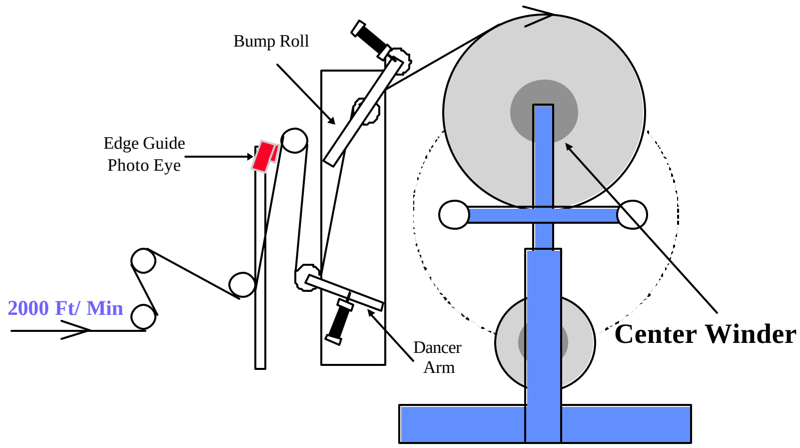
Center Winder Specification



Overview

Winding is simply a rotational means to take up and package material for more efficient handling or preparation for the next operation. A winder is used for rolling up material in a continuous or limited length of processed material such as wire, paper, film, metals and textiles.

Winders have different names in each industry.

Industry	Winder Name	Roll Name
Paper, Textile, Film	Winder	Roll
Textile	Beamer	Beam
Wire	Takeup, Reeler	Reel
Wire	Spooler	Spool
Metal	Coiler	Coil

Material Wound

Wound Materials may be extensible (Stretchable) or non-extensible (non-Stretchable). This paper will discuss both materials. The typical materials that would be wound are:

-Paper	- Metals and Foils
-Textile	- Fiber Glass Materials
-Plastic Film	- Wire and cable

Winder control

The motor RPM of the center wind varies with roll diameter and line-speed. The motor torque (which produces material tension) also varies with roll diameter and tension set point. In any given system, it is possible to **control only one variable at a time**. Center wind drives are broken up into two basic groups based on function. Either the center wind controls the speed of the material (*Speed regulated*); or the center wind controls the tension in the material (*Torque regulated*).

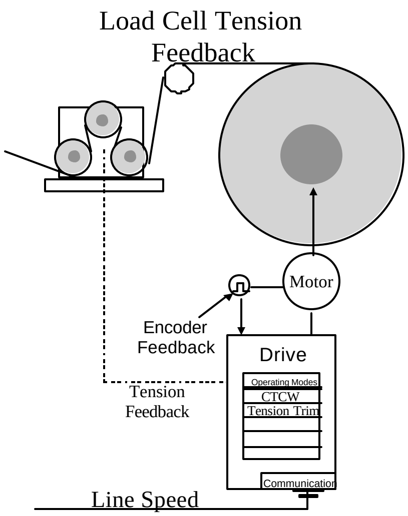


Figure 1

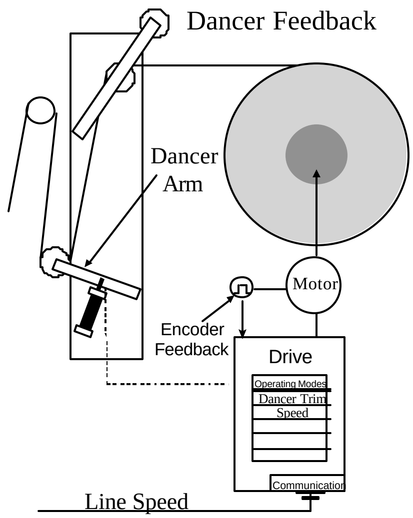


Figure 2

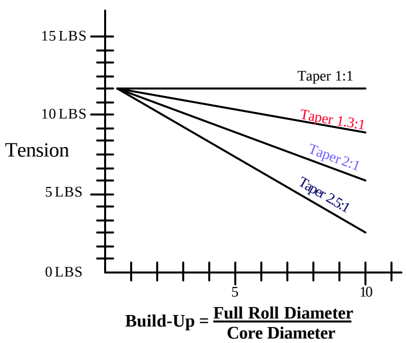
The *Torque regulated* center wind has the ability to run “open loop” or “closed loop”. Closed loop systems usually have an outer loop regulator with a feedback device typically comprised of a load cell (force transducer). *Reference figure 1 above*

