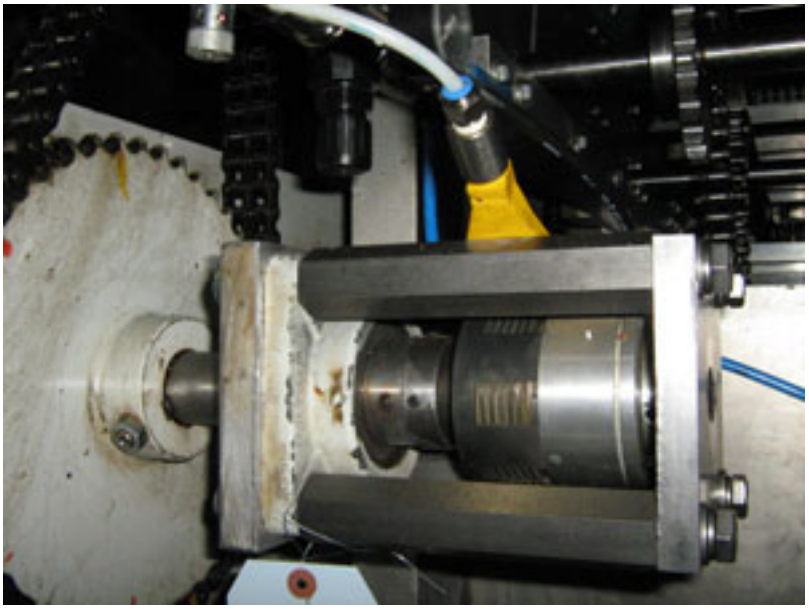
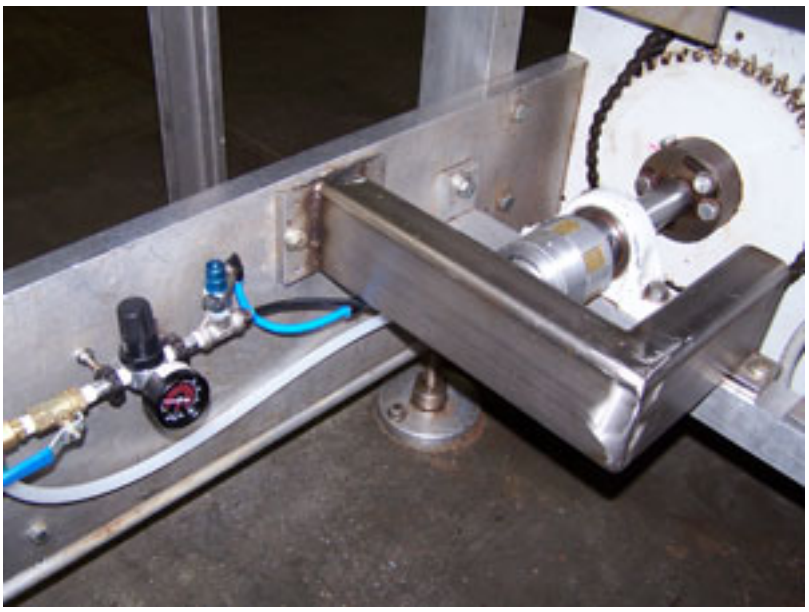
Prevent Slip-Ups With A Slip Clutch



Previously, a prominent food manufacturer was unable to run one of its production lines at its rated capacity because of difficulty in managing drive chain slack that affected indexing.

The line handles rectangular packages weighing about 10 pounds each. Each item moves down the conveyor straightaway on its narrow side, but as it is picked up and indexed, it needs to be moved along its length. The speed discrepancy caused by the difference in length and width contributed to the difficulty in managing slack in the conveyor's reciprocating drive chain.

Problems in managing the slack limited the speed at which the line could be operated. A company technical specialist explains: "The combined inertia of the chain and the product it is carrying caused the chain to overrun and build up slack. Then the dogs that pick up the product become out of position at higher speeds, which cause it to jam and drop the package." He says a spring was included in the original design of the machine in an attempt to control the chain tension and eliminate the slack, but it was only marginally effective. "It would start to jam at about 25 or 26 units a minute, and we never were able to run the line at the design speed of 30 units per minute," he says.



Looking for a better way to manage the chain tension and increase the line speed, the company added a Polyclutch Slip-Aire pneumatic slip clutch. The spokesman fabricated an assembly to fit onto a four-bolt flange bearing at the stub end of the shaft on the driven side. He says, “As the assembly starts going faster, the clutch creates just enough drag to keep the inertia of the chain from overcoming the reciprocating part.”

A slip clutch consists of two assemblies: a cartridge and housing. The cartridge is set-screwed or keyed to the input shaft. The housing may be either se- screwed, keyed to the output shaft, or attached to the output gear or pulley, with a bronze bearing to allow relative motion between the input shaft and the output gear or pulley. In a mechanical slip clutch, the torque level is controlled by compressing the clutch’s springs with the adjusting nut. The Polyclutch Slip-Aire used in this application is an air pressure actuated version of the mechanical design. Air actuation allows the clutch to be used to engage or disengage, to vary the torque during operation, or to adjust the torque remotely at any time.

When the company first conceived the idea of using a slip clutch to manage the chain slack, the largest unit available actually was undersized for the application. The spokesman says that it worked as intended, but its service life was shorter than desired. “All it was intended to do was to prove the concept,” he states. Shortly thereafter, a larger size pneumatic Polyclutch became available and was installed successfully.

The line typically runs around the clock, five days per week, with occasional periods of 24/7 production. To maximize clutch performance and service life, a solenoid valve was added to turn the clutch off at line speeds of less than 22 units per minute. The spokesman says, “When the line isn’t going fast enough to need the clutch, this prevents unnecessary wear.” Air is also blown across the clutch to keep its temperature at optimum levels in the hot environment.

The newest design clutches were installed on two crossover locations at opposite ends of the line, with the second one incorporating additional steel components to ensure optimum service life. The spokesman says the first unit was installed early in 2008. He anticipates a service life of 1.5 years under constant operation and says they are performing as expected to date.

A continuous slip clutch can provide a surprisingly long life in a broad range of applications, and at a definite cost advantage when compared to alternative solutions. A friction plate design, when running within design limits, will generally operate for more than 30 million cycles. In most applications, the clutch will outlast the mechanism in which it is installed.

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