VULCAN GRIP
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White Paper: The True Costs of Belt Slippage

Summary

The total economic harm due to belt slippage goes well beyond the cost of replacement belts and pulleys. In this white paper, we show how a mere 8% slip rate results in an annual waste of energy costing nearly *four times* that for replacing parts worn due to belt slippage.

We also show how a seemingly small, 8% slip rate can reduce equipment power by over 19%.

Cost of lost productivity

It is difficult in a white paper like this to provide a relevant example of the complete downstream economic impact *due to lost productivity*. Why is this the case?

Lost-opportunity costs depend upon the precise industry and manufacturing process in which a belt is the limiting factor. Engineers must examine the particular process, determine the extent to which its inefficiency detracts from end-game productivity, and calculate the bottom-line effect on the company's net profit.

With net profits in American manufacturing averaging about nine percent, a productivity-critical process that is suffering an extra (read: "unnecessary") eight percent inefficiency can be causing a huge impact on net profit.

Analysis of replacing pulleys and belts

Consider the following example of a belt-driven, fully loaded industrial machine operating 24/7:

Item	Spec.	Replacement cost
Motor size	100 h.p.	N/A
Motor efficiency	95%	N/A
5V Driver pulley	3-groove, 11″	$250
Driven pulley	3-groove, 8″	$205
5V belt	3-rib, 100″	$265
Avg. belt slip	8%	N/A
Torque reduction	12.5%	N/A
Labor (3 hrs)	$60/hr	$180
Annual total parts & labor:		$900

In the above chart, the total cost of replacing a belt and two, commodity-grade imported pulleys is $900. If the pulleys are manufacturer-proprietary ones, replacement costs can be over three times greater.

Analysis of electricity waste

When a V-belt slips, the driven pulley slows down while the motor simultaneously speeds up slightly due to reduced torque demand. Since a motor's current draw closely follows torque, you pay slightly less for electricity but less work gets accomplished. The annual economic impact of 8% slippage is as follows:

Item	Spec.	Cost
Electricity rate	Per kW·hr	7¢
Annual electricity consumed	601,900 kW·hr	$42,100
Electricity wasted	48,150 kW·hr	$3370

As can be seen above, a slip rate of 8% results in an annual electrical 'waste' (defined as a correctable cause of electricity being unable to perform useful work) of $3370. This is nearly *four times* the annual $900 cost of replacing a belt and pulleys that have become worn and glazed due to belt slippage.

Lost productivity

If belt slippage is occurring in a process that detracts from end-game productivity, the bottom-line effect on a company's net profit can be *orders of magnitude* greater than those shown here. Moreover, slippage has a *compound* effect on mechanical power. Here's why:

The 12.5% reduction in torque due to slippage means the motor runs slightly faster… about ⅛ of 1%. Since power equals torque times rotational speed, the 12.5% reduction in torque *and* the 7⅞% reduction in the speed of the driven pulley means *only 80.8% of useful work is being performed!* Most manufacturing engineers fail to fully appreciate the consequences of belt slippage.

How does Vulcan Grip® improve profits?

With Vulcan Grip, you now get *full* productivity from your machine and your V-belt drive components last much longer.