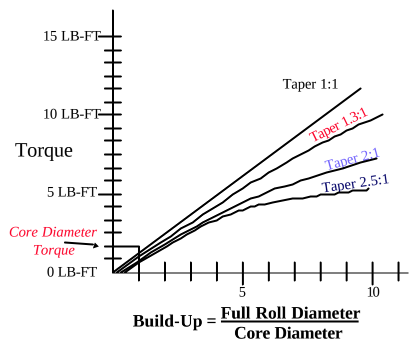
The *Speed regulated* Dancer trim center winder runs in closed loop with the outer loop regulator being a dancer feedback device. *Reference figure 2 above*

Tension Control

In order to have repeatable perfect rolls, the winder must wind material under conditions of constant tension, or tapered tension as the roll builds from core. In materials such as paper, film, and textiles, the material must have *taper*[*] so wound rolls do not become distorted. Without a *taper* tension profile, the tension on the inner layers becomes excessive and may deform the roll. To much taper may entrap air and cause a roll deformation known as “Starring”, due to slippage between layers.

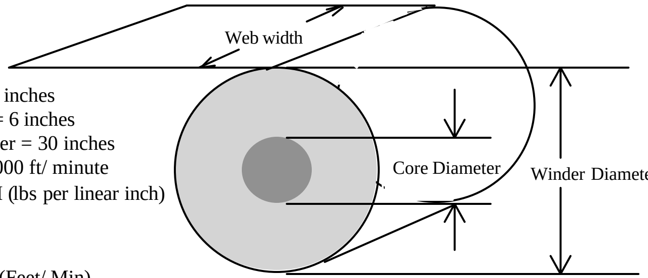
Tension trim provides direct tension control for a center wind drive by providing a trim adjustment to a torque control or a speed trim to a dancer control. Tension is measured and controlled by means of force transducers, (load cells) or dancer feedback directly actuated by the web tension. The controller will automatically adjust the motor speed to compensate for roll build-up, and compensate for changing roll inertia. Under normal operating conditions web tension is controlled, however speed follower control without trim is also provided for setup operation or as a maximum speed limit in the event of a web break.





Without taper tension, rolls tend to become distorted in shape due to the increasing torque transmitted through the inner layers of the material. The graph above shows how the tension of the material should decrease at the programmed rate.

Sizing Example



Example:

Web width = 72 inches
Core Diameter = 6 inches
Max roll diameter = 30 inches
Line Speed = 2000 ft/ minute
Tension = 4 PLI (lbs per linear inch)
Taper 2:1

$$RPM = \frac{\text{Line Speed (Feet/ Min)}}{\pi * \text{Diameter}}$$

Diameter = Diameter of winder Ft

Torque = total tension * radius

Total tension = total tension at Diameter
Radius = Diameter of winder/2
Total tension = PLI * Web width
Torque = lb * Ft

$$HP = \frac{\text{Torque * RPM}}{5250}$$

$$\text{Web HP} = \frac{\text{Total Tension * Line speed}}{33{,}000}$$

Line Speed = Ft / Minute
Tension = lbs

$$\text{Winding HP} = \frac{\text{Web HP * Build up ratio}}{\text{Taper Ratio}}$$

Total HP = Winding HP + Losses

Losses = 10 % * Winding HP

Steps

1. Tension = 72 inch * 4 PLI
   Tension = 288 lbs
2. $\text{Web HP} = \frac{\text{288 lbs * 2000 ft/ minute}}{33{,}000}$
3. Web HP = 17.45 HP
4. $\text{Winding HP} = \frac{\text{17.45 HP * 30inch/6inch}}{2}$
5. Winding HP = 43.6 HP
6. Total HP = 43.6 HP + 4.3HP = 47.9 HP

The horsepower rating of a constant torque drive for a 5:1 build up must be five times the actual required web horse power (17.45HP) in order to produce the required torque at full roll (87.25 HP). Now we take into consideration the taper requirement, which is 2:1. The required HP drops to 42.6 HP. The energy loss in the winder is typically 10% of the winding hp.

* Reduction of web tension as winder roll diameter increases.

