



MAXCESS®

Increasing Web Throughput with Core and Roll Centering Shafts

Presented by: Sean Craig

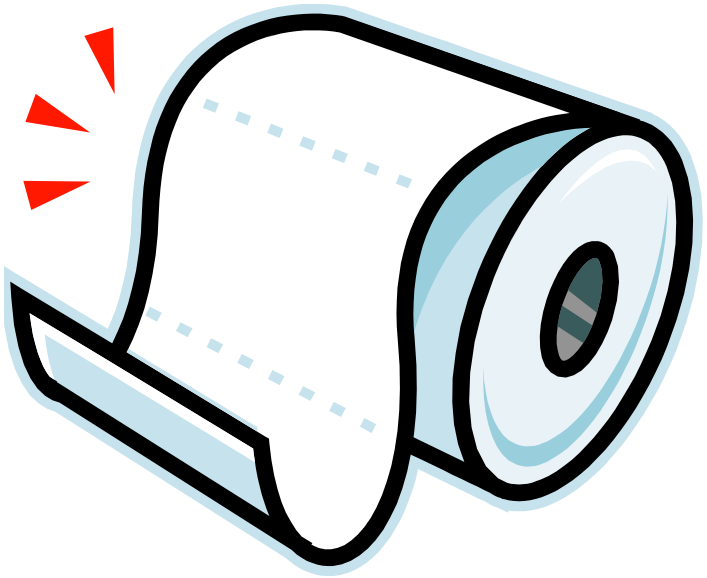
General Manager, Maxcess-Tidland

Date: October 16, 2017

ValleyRoller WEBEX FIFE TIDLAND MAGPOWR

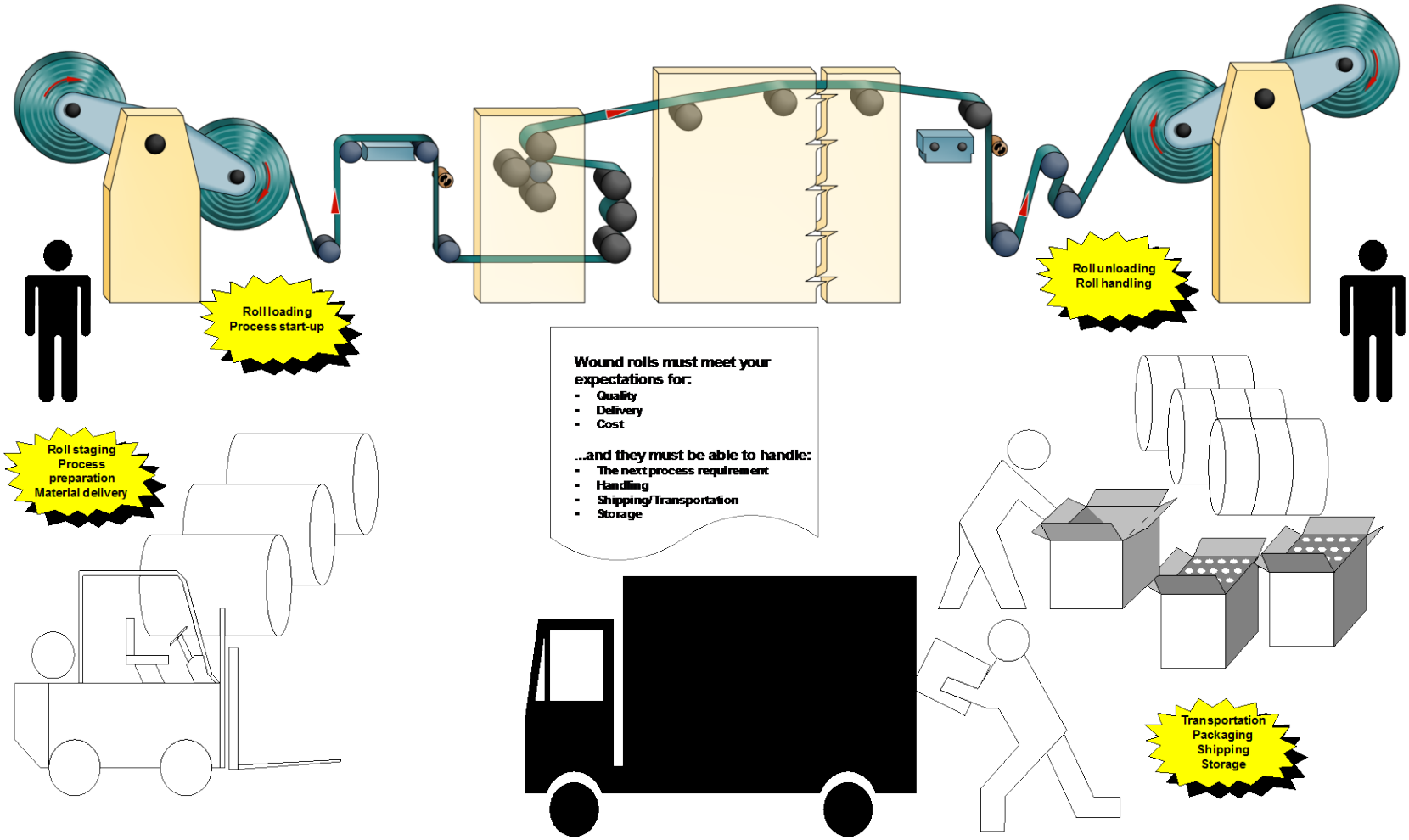
Winding has existed almost as long as writing

What's the worst part about celebrating National Toilet Paper Day?



August 26th – National Toilet Paper Day

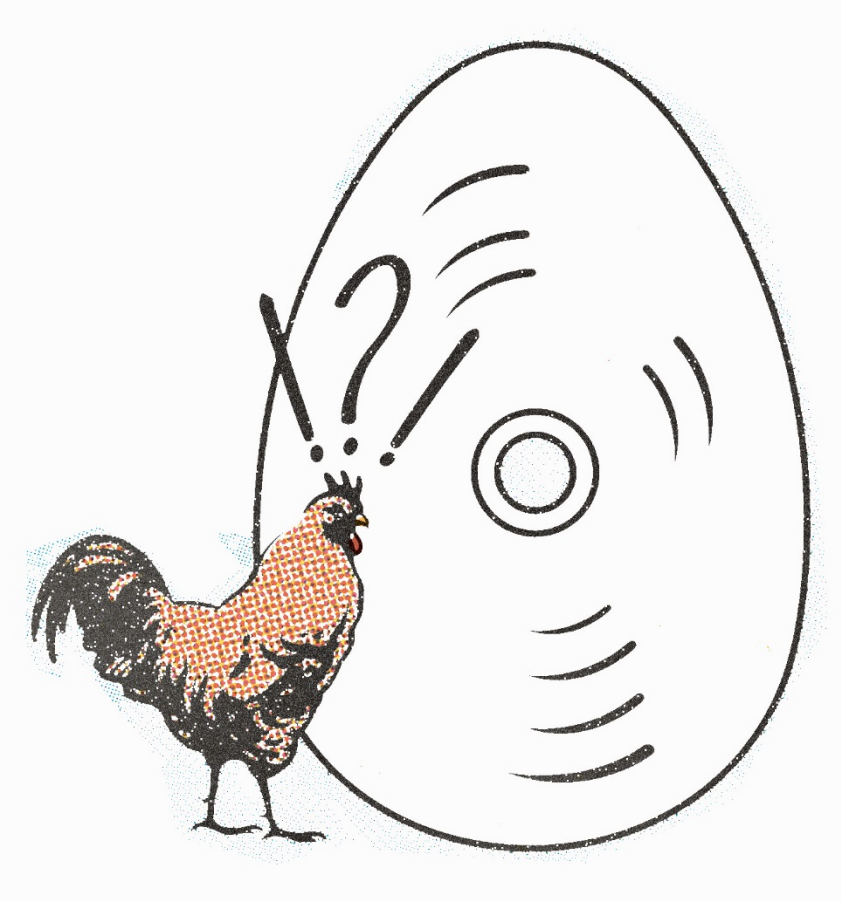
The roll as a package



Wound rolls need to survive transportation

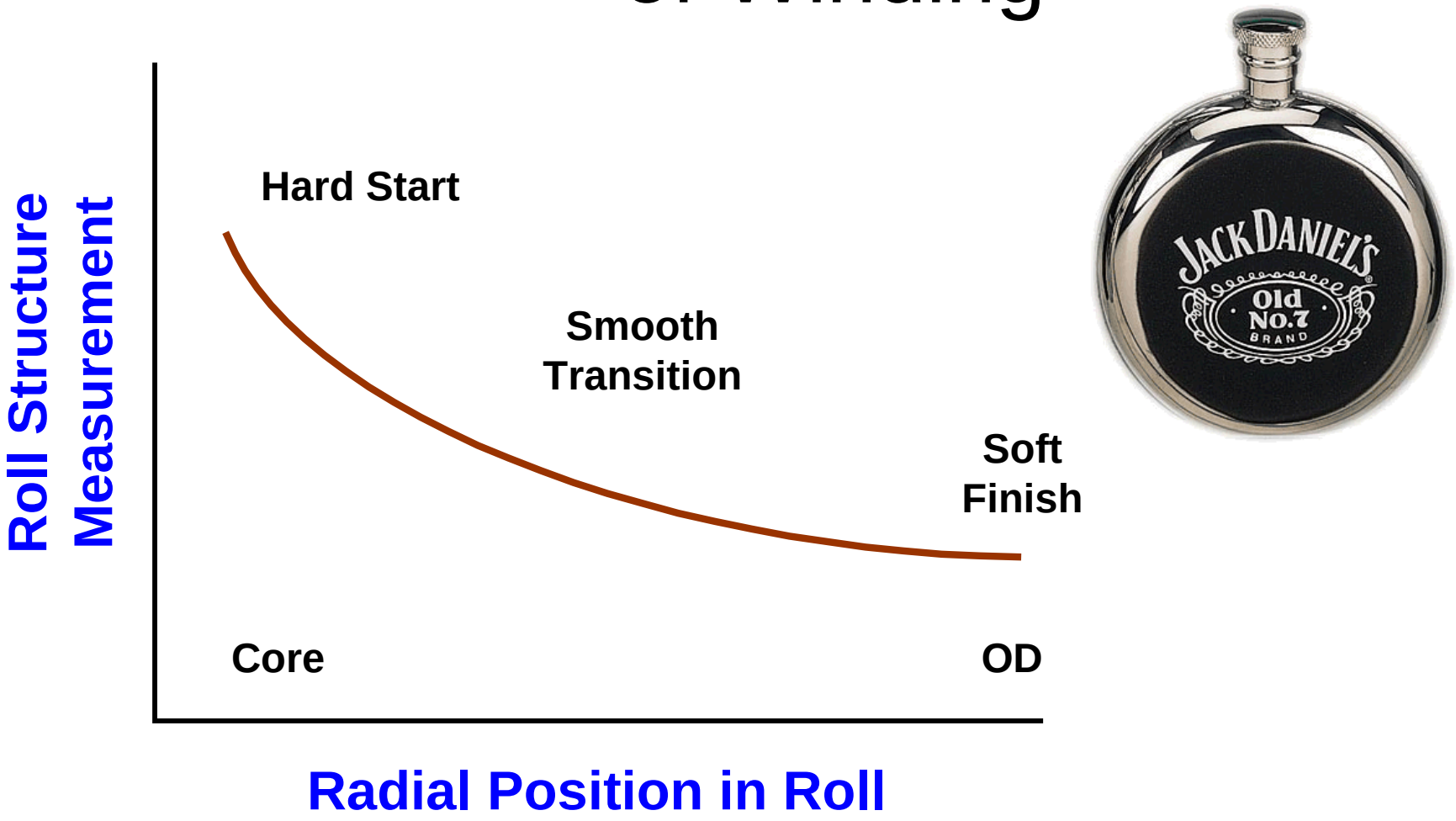
The first challenge is to find a usable roll…

