

Sealed-for-life clutches make inclined conveyors safer

INVESTIGATORS HAVE REVEALED THAT A RECENT INCIDENT WITH A BACKWARDS-RUNNING INCLINED CONVEYOR, WHICH LED TO SERIOUS INJURY TO A STEEL WORKER, WAS THE RESULT OF SIMPLY USING THE WRONG TYPE OF GREASE. FORTUNATELY, THERE IS A SOLUTION WHICH ENSURES THIS KIND OF MISTAKE WON'T HAPPEN AGAIN – AND COMPLETELY ELIMINATES THE NEED FOR LUBRICATION MAINTENANCE.

In the incident, the inclined conveyor – of the type often found in quarries and mines – ran backwards out of control, causing the fluid coupling in the drivetrain to explode like a bomb, spreading shrapnel and hot hydraulic oil over a wide area. Maintenance engineers had used the wrong type of grease to lubricate the conveyor's most important safety device: the sprag clutch that allows it to run in one direction only. This was the sole cause of the horrific incident.

If a conveyor drivetrain fails and the conveyor back-drives, it will accelerate under gravity until all the load on the conveyor has been dumped at the bottom. But because a backward-running conveyor tends to run faster than it normally runs forwards, it puts enormous strain on the components on the high-speed side of the gearbox.

The gearbox – used for speed-reducing functions – becomes a speed amplifier when driven the wrong way round. And when the

conveyor's runaway speed exceeds its normal driving speed, all the components on the high-speed side of the gearbox are running above their intended operating speed. So if the belt reaches three times its normal uphill speed, the components on the high-speed side of the gearbox will be running at three times their maximum too.

The electric motor for the conveyor's drive train has a fluid coupling sized specifically to soft-start the conveyor and protect the motor/drive package from overloads. Made from aluminium, it is intended to run, in this case, at 1,500–1,800rpm. So if it is run at speeds of up to 6,000rpm, the aluminium casing is put under massive centrifugal loads which can cause it to explode – as happened in the case above.

To prevent this, backstop clutches are fitted that allow a shaft to turn in one direction only. If the shaft tries to go into reverse, the sprags – which will slip in one direction – stand up

and lock due to friction, and the conveyor and load stop instantly. However, certain greases have additives such as molybdenum disulphide that reduce friction and encourage slipping. So if a sprag clutch is filled with this type of grease, it will slip when the drive train fails, the conveyor will back drive – and the fluid coupling will become a bomb just waiting to explode.

To prevent this slippage, clutch manufacturers recommend MP (multi-purpose) greases and oils, which comprise simple mineral oils and non-complex lithium soaps. But if a clutch is wrongly filled with a grease containing an extreme pressure (EP) additive, it will slip rather than hold.

The problem for maintenance engineers is that all the major lubricant suppliers have versions of MP grease that also have EP additives, with only one letter difference in their names. For example: Renolit MP2 or Renolit EP2. Also, suppliers asked for an





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equivalent to, for instance, Mobilux No. 2 are likely to offer Renolit EP2 rather than Renolit MP2, on the basis that they want to offer the best, most modern grease to their customers. But unfortunately, the EP additives mean this is not a direct equivalent, and make it unsuitable for the job it's being requested for.

The type of grease used is not the only peril for the unsuspecting maintenance fitter.

Too thick a grease will cause the sprags to stick – perhaps held off the race. It may even form an impenetrable treacle-like layer on the sprag tracks, preventing metal-to-metal contact. On the other hand, a grease with too low a viscosity will just flow out of the clutch and leave the over-running, active surfaces starved of lubricant, leading to rapid wear.

Regular lubrication with the correct lubricant will ensure long and reliable life for a backstopping clutch. But using the wrong grease can lead to rapid clutch failure,

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damage to drive equipment, and potential danger to personnel.

So serious is the issue that Renold Clutches & Couplings of Cardiff now recommend using sealed-for-life clutches as a matter of course in safety-critical backstopping applications.

Sealed-for-life clutches require absolutely no lubrication, and are simply replaced at the end of their service life. Filled by the manufacturer, their aerospace-quality grease is kept in place by high-integrity lip seals, and in many applications sealed-for-life clutches can run for over five years before they need changing. And clearly, if a clutch requires no

lubrication there is no possibility of it being filled with the wrong grease with all the associated problems and dangers.

In the accident above, plant managers had wanted to simplify the lubrication regime and eliminate the use of different greases for different components. So plant maintenance teams had been given one standard grease to lubricate everything. Unfortunately for the operation of the conveyor's sprag clutch, and for the safety of the steel worker, the grease contained EP additives.

A sealed-for-life clutch offers the perfect solution, as it not only improves safety but also simplifies the plant's maintenance schedule.

