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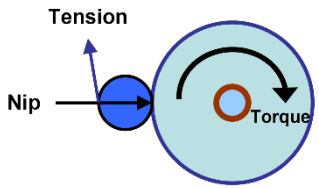
Increasing Web Throughput with Core and Roll Centering Shafts

Winding has been around almost as long as writing. It's an efficient and economical way to package a flexible web of a variety of materials in order to store, transport or further process it. If it's done right. The key word to understand is "package." Your wound roll is a package. As such it needs to survive the winding process itself, handling, storing, transporting, unloading, more handling, unwinding, processing the web, winding back up, more handling, more transporting until the web becomes its final product.

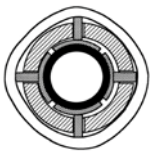
In order to wind rolls converters follow the TNT's of Winding – Tension, Nip and Torque. Tension is managed carefully and the Jack Daniel's Principle of Winding is applied – Hard start, smooth transition, soft finish – otherwise known as taper tension. A series of torque transfers from a motor to a gear, a gear to a journal, a journal to an air shaft, an air shaft to a core, a core to the web and the web to each layer of web as it builds ensures a finished roll that meets the demands of the package. Nip is applied to further improve the roll structure with some converters using center-surface winders to apply as much nip force as possible. And they put it all together to build good rolls day in and day out.



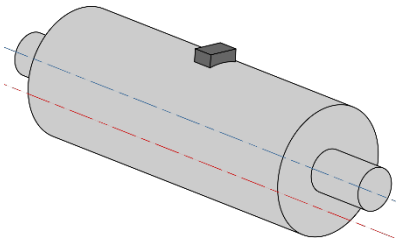
But even with all of that, converters become frustrated that while they can build good rolls, they cannot build them fast enough. So what is slowing them down? The answer: Unbalance. Something in their system is distributing the mass of the wound roll unequally causing the mass axis to differ from the bearing axis. The result: excess vibration that keeps the machine from running at optimal speeds.

The three most common causes of unbalancing the winder are critical speed, core deformation and an eccentric rotating mass. Critical speed is when the rotational speed of the shaft exceeds the natural resonant frequency and is usually a function of the deflection of the shaft during rotation. Increasing the stiffness of the shaft material is the best way to counteract this vibration.

Core deformation is caused by the expanding elements of the shaft distorting the core during expansion to grip the core. This can be minimized by insuring 360



degree contact with the core or by maximizing the amount of contact points from the expansion elements against the core.



One of the major culprits of vibration is eccentricity that is created due to the axis of the roll being offset from the axis of the shaft. This unbalanced condition can lead to tension defects in the web as well as reduced operating speeds due to potential risks of damage to equipment. One of the best ways to address this condition is to use roll or core centering shafts that position the core concentric to the axis of the shaft. When this is done, there is a significant reduction in centripetal force which will allow the machine to run faster. See the two charts below which demonstrate the significant effect of centripetal force in a winder. Managing these forces will significantly improve throughput in your operation.