…or at least roll that you can load into your machine

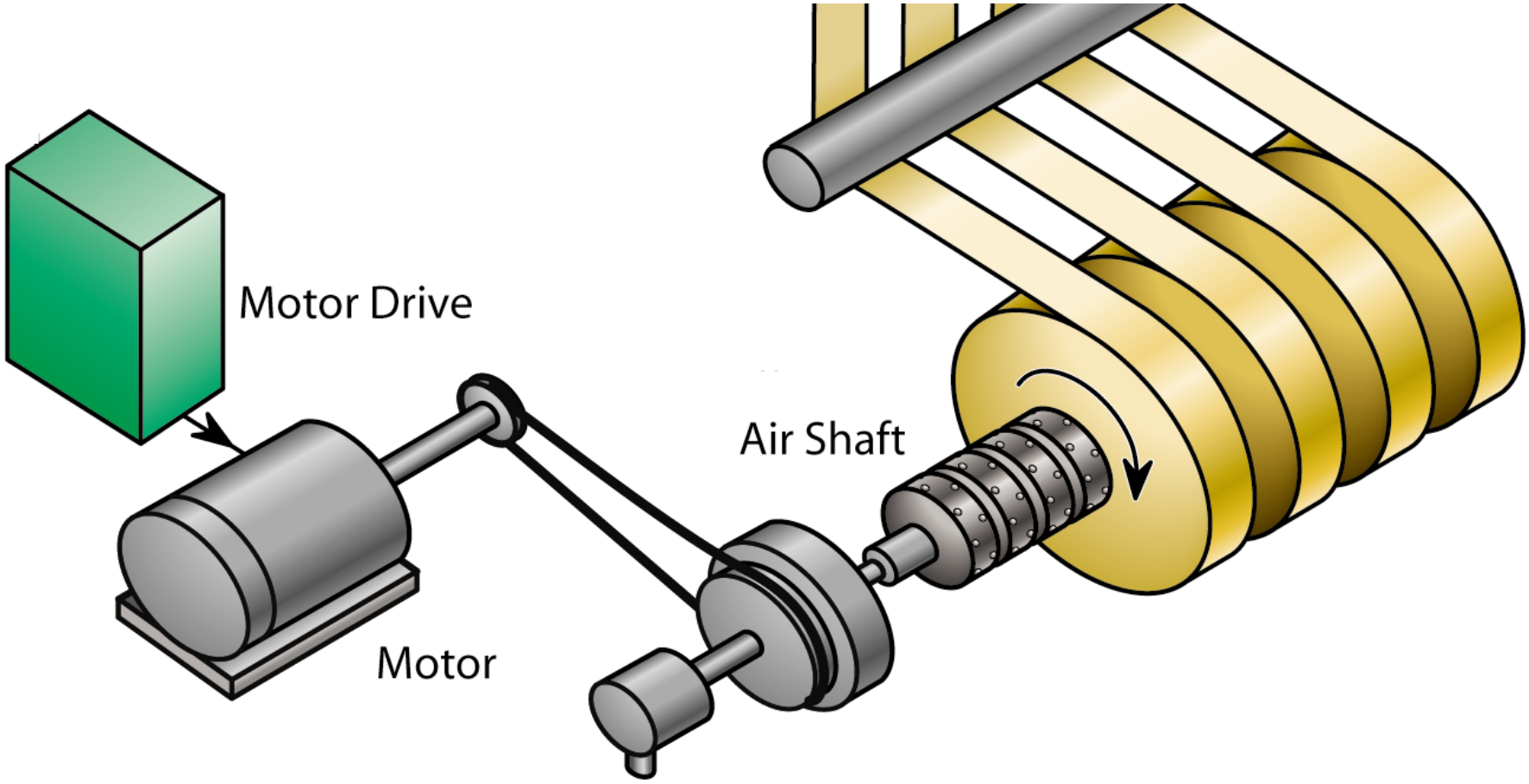


TNT’s of Winding

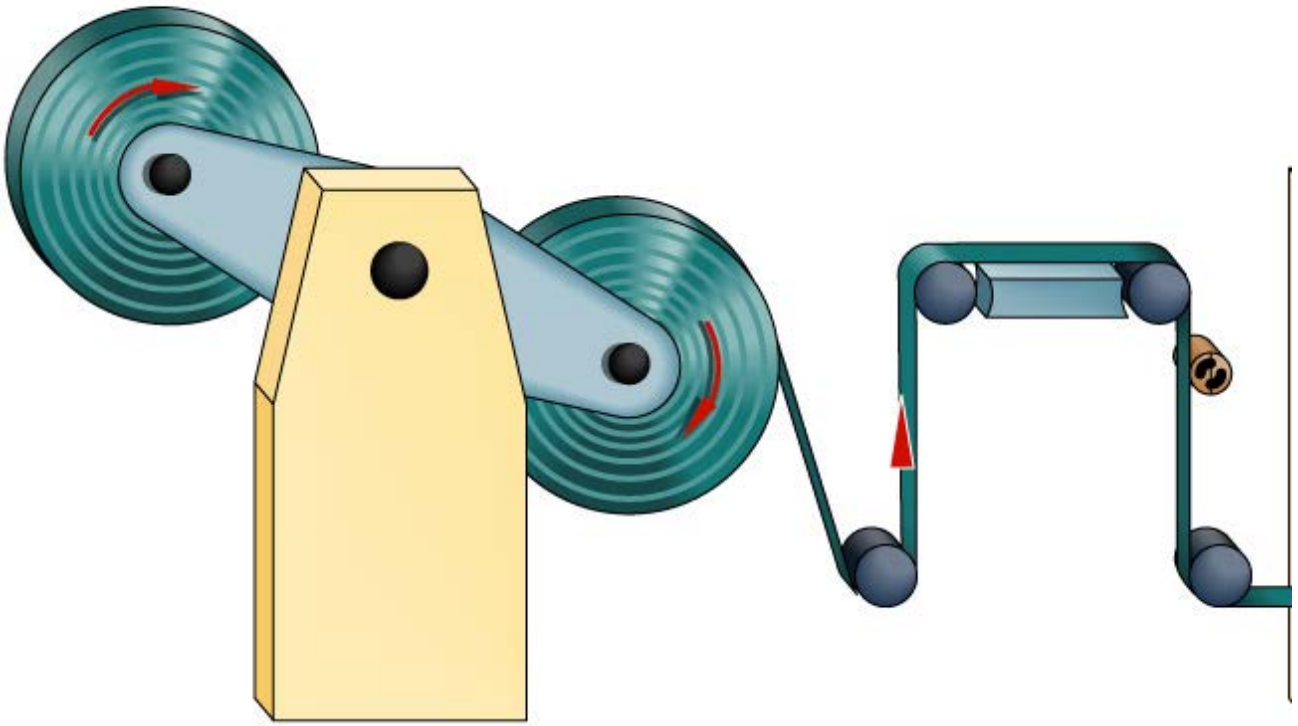
The Jack Daniel's™ Principle of Winding



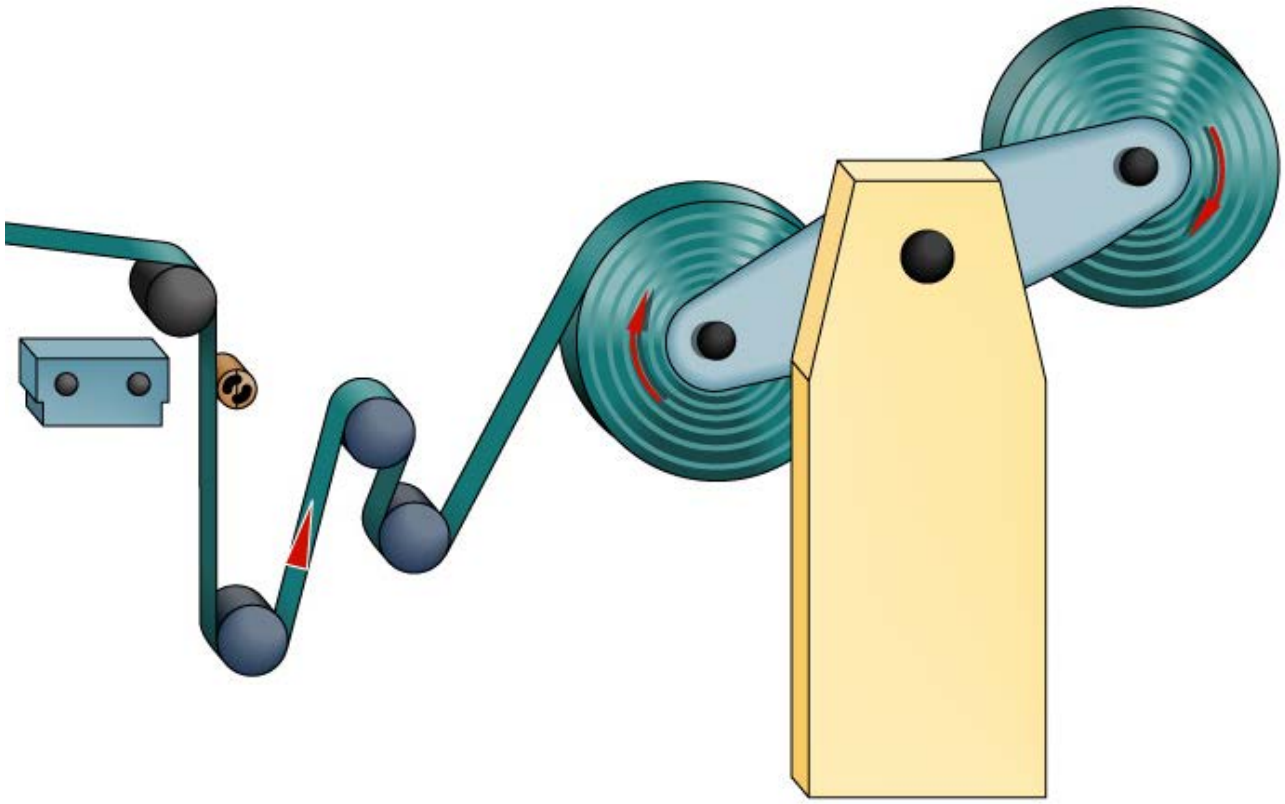
Winding is a series of torque transfers.



