Performance Increase In Existing Slitter/Rewinders By Upgrading Controls
Why upgrade an old slitter/rewinder?

- Over the years, product expectations have changed
  - Thinner Substrates
  - Roll Quality (density of the roll)
  - Fewer Splices allowed
  - Rolled Edges
  - Slit Quality

Performance Increase using Upgraded Controls
Why upgrade an old slitter/rewinder?

- Simplify Operation
- Increase Productivity
  - Decreased Scrap
  - Decreased Set-up Time
  - Decreased Edge Trim

Operating older winders is typically an “ART” not a “SCIENCE” and never “INTUITIVE”

= INCREASED PROFITS
Performance Increase using Upgraded Controls

Why upgrade an old slitter/rewinder?

- Maintenance
  - Decreased Required Maintenance
  - Easier to find replacement parts
  - Lower costs for parts
  - Commonality regardless of original machine brand

RESULT IS DECREASED DOWN TIME
STEP 1  WHAT ARE YOUR EXPECTATIONS?

1ST Law of Rebuilding

The higher the expectations, the higher the cost

- Yes, you can build a slitter/rewinder capable of slitting 3 inch wide x .001 inch thick polyethylene up to 72 inch wide x 18 gauge steel but, the cost is going to be 10x greater than buying two separate slitter/rewinders

2nd Law of Rebuilding

Once everyone has decided on a plan, do not deviate

- Changes made mid stream can completely kill a rebuild
Performance Increase using Upgraded Controls

STEP 2

Break down the machine to its core process

- Every “roll to roll” slitter/rewinder has:
  - Unwind
  - Rewind
  - Slitting System
  - Driven Roller (sets line speed)

Create Isolation Zones

![Diagram of machine process]

UNWIND ➔ NIP ➔ SLITTING SYSTEM ➔ S-WRAP ➔ REWIND ➔ DRIVEN ROLLERS
Performance Increase using Upgraded Controls

- Break down the machine to its core process
  - Driven Rollers (NIP or “S”-WRAP), provide isolation only if the web cannot pull through
    - Create Separate Zones
    - Also referred as Tension Zones
Performance Increase using Upgraded Controls

- **Core Process**
  - Number of Driven Rollers (Tension Zones), can vary
Performance Increase using Upgraded Controls

Application Example:

Application is a simple “3 Tension Zone” slitter rewind that the only driven roller is the slitting anvil.
Performance Increase using Upgraded Controls

- Application Example:

  Background
  Facility produces films used in industrial and military grade products

  Needed new slitter rewinder, received quotes from several sources. Pricing was from $180,000 - $300,000. Corporate turned down requisition.

  Facility received a 1980 model Slitter Rewinder that was going to be scrapped.

  Winder was rebuilt in house for $45,000
  - Differential Shafts
  - Knifeholders
  - Line controlled web guide
  - Tension control systems
  - New motors, gearbox, drives and control panel
Performance Increase using Upgraded Controls

Application Example:

Application Specifications
Slitter / Duplex Rewinder
Material Tape
- Unwind Width: 40-50 inch
- Slit Width: 1-12 inch
- Tension: .75-2 pli
- Line Speed 60 – 500 fpm
- Roll diameters: 3 inch core – 16 inch Full Roll

APPLICATION NOTES
- No plc were used
- Needed to be extremely simple to operate and maintain
- Required to produce high quality rolls and be repeatable
Performance Increase using Upgraded Controls

Break down the machine to its core process

- 3 Tension Zones

We will start with the Unwind Zone 1

ZONE 1

UNWIND

DRIVEN S-WRAP

ZONE 2

ZONE 3

REWIND

REWIND
Performance Increase using Upgraded Controls

- UNWIND SECTION (ZONE 1)

Add Web Guide

- Linear Bearings
- Electro Mechanical Actuator
Unwind is completely stripped to frame

Unwind is mounted to Linear bearings and base

Safety Chucks and mounting brackets are added

Safety chucks help to reduce shaft weight, decrease number of wear components and reduce backlash.

Add Composite Air Shaft

Shaft weight is dropped from 90 lbs to 35 lbs
Performance Increase using Upgraded Controls

- UPGRADING UNWI ND TENSION SYSTEM

Dancer was removed and replaced with load cells

Newer tension control Systems can handle out of round rolls

Infeed and outfeed idler rolls added to maintain wrap angle around load cells
Performance Increase using Upgraded Controls

- Upgrading Web Guide Sensor

Web guide sensors have made huge advances in the past few years.
Key Features: Line Mode

- Line Width Min – 0.5 mm
  \[(0.5\text{mm}/25.4 = 0.020\text{-inch})\]

- Line Width Max – 20 mm
  \[(20\text{mm}/25.4 = 0.787\text{-inch})\]

- Band Width – 30 mm
  \[(30\text{mm}/25.4 = 1.181\text{-inch})\]
Key Features: Pattern Mode

- One Dimensional Graphic Detection (Bar Codes)

- Band Width –
  30 mm / Bar Code = 20 mm
  (20mm/25.4 = 0.787-inch)

- Shortest Detectable Feature
  1.85 mm (0.007”) at 300 m/min
  3.70 mm (0.146”) at 600 m/min
  7.40 mm (0.291”) at 1,200 m/min
Performance Increase using Upgraded Controls

- Next Tension Zone
Performance Increase using Upgraded Controls

- Rewind and slitting section stripped to frame

- Differential Air Shafts added to rewind
  - Differential air shafts allow for individual roll tensioning
  - For multiple rolls on same shaft
Performance Increase using Upgraded Controls

- Original Gearbox, motor, pulleys, air clutches removed

- New Motor and gearbox added to S-Wrap/anvil shaft

  Sets line speed

- New Motors and gearbox added to rewind Differential Air Shafts

  Sets overspeed on Differential Air Shafts

No feedback required between Anvil Motor and Rewind Motors COMPLETELY INDEPENDENT
Performance Increase using Upgraded Controls

- Control of Gearbox and Motors

  S-WRAP MOTOR (anvil motor)
  - Anvil motor sets line speed
  - Motor is controlled by a basic ac drive.
  - Line speed is set by a potentiometer or, “arrow up/arrow down”, touch pad
Performance Increase using Upgraded Controls

- Ultrasonic sensor used with rewind Motion Control System for inverse diameter signal and taper tension

Motion control system (tension sensor input) is pre-designed from the manufacturer to utilize simple Inverter Duty a.c. motors
Performance Increase using Upgraded Controls

- Load cells added to rewind to measure actual tension
  - Load cells added to rewind to measure actual tension
  - Load cells send signal to motion control system (Tension System) to control air pressure to shaft
  - Idler rolls added to maintain wrap angle around load
Performance Increase using Upgraded Controls

Control of Gearbox and Motors

REWIND MOTORS

- Ultrasonic Sensor gives diameter feedback to Rewind Motion Control/Tension Control System) for Inverse Diameter and Taper Tension

- Basic electronic drive on S-Wrap gives feedback on line speed to Rewind Motion Control/Tension Control System

- Tension control system sends one signal to current to pressure transducer to control tension through differential air shaft and second signal to control line speed of rewind motors through basic electronic drive
Performance Increase using Upgraded Controls

- Upgraded slitter Rewinder
Thank you

Presented by:

Please remember to turn in your evaluation sheet...