Customer Data

Company Name	☐ End user ☐ Distributor ☐ OEM
Contract Name #1	Contract Name #1 e-mail
Contract Name #2	Contract Name #2 e-mail
Address	City
State	Zip
Phone	Fax

Machine Data

Type of material (paper, Te xtile, Plastic Film, Metals and Foils)____

Machine Design speed ______________ (Feet/ Minute[1]) Machine Design Core Diameters _______________ inches

Machine Design Max roll Diameter _______ inches Machine Design Max roll width _______________ inches

Web Width _________________ Inches Acceleration time _____ Sec deceleration time _____ Sec

Machine Design Tension ________________ PLI Taper Ratio ________________

Roll inertia ____________________________ $LB*FT^2$

Drive Data

Manufacture _________________________ Model # ___________________________________

Horse Power _________________________

Winder Drive ☐ New Application ☐ Retrofit

Existing Voltage ☐ 230VAC ☐ 460VAC ☐ 575VAC

Existing Drive system ☐ AC drive ☐ DC drive

Motor Data

Existing motor Manufacture ____________________ *Model #* ____________________________

New motor required ☐ Yes ☐ No

Existing motor full load ratings:

___________________AMPS

___________________Volt

___________________RPM (850, 1150, 1750)

Conduit Box location *if motor is to be replaced* ☐ F1 ☐ F2 ☐ F3 or ☐ NA

Existing Blower Motor. __________Voltage, _______ Amps or ☐ NA

Existing Encoder Manufacture _________________________________ ☐ NA

Existing Encoder ☐ Digital ☐ Analog AC ☐ Analog DC

Existing Encoder Manufacturer. ________________________ ☐ NA

Resolution Existing (PPR) _______ OR Volts/RPM _________

Encoder Pickup ☐ Optical ☐ Magnetic pickup

Existing Gear Box

Gear Box Ratio ______________

Existing Gear Box Manufacture ___________________ *Model #* __________________________

New Gear Box required ☐ Yes ☐ No

Existing Gear Box ratings:

__________________Gear Box Ratio

__________________Frame Size

__________________C Face

Drive Enclosure information

Ambient Temperature in control room __________ ^{o}F or ___________ ^{o}C

Existing Drive Enclosure ☐ NEMA 1 ☐ NEMA 12 ☐ NEMA 4X ☐ AIR CONDITIONING

New Enclosure Spec ☐ NEMA 1 ☐ NEMA 12 ☐ NEMA 4X ☐ AIR CONDITIONING

Enclosure options ☐ Duplex outle ☐ Lights ☐ Empty cabinet for future use

☐ Other ____

Existing Power Distribution[4]

☐ Isolation Transformer _____ KVA Primary Voltage________ AC Secondary voltage ________ AC

☐ Line Reactors Impedence __________(%) ☐ Load Reactors Impedence ___________ (%)

☐ Dynamic Braking Resistor: Duty Cycle i.e. 3%, 5% __________% Resistance ___________Ohms

Dynamic Resistor Power rating ____________ Watts

Drive Communication Requirements

[1] Ft/minute Max RPM * π * Core Diameter (Ft)

[4] The existing power distribution is required if MagneTek is providing a drive system

☐ Modbus Plus ☐ Modbus ☐ Device Net ☐ Profibus ☐ Arcnet LAN ☐ Other ________________

Drive Input Requirements

☐ Start ☐ Stop ☐ Forward ☐ Reverse ☐ Run
☐ Jog ☐ Taper on ☐ Preset Speed1 ☐ Preset Speed 2
☐ Other ____

Drive Output Requirements

☐ Drive alarm fault ☐ Drive severe fault ☐ Run ☐ Zero speed
☐ At speed ☐ Encoder feedback pass through (PGX card)
☐ Other ____

Comment [mkm1]: May need Analog output to replace the individual pump pressure sensors.

Analog Input

☐ speed reference ☐ 0-10VDC ☐ 4-20ma ☐ Other ____________________________________

Analog Output

☐ Drive Speed (Ft/minute) ☐ Bus Voltage ☐ Other ______________________________

Special Types of Control

☐ Drive system start ☐ Drive system stop ☐ Regenerative to fast stop - full current limit or ramped
☐ DC Bus Over Voltage Suppression (Used to prevent overvoltage tripping from an unbalanced load)
☐ In Window, or OK to feed product. ☐ Counter for # of parts produced
☐ Existing load cell information
☐ Existing Dancer information
☐ Other ____

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