Davis-Standard CONVERTING SYSTEMS
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TECH TIPS
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Advance | Blown Film | Cast Film | Extrusion Coating & Laminating | Liquid Coating & Laminating | Pelletizing | Process Control | Unwind & Winding

When to Use CENTER/SURFACE WINDING

Winding high quality rolls on conventional turret type winders can be a real challenge especially when the application requires winding large diameter rolls of slippery materials, inline slitting and/or applications requiring high web tension. With center winders, the web tension is created by transmitting torque through the layers of the winding material. The solution for consistently producing quality rolls for these applications is to use a winder with a combination of center and surface winding capability. With Center/Surface winders, web tension is pulled by the surface roll drives. Roll hardness is created by profiling nip from the surface roll and the profiled torque from the center drive which is independent from the web tension coming into the winder.

When winding slippery materials, a center/surface winder helps prevent internal web slippage called “cinching” and roll “dishing” during the winding operation. Slippery materials often do not have the required layer-to-layer coefficient of friction to transmit the torque required to pull the web tension at larger roll diameters without web slippage. These materials need to be wounding using high inwound tension from the spindle torque and then significantly taper this tension and build the desired roll hardness using the nip hardness tool. This inwound tension is completely independent from web tension.

Center/surface winders are used for inline slitting applications requiring a center drive. The spreading action of slit webs is a function of the web tension. For proper roll structure, this torque must be profiled to decrease hardness as the roll winds. (See figure #1.) The reduced tension as the roll builds results in decreased amounts of spreading as the slit rolls wind. With a center/surface winder, the torque can be profiled as a function of the winding roll's diameter, and the web tension and resulting spreading action can be held constant by the surface roll's drive.

On heavier grades of rigid films, boards and composites, center/surface winders are used in conjunction with a turret type winder. These heavier grades require high web tensions and are typically wound to large roll diameters, ranging from 1.2 (48") to 1.8 meters (72") in diameter. If pure center winding, the required spindle horsepower for these applications will be very large. Using center/surface winders, the required spindle horsepower can be reduced by as much as 40 percent because the surface roll drive is used to make up the remaining tension horsepower.

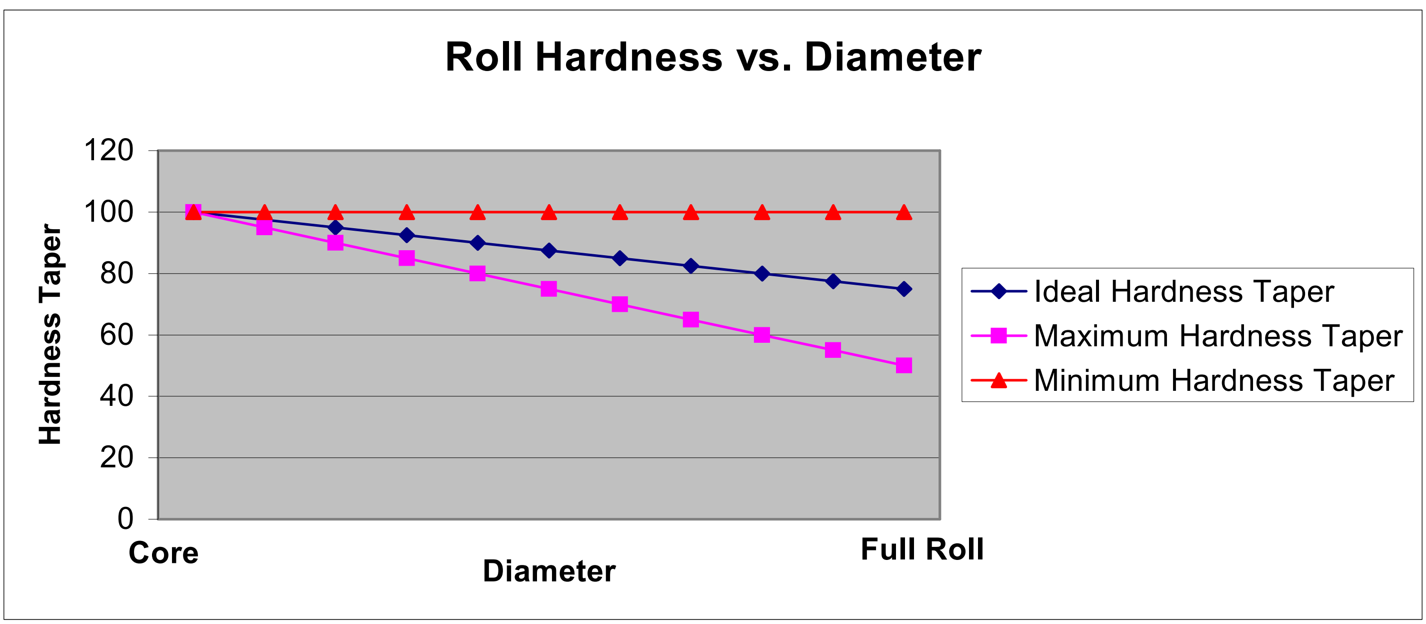

Figure #1

Understanding Winding Tension on a Center/Surface Winder

On a center/surface type winder, the winding tension is controlled independently from the web tension coming into the winder. Typically, the winding tension at the core is approximately 50 percent greater than the unwinding or process tension. As the roll builds, the tension is tapered proportional to the winding rolls diameter. An example of this would be as follows:

If winding a 100 gsm basis weight paper, the suggested unwinding and typical process tension would be 100 gsm x 0.112 (unwinding tension factor) or 11.2 kg/cm (2.1 pli) web tension. The suggested winding tension would be 100 x 0.176 (winding tension factor) or 17.6 kg/cm (3.3 pli) web tension. For proper roll structure, we may want to taper the winding tension by 50 percent at a .75 m (30") roll diameter. The drive would progressively taper the winding tension from 17.6 kg/cm (3.3 pli) web tension at core to 8.8 kg/cm (1.65 pli) web tension at the maximum (.75 m) diameter. This would mean that the pressure roll drive would be regenerating or pulling negative current at the start of the wind to make up the difference between the 17.6 kg/cm (3.3 pli) web tension being pulled at the winder and the 11.2 kg/cm (2.1 pli) process tension coming into winder.

As the roll winds, the tension being pulled from the center drive would be constantly decreasing and the pressure roll drive amps would be constantly increasing toward zero. At the point the winding tension is equal to the incoming web tension the pressure roll's drive would be zero amps. At the .75 m diameter, the pressure roll drive would be pulling a positive current to make up the difference between the 11.2 kg/cm (2.1 pli) process tension and the 8.8 kg/cm (1.65 pli) winding tension. (See figure #2.)

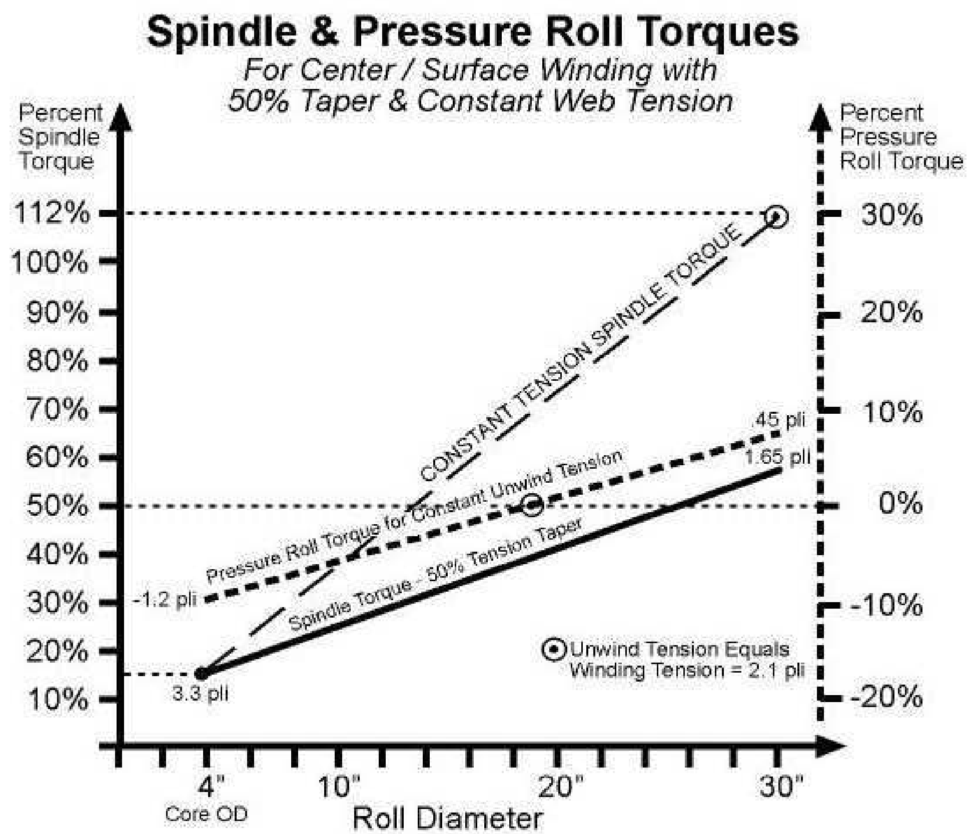

Figure #2

The resulting torque of the motor is proportional to the winding tension *multiplied by the* web width *multiplied by the* radius of the winding roll *multiplied by the* taper set by the operator. For constant tension winding, the torque increases proportional to the radius roll. For constant torque winding, the torque stays constant through out the winding cycle and the inwound tension decreases proportional to the roll radius. Normally rolls are wound somewhere in between the constant tension and constant torque winding to achieve the proper roll hardness taper.

For more information on meeting your winding requirements, contact R. Duane Smith, Product Manager-Specialty Winding, Davis-Standard Converting Systems at smithd@bc-egan.com .

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