and has hardened and lost flexibility. A very visible symptom is cracks in the surface, which create the additional problem of waste build-up on the drive motor and other components because dust particles penetrate the cracks and are then shaken out on the return (underside) run. Although resistance is easily achieved when the rubber is made, more than 85% of tested belts sold in Europe, the Middle East, and Africa are not ozone- and UV-resistant because of price competition. Important tip: always insist on resistance to ozone and ultraviolet light certification according to the EN ISO 1431 test methods.

Seized or damaged rollers

If rollers (especially in the return) seize due to debris or lack of lubrication, they create significant drag, forcing the motor to work that much harder to pull the belt over the stationary

rollers, while at the same time causing excessive wear on the conveyor belt surface. As with the conveyor system as a whole, the two key preventative measures are a disciplined maintenance programme (including lubrication of the drive pulleys and rollers) and not using 'cheap', low quality components.

Many operators choose low grade components to reduce outlay, but experience shows time and time again that a purchasing criteria based on the low buying price of a component rather than its whole life cost is invariably a false economy. Low-grade bearings and rollers are susceptible to premature wear and can seize up or disintegrate very easily, causing significant friction that can lead to motor burnout or extremely expensive belt damage so only use premium quality rollers.

As with conveyor belts, there can be huge price differences for components of seemingly the same specification, but low-priced components are low priced for a reason. Precision-engineered bearings and robust rollers are more expensive to make, but they are specifically engineered for prolonged use and require less power to operate. Exactly the same principle applies when buying drive motors and conveyor belts.

'Over-spec' conveyor belts

When experiencing rapid cover wear or, more commonly, rip, tear, and impact problems, many operators make the mistake of increasing the cover thickness, the number of plies,



Easy come, easy go – low-priced components are low priced for a reason.



Bigger is not always better – installing a heavier belt can increase absorbed motor power.

or the tensile strength, sometimes all three at once. Although a seemingly logical solution, experience proves that this is very rarely the best course of action.

Belts that are too thick or have a tensile strength that is too high can cause troughing and handling problems. Even more significantly, when it comes to drive motors, the added weight can also increase the absorbed motor power of the system.

The only real solution to rip, tear, and impact damage is to fit a conveyor belt that has been specifically engineered to withstand the kind of punishment that would destroy a normal belt. The initial investment will understandably be bigger but the key word here is 'investment', because they are, without doubt, the most cost-effective solution by far.

The best examples are special one and two-ply belts that use uniquely designed fabrics. As the trapped object is being pulled through the belt, the strands of the fabric stretch and gather into a bundle that eventually becomes strong enough to stop the belt in its tracks rather than propagate over a much longer distance. The design of the fabric also dissipates impact energy over a much wider area. In the context of drive motors, such belts are stronger, lighter, and a much better option than unnecessarily thick, heavy belts.

Misalignment

A misaligned belt that rubs against the conveyor structure creates excessive friction, which again puts unnecessary extra load on the motor and irreparably damages the belt at the same time.

A common cause is material that sticks to the belt and builds up around the drive pulley (carry-back), increasing the tension required to move the belt and adding strain on the motor.

Efficiency drive

Although drive motors truly are the beating heart of any conveyor system, their efficiency also relies on other primary components, in particular the conveyor belts and the pulleys, idlers, and rollers. They work in unison and therefore their quality, reliability, and need for attention share equal status. ■

About the author

Leslie David has worked in the industrial conveyor industry for over 20 years. During that time, he has become one of the most published authors on conveyor technology in the world.



Rubbing against the conveyor structure strains the motor and damages the belt.