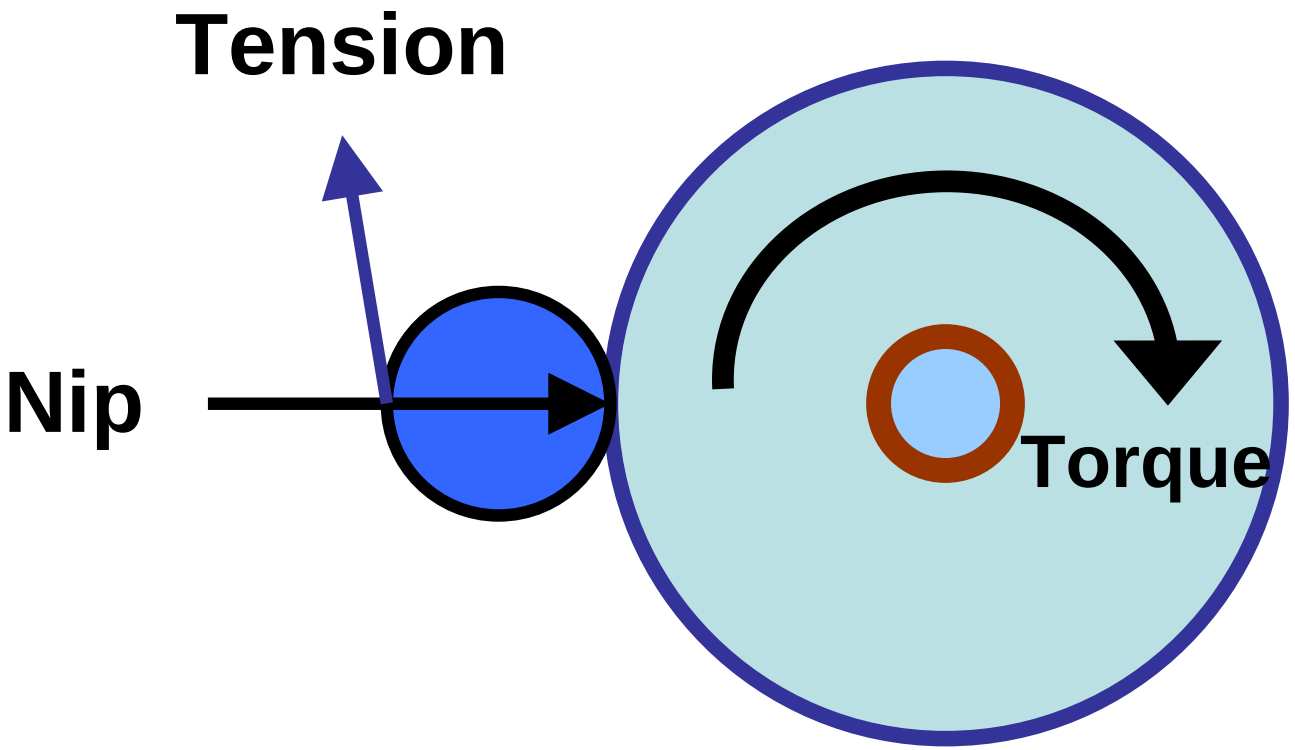
Unwind



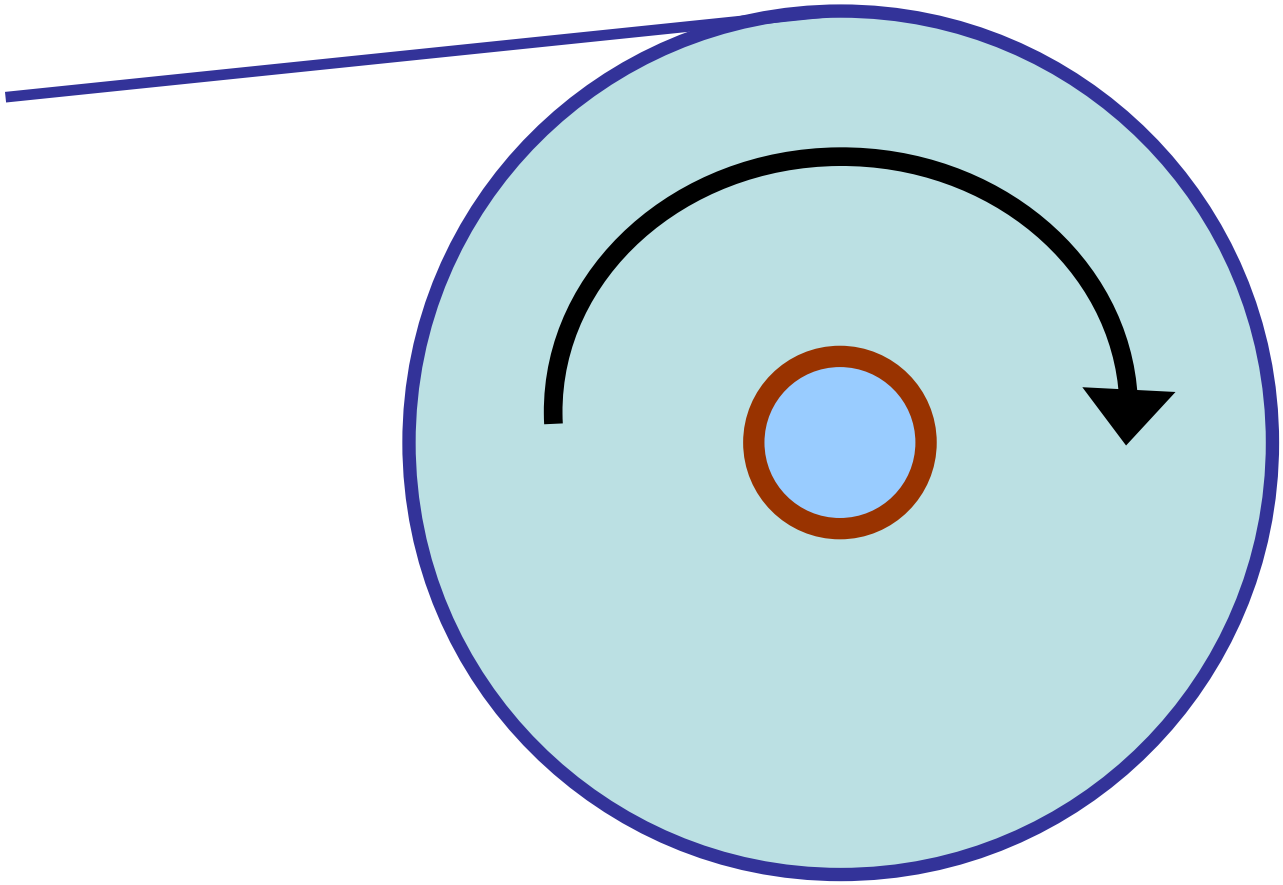
Rewind



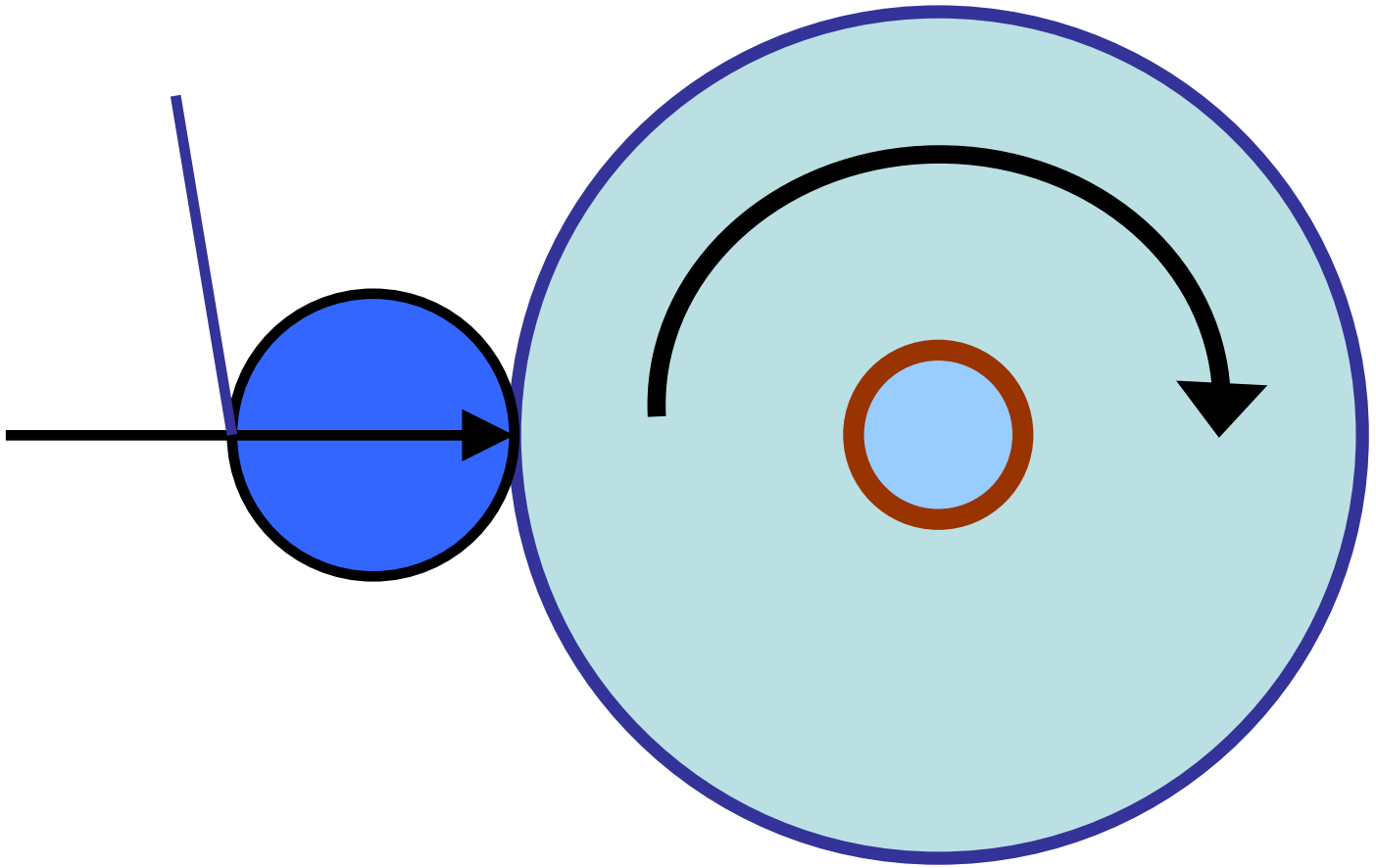
The TNT's of Winding – Tension, Nip and Torque



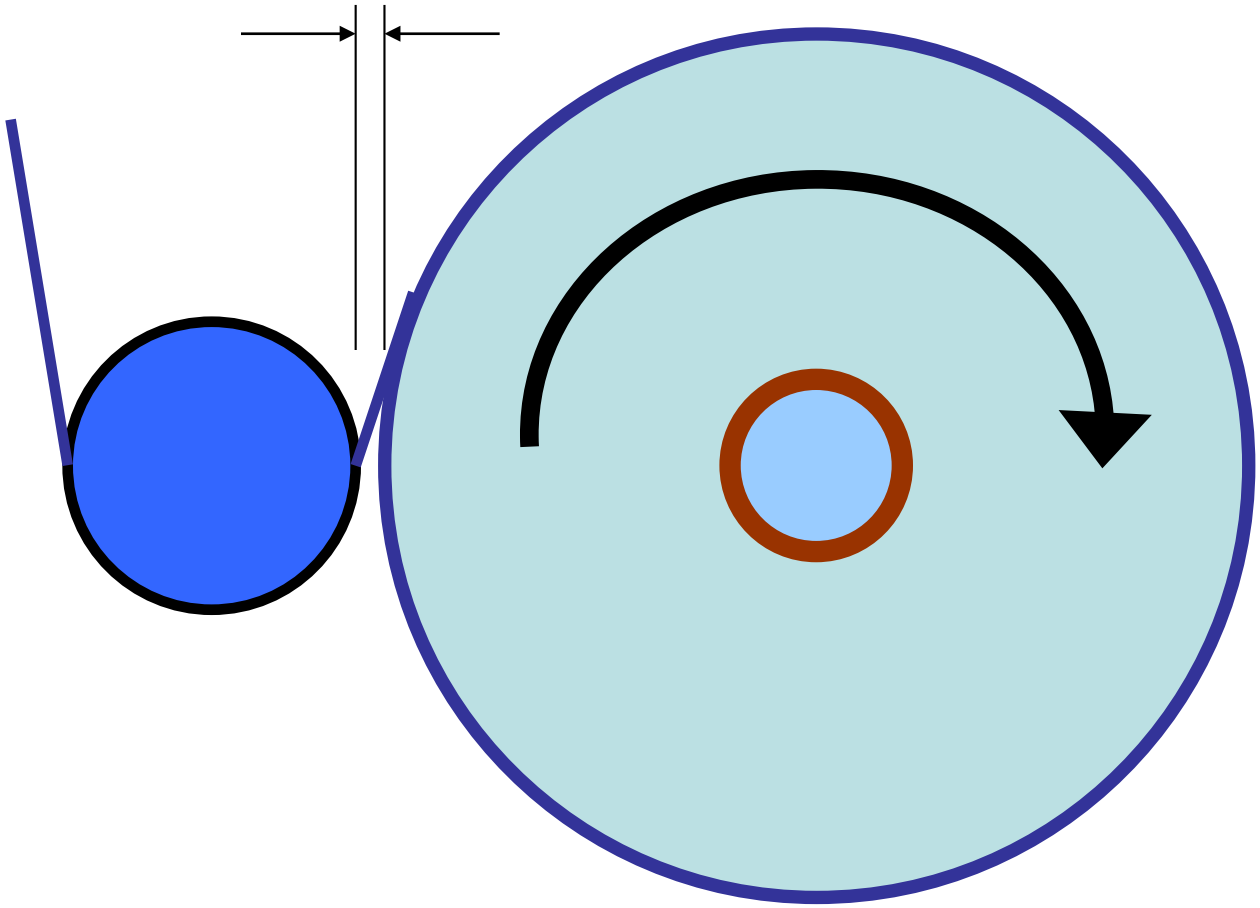
Free span winding is simple yet prone to torque capacity defects



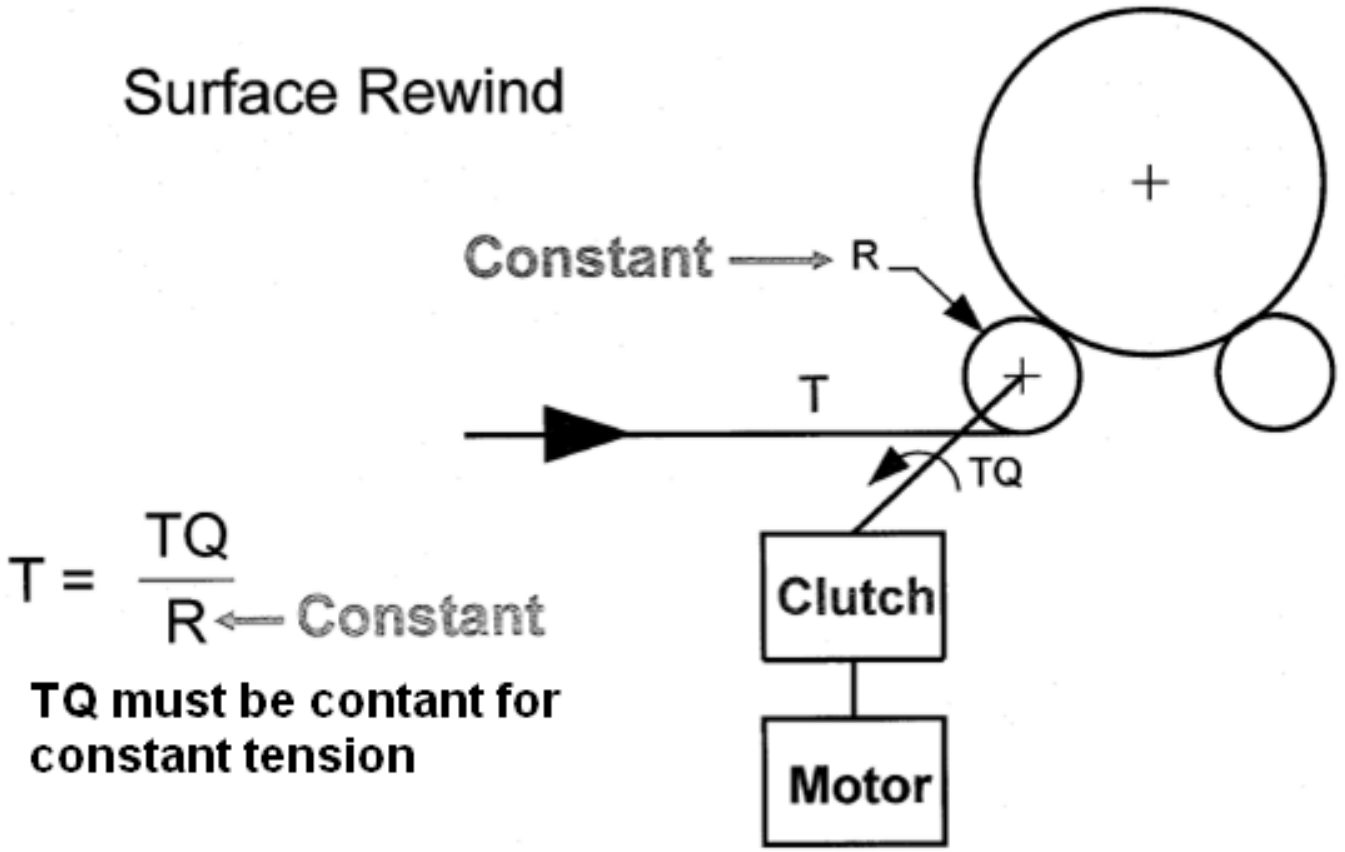
Nip winding increases roll tightness but may compress web



