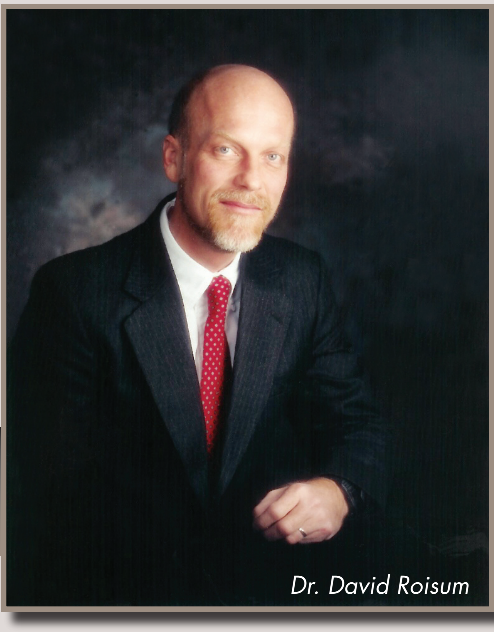
CRITICAL THINKING

by Dr. David Roisum



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When is Traction Desirable?

The three modes of web-to-roller interaction are tracking, sliding and floating. There are advantages and disadvantages with each mode. If you need to change tension, for example, you will need a driven roller in traction to do so. Most guides and spreaders require traction to operate. If, however, you have a web whose coating is fragile, you may need an air-float bar so that the web is not touched until dry.

Some machines will employ all three modes. However, a principle of good web-machine design states that on any particular element you should pick a mode and maintain it. Changing modes on an element will always cause a tension upset and often a CD position upset as well.

Hitting an icy patch

Let's use a car as an analogy. In most cases you will have all four tires in traction with the road. However, if you lock up the brakes on icy road, you may be lucky and continue in a straight path down the road. Should one tire grab a bare patch of pavement the situation will change in a heartbeat. First, you will feel a sudden jerk as the tire bites in. Second, your car will pivot about that tire.

On an air-float oven, therefore, we want to stay in flotation at all times and all the way across the width. A momentary touchdown anywhere can cause big problems.

Of the three modes, traction is by far the most common and thus the most important. In fact, we can't handle webs without at least one tracking element. Traction is necessary to establish and control tension as well as CD position. This is not to imply, however, that you can control tension or position better with more elements. In fact, it is just the opposite. The more driven rollers you have, the more challenging drive control becomes. The more rollers you have, the greater the chance of a position upset on a misaligned or diameter-varying roller. Thus, another principle of good web-machine design states that a minimum roller count is usually best.

Feel that friction

On most simple rollers, only three factors control traction. The first is the coefficient of web/roller friction. The friction depends in part on surface roughness and surface chemistry but also on other factors, such as air entrainment. While the details are complex, the net effect is friction. The second factor is wrap angle. The greater the wrap, the greater the potential traction. There is a common fallacy that radius affects traction, but this is only true in special situations such as non-coulomb friction and air entrainment. The final factor is drive torque. The greater the motoring or braking torque, the greater the potential to lose traction.

On more complex systems, other factors may contribute to traction. For example, unit nip load is the predominant factor in nipped roller sets. While most often very weak, static can approach noticeable levels when the web and roller carry opposite charges such as might be generated by systems similar to electrostatic bars. Other complex systems include pin feed and vacuum rollers.

As you might guess, traction and especially friction are complicated to predict. In fact, they are not predictable without measurement and even then it will be difficult. This has led many machine designers to use nip rollers rather than the much simpler wrapped roller for some drive points. While adding a nip is a conservative means to get traction, nipped rollers have significant penalties. Nips increase machine and maintenance costs and make the process finicky and intolerant, especially to baggy webs.

No matter how you obtain traction, however, you must maintain traction at all times and all the way across the width of the roller. If you do not, you will lose control in the MD as tension and very possibly in the CD as position.

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