The Spin on Idler Roller Testing

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It's an election year, so I'd like to join the political pundits and offer some spin of my own, but my spin will be free of political opinions. Instead, I'll be giving you my spin on free-spinning rollers.

Not every converter needs to consider improving idler roller performance. If you have a high-tension process, giving up a few pounds to your idler rollers is okay. If you have a scratch-insensitive product, a few rollers that fail to spin may not affect your yields. But not all converters are so lucky.

If you have a low-tension process, you can't afford to give up much tension to your idler rollers. If you have rollers where the available traction is marginal, such as extra-low tension, low wrap angle, low web-to-roller COF, or a reduced traction coefficient due to air lubrication, then keep reading.

Before we can talk about improving idler rollers, we need to measure their performance. There are three tests I recommend: break-away drag, at-speed, and spin-down testing.

Break-away testing is the simplest test and something that comes naturally, like kicking the tires of a new car. With the web out of the machine, reach out and spin an idler roller, noting the ease or difficulty in getting the roller started. If you want to quantify this value, use a small spring scale and measure the surface force required to move the roller at creep speed.

At-speed testing answers the question, "Are your idler rollers turning at line speed?" You can use a contact or noncontact tachometer. Using a noncontact tachometer eliminates the concern the measurement load will slow the roller down, but it will take more work on your part, requiring you to attach a small piece of reflective tape to the side of your roller. You also will need to know the roller's diameter, so you can convert rpms to speed in feet or meters per minute.

Many people feel at-speed testing—comparing the speed of your idler rollers to speed of your web or to a non-slipping roller such as a nipped or vacuum-assisted driven roller—is the acid test. If the roller isn't slipping, what could be wrong? That's the same thinking the captain of the Titanic had just before that unsuspected iceberg. At-speed tests will measure failure but won't tell you if you are living on the edge.

Spin-down testing is more complicated, but it will give you a sense of your safety factor for slipping idlers. The spin-down test tools are simple: a stopwatch, a tachometer, and some way to accelerate the roller (I recommend a rubber wheel on a cordless screwdriver).

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The spin-down test is a balance of the roller's inertia, wanting to keep the roller spinning and the bearing drag trying to decelerate the roller. The spin-down test itself is simple: 1) Drive the roller to a given speed; 2) measure the roller speed; 3) note the speed and start the stop watch; and 4) measure the time until the roller stops. Long times indicate free-turning rollers (or high inertia).

You can use spin-down times to compare a set of nearly identical rollers, but the real value of this test is a few calculations away. Calculate the roller's rotational inertia from function of diameter, wall thickness, width, and density. Calculate deceleration in radians per second-squared from the spin-down speed and time. Multiply inertia by deceleration, and you get bearing torque. Divide by radius to get surface force of the bearing drag. Compare this surface force to the available traction (COF, tension force, and wrap angle), and you will know quickly if there are any idler bearing icebergs in your process.

COMING NEXT MONTH
IDLER ROLLER BEARINGS

In July we will cover the key factors in idler roller bearings that will reduce bearing drag without sacrificing bearing life. PFFC

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