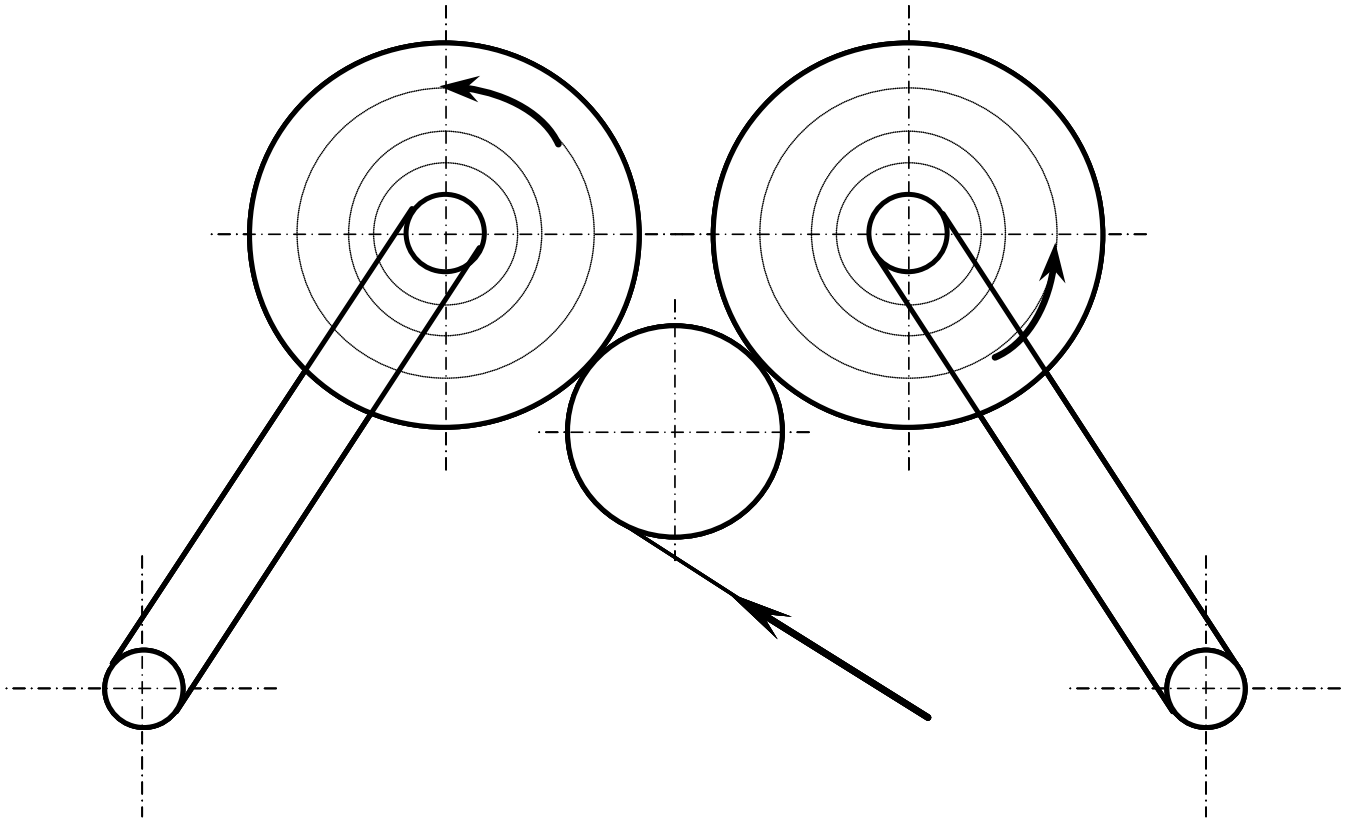
Gap winding prevents damage to product but requires sensing equipment



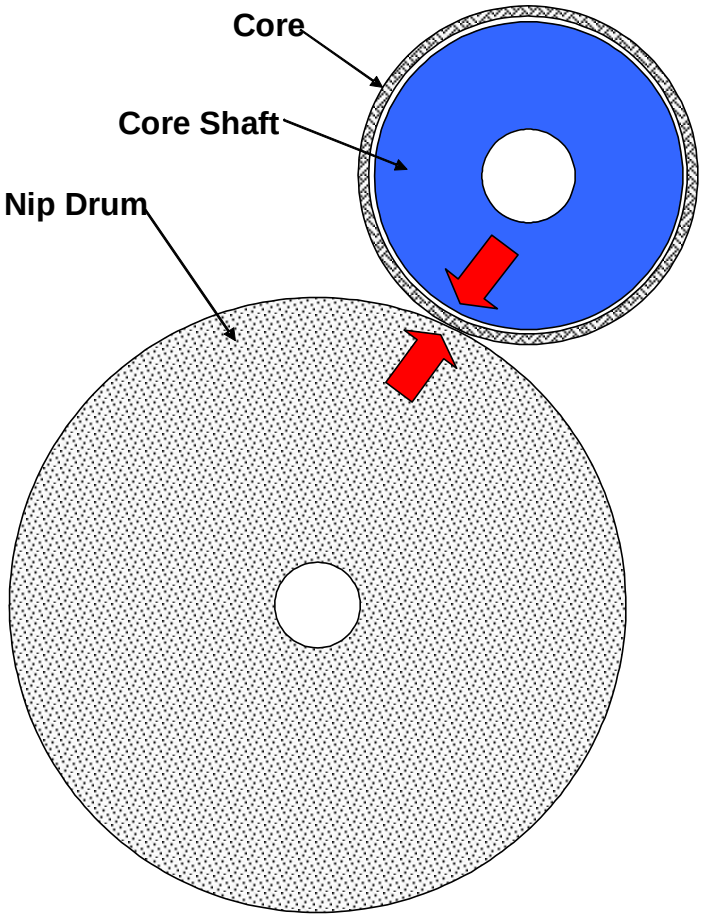
Surface wind torque model



Center-surface winding gives you the advantage of both nip and center torque.

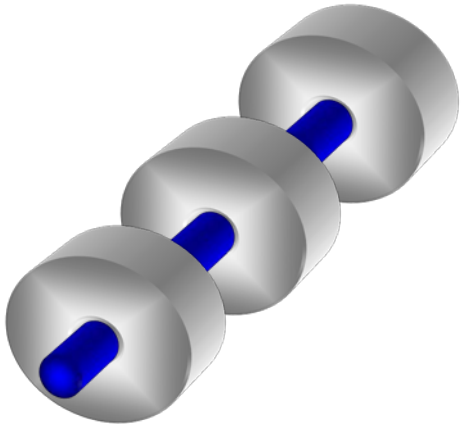


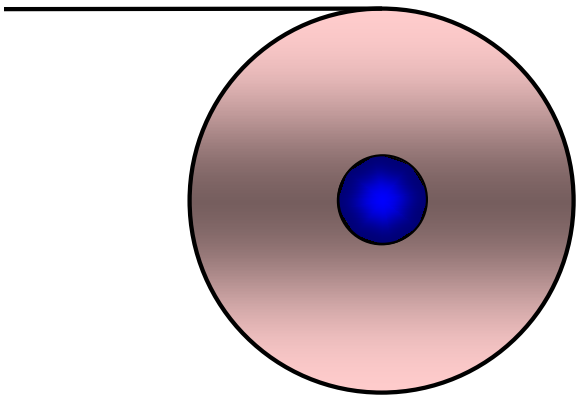
Nip Pressure Dynamics

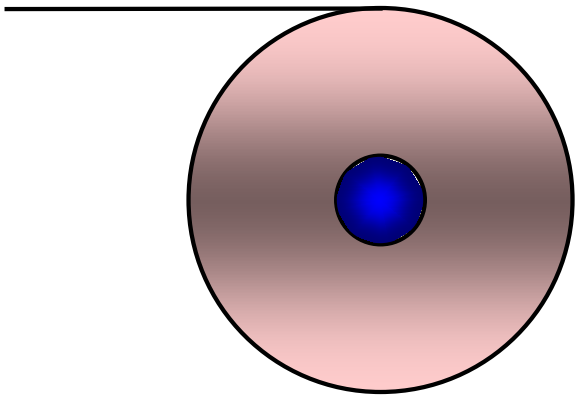


Center-Surface Winding

Putting everything together enables you to build good rolls.







So what is slowing you down?

Unbalance

Unbalance hinders throughput

Unbalance - to distribute a mass unequally **causing** the mass axis to differ from the bearing axis.

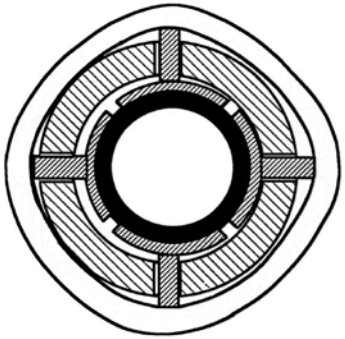
The common **cause** of **vibration** within **rotating machinery** equipment.

What unbalances and creates vibration at the winders?

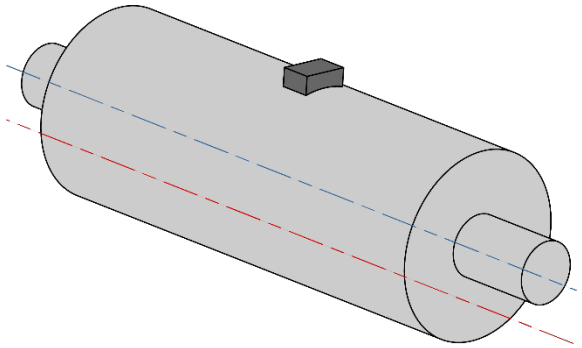
Critical Speed

$$N_{critical} = \frac{211}{\sqrt{\Delta_{defl}}}$$

Core Deformation



Eccentric Rotating Mass



Speed and Vibration

Critical Speed:

Rotational speed combined with deflection at which the winding product exceeds its natural resonant frequency

$$N_{critical} = \frac{211}{\sqrt{\Delta_{defl}}}$$

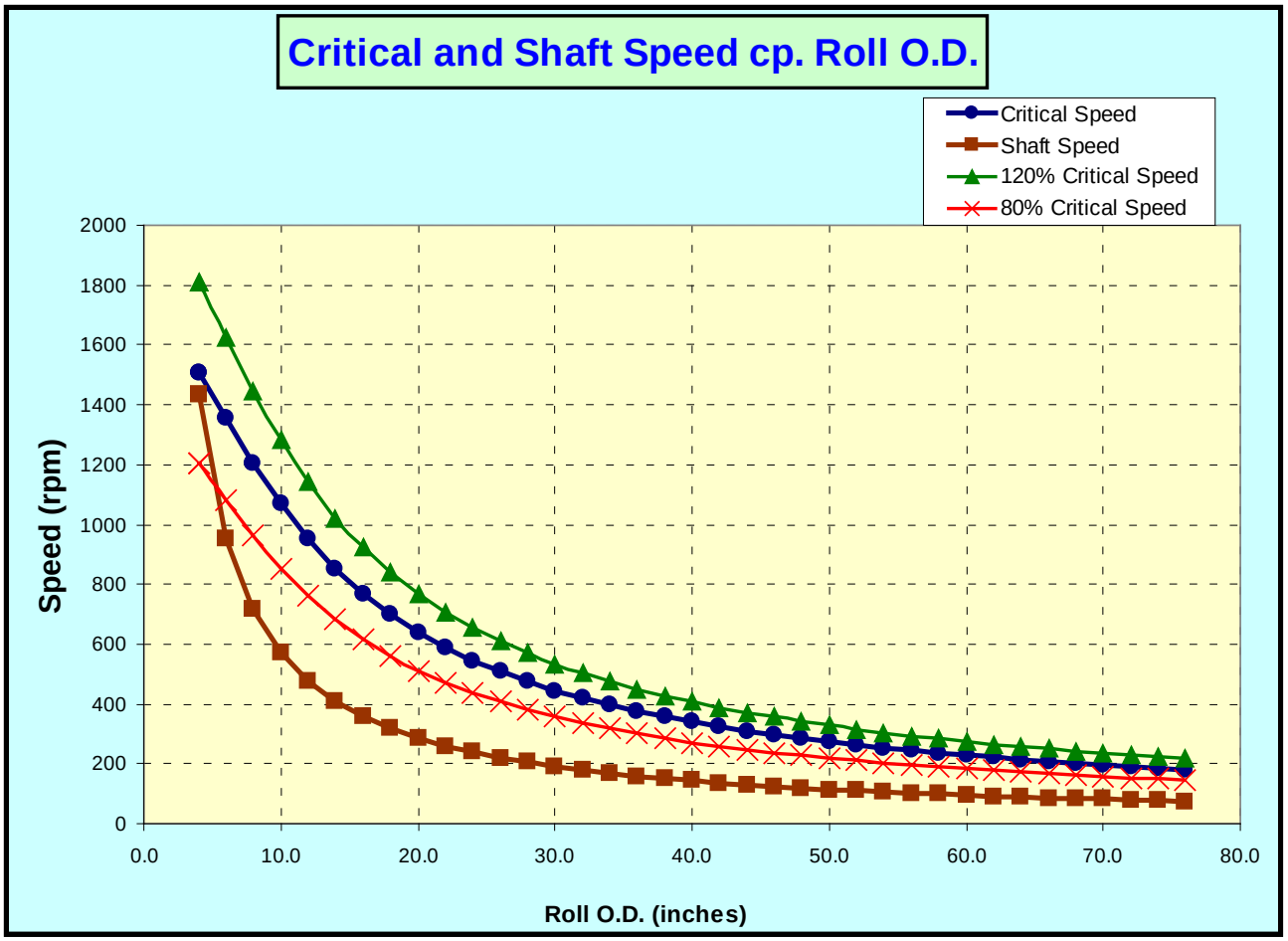
211 = Constant

N = Shaft Speed (RPM)

Δ = Shaft Deflection, in.

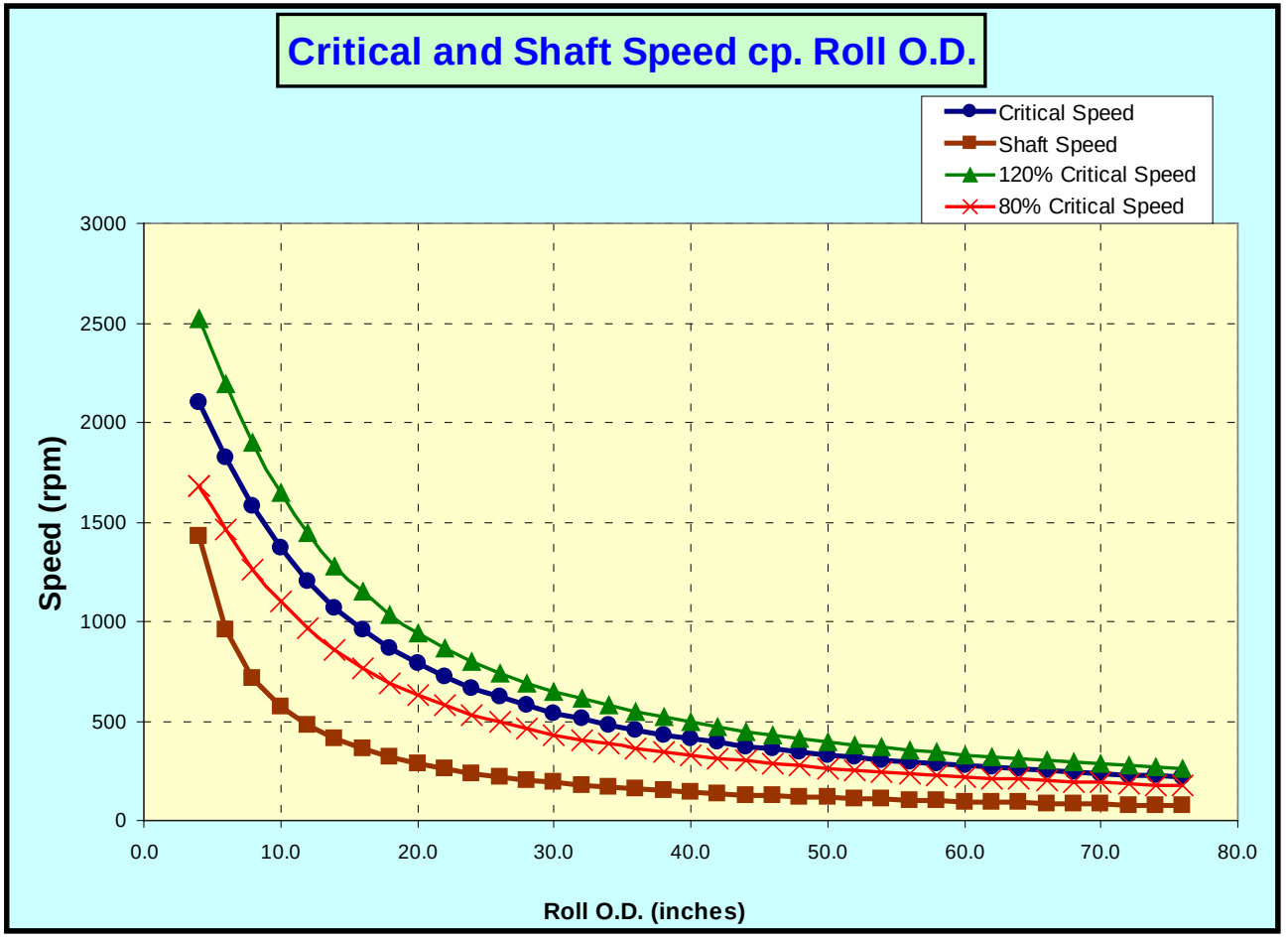
Affecting Critical Speed

Steel shaft critical speed curve

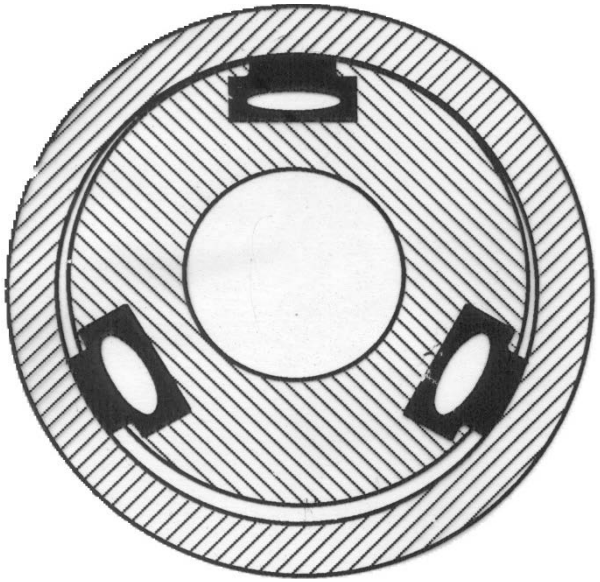


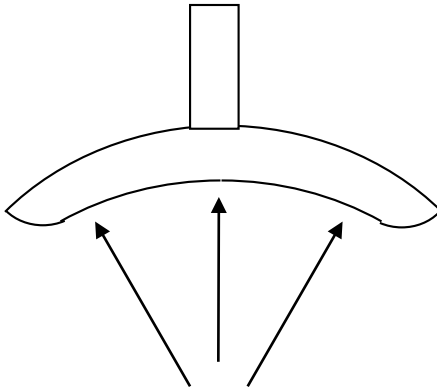
Affecting Critical Speed

Carbon fiber shaft critical speed curve

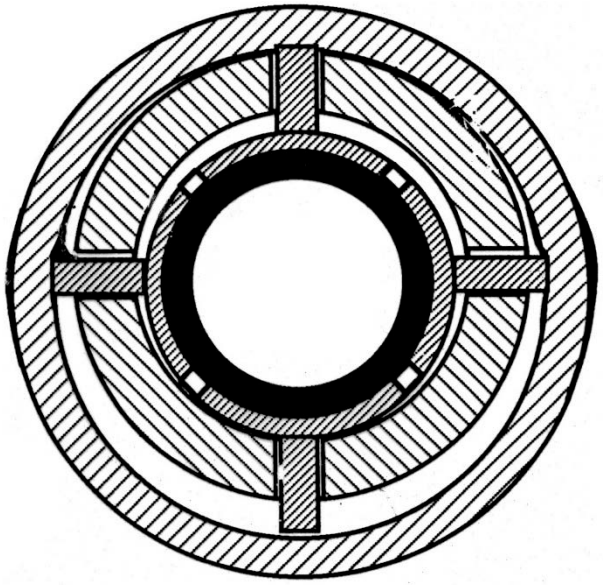


Shaft or chuck torque is created by pneumatic or mechanical force

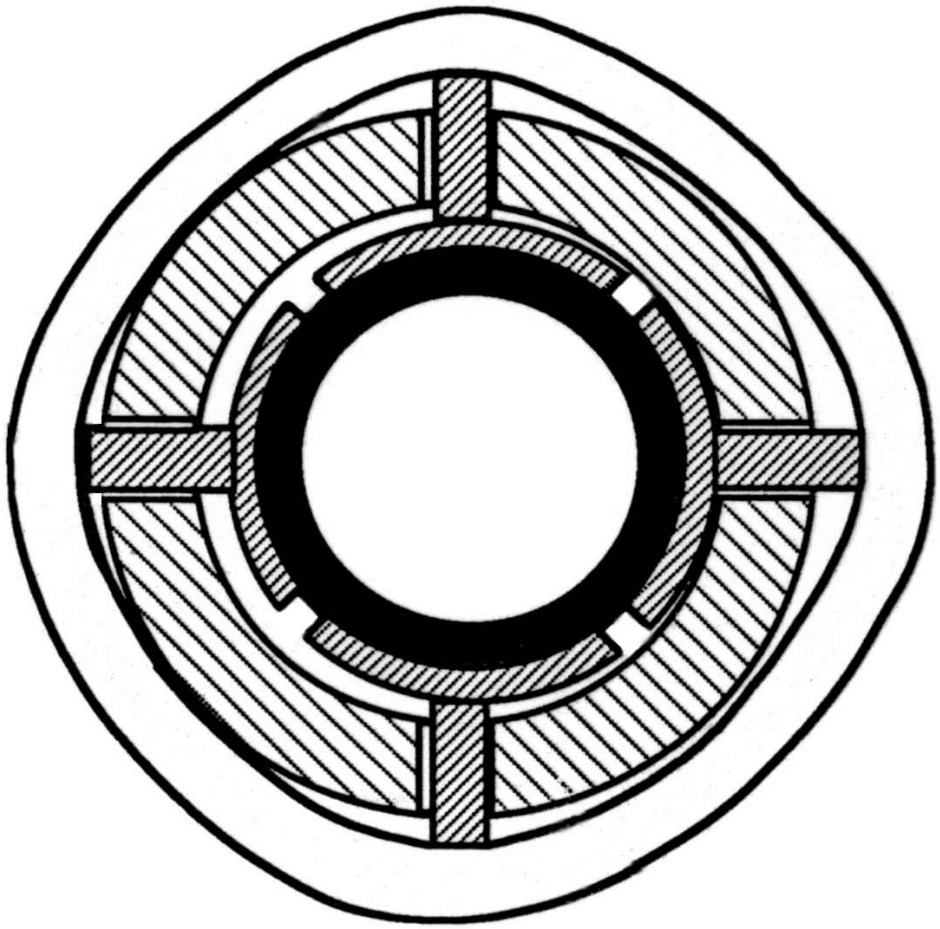




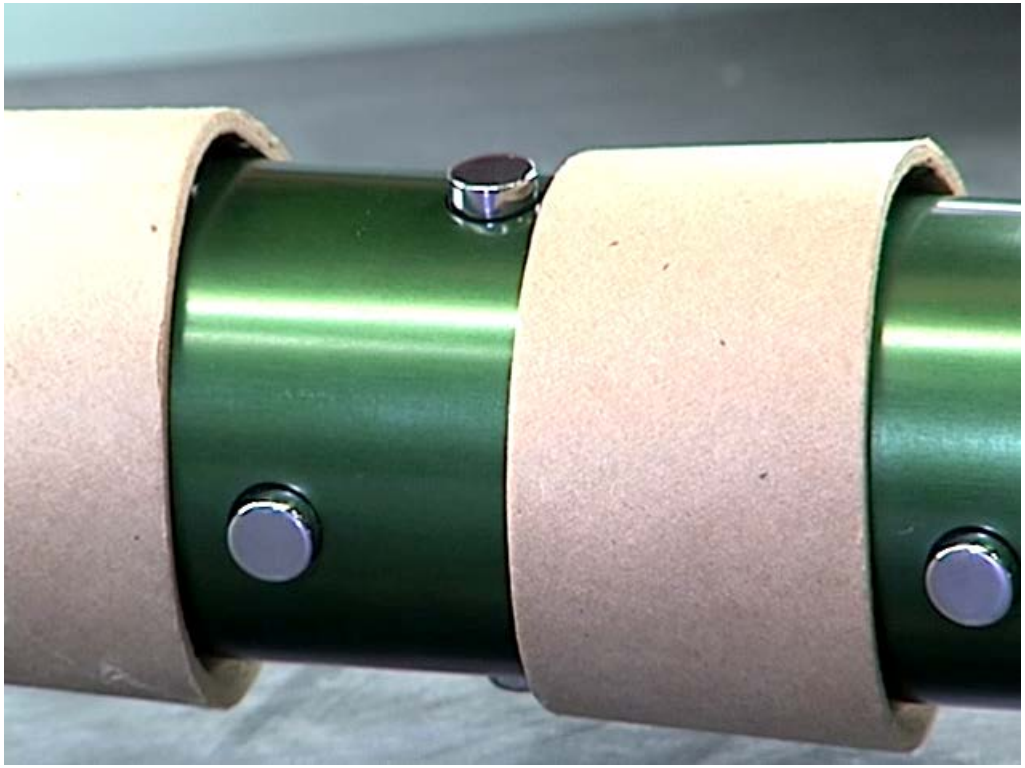
Pneumatic/Mechanical
Tangential Force



This can result in significant core deformation

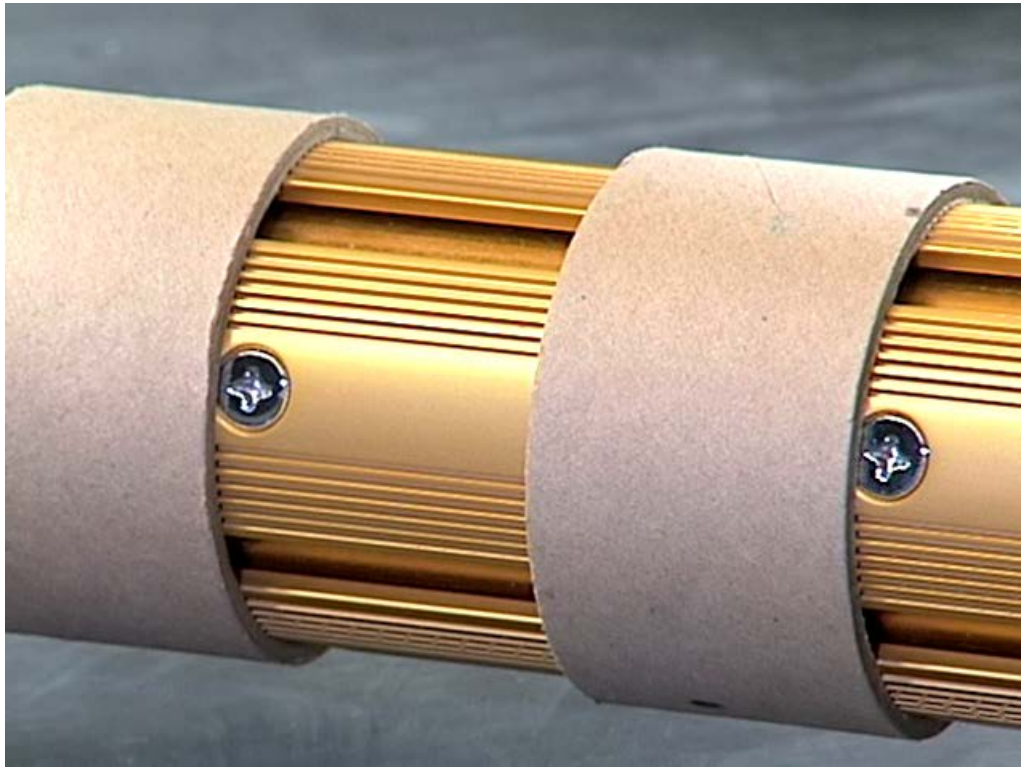


Core deformation can lead to vibration

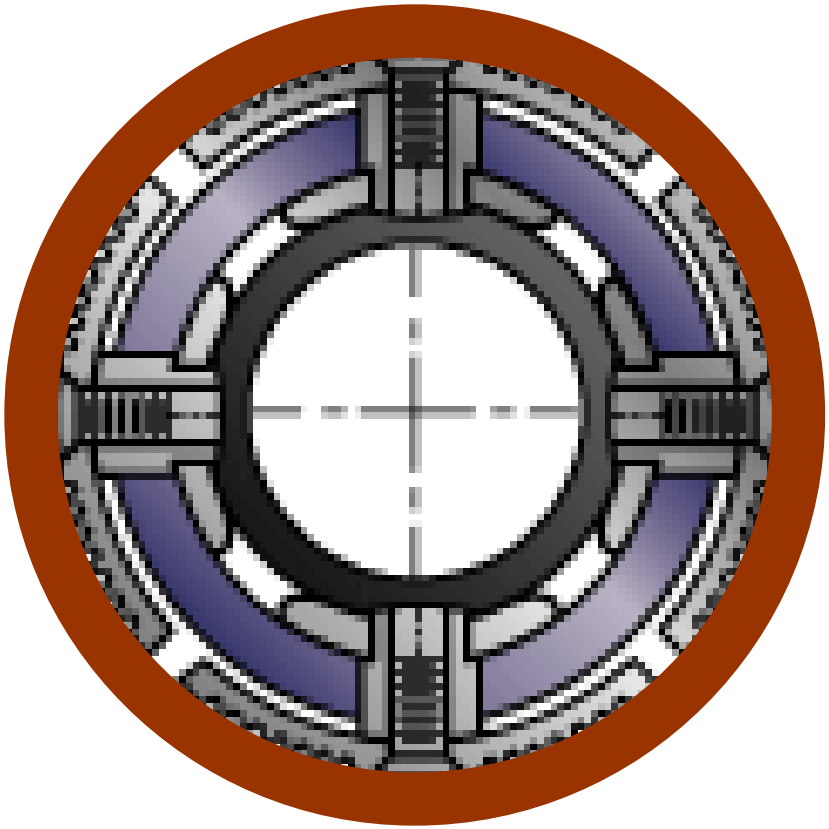


Core deformation can lead to tension defects

360° support minimizes core deformation



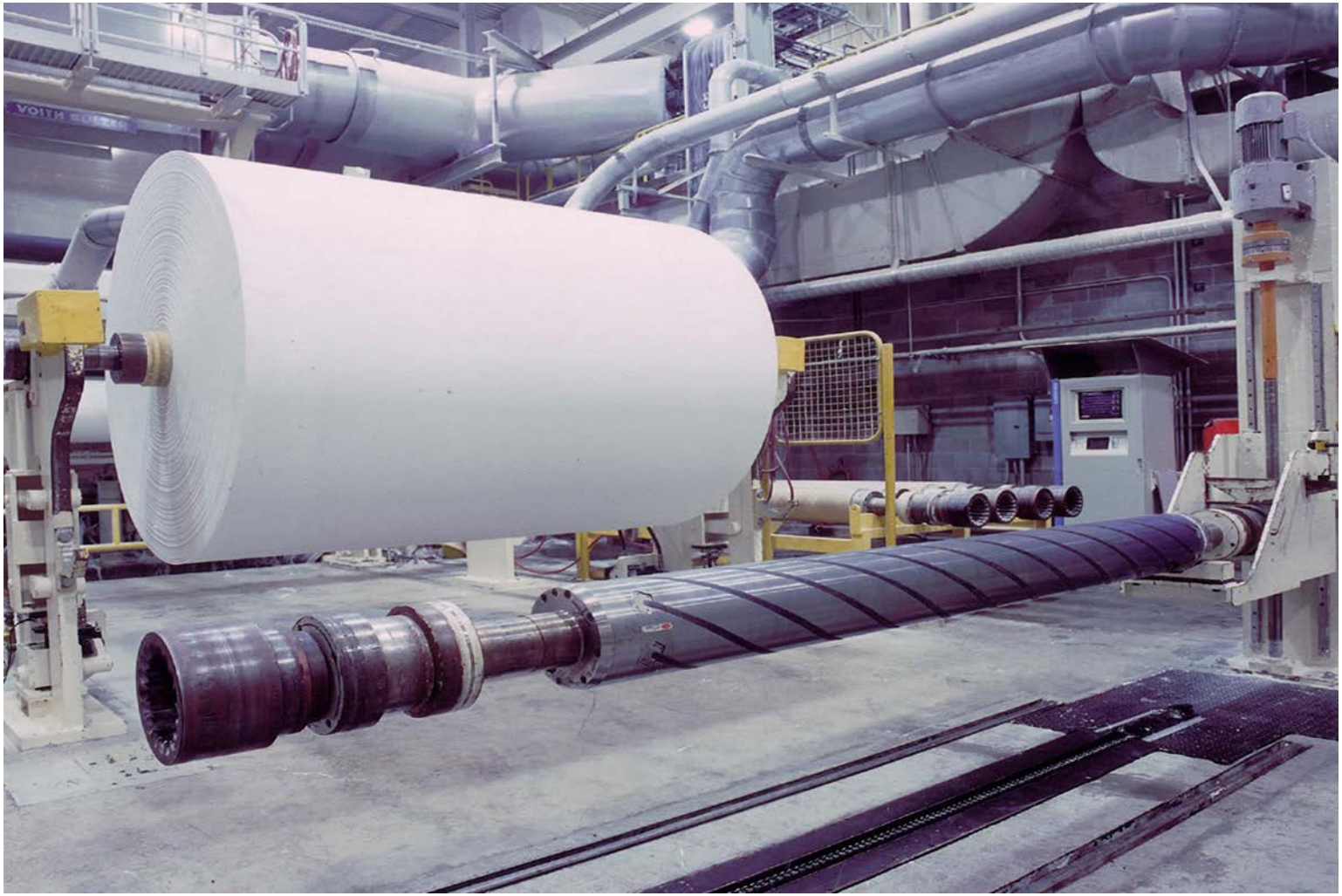
Minimize core deformation by supporting more surface of the roll/core



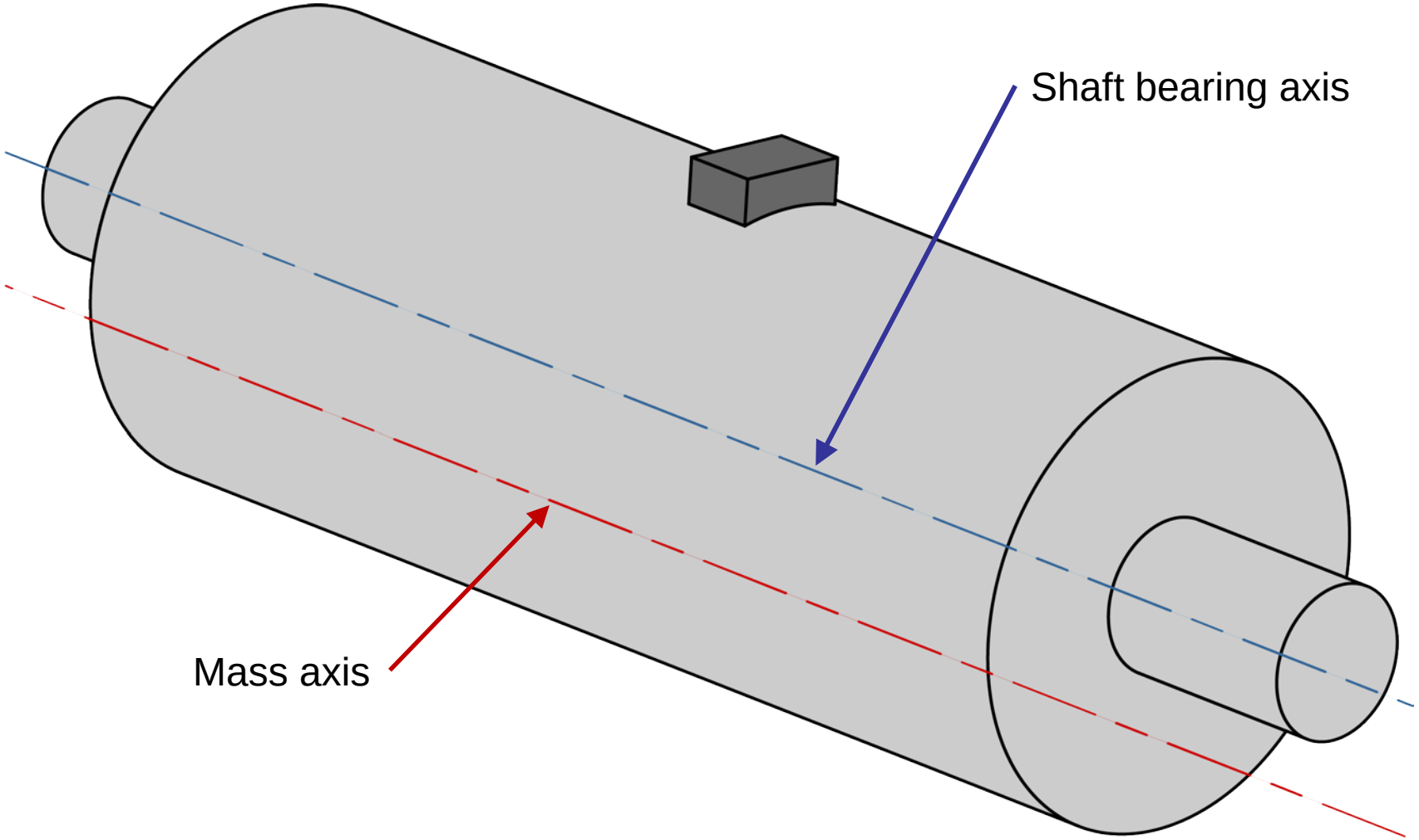
Center-Surface Winding

Spiral Air Shafts for surface winders provide 360 degree support to the core

Spiral Air Shaft for surface winders

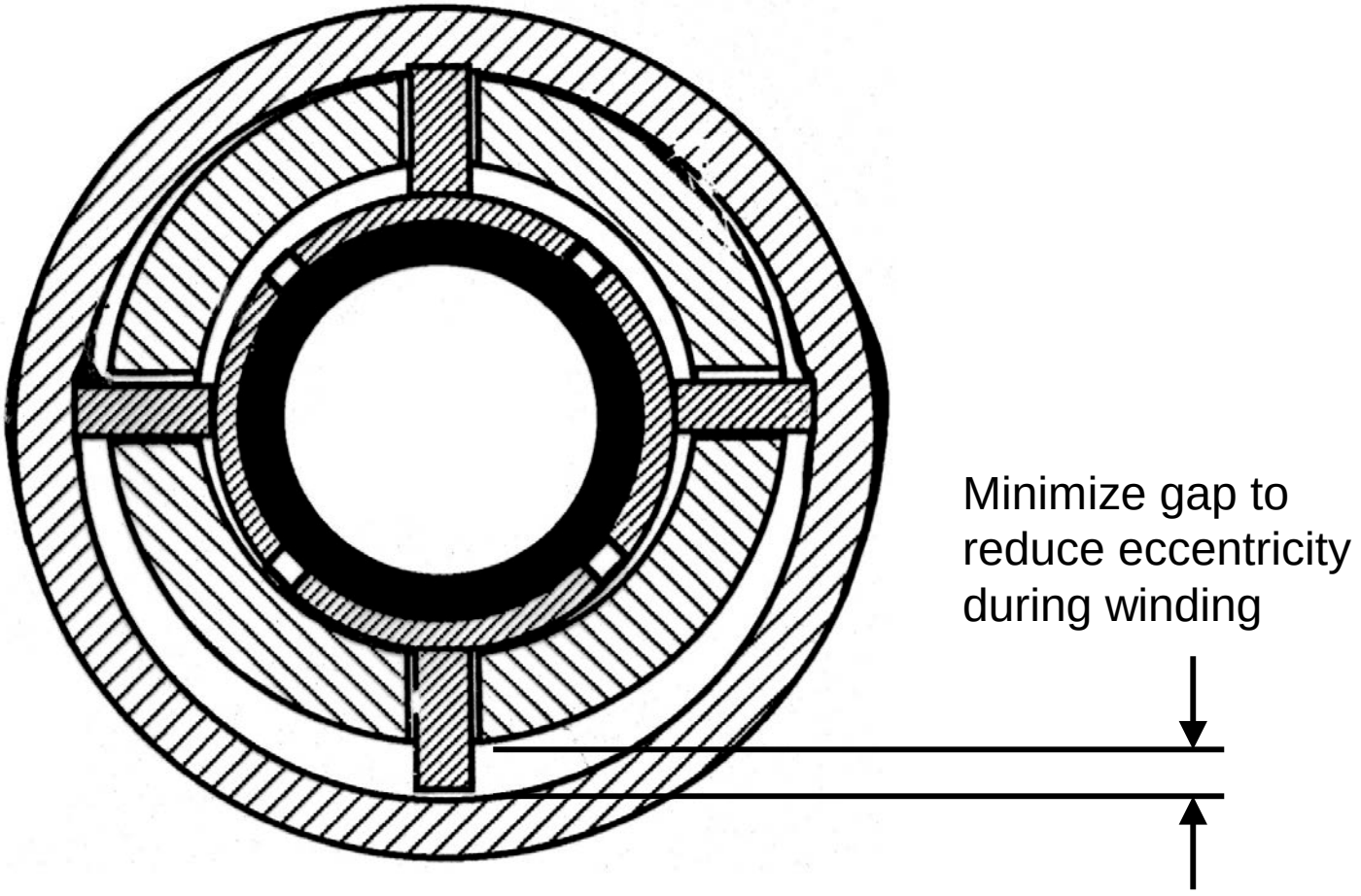


Eccentric Rotating Mass



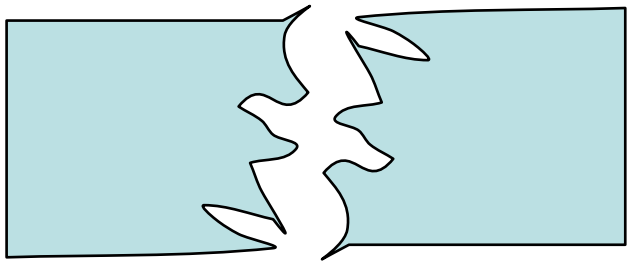
The key is the manage or eliminate the eccentricity

Unbalance created by shaft/core clearance

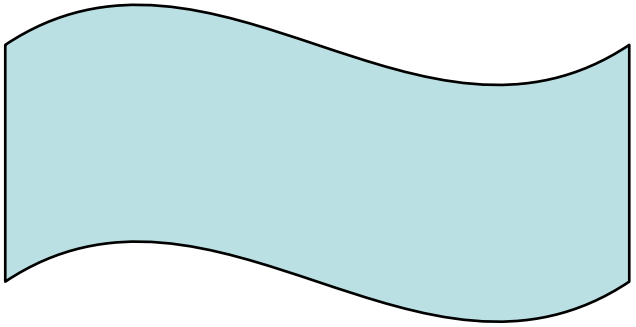


Tension effects in the web

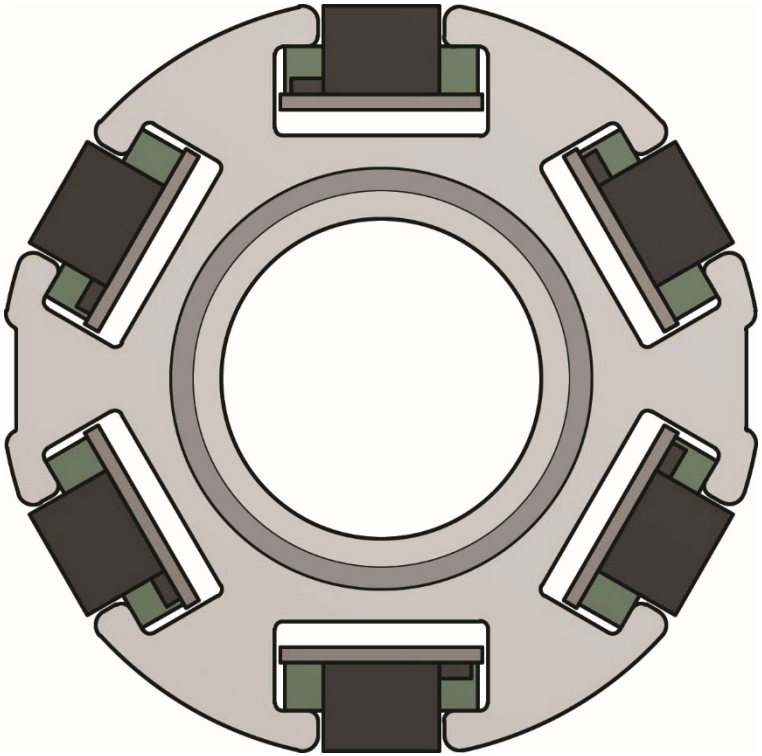
Web tension increases and breaks or roll will wind tight causing radial stress leading to telescoping



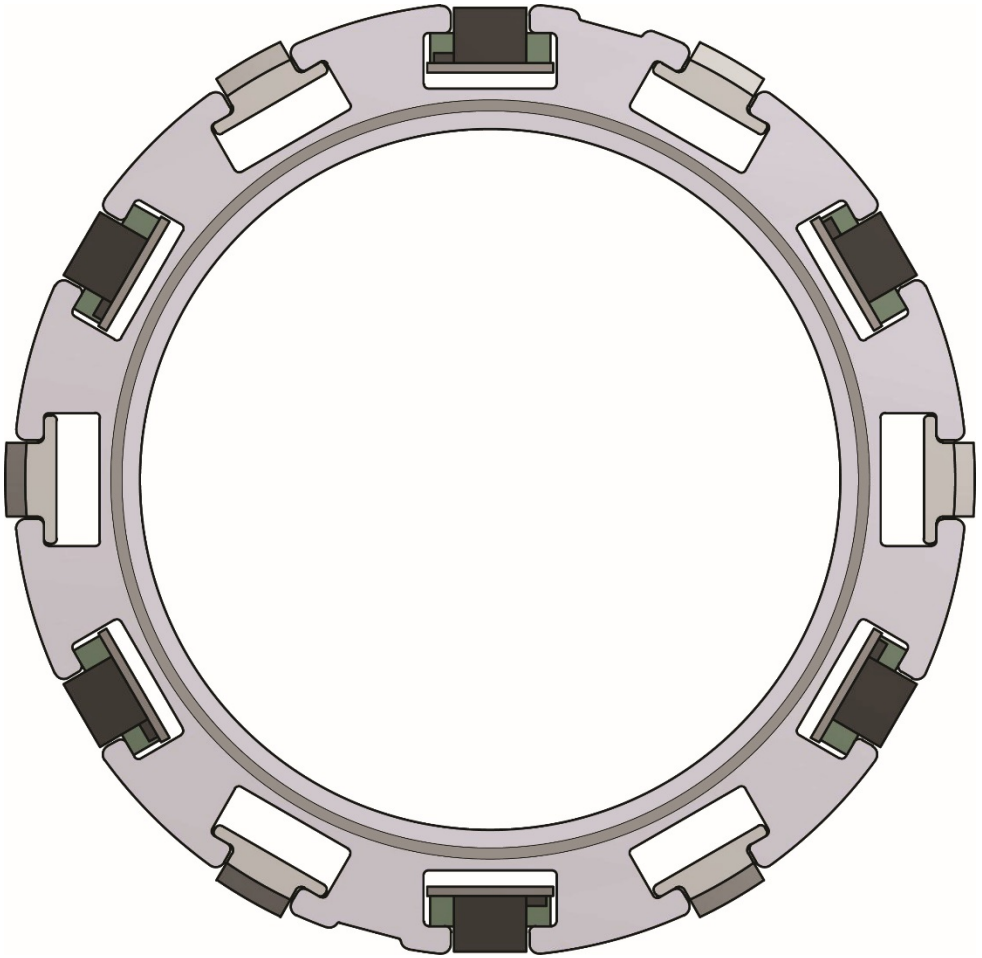
Web tension decreases causing slack roll resulting in loose wind leading to telescoping or dishing



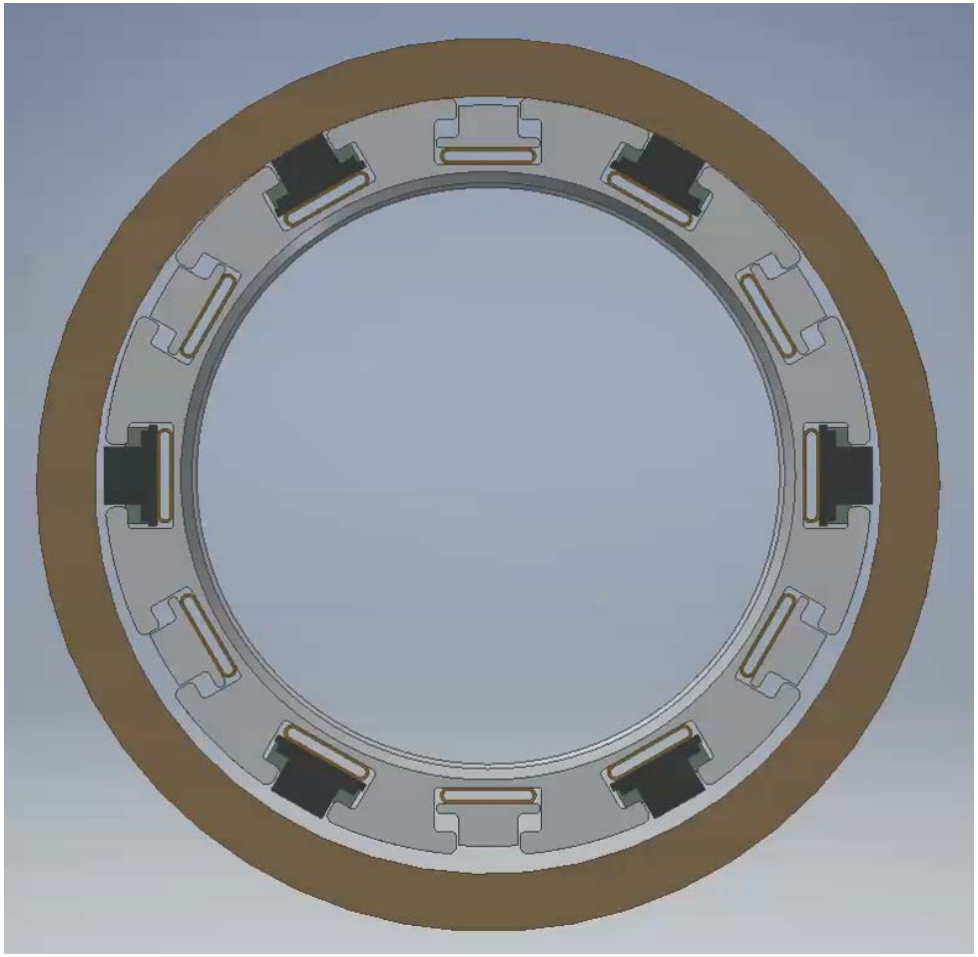
Multiple support points to the roll or core can significantly reduce eccentricity



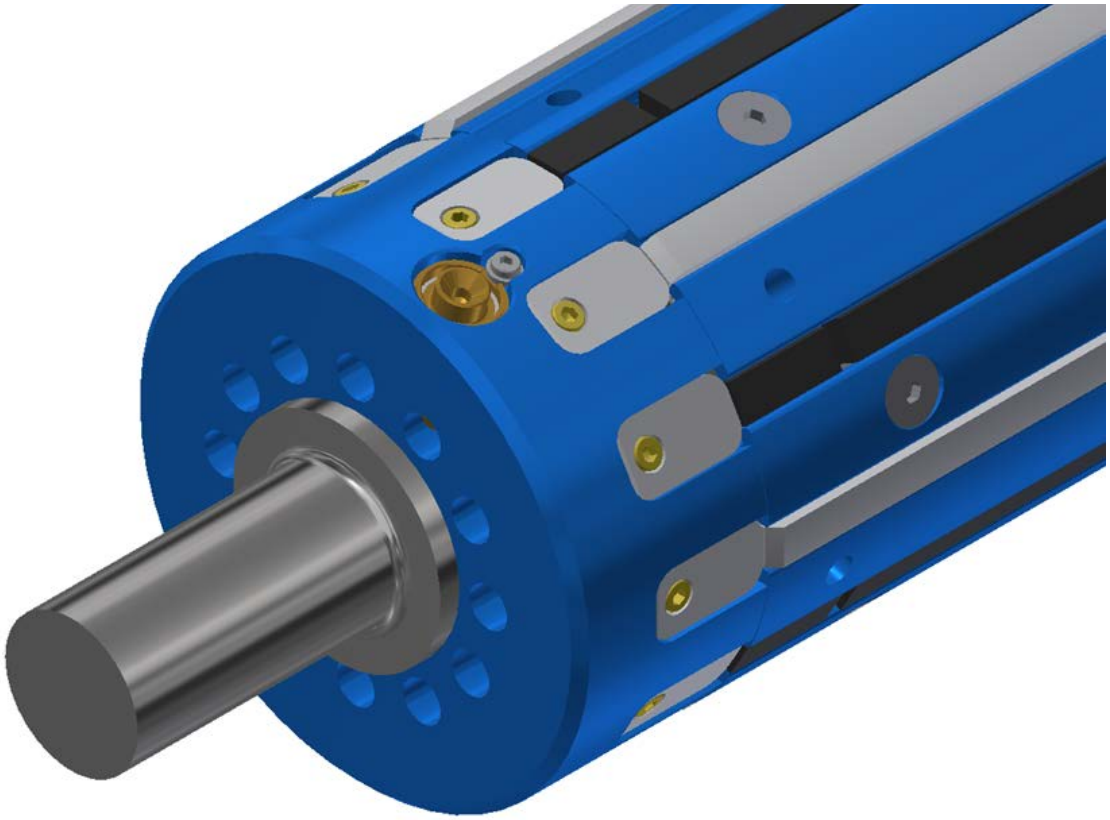
Centering shafts position the core or roll concentric to the axis of the shaft before applying torque



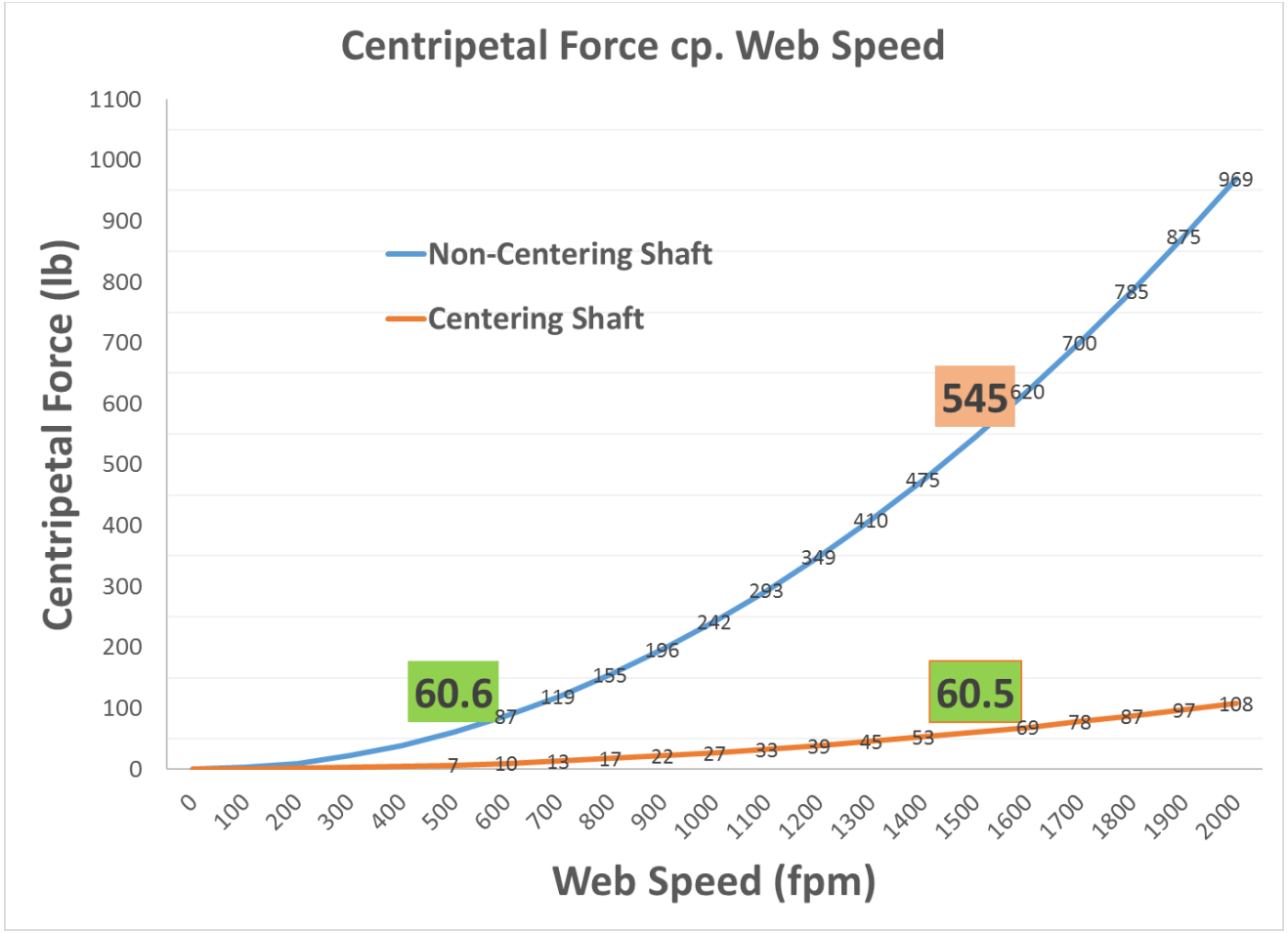
Roll/Core Centering



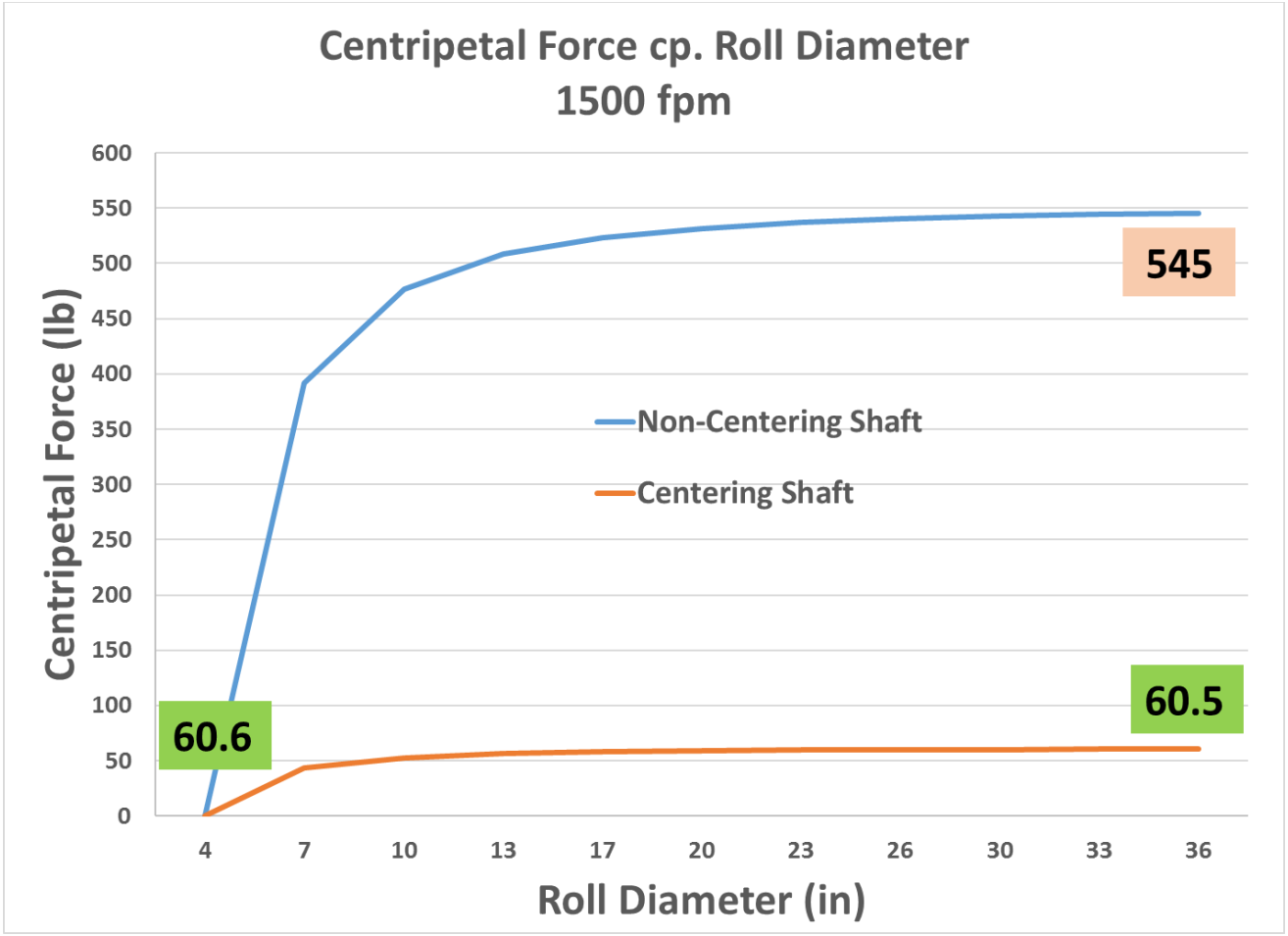
Centering shafts reduce imbalance enabling higher line speeds



Centripetal force due to imbalance requires lower operating speeds



Centripetal force due to imbalance reduces throughput



Applying the TNTs of Winding with shafts that manage the gap between the core and the shaft results in good quality rolls run at optimal production speeds.